

AUSTRAL ARCHAEOLOGY PTY LTD
ABN: 55 629 860 975
Info@australarch.com.au
www.australarchaeology.com.au



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YANCO CREEK MODERNISATION PROJECT: PART 2 – BILLABONG CREEK REGULATORS NEW SOUTH WALES

ABORIGINAL CULTURAL HERITAGE ASSESSMENT

FINAL REPORT

NSW DCCEW

2 June 2025



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Prepared by:	Brody Saccoccia, Madelaine Firth and Carmen Baulch
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EXECUTIVE SUMMARY

This report has been prepared for the Department of Climate Change, Energy, the Environment and Water (DCCEEW) and details the Aboriginal cultural heritage assessment of land associated with Hartwood Weir, Forest Creek Block Bank, Wanganella Weir and Wanganella Bypass Floodplain Channel, Hartwood and Wanganella, NSW. These sites cover Lot 1 DP707463, Lot 28 DP756330, Lot 27 DP756330 Lot 56 DP756322 (Hartwood Weir), Lot 7301 DP1162488 (Forest Creek Block Bank), Lot 7005 DP1024202, Lot 7004 DP1024203 and Lot 92 DP 756336 (Wanganella Weir and Wanganella Bypass Floodplain Channel) [the study areas]. Located 10 kilometres east of Conargo and 600 metres west of Wanganella, all study areas fall within the Deniliquin Local Aboriginal Land Council (DLALC) boundary. This assessment forms part of the broader Yanco Creek Modernisation Project's Billabong Creek Regulators initiative, *Part 2 of the Billabong Creek Regulators component of the Yanco Creek Modernisation Project*, aimed at water infrastructure improvements.

This Aboriginal Cultural Heritage Assessment (ACHA) was undertaken to assess the archaeological potential for Aboriginal material as part of an Environmental Impact Statement (EIS) for a State significant infrastructure (SSI) being prepared under Part 5.2 of the *Environmental Planning and Assessment Act 1979*, before the proposed construction and replacement of the Hartwood Weir, Forest Creek Block Bank, Wanganella Weir and Wanganella Bypass Flood Channel study areas. The ACHA has been undertaken in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (Department of Environment Climate Change and Water NSW 2010).

The background research conducted as part of this ACHA identified 13 previously registered sites within 10 kilometres of the study area with two of these AHIMS sites located in close proximity to the study areas and consisting of modified trees. No previously registered sites were recorded within the study area.

An archaeological survey of the Hartwood Weir, Forest Creek Block Bank, Wanganella Weir, and Wanganella Flood Bypass Channel study areas identified eight new Aboriginal sites and re-identified two previously recorded sites. One previously recorded site could not be relocated. The findings include 6 modified trees, 3 earth mounds and one modified tree with a potential archaeological deposit (PAD). The site that was unable to be relocated was recorded as a modified tree.

The Aboriginal sites identified during this ACHA are described, along with their significance and degree of harm, in the table below:

Site / AHIMS	Aboriginal cultural heritage values	Significance	Impact
Forest Creek Block Bank Scarred Tree 2 / AHIMS # 54-3-0031	Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031) is a scar tree in good condition and is not associated with any other sites. This form of scar tree is common within the surrounding region; however, scar trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031) has a moderate scientific value at a local level.	Moderate	This site will be partially harmed through trimming and removal of branches. The impact is considered minimal. The site is to be managed through the preparation of an Aboriginal Cultural Heritage Management Plan.

Site / AHIMS	Aboriginal cultural heritage values	Significance	Impact
Forest Creek Block Bank Scarred Tree 3 / AHIMS # 54-3-0034	Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) is a scarred tree in good condition and is not associated with any other sites. This form of scarred tree is common within the surrounding region; however, scarred trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) has a moderate scientific value at a local level.	Moderate	This site was unable to be relocated during Austral's survey. If it is relocated the recommendation is to, avoid the site. The drip line of the tree using site extents from the site card should be the buffer zone.
Forest Creek Block Bank Scarred Tree 4 / AHIMS # 54-3-0057	Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) is a scar tree in good condition and is not associated with any other sites. This form of scar tree is common within the surrounding region; however, scar trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) has a moderate scientific value at a local level.	Moderate	This site will be partially harmed through trimming and removal of branches. The impact is considered minimal. The site is to be managed through the preparation of an ACHMP.
Forest Creek Block Bank Earth Mound 1 / AHIMS # 54-3-0058	Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058) contains high scientific value at a local level. This earth mound is isolated from other earth mounds and is uncommon within the surrounding region. Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058) contains both educational and research potential as well as being a representative example of an earth mound.	High	No impact, the site can be avoided.
Hartwood Weir Scarred Tree 4 / AHIMS # 54-3-0059	Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) is a scarred tree in good condition and is not associated with any other sites. This form of scarred tree is common within the surrounding region; however, scarred trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) has a moderate scientific value at a local level.	Moderate	The site cannot be avoided and will be destroyed. Managed through the preparation of an ACHMP.
Hartwood Weir Scarred Tree and PAD / AHIMS # 54-3-0055	Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055) contains two components; a scarred tree in good condition, and an associated potential archaeological deposit (PAD). This type of associated site is uncommon within the surrounding region, and, although scar trees are a declining cultural site since they are dependent on the life of the tree, the associated PAD contains both educational and research potential. Therefore, Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055) has a high scientific value at a local level.	High	No impact, the site can be avoided. The drip line of the tree is to be used as the buffer zone.

Site / AHIMS	Aboriginal cultural heritage values	Significance	Impact
Hartwood Weir Earth Mound 1 / AHIMS # 54-3-0054	Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) contains high scientific value at a local level. This earth mound is isolated from other earth mounds and is fairly common within the surrounding region. Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) contains both educational and research potential as well as being a representative example of an earth mound.	High	No impact, the site can be avoided.
Hartwood Weir Earth Mound 2 / AHIMS # 54-3-0056	Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056) contains a high scientific value at a local level. This earth mound is associated with Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) and is fairly common within the surrounding region. Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056) contains both educational and research potential as well as being a representative example of an earth mound.	High	No impact, the site can be avoided.
Hartwood Weir Hearth / AHIMS # 54-3-0061	Hartwood Weir Hearth (AHIMS # 54-3-0061) contains a high scientific value at a local level. This hearth is isolated and is a common site type within the surrounding region. Hartwood Weir Hearth (AHIMS # 54-3-0061) contains limited educational and research potential and is a representative example of a hearth.	Moderate	The site cannot be avoided and will be destroyed. Managed through the preparation of an ACHMP.
Wanganella Weir Scarred Tree 1 / AHIMS # 54-2-0263	Wanganella Weir Scarred Tree 1 (AHIMS # 54-2-0263) is a scarred tree in good condition and is not associated with any other sites. This form of scarred tree is common within the surrounding region; however, scarred trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) has a moderate scientific value at a local level.	Moderate	No impact, the site can be avoided. The drip line of the tree should be the buffer zone.
Wanganella Weir Scarred Tree 3 / AHIMS # 54-2-0264	Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264) is a scarred tree in good condition and is not associated with any other sites. This form of scarred tree is common within the surrounding region; however, scarred trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) has a moderate scientific value at a local level.	Moderate	The site cannot be avoided and will be destroyed. Managed through the preparation of an ACHMP.

ABORIGINAL COMMUNITY CONSULTATION

Consultation with Aboriginal stakeholders has been completed in accordance with the Consultation Requirements (DECCW 2010a). This consultation process commenced in 2021 by 3Rivers. A summary of this process is included below.

Stage	Component	Commenced	Completed
Stage 1	Letters to agencies by 3Rivers	25/08/2021	N/A
	Registration of stakeholders by 3Rivers	31/08/2021	21/12/2022
Stage 2	Project information by 3Rivers	01/03/2022	09/05/2023
Stage 3	Review of project methodology by 3Rivers	12/04/2022	19/12/2022
Stage 4	Review of ACHA by Aboriginal stakeholders by Austral	03/06/2024	01/07/2024
		28/03/2025	11/04/2025

Further information on the consultation completed for the project can be found in Section 2 and Volume 2 associated with this report.

RECOMMENDATIONS

The following recommendations are derived from the findings described in this ACHA. The recommendations have been developed after considering the archaeological context, environmental information, consultation with the local Aboriginal community, the findings of the archaeological survey and the predicted impact of the planning proposal on archaeological resources.

It is recommended that:

1. All ground-disturbing works to the following earth mounds and potential archaeological deposit (PAD) site must be avoided, specifically:

- Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058),
- Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055),
- Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) and
- Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056),

Traditional Owners must be involved in monitoring works to ensure the protection of these sites from the proposed works. Specific site protection conditions include:

- i. Four Aboriginal cultural heritage sites are in close proximity to the access tracks. Prior to the commencement of works, these sites must be fenced off using temporary flagging to ensure no disturbance occurs, specifically:
 - Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058),
 - Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055),
 - Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) and
 - Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056),
 - ii. All vehicles must keep to the access tracks.
 - iii. An exclusion line using bollards is to be erected to the south of Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) and Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056) to ensure that no vehicles drive in close proximity to sites.
2. The following culturally modified (scar) trees are to have no ground-disturbing works within the canopy dripline, damage to their trunks or limbed removed and/or damaged this includes
 - Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055),
 - Wanganella Weir Scarred Tree 1 (AHIMS # 54-2-0263) and
 - Forest Creek Block Bank Scarred Tree 3 (AHIMS # 54-3-0034)

- i. Temporary flagging must be erected to ensure the preservation of these sites and Traditional Owners must be involved in monitoring works to ensure the protection of these sites from the proposed works.
3. Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059), Hartwood Weir Hearth (AHIMS # 54-3-0061), Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031), Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264) and Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) will be impacted by the proposed works and are to be managed in accordance with recommendations 4, 5 and 6 below.
4. The Conditions of Approval must state that impacts the following sites must be managed under the preparation of an Aboriginal Cultural Heritage Management Plan (ACHMP):
 - Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059): digital recording of the tree using LIDAR scanning and casting of the scar; followed by careful removal of the tree avoiding damage to the cultural modification of the tree,
 - Hartwood Weir Hearth (AHIMS # 54-3-0061): including archaeological salvage of the site with RAPs present,
 - Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031): trimming to be conducted by qualified arborist and under supervision of RAPs,
 - Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057): trimming to be conducted by qualified arborist and under supervision of RAPs, and
 - Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264) digital recording of the tree using LIDAR scanning and casting of the scar; followed by careful removal of the tree avoiding damage to the cultural modification of the tree.
5. The ACHMP at a minimum, must include protocols for:
 - i. Minimisation and managing the impacts of the project on heritage items within the disturbance area.
 - ii. Protecting the heritage items outside the project disturbance area.
 - iii. Managing the discovery of human remains or previously unidentified heritage items based on Water NSW's unexpected finds protocol.
 - iv. Ensuring any workers on site receive suitable heritage inductions prior to carrying out any work on site.
 - v. Monitoring and reporting on the effectiveness of any mitigation measures and any heritage impacts of the project.
 - vi. Maintaining and managing reasonable access for registered Aboriginal parties (RAPs) to heritage items on site.
 - vii. Conducting further archaeological and heritage assessments in any disturbance areas where this assessment has not already been carried out.
 - viii. Be developed in consultation with RAPs and Heritage NSW.
6. This assessment covers the harm to all known cultural heritage sites. In the event that unexpected finds occur during the proposed construction activities, an unexpected finds process must be followed. This process will be developed as part of the recommended ACHMP prior to the proposed works' commencement.
 - i. If human skeletal remains are encountered, all work must cease immediately and NSW Police must be contacted, they will then notify the Coroner's Office. Following this, if the remains are believed to be of Aboriginal origin, then the Aboriginal stakeholders and Heritage NSW must be notified.
7. It is recommended that DCCEEW continues to inform the Aboriginal stakeholders about the management of Aboriginal cultural heritage within the study area throughout the completion of the project. The consultation outlined as part of this ACHA is valid for six months and must be maintained by the proponent for it to remain continuous. If a gap of more than six months occurs, then the consultation will not be suitable to support an ACHMP for the study areas.
8. A copy of this report should be forwarded to all Aboriginal stakeholder groups who have registered an interest in the project.

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1 INTRODUCTION

Austral Archaeology Pty Ltd (Austral) has been commissioned by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) of New South Wales (NSW) [the proponent] to undertake an Aboriginal Cultural Heritage Assessment (ACHA) for the proposed works associated with 'Part 2 – Billabong Creek Regulators' of the Yanco Creek Modernisation Project, including the study areas of the Hartwood Weir, Forest Creek Block Bank, Wanganella Weir and Wanganella Bypass Flood Channel [the study areas]. The location of the study area is shown from Figure 1.1 to Figure 1.10.

1.1 THE PROPOSAL

The proposal involves replacing two existing weirs along Billabong Creek with two new regulators. The proposal is summarised as:

- Construction of the Hartwood and Wanganella Regulators immediately downstream of the existing weirs. Each regulator structure would include;
 - concrete piers with maintenance bulkhead slots, concrete apron downstream of the structure concrete wingwalls upstream and downstream of the structure, fixed concrete crests and automated layflat gates across the crest of the structure to assist with flow management
 - a fishway comprising a low turbulence 'keyhole' type vertical slot fishway with allowances for variable headwater to provide upstream fish passage and automated sidewinder gates within the vertical slot fishway to allow for variable headwater conditions
 - regulator access from a trafficable deck (Hartwood Regulator only) and a pedestrian walkway access part way across Wanganella Regulator structure for maintenance
 - regulator automated controls comprising an electrical control house and Supervisory Control and Data Acquisition (SCADA) control system
 - ancillary works including fencing of the structures to prevent public access, crushed rock maintenance pads, access and turnaround areas adjacent to the structure and rock beaching upstream and downstream of the structure for erosion protection.
- Replacement of the Forest Creek Block Bank, associated with the Hartwood Regulator, with a similar earthen structure in the same location.
- Construction of the Wanganella flood bypass channel to reduce potential upstream flooding impacts from the Wanganella Regulator.
- Extension of an existing borrow pit near Hartwood Weir to provide material for the construction of Hartwood Regulator and Forest Creek block bank.

1.2 THE STUDY AREA

Each study area consists of an impact area and an access track. The impact areas consist of a construction zone associated with Hartwood Weir, Forest Creek Block Bank, Wanganella Weir and Wanganella Flood Bypass Channel, access tracks for each study area, a borrow pit for Hartwood Weir and a construction laydown zone for Hartwood Weir and Forest Creek Block Bank. The Wanganella Weir construction zone comprises Lot 7005 DP1024202, while the Forest Creek Block Bank study area is in a portion of Lot 7301 DP1162488. The Hartwood Weir study area consists of portions of Lot 27 DP756330, Lot 28 DP756330, Lot 56 DP756322 and Lot 1 DP707463. The Wanganella Bypass Flood Channel is in a portion of Lot 7004 DP1024203 and a portion of Lot 92 DP756336.

The Forest Creek Block Bank study area contained three options for access tracks. Prior to the survey, the access track was located to the south-east of the study area (purple access track in Figure 1.3). During the survey, an earth mound was identified in very close proximity to this proposed access track, and the RAPs identified this as an issue. An alternative access track was proposed by DCCCEW, which veered west of the original track to the south of the earth mound (orange access track in Figure 1.3). This access track was not agreed upon, so another access track was suggested, which avoided the earth mound completely (green access track in Figure 1.3).

All four study areas are located within the Edward River Local Government Areas (LGA), and the parish of Wodonga in the county of Townsend. They are also within the boundaries of the Deniliquin Local Aboriginal Land Council (DLALC).

The location of the study areas is shown in Figure 1.1 to Figure 1.10.

1.3 PURPOSE OF THE ACHA

The ACHA has been undertaken to assess the potential harm that may occur to Aboriginal cultural heritage values as part of a State Significant Infrastructure (SSI) under Part 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), for the replacement and upgrading of Hartwood Weir, Forest Creek Block Bank and Wanganella Weir and the construction of the Wanganella Bypass Flood Channel (see description of the proposal in Section 1.1).

1.4 ASSESSMENT OBJECTIVES

The scope of this ACHA report is based on the legal requirements, guidelines and policies of Heritage NSW. The guiding document for this assessment is the *Code of Practice for the Investigation of Aboriginal Objects in NSW* (DECCW 2010b) [Code of Practice].

Information provided in this assessment includes, but is not limited to:

- The results of archaeological surveys.
- An assessment of archaeological significance and management recommendations.
- A literary review of available data, including previous studies/investigations from within and adjacent to the study area.
- An assessment of harm posed to Aboriginal objects, places or values as part of the project.
- A description of practical measures that have been used to protect, conserve, avoid or mitigate harm to Aboriginal objects, places and values.

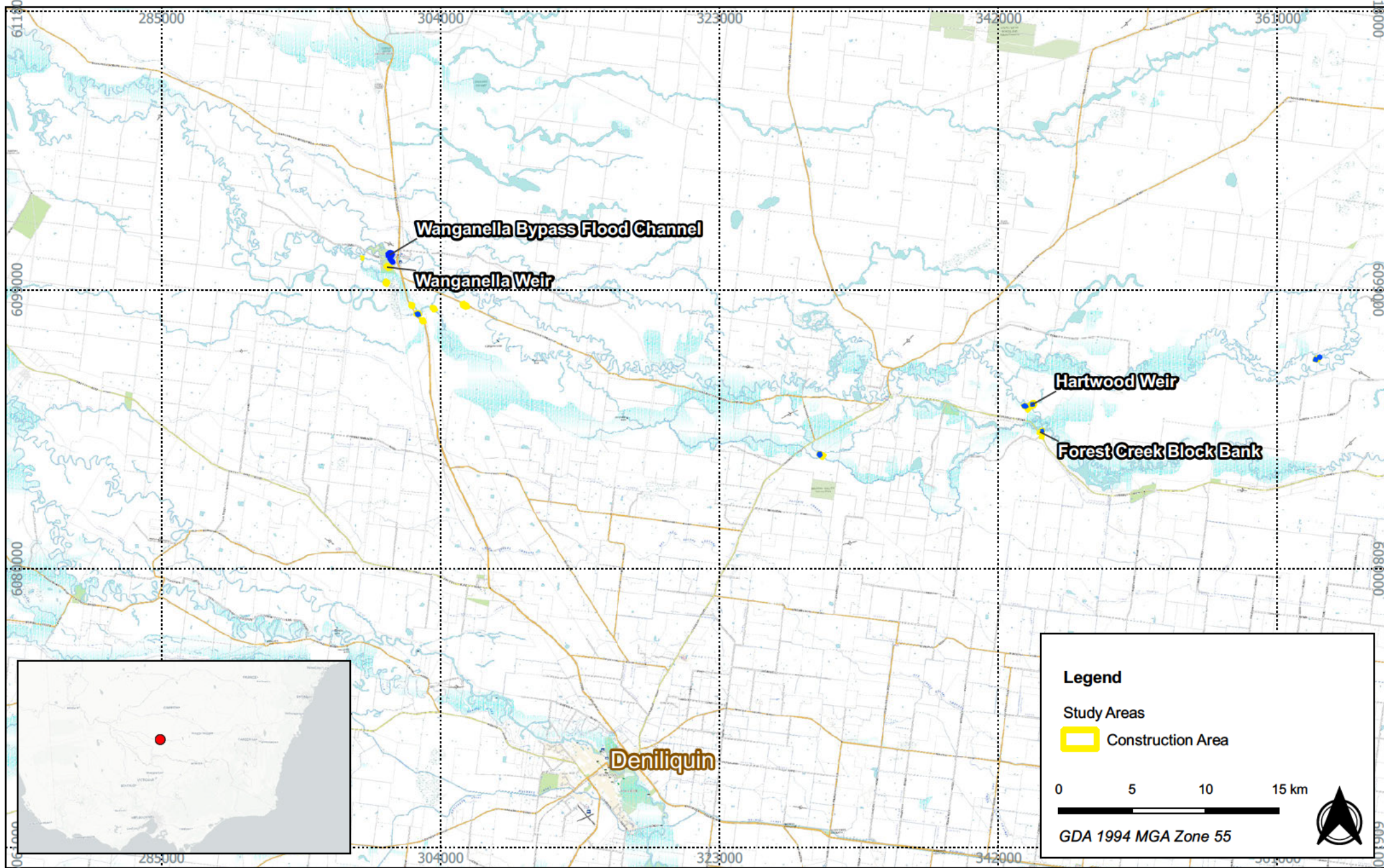


Figure 1.1 - Overview of the location of the study areas

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Basemap, CartoDB Positron

Drawn by: FOT Date: 2024-10-21



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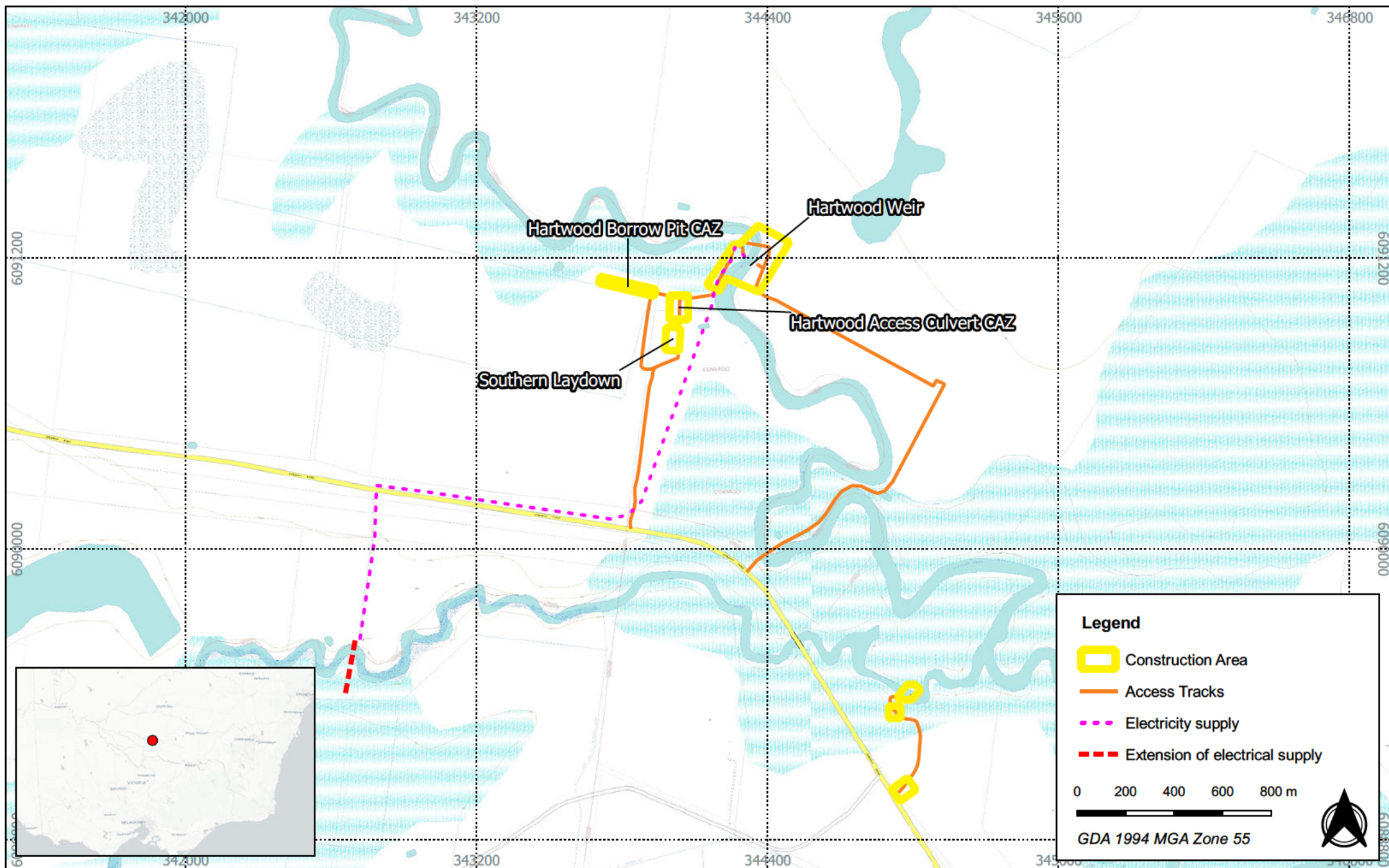


Figure 1.2 - Location of Hartwood Weir study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Basemap, CartoDB Positron

Drawn by: FOT Date: 2024-05-29



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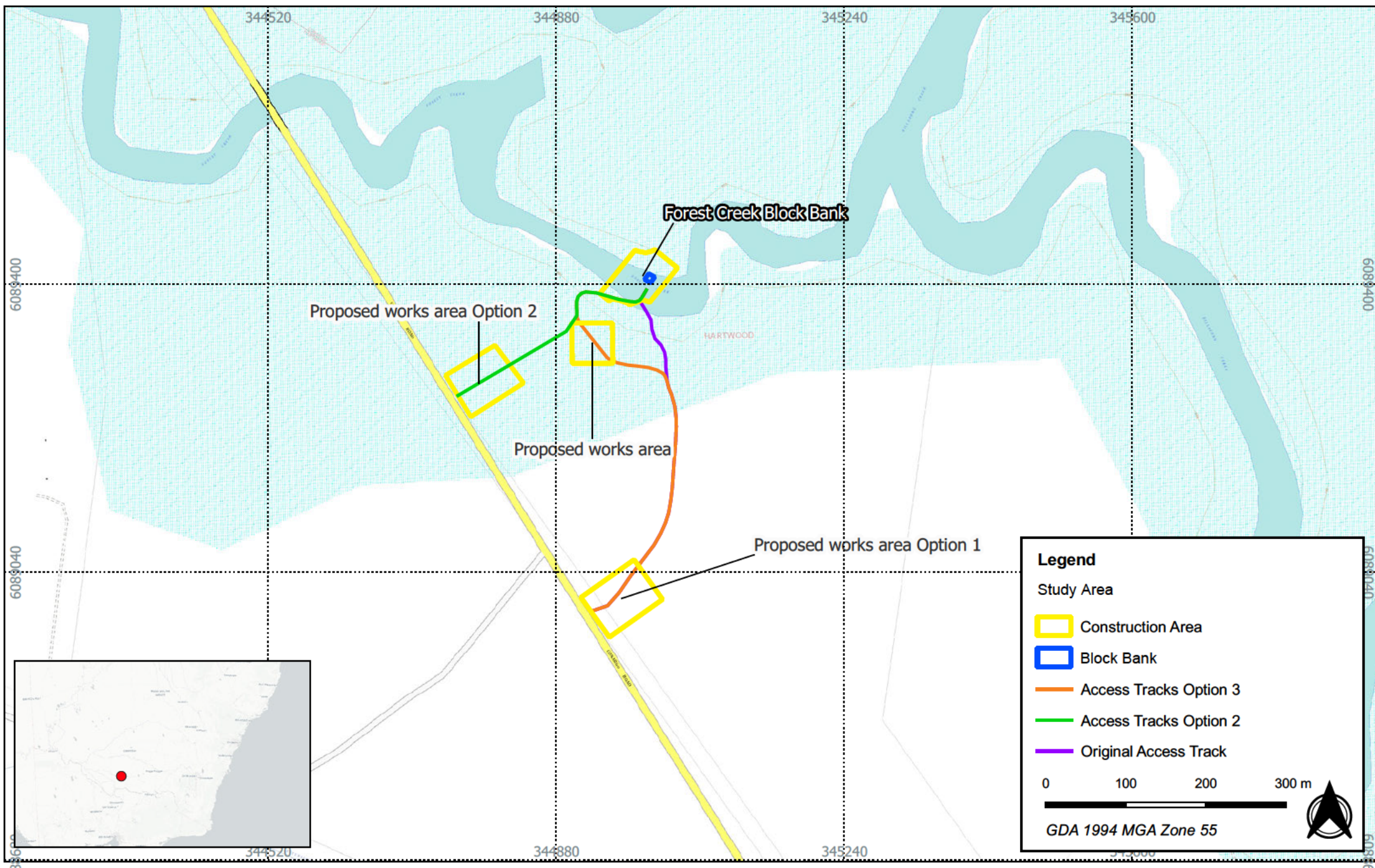


Figure 1.3 – Location of Forest Creek Block Bank study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Basemap, CartoDB Positron

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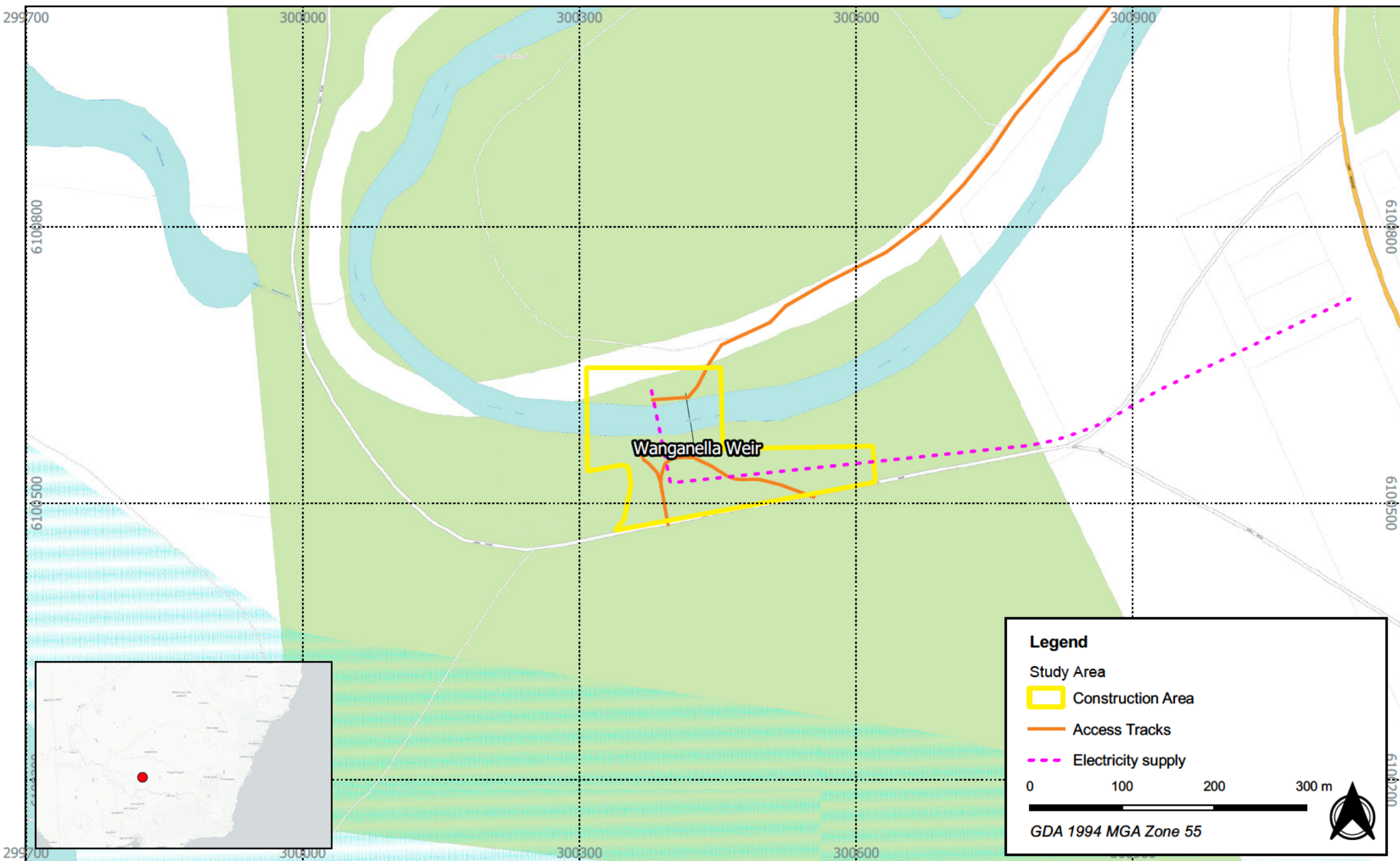


Figure 1.4 – Location of the Wanganella Weir study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Basemap, CartoDB Positron

Drawn by: FOT Date: 2024-01-25



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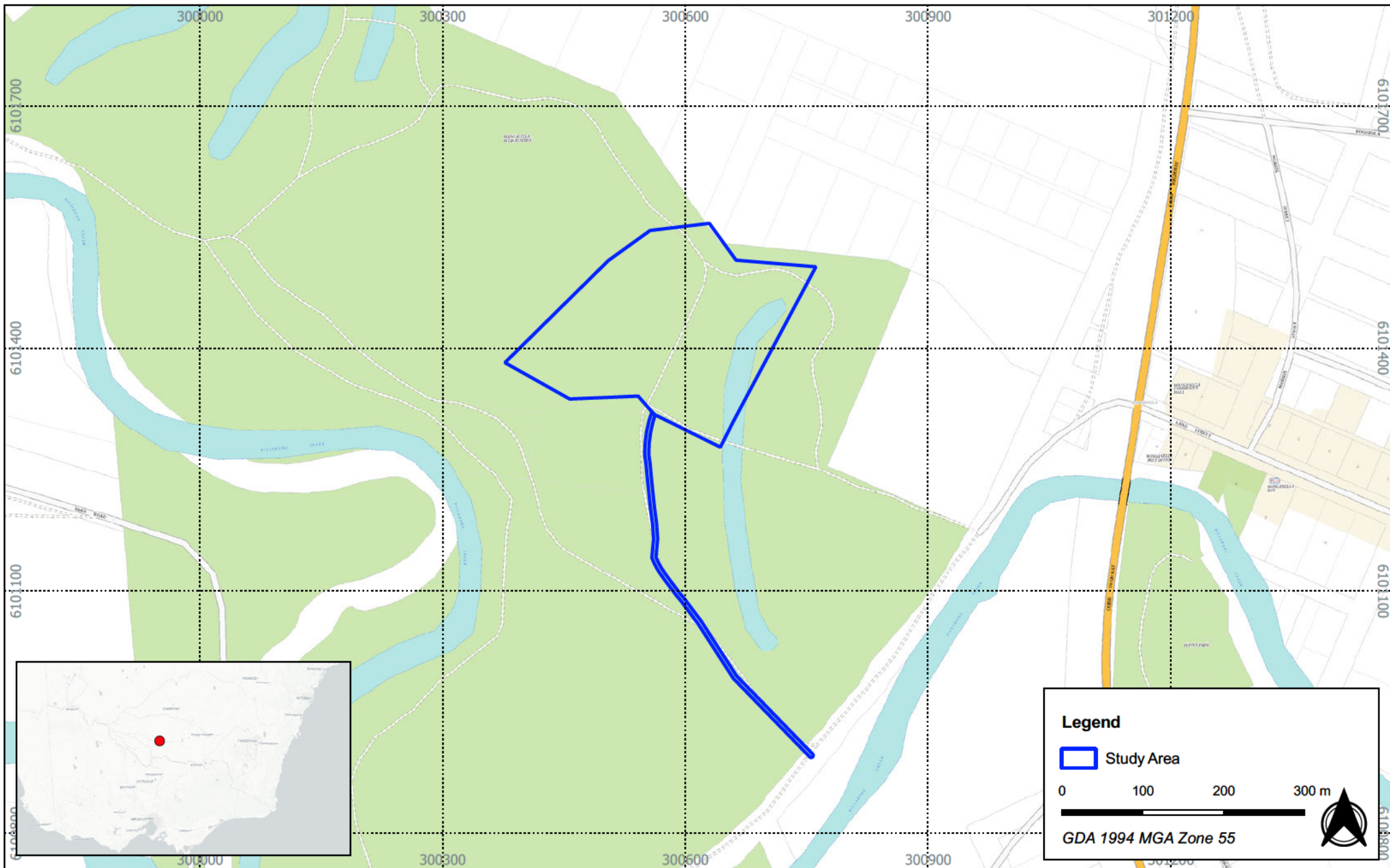


Figure 1.5 - Location of the Wanganella Bypass Flood Channel study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Basemap, CartoDB Positron

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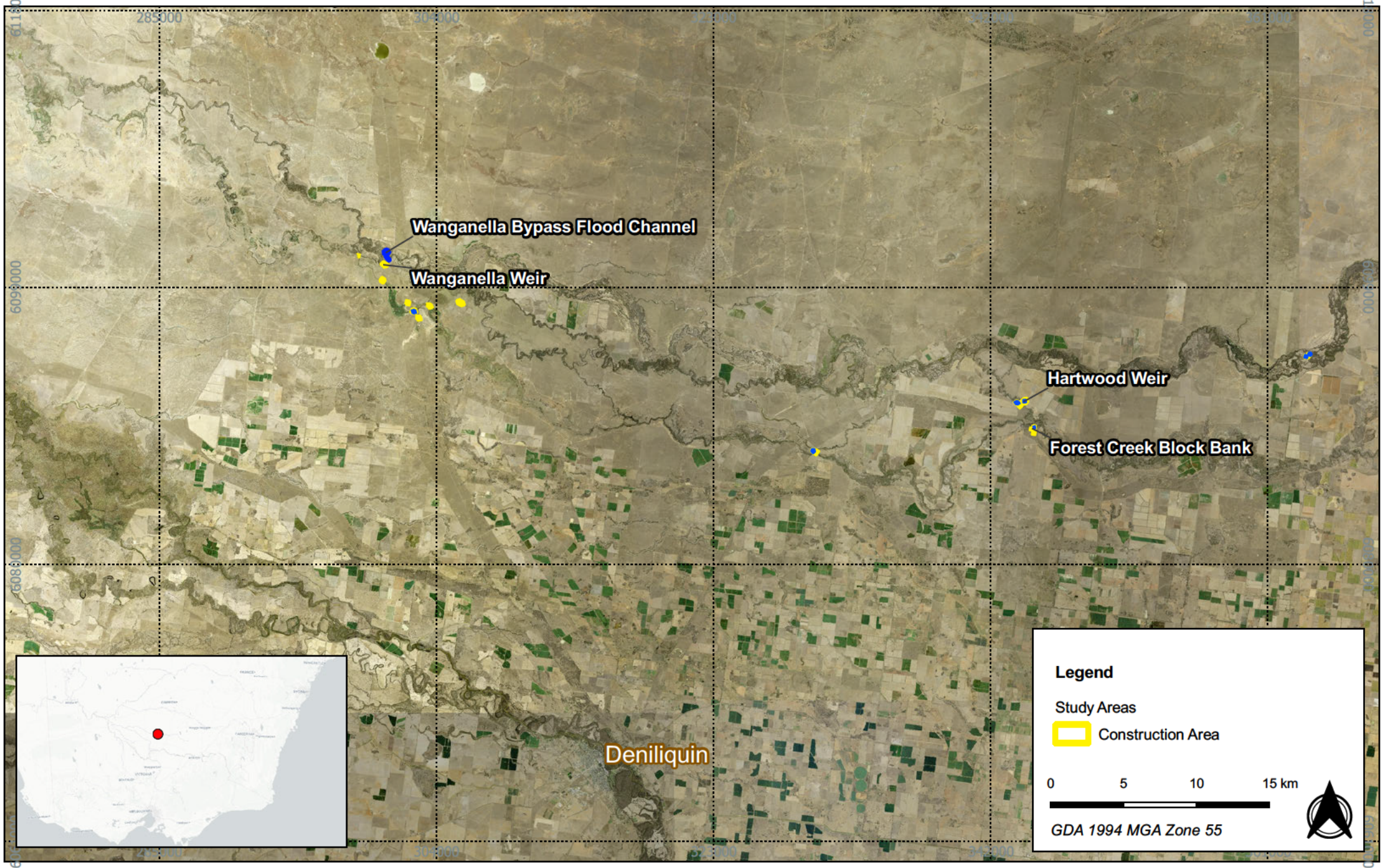


Figure 1.6 - Detailed aerial overview of the study areas

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Aerial, CartoDB Positron

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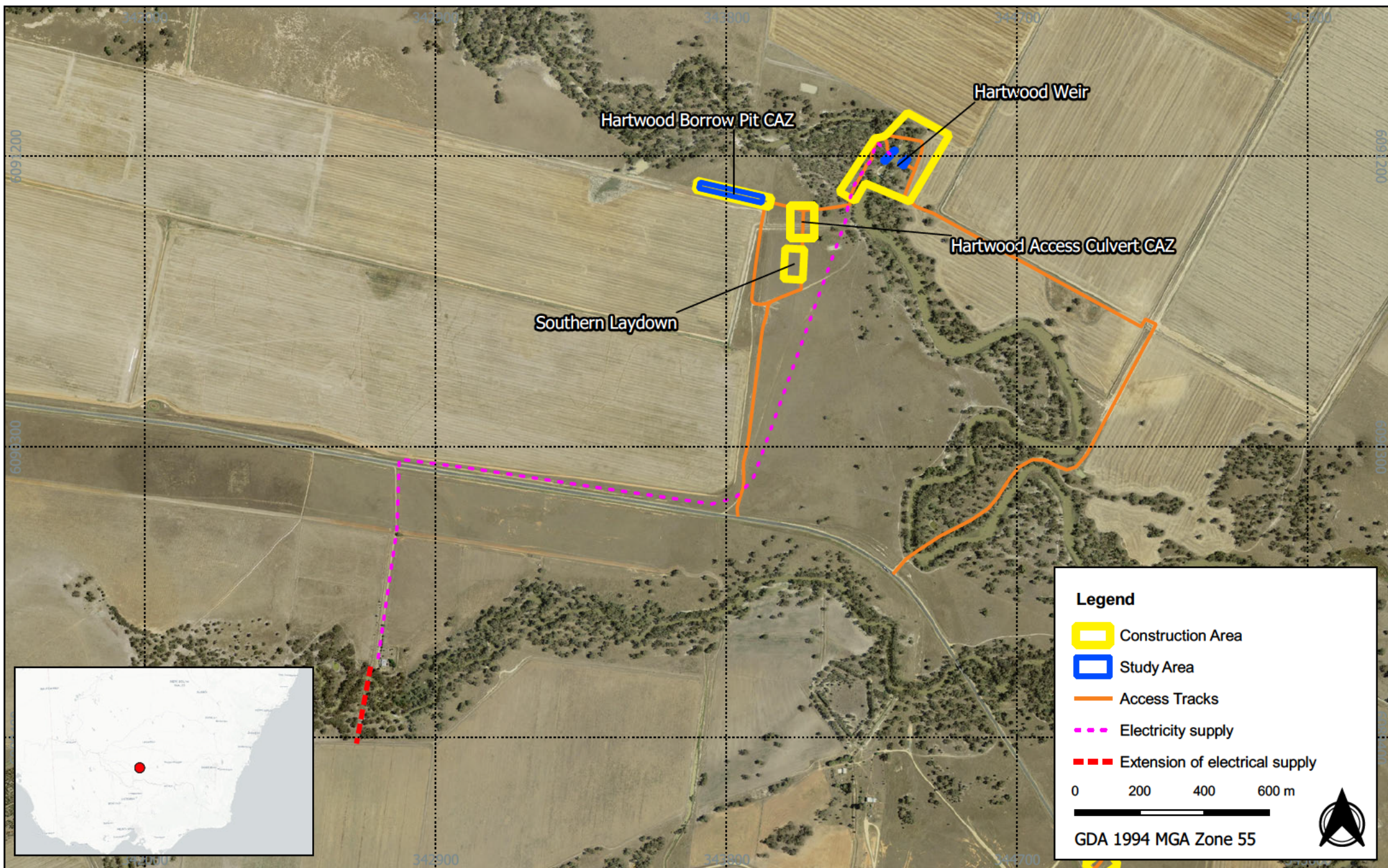


Figure 1.7 - Detailed aerial of the Hartwood Weir study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Aerial, CartoDB Positron

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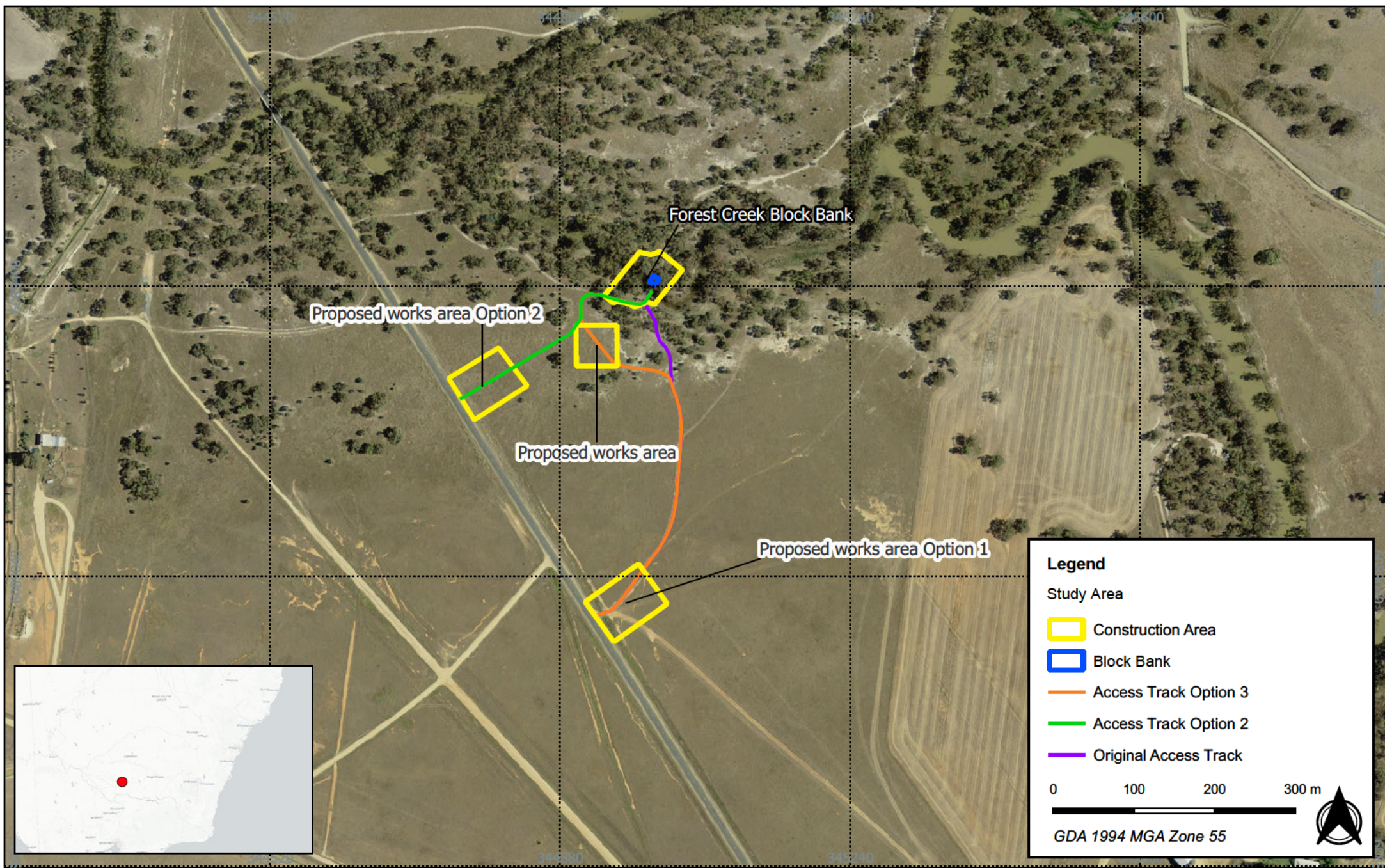


Figure 1.8 – Detailed aerial of the Forest Creek Block Bank study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Aerial, CartoDB Positron

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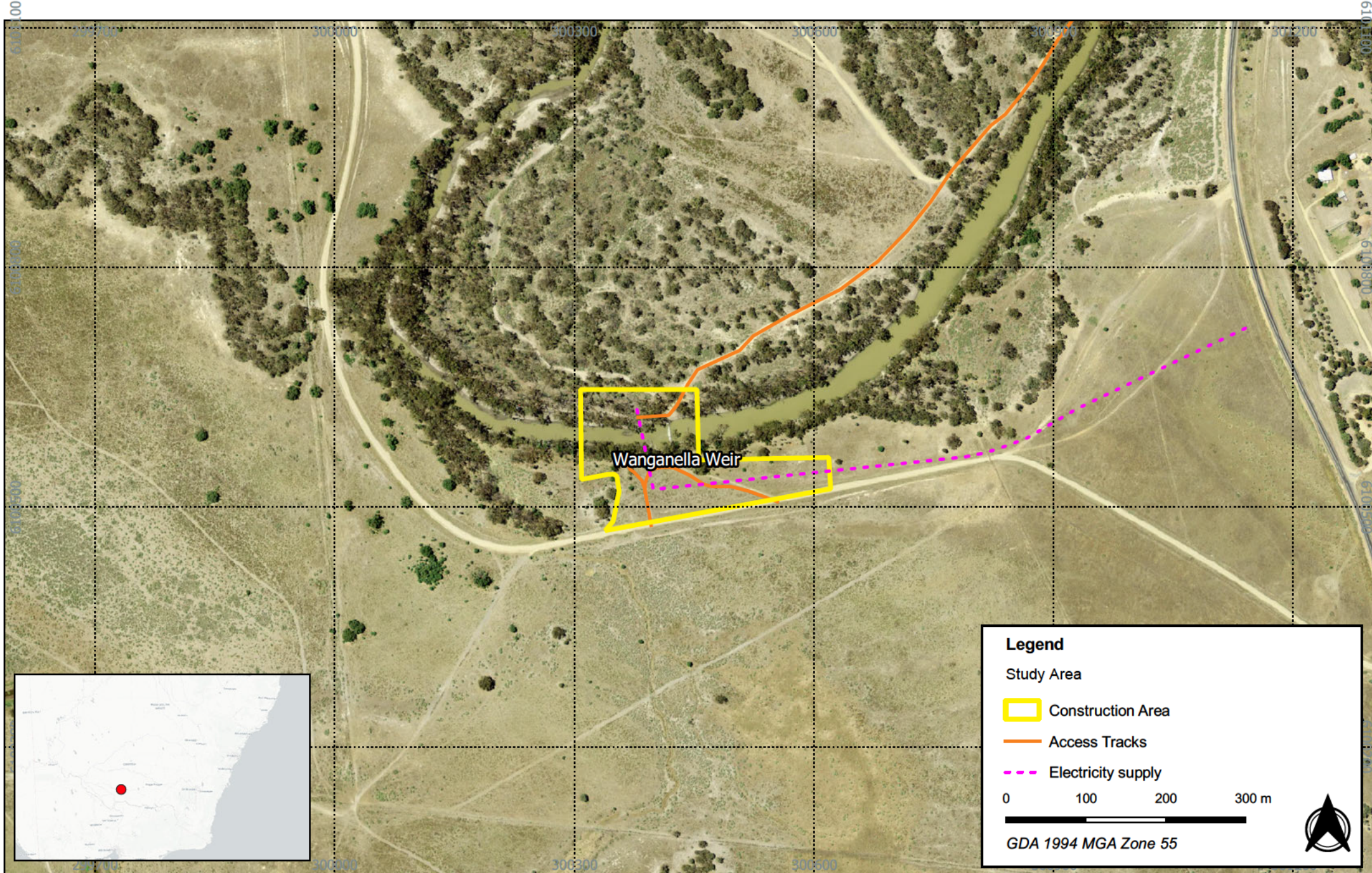


Figure 1.9 – Detailed aerial of the Wanganella Weir study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Aerial, CartoDB Positron

Drawn by: FOT Date: 2024-01-25



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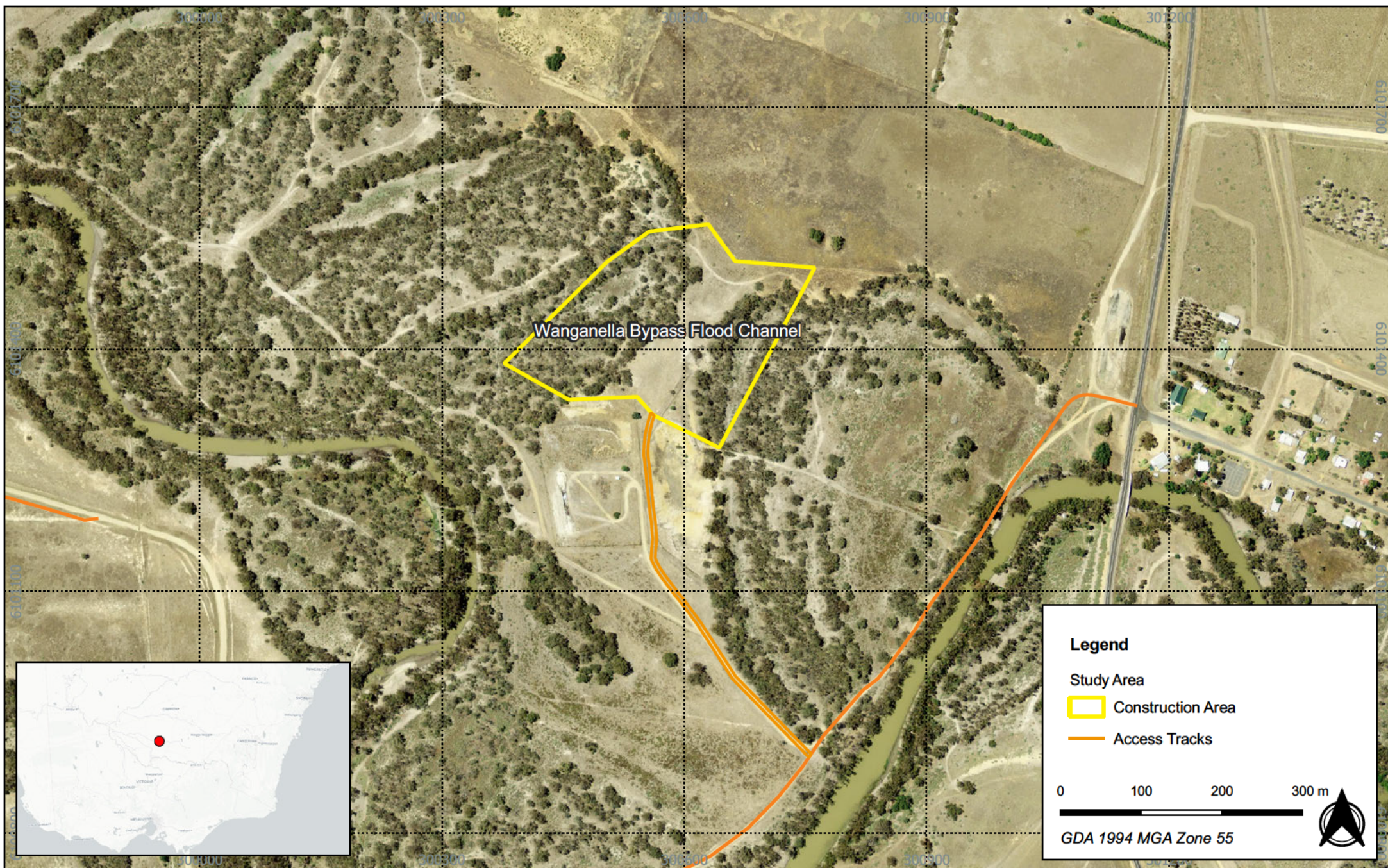


Figure 1.10 - Detailed aerial of the Wanganella Bypass Flood Channel study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Aerial, CartoDB Positron

Drawn by: FOT Date: 2024-10-21



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1.5 SUMMARY OF LEGISLATIVE PROCESS

Aboriginal archaeological and cultural heritage assessments in NSW are carried out under the auspices of a range of State and Federal Acts, Regulations and Guidelines. The Acts and Regulations allow for the management and protection of Aboriginal places and objects, and the Guidelines set out best practice for community consultation in accordance with the requirements of the Acts.

This section outlines the Australian acts and guidelines that are applicable or have the potential to be triggered with regard to the proposed development and are detailed in Table 1.1 to Table 1.4.

Table 1.1 Federal acts

Federal Acts:	Applicability and implications
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	This act has not been triggered and so does not apply, as: - No sites listed on the National Heritage List (NHL) are present or in close proximity to the study area. - No sites listed on the Commonwealth Heritage List (CHL) are present or in close proximity to the study area.
<i>Aboriginal and Torres Strait Islander Heritage Protection Amendment Act 1987</i>	Applies, due to: This Act provides blanket protection for Aboriginal heritage in circumstances where such protection is not available at the state level. This Act may also override state and territory provisions.

Table 1.2 NSW Acts

NSW Acts:	Applicability and implications
<i>National Parks and Wildlife Act 1974 (NPW Act 1974)</i>	Applies, due to: - Section 86 – Prohibits both knowingly and unknowingly, causing harm or desecration to any Aboriginal object or place without either an AHIP or other suitable defence from the Act. - Section 87 – Allows for activities carried out under an AHIP or following due diligence to be a defence against the harm of an Aboriginal object. - Section 89A – Requires that Heritage NSW must be notified of any Aboriginal objects discovered, within a reasonable time.
NPW Regulation 2019	Applies, due to: - Section 80A – States minimum standards of due diligence to have been carried out - Section 80C – Requires Aboriginal community consultation process to be undertaken before applying for an AHIP. - Section 80D – Requires production of a cultural heritage assessment report to accompany AHIP applications.
<i>The Environmental Planning and Assessment Act 1979 (EP&A Act 1979)</i>	Applies, due to: - This project is being assessed under Part 5, Division 5.2 of the EP&A Act 1979. - Sections 86, 87, 89A and 90 of the NP&W Act 1974 will not apply as the project is classified as SSI. - The Part 5 Guidelines will not apply.
<i>NSW Heritage Act 1977</i>	There are no sites listed on the State Heritage Register associated with the study area, and therefore Section 57 of this act does not apply.

Table 1.3 State and local planning instruments

Planning Instruments	Applicability and implications
Local Environmental Plans (LEP)	The following LEP is applicable: Conargo Local Environmental Plan 2013 (Conargo LEP 2013)
Development Control Plans (DCP)	There is currently no DCP for the former Conargo Shire.

Table 1.4 Aboriginal community consultation guidelines

Guidelines	Applicability and implications
Consultation Requirements	SSI consultation has been undertaken in accordance with the <i>Aboriginal Cultural Heritage Consultation Requirements for Proponents</i> (DECCW 2010a)

1.6 PROJECT TEAM AND QUALIFICATIONS

The personnel responsible for the preparation of this report are detailed in Table 1.5.

Table 1.5 Personnel involved in the preparation of this ACHA

Name	Qualifications	Title	Responsibilities
Amanda Hansford	BA (Archaeology/ & Palaeoanthropology). Graduate Diploma (Archaeology)	Director	Project Management, Report Writing
Nicole Monk	BA (Archaeology) & Graduate Diploma (Archaeology)	Senior Archaeologist	Survey
Brody Saccoccia	BA (Archaeology) & BA Hons. (Archaeology)	Archaeologist	Background Research, Report Writing
Madelaine Firth	BA (Archaeology and Ancient History)	Archaeologist	Survey

1.7 ABBREVIATIONS

The following are common abbreviations that are used within this report:

Austral	Austral Archaeology Pty Ltd
Burra Charter	Burra Charter: Australia ICOMOS Charter for Places of Cultural Significance 2013
CBD	Central Business District
CHL	Commonwealth Heritage List
CLALC	Cummeragunja Local Aboriginal Land Council
Conargo LEP 2013	Conargo Local Environmental Plan 2013
DCP	Development Control Plan
DCCEEW NSW	Department of Climate Change, Energy, the Environment and Water of New South Wales
Deniliquin DCP 2016	Deniliquin Development Control Plan 2016
DLALC	Deniliquin Local Aboriginal Land Council
EPA Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environmental Protection and Biodiversity Act 1999
EPI	Environmental Planning Instrument

GSV	Ground Surface Visibility
Heritage Act	NSW Heritage Act 1977
ICOMOS	International Council on Monuments and Sites
IHO	Interim Heritage Order
LEP	Local Environmental Plan
LGA	Local Government Area
NHL	National Heritage List
NPW Act	National Parks and Wildlife Act 1974
The Proponent	Department of Climate Change, Energy, the Environment and Water of New South Wales
RNE	Register of the National Estate
SDLAM	Sustainable Diversion Limit Adjustment Mechanism
Study Area	Hartwood Weir, Wanganella Weir, Forest Creek Block Bank and Wanganella Flood Bypass Channel, Hartwood and Wanganella, NSW

2 CONSULTATION PROCESS

This section outlines the consultation process that has been followed as part of the preparation of this ACHA.

2.1 INTRODUCTION

Stakeholder consultation for this project commenced in line with the Consultation Requirements (DECCW 2010a). Heritage NSW (2010a, p.iii) recognises that:

- Aboriginal people should have the right to maintain their culture.
- Aboriginal people should have the right to participate in matters that may affect their heritage directly.
- Aboriginal people are the primary determinants of the cultural significance of their heritage.

The Consultation Requirements outline a four-stage consultation process which includes:

- Stage 1 – Notification of the project proposal and registration of interest.
- Stage 2 – Presentation of information about the proposed project.
- Stage 3 – Gathering information about cultural significance.
- Stage 4 – Review of the draft cultural heritage assessment report.

Volume 2, Appendix A of this ACHA contains a consultation log and evidence of all correspondences that were sent and received as part of the consultation process.

2.2 STAGE 1: NOTIFICATION AND REGISTRATION OF INTEREST

The following section outlines the tasks that were undertaken as part of Stage 1 of the Consultation Requirements and is consolidated from information provided by 3Rivers.

2.2.1 IDENTIFICATION OF RELEVANT ABORIGINAL STAKEHOLDERS

Letters were also written to the relevant agencies suggested in Section 2.2.1 of the Consultation Requirements (DECCW 2010a) on 25 August 2021 and a search was made of the Native Title Tribunal on the same day.

In accordance with the Consultation Requirements the following bodies were notified as part of the project proposal:

- A response was received from Heritage NSW with a list of stakeholders who may have an interest in the proposed development.
- The DLALC responded with a notice of registration with the project.
- The Murray Catchment Management Authority replied that they had no list of stakeholders who may have an interest in the proposed development.
- The Edward River City Council did not reply.
- The National Native Title Tribunal was searched, which provided a list of stakeholders who may have an interest in the proposed development.
- The Office of the Registrar of the *Aboriginal Land Rights Act 1983* (NSW) did not reply.

A copy of these letters and searches are included in Volume 2, Appendix B of this ACHA.

2.2.2 PUBLIC NOTICE

An advertisement was placed in the Yanco Newspaper, to run on 20 August 2021, requesting the registration of cultural knowledge holders relevant to the project area. A copy of this advert is included in Volume 2, Appendix B of this ACHA.

2.2.3 INVITATION TO REGISTER

As a result of the consultation procedure, the following groups shown in Table 2.1 registered as Aboriginal stakeholders with an interest in this project. Two organisations, not listed, also registered as Registered Aboriginal Parties (RAPs) for the project but asked that their details not be forwarded to Heritage NSW nor the relevant LALCs.

Table 2.1 Registered Aboriginal Stakeholders

Organisation	Contact person
Bangerang Aboriginal Corporation	Kevin Atkinson
Bundy Aboriginal Cultural Knowledge	Mark Saddler
CLALC	Hayden Love
DLALC	Rose Dunn
Leeton and District Local Aboriginal Land Council	Karen Davy
Sandhills Artefacts	Michael Lyons
Wiradjuri Council of Elders	Yalmambirra
Yarkuwa Indigenous Knowledge Centre	David Crew
Independent	Kevin Atkinson
Independent	Roley Williams
Independent	Maydina Penrith

2.3 STAGE 2: PRESENTATION OF INFORMATION

Stage 2 of consultation was conducted by 3Rivers. All registered Aboriginal stakeholders were provided with information outlining the proposed works, including information relating to proposed impacts as well as the project's methodology during 3 separate community meetings, held on 1 March 2022, 8 September 2022 and 9 September 2022. An on-site meeting was also conducted with the DLALC representatives on 9 May 2023.

Copies of all correspondence relating to the provision of project information to registered Aboriginal stakeholders are included in Volume 2, Appendix B of this report.

2.4 STAGE 3: GATHERING INFORMATION ABOUT CULTURAL SIGNIFICANCE

2.4.1 REVIEW OF DRAFT METHODOLOGY

On 24 April 2022, 3Rivers provided each Aboriginal stakeholder with a copy of the project methodology. The methodology outlined the proposed assessment process that would be used in the completion of the project. Aboriginal stakeholders were provided with 28 days to review and provide feedback on the methodology. No comments from Aboriginal stakeholders were received at this stage of consultation.

Consultation correspondence had been ongoing from 24 April 2022 until 25 January 2023 due to delays in undertaking fieldwork. Due to this period, a number of comments were made to 3Rivers from individual Aboriginal stakeholders regarding the methodology. Most of these comments related to confirming times for fieldwork, however, some raised concerns regarding the survey methodology and the commercial engagement of stakeholder groups. Due to the nature of the concerns information has not been provided to Austral as to the conflict resolution surrounding these issues. Copies of all correspondence relating to the draft methodology from Aboriginal stakeholders are included in Volume 2, Appendix B of this ACHA.

2.4.2 INFORMATION GATHERED DURING FIELDWORK

During Austral's survey of the study areas on the 13 of July 2023, a number of discussions were had between the attending RAPs, the Proponent and Austral on the management of sites identified during this survey. Both the RAPs and the Proponent wish to avoid unnecessary impacts on cultural heritage. During this time exclusion zones were discussed and agreed upon and that test excavation would only cause an unnecessary impact on cultural heritage.

As part of these discussions, some sites were identified as non-cultural due to the lack of evidence of cultural activity and the landform the site was located on.

2.5 STAGE 4: REVIEW OF DRAFT ACHA REPORT

The draft ACHA was provided to Aboriginal stakeholders on 3 June 2024 for their review and comment. Aboriginal stakeholders were given 28 days to review the ACHA, with submissions closing on 28 June 2024.

No comments were received from the registered Aboriginal stakeholders within Stage 4 of the consultation timeframes.

Due to updates to the ACHA, the report was again submitted to stakeholders for review and comment on 14 March 2025. Aboriginal stakeholders were given 28 days to review the ACHA, with submissions closing on 11 April 2025.

No written responses were received from registered Aboriginal stakeholders during Stage 4 of the consultation. Austral received 2 phone calls from the Aboriginal Stakeholder during this time:

- Bundyi Aboriginal Cultural Knowledge: Informed Austral of the issues surrounding JACOBS handling of the earlier stages of consultation process as mentioned in Section 2.4.1.
- Bangerang Aboriginal Corporation: requested information on the major changes to the ACHA. These were discussed and Austral provided a follow up email that contained the key point discussed during the phone call.

Copies of all correspondence relating to the review of the draft ACHA are included in Volume 2, Appendix A8 of this report.

To comply with Section 4.4.5 of the Consultation Requirements, a copy of the final ACHA was lodged with Aboriginal stakeholders, CLALC and DLALC on 18 July 2024.

2.1 EVIDENCE OF CONTINUAL CONSULTATION

As part of the AHCA process, it is necessary to demonstrate that consultation with Aboriginal stakeholders has remained continuous from project commencement through to completion or an Aboriginal Cultural Heritage Plan (ACHMP) is endorsed. Heritage NSW guidelines state that, as a general rule, gaps in the consultation process of 6 months or more will not constitute a continuous consultation process (Office of Environment and Heritage NSW 2011, p. 11). Updates associated with the overall Yanco Creek Modernisation Project were sent to the Aboriginal stakeholders on 6 of December 2024.

Copies of all correspondence relating to the review of the draft ACHA are included in Volume 2, Appendix A9 of this report.

3 LANDSCAPE CONTEXT

The following section defines the study area and its environmental and cultural context.

3.1 ENVIRONMENTAL CONTEXT

The following section discusses the study area in relation to its landscape, environmental and Aboriginal landscape resources. This environmental context has been prepared in accordance with Requirement 2 of The Code (DECCW 2011, pp.8–9).

The study areas are located within the Riverina Bioregion, which covers 9,576,964 hectares. Located in the central south of NSW and encompasses tributaries to the Murray and Murrumbidgee rivers as well as the Lachlan and Goulburn rivers. This bioregion preserves evidence of environmental changes during the Quaternary Period. The alluvial deposits of past stream beds are present throughout the region with rocky outcrops being scarce. The wetlands that formed as a part of floodplains and channels associated with the major rivers are significant habitats for birds and other animals (NSW Department of Planning, Industry and Environment 2021).

The study area is in the southern portion of the Murrumbidgee subregion, which is a wandering river fan and floodplain, formed from Quaternary alluvial sediments. These sediments are made up of clay and sand, with source-bordering dunes and lakes formed from depressions in the flood plain or ancient river and creek channels. The region includes Hay Plains, which exemplifies the saltbush and lignum vegetation groups that populate the subregion. Communities of black box (*Eucalyptus largiflorens*) can be also located on these plains, with river red gum (*E. camaldulensis*) and river cooba (*Acacia stenophylla*) on the water channels, and white cypress pine (*Callitris columellaris*) on dunes (NSW Department of Planning, Industry and Environment 2021, p.97).

3.1.1 TOPOGRAPHY AND HYDROLOGY

Most of the study area is located on floodplains associated with the waterways located in and surrounding the study area. This landform is flat with shallow depressions. Other landforms associated with the study area are creek banks since the study area is associated with the development of water infrastructure and access tracks crossing Billabong and Forest Creek.

The main hydrological features associated with the study area are Billabong Creek and Forest Creek. Yanco Creek is also one of the main waterways that connects the Murrumbidgee River to Billabong Creek, which flows into the Edward River. Billabong Creek and Forest Creek are non-perennial streams with areas of permanent lagoons and billabongs. Billabong and Forest creeks are examples of the braided and transitory nature of the waterways within the Riverina bioregion.

The hydrological systems identified within and in the locality of the study area are identified in Figure 3.1 to Figure 3.4.

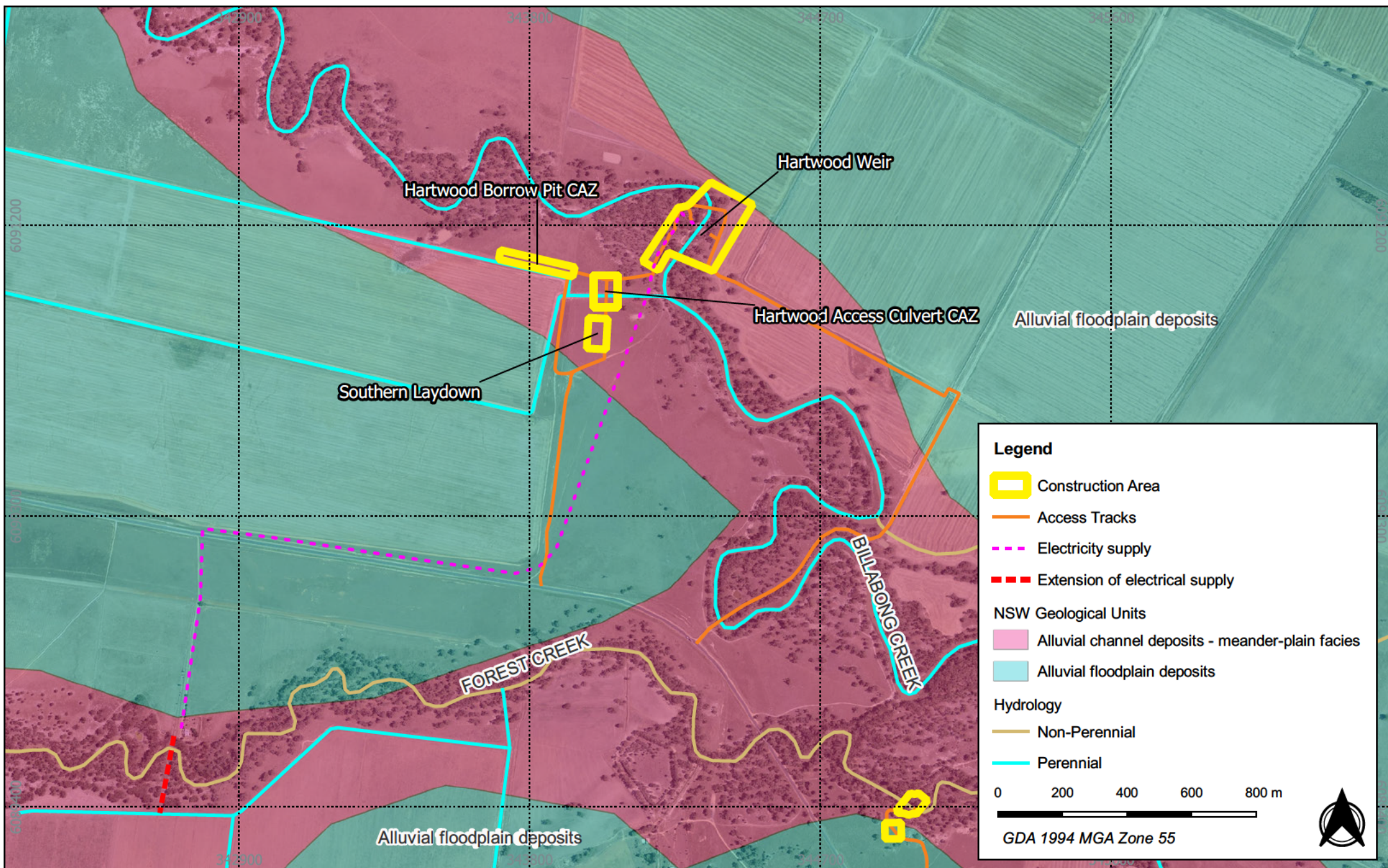


Figure 3.1 – Geology and hydrogeology of the Hartwood Weir study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Aerial, NSW Seamless Geology

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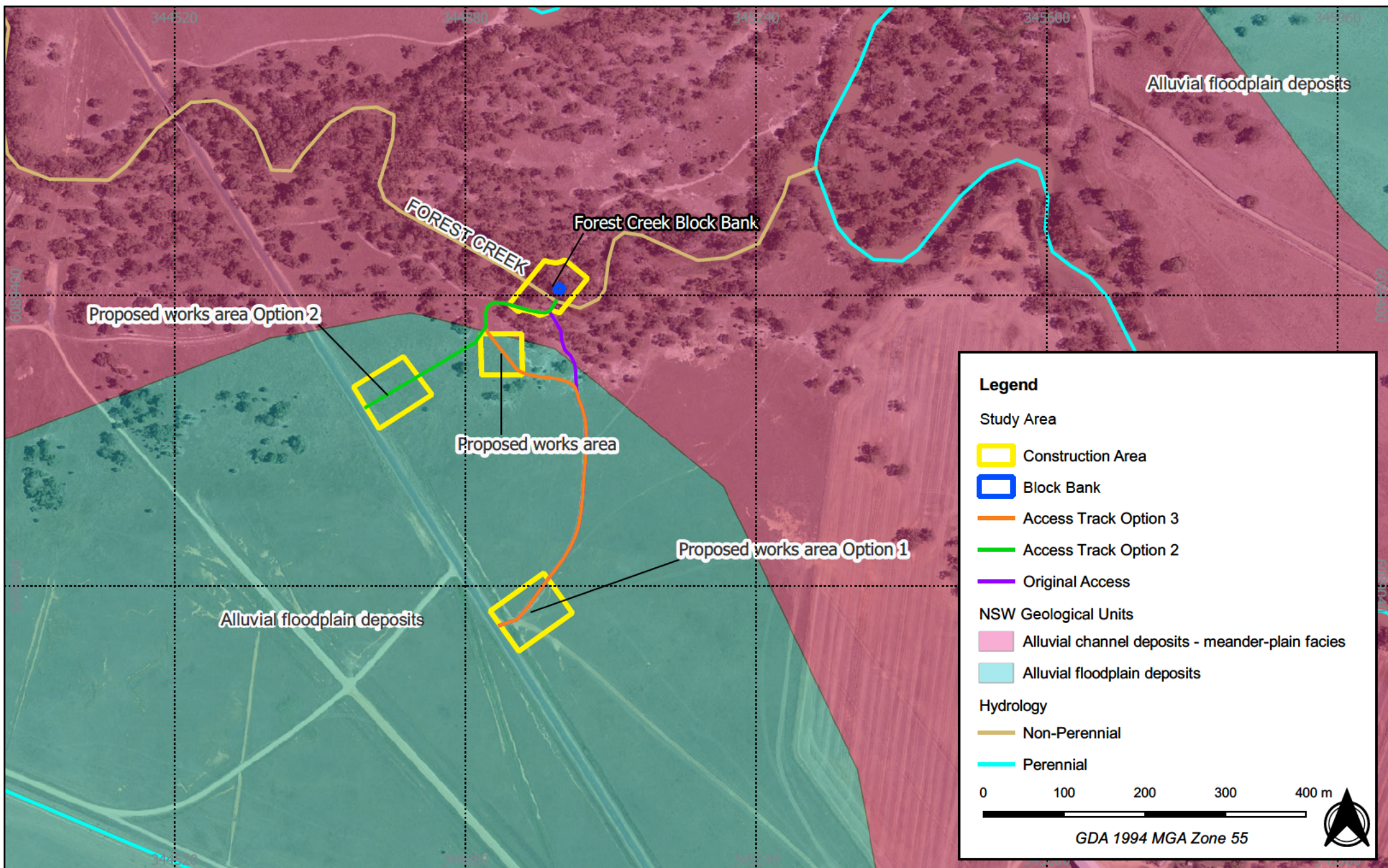


Figure 3.2 – Geology and hydrology of the Forest Creek Block Bank study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Aerial, NSW Seamless Geology

Drawn by: FOT Date: 2024-01-29



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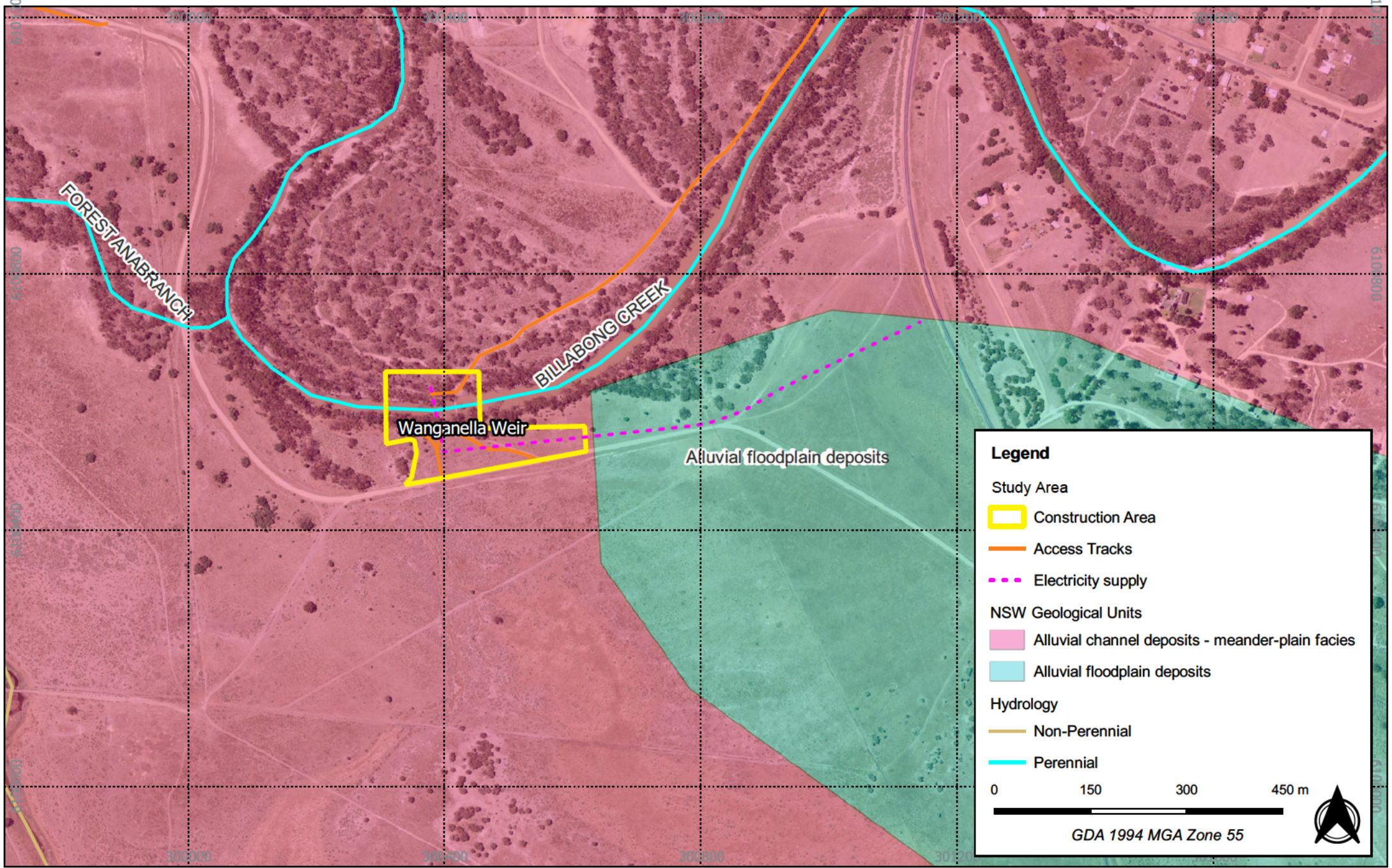


Figure 3.3 – Geology and hydrology of the Wanganella Weir study area

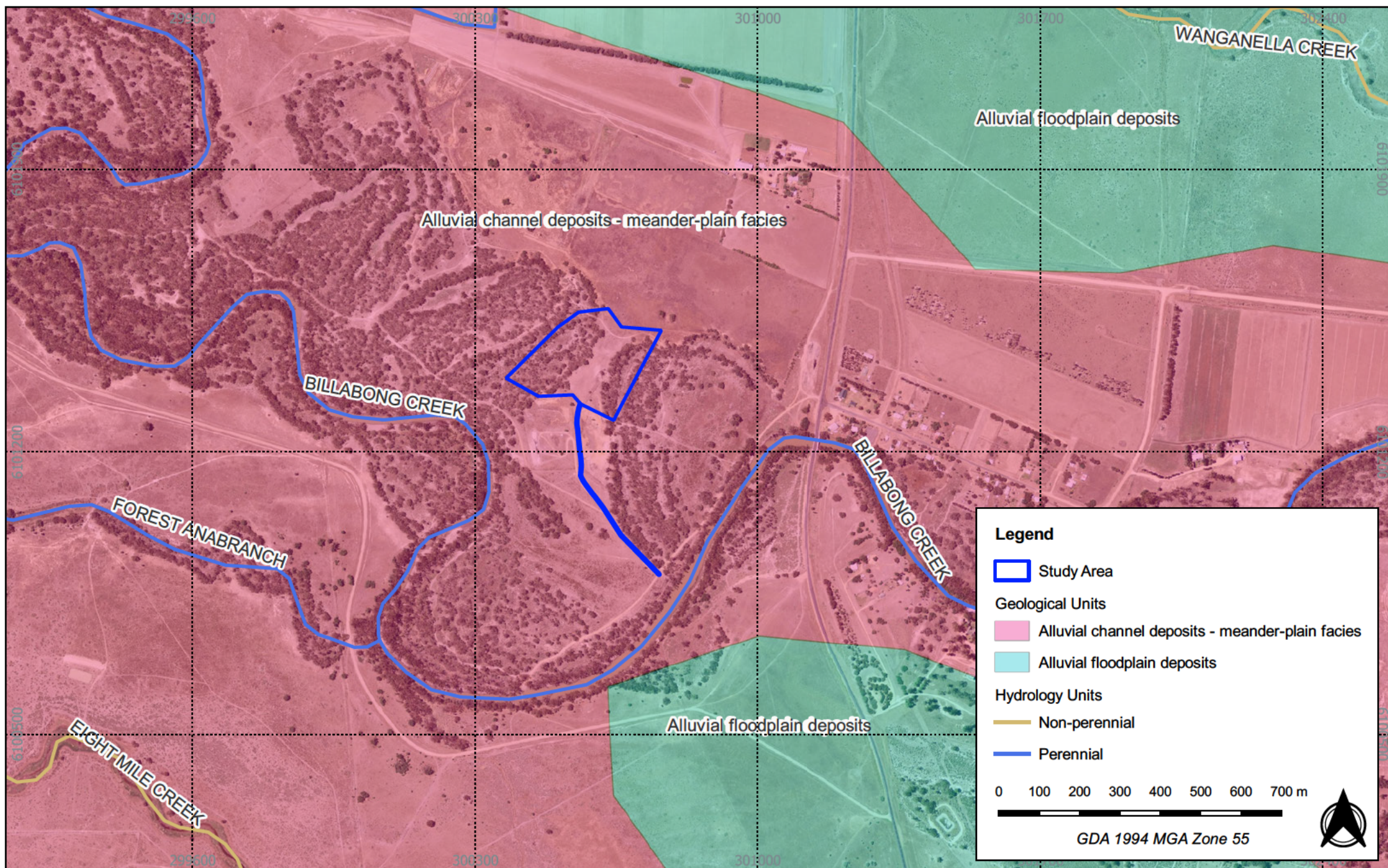
23039 - Yanco Creek Modernisation Project

Source: NSW LPI Aerial, NSW Seamless Geology

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3.1.2 GEOLOGY AND SOILS

Most of the study areas are located on alluvial channel deposits that contain meander-plain facies. This surface geological unit is described as having a surface of unconsolidated grey humic soil, over clayey very fine-grained sand. This is on top of light brown clayey silt. These deposits are quaternary formations and are associated with the flow of local waterways such as the Forest and Yanco Creek systems. A small portion of the study area crosses over onto alluvial floodplain deposits which contain silt and sand. It is also formed from very fine to medium-grained lithic and quartz material (Colquhoun et al. 2019).

The geological units identified within the study areas are identified in Figure 3.1 to Figure 3.4.

The study area is located within a region that is a part of the Soil and Land Resources outline, which gives information on the nature and description of soils within the landscape. A majority of the study area is located within the Jerilderie (jex) soil unit, defined by “red and brown sub-plastic chromosols and sodosols, with reddish-brown chromosol/vertosols... and grey and brown self-mulching and epipedal vertosols” (Department of Environment, Climate Change and Water NSW 2010, pp. 1). This soil unit is associated with the Riverine bioregion on broad-level plains of alluvium. The landform surrounding the immediate Billabong Creek area, where the proposed Hartwood Weir upgrade is located, lies within the Niemur River (nmu) soil landscape. This landscape is comprised of “grey or other dark-coloured Vertosols” (Department of Planning, Industry and Environment 2020, pp. 1). The Niemur River landscape normally occurs on active floodplains associated with and including the Niemur, Edward and Wakool Rivers. Vegetation commonly identified within this soil landscape includes river red gum and grassy woodlands (Department of Planning, Industry and Environment 2020).

Further information on soils is provided by Mitchell Landscapes, with the study area being located within the Murrumbidgee Channels and Floodplains landscape. The soils described by Mitchell for this landscape are alluvial flats of grey and brown clay. In addition, there are isolated rises of sand.

There are no stoney outcrops within or near the study area that could be used as a source of lithic artefacts or as platforms for grinding grooves or rock art. The poor draining soil has been identified in neighbouring regions to be used to create ponds of water that lasted longer during dry periods while high clay content collected from these ponds was used as heat retainer in hearths and earth mounds.

The soil landscapes identified within the study area are identified in Figure 3.5 to Figure 3.8.

Figure 3.5 – Mitchell's soil landscapes identified within the Hartwood Weir study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Aerial, Mitchell Landscapes v3.1

Drawn by: FOT Date: 2024-05-29



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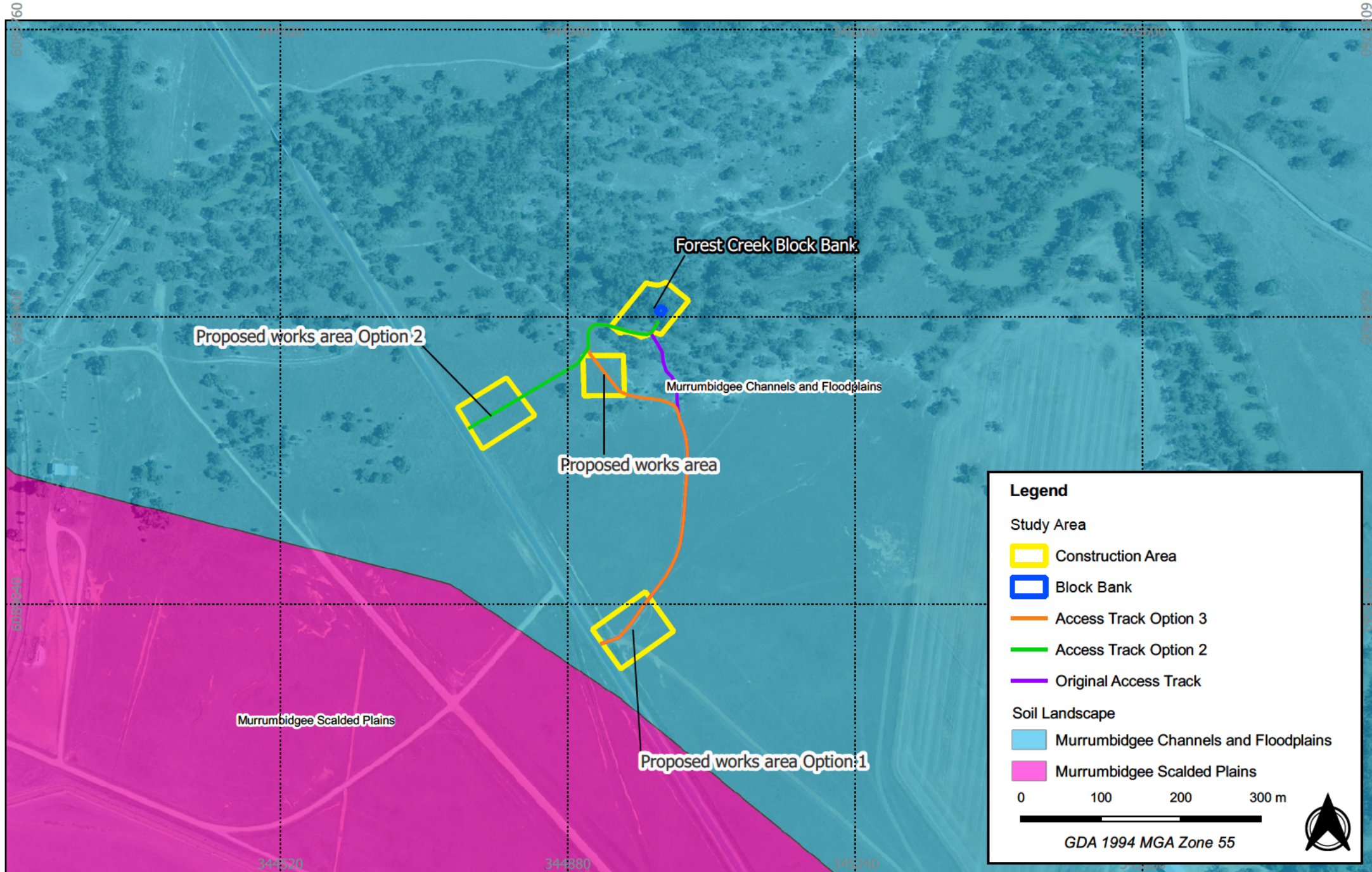


Figure 3.6 – Mitchell's soil landscapes identified within the Forest Creek Block Bank study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Aerial, Mitchell Landscapes v3.1

Drawn by: FOT Date: 2024-01-29



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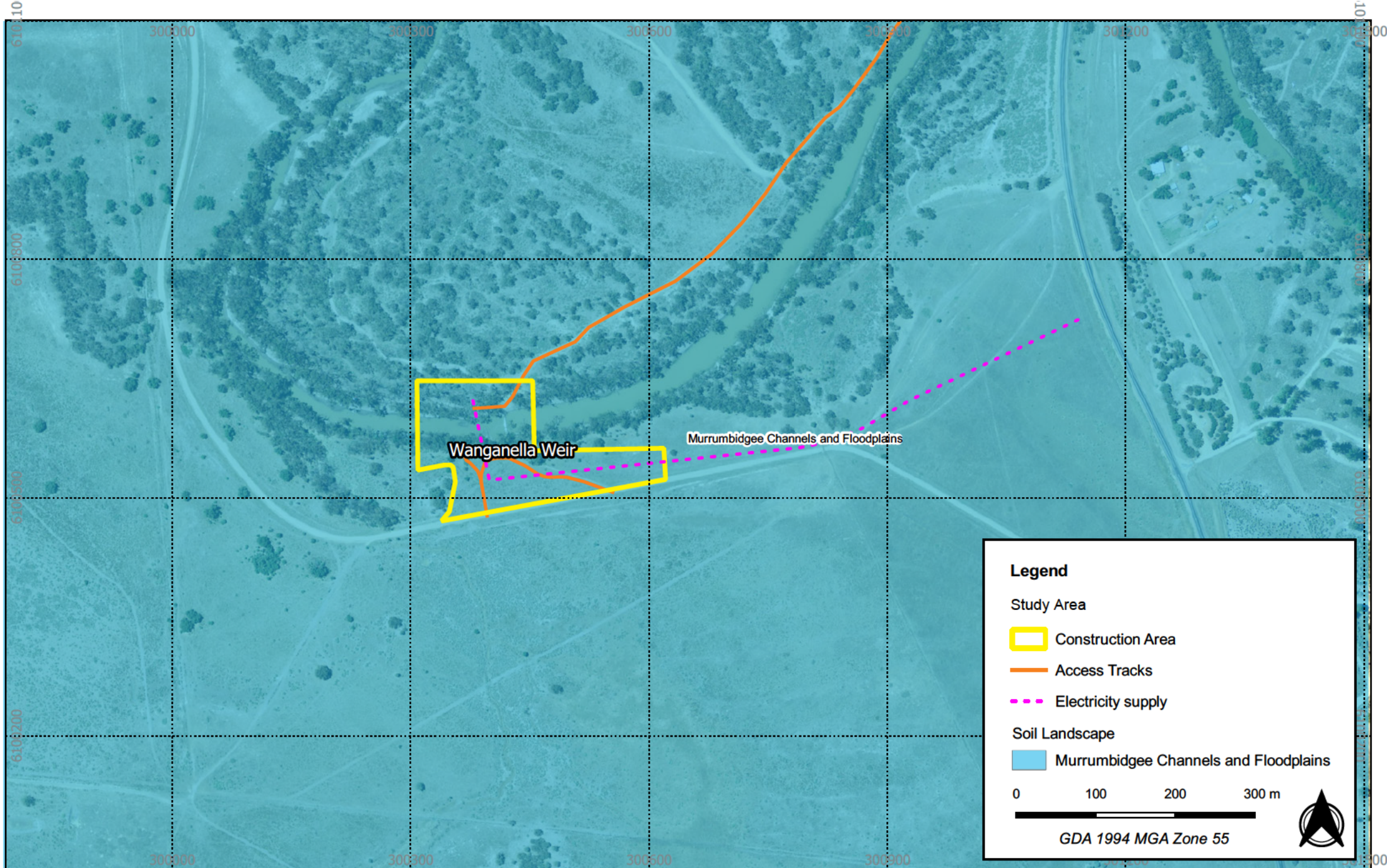


Figure 3.7 – Mitchell’s soil landscapes identified within the Wanganella Weir study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Aerial, Mitchell Landscapes v3.1

Drawn by: FOT Date: 2024-01-25



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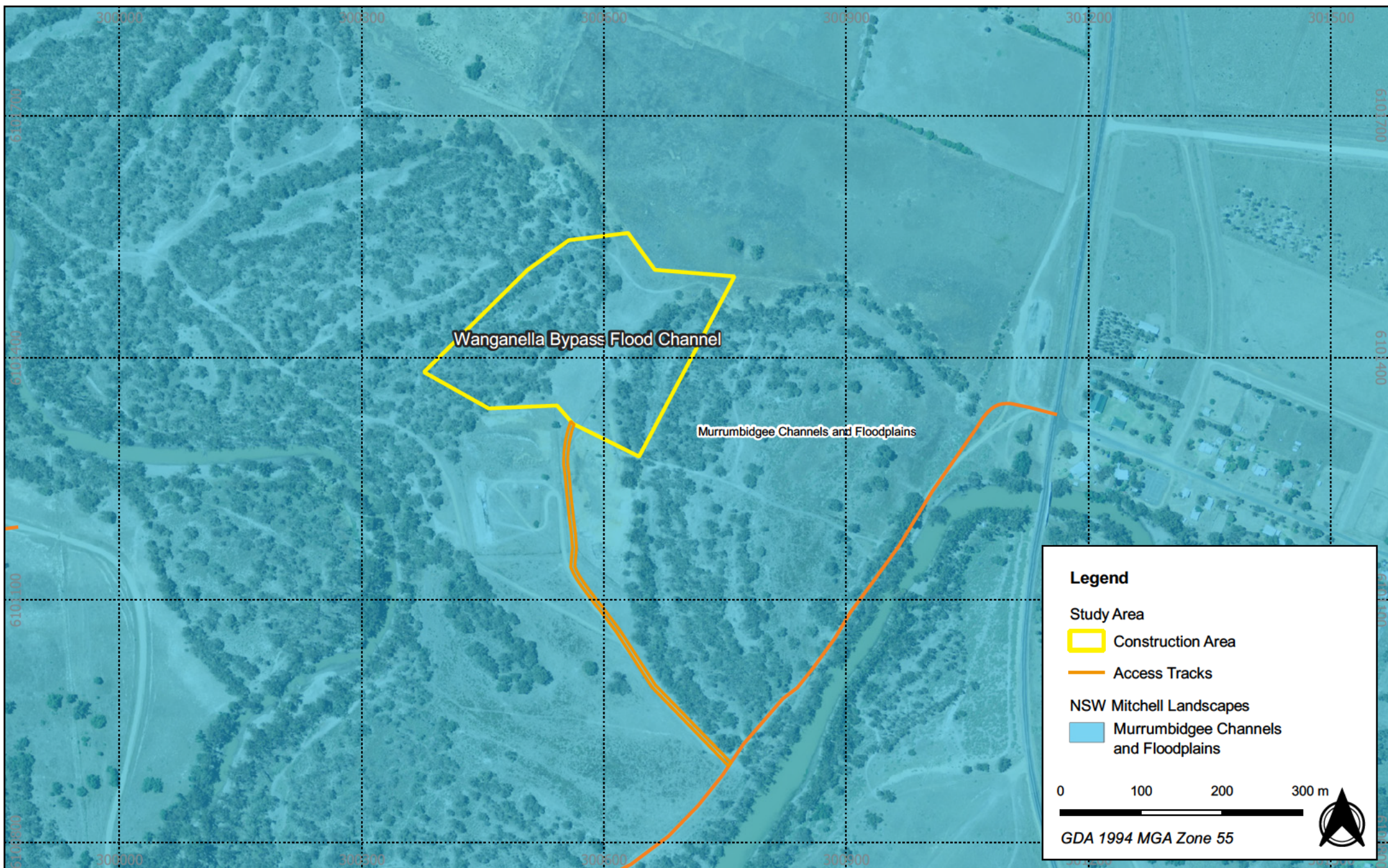


Figure 3.8 - Mitchell landscapes within the Wanganella Bypass Flood Channel study area

23039 - Yanco Creek Modernisation Project

Source: NSW LPI Aerial, NSW Mitchell Landscapes v 3.1

Drawn by: FOT Date: 2024-10-21



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3.1.3 CLIMATE AND VEGETATION

The study area's environmental context is defined by its place within the Riverina Bioregion. Based on climate data from Deniliquin (Visitor Information Centre) [site number 074128], located approximately 40 kilometres from the study area, the local region is characterised by generally hot wet summers and cool to cold dry winters. The highest annual average temperature is 23.6 degrees Celsius (°C) and the lowest is 9.5°C. Summer mean temperatures reach highs of 32.5°C in January and lows of 15.7°C. July is the coldest month with an average max temperature of 14.4°C and an average minimum temperature of 3.4°C. The annual average rainfall is 401.2 millimetres with the wettest month being June with a mean rainfall of 39.5 millimetres. February is the driest month with a mean rainfall of 27.5 millimetres (Bureau of Meteorology 2022).

The study area encompasses several environments and ecological classes within the Riverina Bioregion.

The portion of the study area that falls within the Jerilderie (jex) soil landscape has vegetation consisting of open boree woodlands and open grasslands, which could provide habitat for several species including birds, reptiles and mammals (Department of Environment, Climate Change and Water NSW 2010). Vegetation within the Niemur River (nmu) soil landscape study area consists of river red gum and grassy woodlands (Department of Planning, Industry and Environment 2020).

Vegetation of the Murrumbidgee Channels and Floodplains consists of open river red gum (*Eucalyptus camaldulensis*) forest and black box (*Eucalyptus largiflorens*) woods. With river cooba (*Acacia stenophylla*), cooba (*Acacia salicina*), lignum (*Muehlenbeckia cunninghamii*), numerous grasses and nitre goosefoot (*Chenopodium nitrariaceum*) along the channels and floodplain. Vegetation within and around flooded depressions consists of prickly saltbush (*Rhagodia spinescens*), old man saltbush (*Atriplex nummularia*), lignum, nitre goosefoot, and annual saltbushes are present in black box (*Eucalyptus largiflorens*) woodlands (Mitchell 2002, p.104). The study area's mild to warm climate and close proximity to fresh water would have made it a suitable location for long-term occupation.

3.1.4 LANDSCAPE RESOURCES

The study area encompasses a number of environments and ecological classes within the Riverina Bioregion. Each environment offers its unique mix of flora and fauna, as well as sharing common species. These include, but are not limited to, plant species such as river red gum, black box, wetland grasses and sedges, and animal species such as birds, reptiles, mammals and fish. The study area is also located within close proximity to fresh water, allowing a wide variety of floral and faunal species to be exploited by local Aboriginal people for everyday life (NSW NPWS 2003, p.93)

Many of the plants were utilised by Aboriginal people for not only food but also material resources with reeds often used for the construction of nets. Adding to this list of vegetation is a large number of herbs and grasses that form the ground cover of these communities that can be and were used for food and or medicine including the leaves from old man saltbush (*Atriplex nummularia*) which can be eaten or used as a medicine for dabbing on open wounds, boils, scabies and cold sores (Australia Biotechnology Group 2021). The bark from river red gums would have been used to make canoes and bark from other tree species such as the black box would have been used to make bowls and baskets (Atkinson & Berryman 1983, p.23-25). Bark and grasses were used in the construction of habitation structures such as huts (Buchan 1974). Many plants were included in the diet of Aboriginal people. Wattles, Buloke and other flora would provide seeds that could be ground, and the dwarf cherry and saltbush would provide fruits that were eaten. Other parts of plants could also be consumed such as the bark, stems, and roots. Herbs, such as sow thistle, midge orchid, and river mint, were also gathered from the surrounding area and used in cooking (Bucan 1974, Craib 1991, p.61).

The Riverina Bioregion provides a habitat for an extensive variety of mammals, reptiles, amphibians, molluscs, fish, and birds, that were used in the diet of the Aboriginal population and contributed to material resources. Aquatic species present within the bioregion also included the two-spined blackfish (*Gadopsis bispinuous*), Australian rainbowfish (*Melanotaenia fluviatilis*), silver perch (*Bidyanus bidyanus*), Murray jollytail (*Galaxias rostratus*) and Murray cod [*Maccullochella peelii*] (NSW NPWS 2003, p.94). Fish was the staple of the Aboriginal diet due to the reliability of the Murray River, which provided a permanent habitat for fish species. Other aquatic species that were exploited were freshwater molluscs and crustacean species with there being a small variety of species present in the Murray River and its tributaries (Mitchell 2005) and are often found in midden sites. This includes freshwater crayfish, mussels and snails. Mussel shell was used for scraping and cutting as the stone for tools was not always available (Atkinson & Berryman 1983, p.25).

The Riverina Bioregion is known to house many significant native species such as the “superb parrot, sugar glider, squirrel glider, brush-tailed phascogale, koala, carpet python, freckled duck peregrine falcon” (NSW NPWS 2003, p93). Several mammals have been identified as a part of the ecology of the Riverina Bioregion. Species of possum, kangaroo, wombat, numbat and a variety of smaller marsupials were some of the mammals present within the region before European occupation (NSW Department of Planning, Industry and Environment 2021). Not only did these species make up a part of Aboriginal diets but provided a variety of materials to construct tools, clothing and items of transportation.

Possum was highly sought-after fur for the creation of cloaks and sinews harvested from the carcasses of mammals were used in necklaces, armlets, and belts. Some skins were used to make bags for carrying food or water during periods when people were travelling (Atkinson & Berryman 1983b, p.23-25). Records have described the gathering of duck eggs in the spring along with seasonal duck hunts that used nets across waterways that the birds would be pursued into (Atkinson & Berryman 1983b, p.18–19). Feathers of birds were used as personal adornment, decorating necklaces and armlets. Bones were also used in a similar fashion (Atkinson & Berryman 1983b, p.25).

Current threatened and endangered species such as the plains-wanderer, trout cod, and the bridled nail-tail wallaby, as well as the extinct eastern hare-wallaby and northern hairy-nosed wombat, also thrived in the Riverina Bioregion pre-contact. However, heavy pastoral and agricultural practices brought into the study area post-contact in the 19th Century also introduced faunal species such as cattle, pigs, sheep, foxes and rabbits, leading to a significant decline and extinction of most species endemic to the Bioregion (NSW NPWS 2003, p93.).

3.2 PAST LAND USE PRACTICES

European settlement in the area occurred in the mid-1800s, with the pastoral holding that the study area is located on being Coree (The Bathurst Daily and Free Press and Mining Journal, 3 December 1890, p.4). The pastoral station was mainly used for livestock, most notably for sheep, as well as cropping, including wheat. Water at the station was through water holes and dams along the creeks and constructed water tanks and dams within the station (The Sydney Mail and New South Wales Advertiser, 19 August 1903, p.459). The land has been cleared for agriculture and has changed very little since early aerials have been taken (Figure 3.9, Figure 3.10, Figure 3.11 and Figure 3.12).

In 1912, the Yanco, Colombo and Billabong Creeks Water Trust (The Water Trust) was established to secure water within Billabong and surrounding creeks (Government Gazette of the State of New South Wales, 18 March 1921, p.1805). Works conducted by the trust and privately have greatly affected the permanency of the water within the creek and the flow of the water. The water infrastructure within the study area was constructed under the 1912 Water Act, as a “block dam and pipe regulator” as a part of an irrigation license for Gerard Harris McLaughlin and Wendy Laraine McLaughlin (Government Gazette of the State of New South Wales, 30 March 1984, p.1820).

The construction of water infrastructure, the clearing of the land and developing it for cropping has greatly impacted the survivability of Aboriginal sites. Scar trees would have been removed, and the earth mounds and hearth been slowly flattened over the years. Grazing the land also has an impact on sites, with cattle being found to move lithic artefacts from their original locations, depending on the grazing intensity, site topography, and size of the artefacts (Schoville 2019). Hoofed animals have also exacerbated the effects of clearing and cropping regarding soil erosion, leading to subsurface cultural sites being exposed.

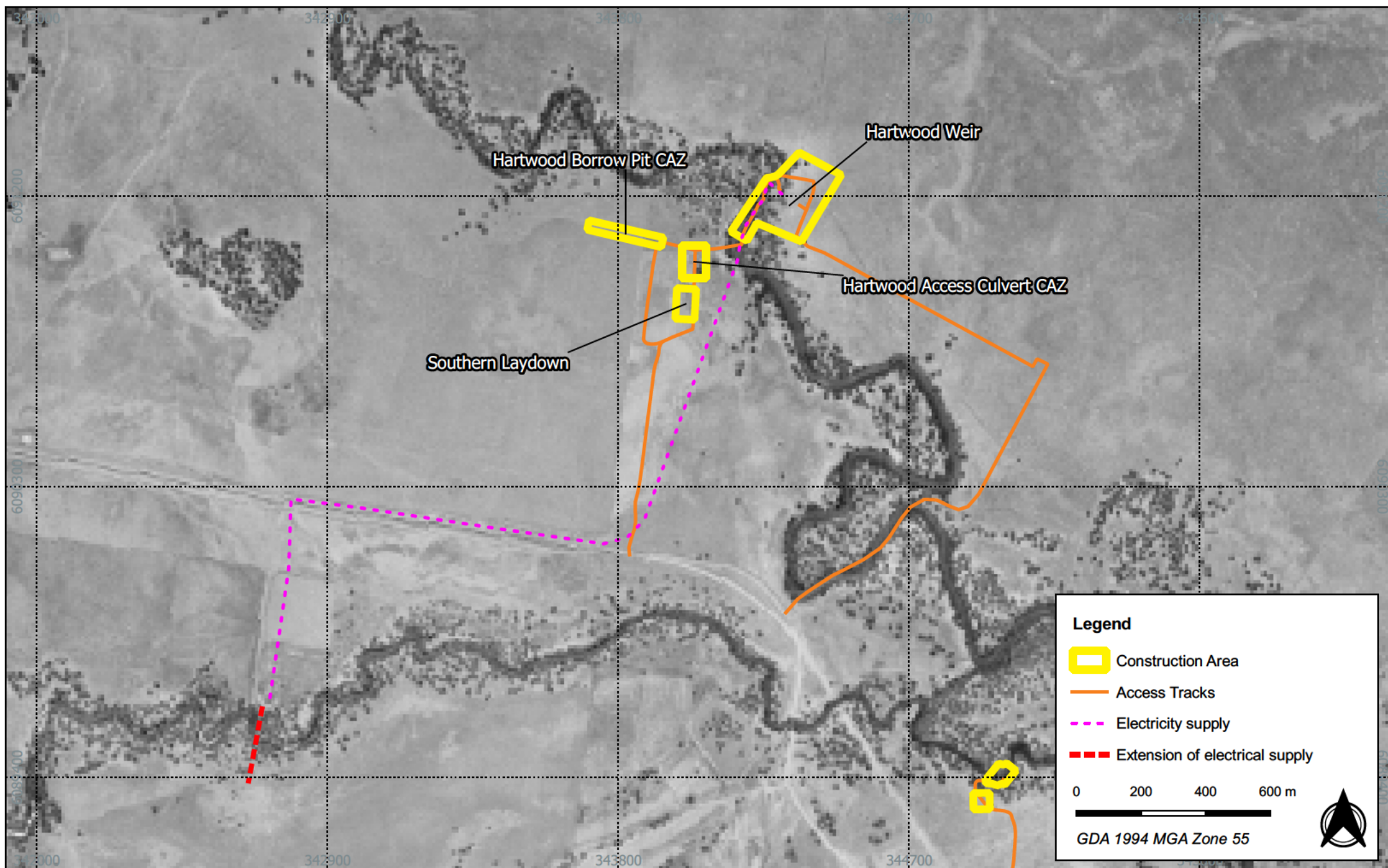


Figure 3.9 - 1986 Historical aerial of the Hartwood Weir study area

23039 - Yanco Creek Modernisation Project

Source: NSW Spatial Services

Drawn by: FOT Date: 2024-05-29



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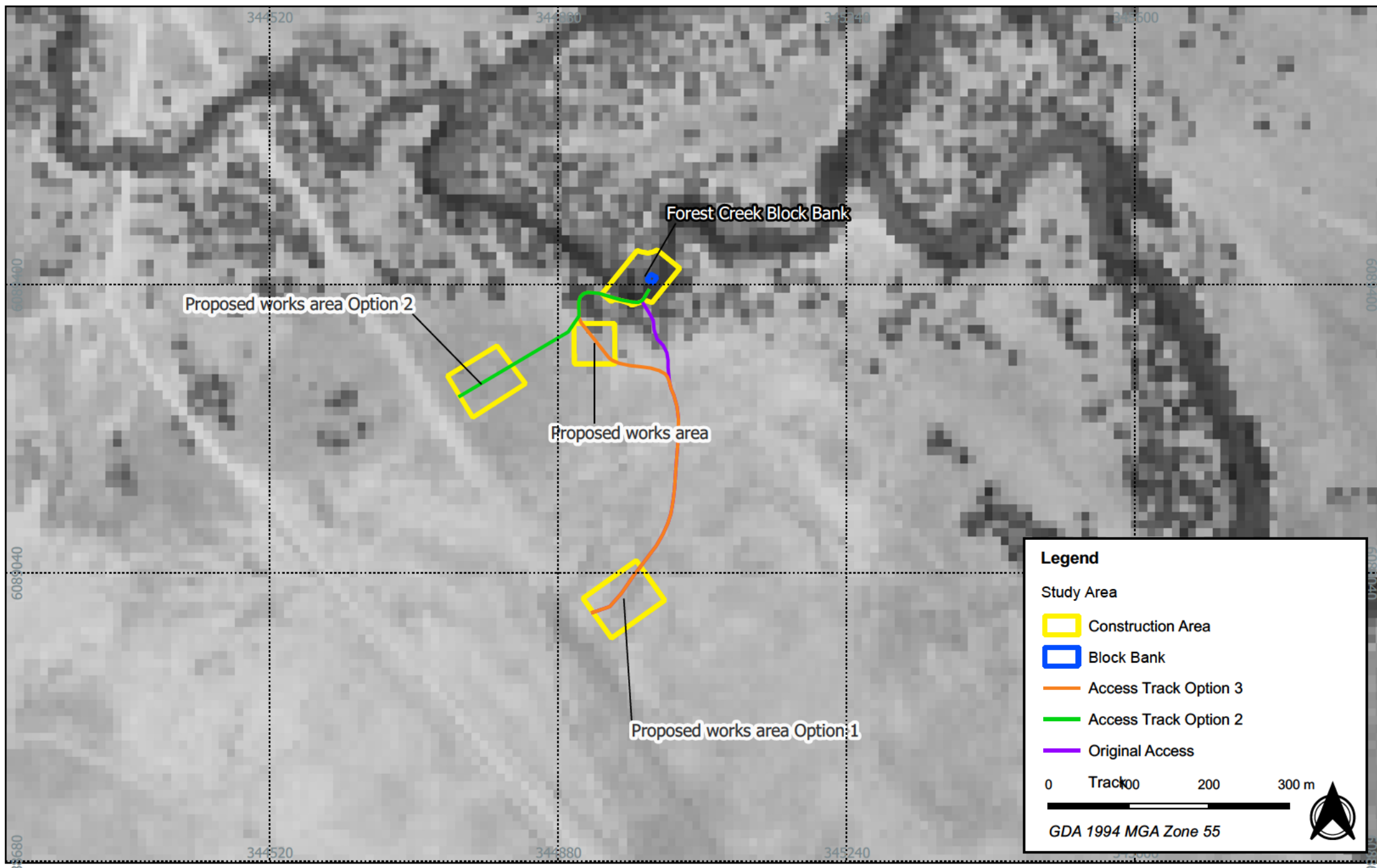


Figure 3.10 – 1968 Historical aerial of the Forest Creek Block Bank study area

23039 - Yanco Creek Modernisation Project

Source: NSW Spatial Services

Drawn by: FOT Date: 2024-01-29



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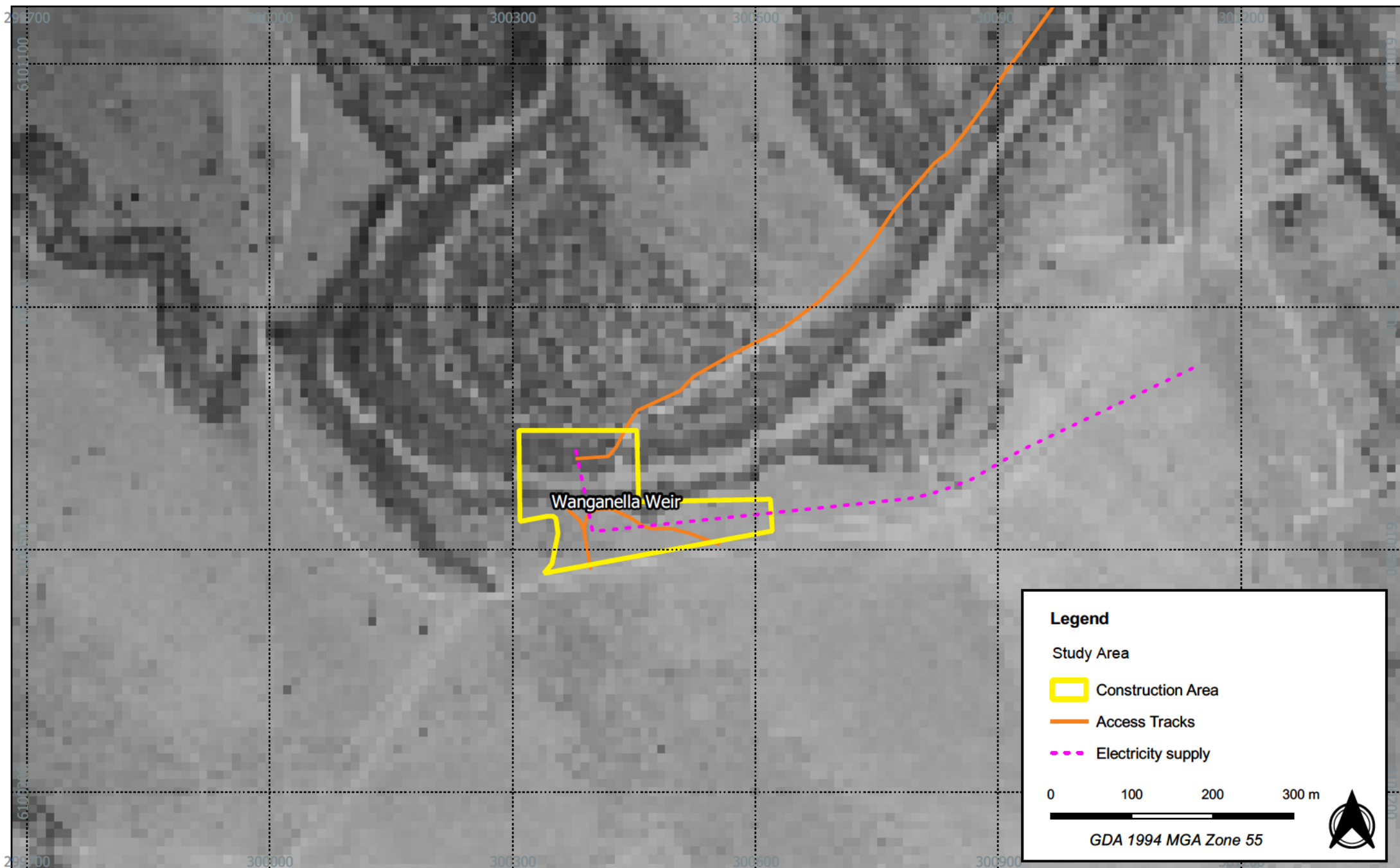


Figure 3.11 – 1985 Historical aerial of the Wanganella Weir study area

23039 - Yanco Creek Modernisation Project

Source: NSW Spatial Services

Drawn by: FOT Date: 2024-01-25



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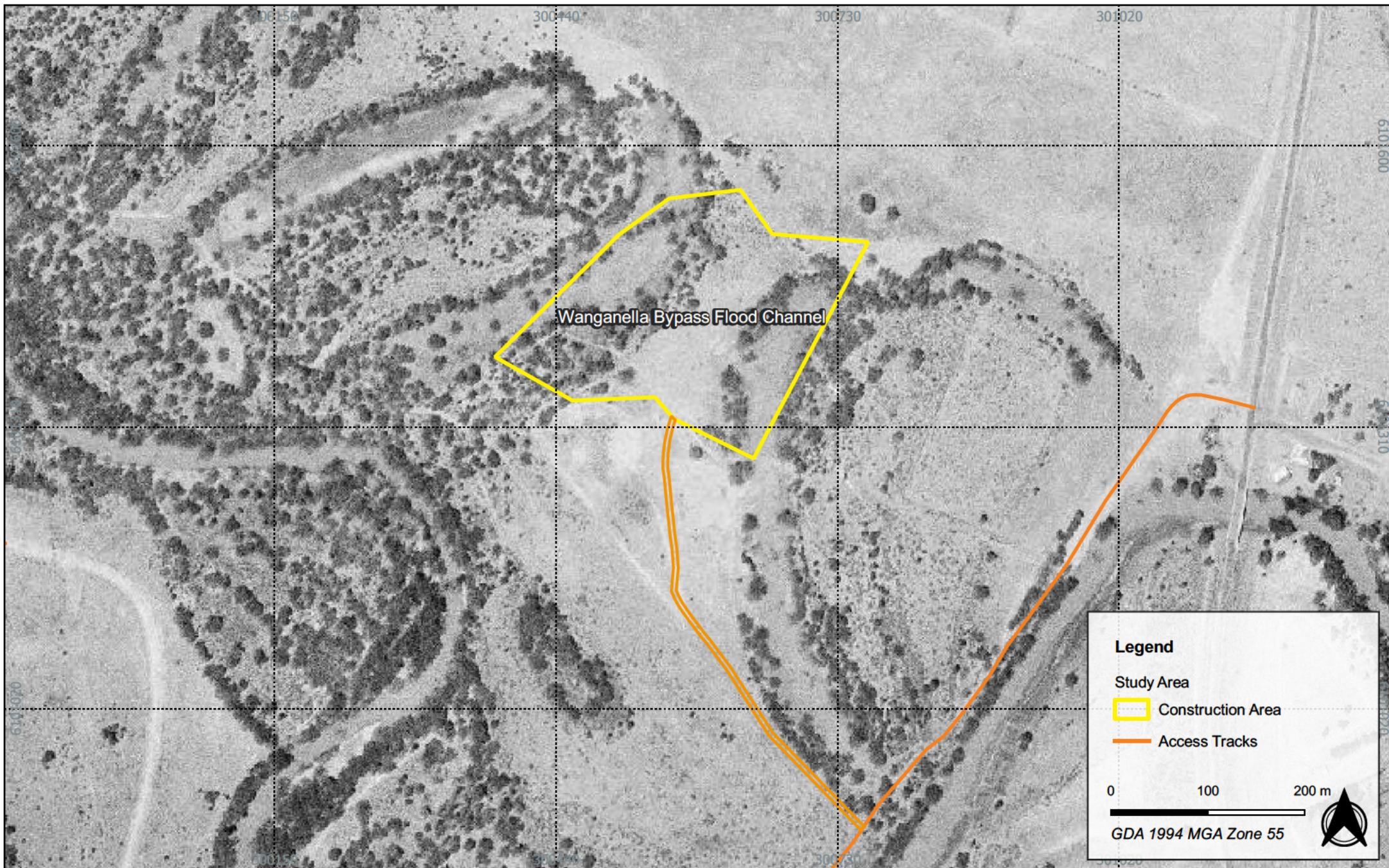


Figure 3.12 - 1976 Aerial of the Wanganella Bypass Flood Channel study area

23039 - Yanco Creek Modernisation Project

Source: NSW Spatial Services

Drawn by: FOT Date: 2024-10-21



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4 ARCHAEOLOGICAL CONTEXT

The range of environments and landscapes within the Riverina region had a profound influence on the lives of the Aboriginal people who lived there. As hunters and gatherers, Aboriginal people were reliant on their surroundings to provide food. Their transitory lifestyle affected population size, social interactions and degree of mobility, which can be confirmed in the archaeological record.

4.1 POPULATION AND CONTACT HISTORY

The ethnography of the region is dynamic and has been described notably by two people Tindale in 1940 which was revised in 1974, and Horton in 1996 for the Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS). These maps and descriptions do not accurately depict the distribution of Aboriginal groups, which is mentioned by Tindale, represented through the dashing, and dotting of boundary lines on his maps.

According to Tindale (1974), the study area is associated with the traditional lands of 3 Aboriginal peoples, the Yorta Yorta, Barapa Barapa, and the Jeithi as it is located close to the boundaries of these groups. The Yorta Yorta nation, also known as the Jorta Jorti and Yota Yota, ranges from Deniliquin (north) to Moama (south) and Cohuna (west) to Tocumwal [east] (Tindale 1974, p.194). The Barapa Barapa were recorded to range from the Murrumbidgee River (north), southward past Kerang and share a portion of its south-eastern boundary with the Yorta Yorta (Tindale 1974, p.191). The Jeithi were identified to inhabit the land between the Murray River and Lake Urana, Jerilderie and Lockhart (Tindale 1974, p.193). It should be noted that in Tindale's 1940 map, the Bangerang people extended over the Murray River and incorporated the Jeithi lands, which is also the case with the Yorta Yorta boundaries, with the Yorta Yorta being depicted as being further north than in the 1974 map. Horton (1994) focuses on language groups, which place the study area on the boundary of Barapa Barapa, Yorta Yorta, and Wiradjuri. The area where the study area is located is currently considered to be shared land, with representatives from multiple groups attending fieldwork.

The Riverina would have been able to support large populations of Aboriginal people, due to the number of permanent watercourses and the associated food and material resources. Resources along the water sources would have included materials that were used for the creation of canoes, nets, stone tools, and other items for the collection and transportation of goods (Atkinson & Berryman 1983).

The significance of the relationship between Aboriginal communities and the environment is reflected in the use of Totems. Traditionally, early anthropological works see the totems as a part of a spiritual connection surrounding the social connections between individuals, family and marriages, as they were symbolised by specific animals or plants (Mathew 1907, p.100). The totemic systems throughout Australia differ greatly and the number and type of totems an individual may have is dependent on the traditions of the nation to which they belong (Berndt et al. 1988). Modern interpretations of some Aboriginal totemic systems describe them as a form of resource management or agriculture. In the areas around Riverina, an individual will avoid eating their totems and this reduces the dependency on any one resource in an area and ensures that a wider variety of the resources in an area where used.

Borders were dynamic, changing continuously with the movements of the different groups. This, along with a decrease in population due to the introduction of disease, makes it difficult to estimate the total population of Aboriginal groups. At the time of European occupation, numbers varied with some groups noted to have up to 3,000 people. These numbers should not be considered an accurate description of the total population, as the areas considered fertile by the European settlers may not be the same for the Traditional Owners and since Aboriginal communities were greatly affected by the European diseases, they may have avoided the bigger rivers like Murrumbidgee during times when population numbers were estimated (Read 1983).

After colonial contact, the Aboriginal population continued to decline with groups being displaced by European settlers and the forcible relocation to several missions and reserves in Victoria and NSW. In 1863 the Aboriginal Protection Board made Coranderrk, at Healesville, a compulsory refuge for the Aboriginal population, which led to a large number of Aboriginal people moving to the NSW side of the Murray River (Bell et al. 2015, p.24, Clark 2002, pp.19–20). A number of reserves, protectorates and missions were established in NSW, the most famous of which being the Cummeragunja protectorate. After the establishment of the Maloga Mission in 1873, 15 miles outside of Moama, the NSW government established the Cummeragunja protectorate next to a mission in 1883, with the last of the mission's population moving to the protectorate in 1889. Throughout this time many Aboriginal children were relocated by the governments. In 1908, the community of Cummeragunja was forced to take wages from the NSW government, removing their independence. This led to some of the population leaving the protectorate (Clark 2002, pp.19–20). Other reserves established in the wider area were:

- Moonahcullah Aboriginal Reserve: 1866 -1964, located on the banks of the Edward River 40 kilometres north-west of Deniliquin (Government Gazette of the State of New South Wales, 14 August 1964, p64; Tribune, 29 November 1961, p.2)
- Deniliquin Aboriginal Reserve: 1949-Current, located one kilometre west of Deniliquin, on the banks of the Edward River (Government Gazette of the State of New South Wales, 12 August 1949, p.2308).
- Warangesda Aboriginal Reserve: 1879-1926, located 3.5 kilometres south of Darlington Point (Commonwealth of Australia Gazette, 15 May 1990, p.57; The Riverine Herald, 14 January 1941, p.1; The Sydney Morning Herald, 5 June 1926, p.9).
- Moulamein Aboriginal Reserve: 1967 -1981 located within the township of Moulamein on the corner of Cedar Avenue and Gwynne Street (Government Gazette of the State of New South Wales, 13 May 1966, p.1950)

Aboriginal people in the district were also employed on stations and as a part of the native police force. On stations, Aboriginal men were employed as cheap labour to work with stock and build farming infrastructure. Some worked as guides helping European settlers through the region (Evening News, 29 June 1872, p.6). The Native police were commissioned to aid in mitigating conflict between European settlers and Aboriginal communities. The first troopers recruited by Frederick Walker in 1848 were from groups in the Murrumbidgee, Murray and Edward river regions (National Museum Australia 2022). The men of the Native police, however, did not always operate in their home regions and often worked outside of their country (National Museum Australia 2022); Evening News, 29 June 1872, p.6). The Native Police were active in NSW until 1960 (National Museum Australia 2022).

4.2 PREVIOUS ARCHAEOLOGICAL WORK

The material evidence of Aboriginal land-use has been compiled based upon a review of previous archaeological studies at a regional and local level, heritage database searches and field investigations.

4.2.1 REGIONAL ARCHAEOLOGICAL CONTEXT

REPORT ON AN ARCHAEOLOGICAL SURVEY IN THE MURRAY VALLEY, NEW SOUTH WALES – 1973-1974

The overall purpose of this study was to record as many Aboriginal sites as possible so that they could be added to the NP&WS Register of Aboriginal Sites and ensure that those that needed protection were protected. The survey was conducted covered a 30-mile (48.28 kilometre) length of the northern bank of the Murray River, between Albury and Mildura and sampling an area of 16,000 miles² (4,143,981 hectares) (Buchan 1974, p.1).

The survey was conducted on selected sites since the whole area could not be subject to a full archaeological survey. There were 5 of these areas that each covered approximately 300 miles² (77,699.6 hectares). These sites were centred on Deniliquin, Swan Hill, Corowa, Wentworth, and Hay. Some sites outside these study areas were made known to the survey team by local landowners. This method leaves some areas in the study underrepresented compared to those that were surveyed in detail. The survey located 198 sites, which included ovens, scarred trees, shell middens, surface campsites, burial, ceremonial sites, and archaeological deposits. Most of the sites were located in the Deniliquin survey area with 86 sites. A total of 25 sites were recorded within the Wentworth area, 18 at Swan Hill, 6 at Hay and only 4 around Corowa. The total number of sites recorded outside of these areas was 58 (Buchan 1974, p.39).

Throughout this study, it was observed that:

- Nearly half of the sites (n=94) located within the survey were oven mounds that were found throughout the area and were associated with water sources. The size of an oven could be as small as one metre in diameter and 100 millimetres high up to as large as 120 metres in diameter and 2 metres high. Oven mound sites commonly consisted of multiple oven features, ranging from 2 to 3 mounds up to 50 or 60. Oven mounds contain baked clay, shell fragments, charcoal, stone artefacts, and animal and human bone, with the possibility of a human burial being located within the mound.
- Scarred trees (n=75) were the second most common site recorded.
- Out of the 16 burials, 10 were identified in association with other cultural material, with all the burials belonging to adults.
- All 7 middens contained stratified deposits of freshwater mussels with small amounts of freshwater deposits. Charcoal was located throughout the extent of the middens and other materials such as animal and human bone can be found within the middens. The length of midden sites ranged from 15 to 650 metres with a width ranging from 2 to 60 metres. The thickness of midden deposits averages between 200 to 300 millimetres.
- 2 suspected ceremonial sites were located during the survey. One within the Corowa survey area, on Goombargana Hill, and the other Buronga that had been destroyed before the survey had started.
- There was one site of archaeological deposits that could not be identified as any particular site type. The site is a stratified deposit that had been exposed through erosion. It contains burnt clay, charcoal, bone, and worked stone.

These sites were located across 10 landforms that are summarised in Table 4.1 (Buchan 1974, p.48).

Table 4.1 Topographic location of sites

Site Type	Creek	River	Lake	Lagoon	Swamp	Dune	Hilltop	Rock Outcrop	Stream	Open	Total
Oven	68	10	-	-	11	-	-	-	-	5	94
Scarred Tree	25	18	17	3	2	-	-	-	-	11	75
Shell Midden	1	6	-	1	-	-	-	-	-	-	8
Surface Campsite	3	-	-	-	-	6	-	1	2	-	12
Burial	1	-	-	-	-	3	-	-	1	1	6
Ceremonial Site	1	-	-	-	-	-	1	-	-	-	2
Archaeological Deposit	-	-	-	-	-	-	-	-	1	-	1
Total	99	34	17	3	13	9	1	1	4	17	198

ABORIGINAL BURIALS AND SAND MINING ON THE RIVERINE PLAIN, NSW

This report focused on burials associated with sand dunes. The desktop analysis found burial is the most common mortuary practice that is recorded, but these practices can be complex with many regional variations and individuals treated differently based on social status, age and sex. Burial locations are dependent on the topography of the area, with dunes being locations of 'cemeteries,' especially if they are close to current or past water sources. In areas where there are no or few dunes "artificial burial mounds were constructed" (Bonhomme 1990, p.34). Sand bodies become more favoured as burial sites in the western portion of the Riverine Plain than in the east. Burial grounds in sand bodies will also contain multiple burials with isolated individual burials not being overly common throughout the region being studied. Graves are generally shallow in the upper crest sediments of a sand body. Burials on the Riverine Plain have the potential of dating as far as at least 26,000 BP with many burial grounds falling out of use 3,000 years ago (Bonhomme 1990, p.76).

The survey conducted for this report was across 33 burial sites from the Riverina plains region, 6 of which were in the Edward-Wakool River system. 29 of these sites were located on landforms that were formed by sand such as sand plains, dunes, lunettes and prior stream sediments. Some of these burials were within middens that were located on one of these landforms. One location contains 2 burial sites, one within a dune, and the other is located on a flood plain one kilometre from the dune. Most of the rest of the sites were located on flood plains. One site was located within a mound and another burial ground was within a levee (AHIMS # 54-4-16) on Thule Creek. Bonhomme concluded that the Aboriginal population was higher in the west than it was in the east due to the number of sites increasing the further west the study went. Many of the burials along the Murray River are often identified alongside middens that have been dated between 13,000 and 10,000 BP. 3 types of burial sites were identified:

- Isolated, Individual Burials: these appear to occur randomly and are common throughout the Riverina Plain. Many of the burials located in dunes along the Murray can be classified as this type of burial, but they can also appear in floodplains, prior stream sediments, mounds and lunettes.
- Locations that contain a great many individuals: these burials are located in lunettes, sources bordering dunes, and stream channels. These locations were used over long periods, but there appears to be no continuity between burials, suggesting that they are connected in time or space.
- Burial Grounds or 'cemeteries': these locations appear to be deliberately planned, with defined boundaries and grave patterns. They are located in source bordering dunes, prior stream levees and point bars. There is an association with junctions of permanent water sources, or where there are stable resources that are needed for the occupation of the area. These sites date to the Holocene, in which Bonhomme contributed to a possible change in social organization.

Burial grounds are reported more in the west than in the east of the Riverina Plain, with isolated burial being common in the east. Though the western area of the Riverine contains a higher number of burial sites than the eastern area has been subject to higher rates of development, leading to the exposure and reporting of sites. These developments are also concentrated on landforms that are identified as containing potential burials (Bonhomme 1990, p.158).

EAST AND WEST: BURIAL PRACTICES ALONG MURRAY RIVER

Littleton examined the variation of burial practices along the Murray River, using data from a variety of sources such as the NPWS site register, analysis of Victorian Burials by Russell in 1990, surveys conducted by Pardoe, and the author's fieldwork, and published sources. The oldest burial used in this analysis was dated to 12,000BP and was from Coobool Creek. The report compares Lower, Central, Upper Murray, and Lower Darling (Figure 4.1) [Littleton 1999, p.2]. The upper Murray includes the riverine Plain which includes the Lachlan, Murrumbidgee and Murray rivers with their tributaries and anabranches. The Central Murray is defined as the narrowed portion of the Murray River that flows through the Mallee. The Lower Murray is defined as the portion of the river that is below the tri-state border. This is an area where the river flows through a narrow gorge. The Lower Darling included the Darling River and the Anabranch between the Menindee Lakes to the junctions with the Murray River (J Littleton 1999, pp.1–2).

This study involved 2,016 burials that are located within 236 sites. Five sites were located in the Lower Murray with 308 burials being contained in these sites. The Central Murray had the greatest number of burials with 794 burials being located in 54 sites. The upper Murray had the highest number of sites with 164 sites that contain 739 burials overall sites. The Lower Darling had 175 burials over 13 sites (J Littleton 1999, pp.4–5). Sites were identified as being located in specific landforms, being shelters, occupation sites, clay pans, riverbanks, levees, lunettes and dunes. The distribution of sites in landforms can be seen in Figure 4.2 (J Littleton 1999, p.6). Around half the sites located in the Central Murray, Upper Murray and Lower Darling contain 2 to 10 burials. The Upper Murray has a lower number of burials per site than the Central Murray and Lower Darling, with 39.5 per cent of sites containing one burial. No Sites in the Central Murray contain more than 50 burials with there being at least 7 per cent of sites in the Central Murray and lower Darling containing more than 50 burials (J Littleton 1999, p.7). Most burials are in the form of inhumation.

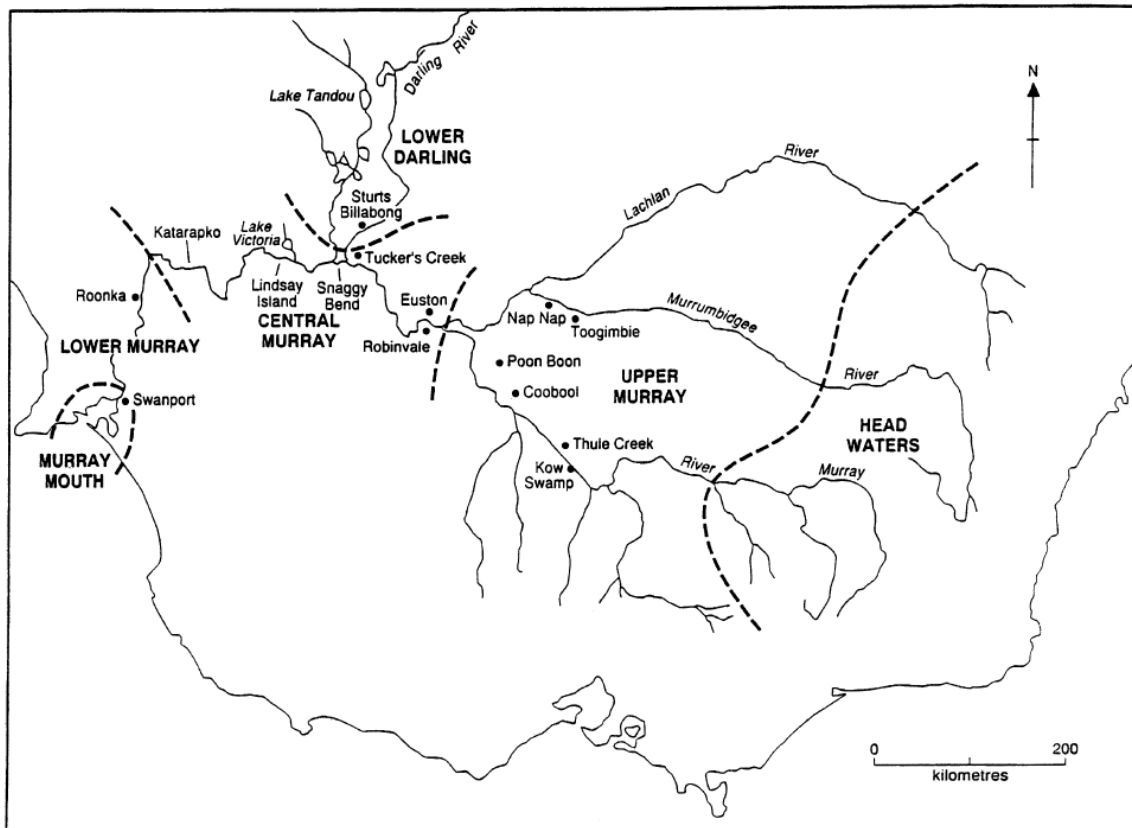


Figure 4.1 The Murray Basin and location of sites with >20 burials

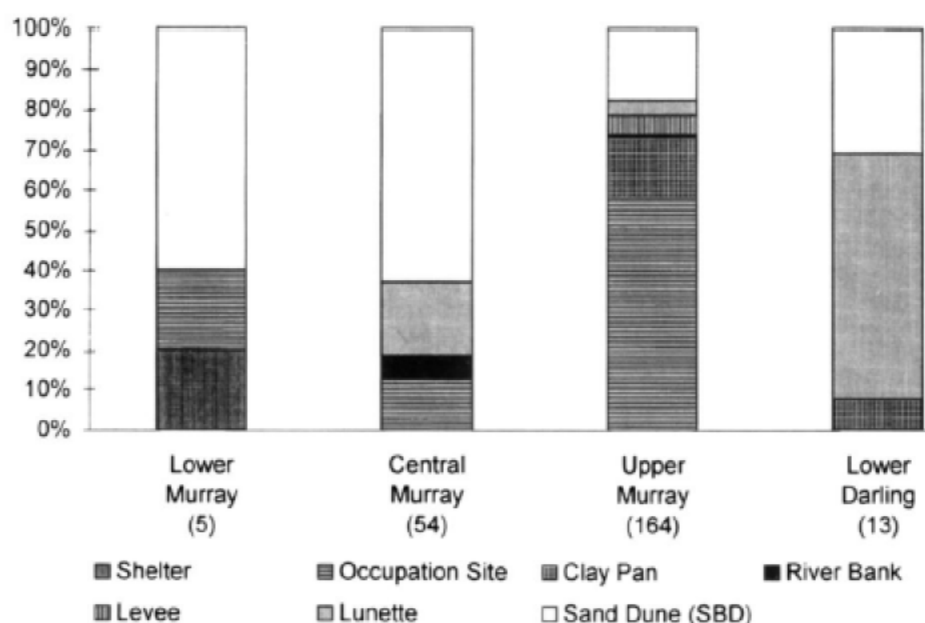


Figure 4.2 Burial locations by landform

BURONGA TO WAGGA WAGGA, NSW. REVISED ACHA

Navin Officer (2022) was commissioned by WSP Australia Pty Ltd to complete a Revised Aboriginal Cultural Heritage Assessment report for the intended construction and operation of a new high-voltage interconnector between NSW and SA. The study area comprises a one-kilometre-wide corridor that runs between the Wagga Wagga substation and the Buronga Substation and traverses approximately 540 kilometres. The report encompasses several Local Government Areas that are relevant to this report which include Federation and Edward River as well as Wagga Wagga, Lockhart Shire, Murrumbidgee, Hay Shire, Murray River, Balranald Shire and Wentworth Shire.

Due to the lack of access granted by landowners, some areas were not surveyed, and other areas were surveyed visually from a vehicle or accessible areas. Resulting in a survey coverage of 97 per cent with approximately three per cent or approximately 18 kilometres remaining unsurveyed. One hundred and five new Aboriginal sites and 45 areas of Potential Archaeological Deposits (PADs) were identified during the survey (Table 4.2). This report is unclear on how PADs were determined during the survey.

Table 4.2 Survey Results

Site Features	Number	Percentage
Isolated Artefact	45	42.8
Artefact Scatter	23	21.9
Modified Trees	8	7.61
Hearth	6	5.71
Earth Mounds	3	2.85
Shell Middens	1	1.09
Artefacts, Hearth and Modified Tress	13	12.38

Landscape across the study area varied and the majority of sites were identified on Alluvial plains (n=55). A further 28 sites were identified within a Flat Plain Landform. Other sites were identified on plains, flood plains, undulation sandplains, a dune crest, a levee, and a mid-slope. It was identified that distance to water appeared to determine site density, with clusters of sites located in areas with close access to perennial and non-perennial watercourses.

Twenty-six of the 45 PADs were identified as being directly impacted by the works with the remaining 19 PADs unlikely to be impacted.

Test excavations were carried out in accordance with the Code with all pits excavated by hand in 0.5 X 0.5 metre units. Test excavations revealed that some PADs had no archaeological potential, and the PAD classification was removed.

The majority of PADs held a single artefact, with six PADs containing artefact scatters. Two PADs held three stone artefacts each, one PAD held four stone artefacts whilst another had six. Two PADs held the largest scatter with one having eleven stone artefacts and the largest one having 25. Another PAD had evidence of a hearth with a number of termite mound heat retainers identified and two PADs had both stone artefacts (n=1 and n=4) and evidence of a hearth. Eleven PADs contained no archaeological evidence.

MURRUMBIDGEE PROVINCE ABORIGINAL CULTURAL HERITAGE STUDY

A regional study for the Murrumbidgee sub-region was conducted by Colin Pardoe and Sarah Martin. The study involved a register search for sites and a survey of 61 sample units (quadrants) across the regions. The register search identified 307 sites previously recorded and the survey identified 347 sites across the 61 quadrants. The frequency of site types identified during the survey is displayed in

Table 4.3 (Pardoe & Martin 2001, p.61).

Table 4.3 Number of sites by site type

Site Type	Number	Percentage
Scar	91	26.2
Mound	84	24.2
Open Site	50	14.4
Oven	43	12.4
Burial	27	7.8
Hearth	21	6.1
Midden	9	2.6
Isolated Artefact	6	1.7
Dinner Camp	5	1.4
Shell Midden	3	0.9
Historic	3	0.9
Soak	1	0.3
Myth	1	0.3
Historical Burial	1	0.3
Bora Ring	1	0.3
Artefact Scatter	1	0.3
Grand Total	347	100.0

Mounds are considered one of the most common site types in the region with them forming a quarter of the identified site and were identified in 27 of 61 quadrants during the survey. Mounds are described as nearly circular rises of various sizes. They often contain different soil characteristics to the surrounding landscape which leads to the vegetation associated with mounds being different. They also included organic materials such as charcoal, bone, and shell, as well as materials that will retain heat such as clay (Pardoe & Martin 2001, pp.68–69). During the study it was identified that mounds would be located in clusters (Table 4.4) [Pardoe & Martin 2001, p.69], with there being an average of 3.4 mounds per cluster, with the largest number of mounds in a cluster being 12 (Pardoe & Martin 2001, p.69). The mounds identified averaged around 25 meters by 22 meters in size with the largest having a diameter of 80 meters and the smallest, a diameter of 4 meters. Similar variation is seen in the high number of mounds with a range of 3 centimetres to 1.2 meters (Pardoe & Martin 2001, p.70). Mounds are often affected by ploughs and bulldozers that reduce the size of mounds but reveal the soil features associated with these archaeological features.

Table 4.4 Frequency distribution of mound clusters

# of mounds in the cluster	frequency	total #
1	8	8
2	8	16
3	4	12
4	3	12
5	0	0
6	1	6
7	1	7
8	0	0
9	0	0
10	1	10
11	0	0
12	2	24
Sums	28	95
Average # mounds per group	3.4	

Ovens and hearths, though similar have distinct differences in their formations. Ovens are generally subsurface with associated heat retainers, whereas hearths are surface features and do not contain forms of heat retainer as they are the remains of small fires. Ovens can be mistaken for hearths with the idea that heat retainers can still be present in these features. Due to the nature of hearth, it can be very difficult to identify them in vegetated settings. Ovens identified during the survey were mostly identified in sandy deposits, like sources bordering dunes and lunettes, and also raised landforms around paleochannels, swamps and lagoons (Pardoe & Martin 2001, p.71).

Middens are associated with larger bodies of water where sandy to silty deposits and molluscs can be located. The boundaries of middens are generally well-defined compared to mounds and contain a higher density of organic material, especially shell. Dinner camps are small sites that generally contain between 5 and 20 mollusc shells. They represent one event of a small meal an often associated with a hearth or oven (Pardoe & Martin 2001, p.72).

Burials in the region are generally associated with earth mounds. The burials in the survey were identified through the observation of displaced bone brought to the surface of a mound by rabbits. Most of these were individual burials, however, some mounds contained more than one burial. Not enough information is provided to determine trends in the burial method with the orientation and position of individuals, where it could be determined, being variable. In one case there is evidence that the remains have been affected by burning, with the burning patterns being consistent with the mounds being used after internment rather than cremation (Pardoe & Martin 2001, pp.72–73).

A number of different forms of scar trees were identified during the survey including functional and ritual trees, with some natural, yet culturally important, forms such as scars associated with honey and grubs. These scars have different dimensions that aid in distinguishing between the two (Figure 4.3) [Pardoe & Martin 2001, p.75], however, ritual trees are mainly determined through their association with other features, like boral rings and burials.

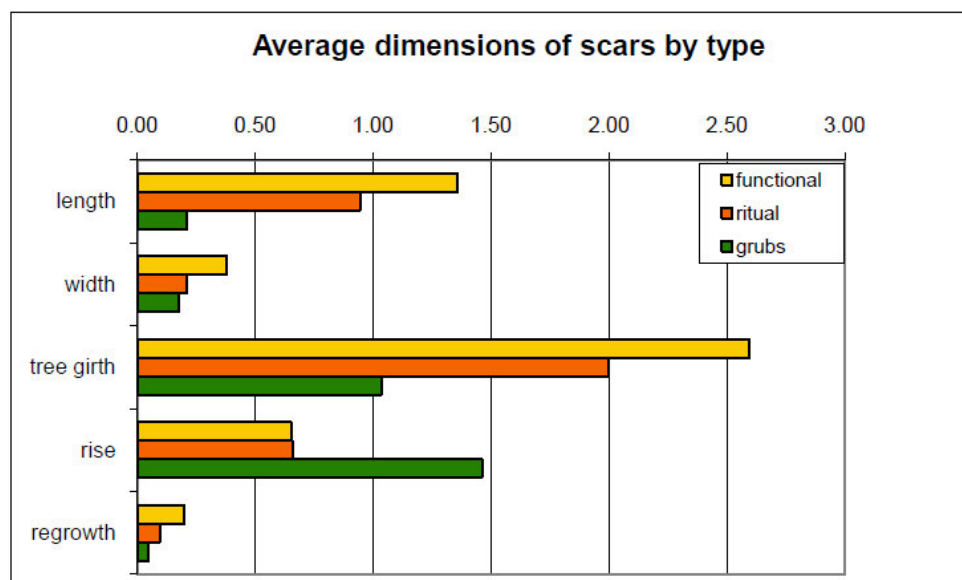


Figure 4.3 Average dimensions of scars, measured in meters. Rise refers to the distance

Artefacts recorded during the survey were of many different types and materials. Raw materials that were present were predominately silcrete, but also quartzite, hornfels, sandstone, quartz, and greenstone. Flakes and flake pieces in the region are small, generally having an area (Square root of Length by Width) of between 5 and 25 millimetres and a thickness of 10 millimetres. Flake tools are more variable in size, but they maintain the same area-to-thickness ratios. Grindstone artefacts have a variety in their size and ratio (Pardoe & Martin 2001, pp.75–78)

4.2.2 HERITAGE DATABASE SEARCH

A search of the Heritage NSW AHIMS database was undertaken on 28 June 2023 (Client Service ID 795684). The results from the AHIMS search identified 13 previously recorded sites within a 10-kilometre radius of the study area. The search indicates that Modified Trees (Carved or Scarred) are the predominant site type with 100% of known sites belonging to this category (Table 4.5). The second-most, and only other site type located within 10 kilometres of the study area, is an Earth Mound (Hearth, Mound, Oven) associated with a Modified Tree. A review of the AHIMS listings indicates that scarred trees are the most likely site type to be identified within the study area (Figure 4.4, Figure 4.5, Figure 4.6 and Figure 4.7).

The entirety of identified scarred tree and earth mound sites are in close relation to Forest Creek, Billabong Creek and Yanco Creek, both north and south of the current study area.

It should be noted that no historical sites are located within the vicinity of the area.

For Figure 4.4, Figure 4.5, Figure 4.6 and Figure 4.7, it is assumed that the correct coordinate system has been registered for each site.

A second search of the Heritage NSW AHIMS database was undertaken on 21 October 2024 (Client Service ID 941958). As this search was undertaken post-survey the results identified the identified sites recorded in section 7.2. The search area was also extended to identify previously recorded sites within a 30-kilometre radius to be sure to include all of the study areas.

The AHIMS search identified 106 previously recorded sites (Table 4.5) and indicates that Modified Tree (Carved or Scarred) are the predominant site type accounting for 45.29% (n=48) of known sites, followed by Artefact which accounts for 25.48% (n=27) and Earth Mound accounting for 11.33 (n=12).

Table 4.5 AHIMS within a 30 kilometre radius

Site Types	No. of Sites	Percentage
Modified Tree (Carved or Scarred)	48	45.29
Artefact	27	25.48
Earth Mound	12	11.33
Earth Mound, Hearth	5	4.73
Aboriginal Resource and Gathering	3	2.83
Hearth	2	1.89
Aboriginal Ceremony and Dreaming	1	0.94
Artefact, Burial, Hearth, Non-Human Bone and Organic Material	1	0.94
Artefact, Non-Human Bone and Organic Material, Burial, Hearth, Potential Archaeological Deposit (PAD)	1	0.94
Burial, Artefact	1	0.94
Burial, Hearth, Non-Human Bone and Organic Material, Shell	1	0.94
Earth Mound, Non-Human Bone and Organic Material, Artefact	1	0.94
Potential Archaeological Deposit (PAD)	1	0.94
Potential Archaeological Deposit (PAD), Modified Tree (Carved or Scarred)	1	0.94
Water Hole	1	0.94
Total	106	100

LOCAL ARCHAEOLOGICAL CONTEXT

Archaeological investigations of the Riverina bioregion, and in particular the suburb of Hartwood and Conargo, have been conducted in response to the development of infrastructure such as renewable energy and water management, as well as within the framework of academic enquiries. The limited ethnographic accounts of early settlers and explorers were once considered the primary source for archaeological enquiry. However, with the recent spread of urban development within the region, archaeological investigations have increased accordingly.

A large volume of studies has been completed in the region, as such, this section presents a synopsis of selected archaeological investigations of direct relevance to the Study Area. These reports have been selected based on their landform context, proximity and in particular, relationship to the Yanco-Billabong Creek catchment area and/or the Edward River LGA. The reports that have been reviewed are detailed in Table 4.6.

Table 4.6 Reports selected for review as part of local archaeological context

Author	Date	Relevance to Study Area	Type of assessment
McIntyre	1987	<u>Archaeological Survey of the Proposed Wagga to Darlington Point 330 Kv Transmission Line</u> – this report is located within the Yanco-Billabong catchment.	ACHA
Archaeological Consulting Service	2001	<u>Indigenous Cultural Heritage Assessment: Euroley Bridge Replacement, Murrumbidgee River South of Yanco, Southern NSW</u> – this report is located within the Yanco-Billabong catchment.	ACHA
Biosis	2015	<u>Yanco-Murrumbidgee Effluents SDL: Desktop Heritage Constraints Assessment</u> – this report is located within the Yanco-Billabong catchment and Edward River LGA.	Aboriginal Due Diligence and Historical Desktop Assessment
AECOM	2015	<u>Deniliquin Ethanol Plant: Noise and Vibration Technical Report</u> – this report is located within the Edward River LGA.	ACHA
RPS Group	2017	<u>Cultural Heritage Assessment- Finley Solar Farm</u> – this report is located within the Edward River LGA.	ACHA
OzArk	2018	<u>Aboriginal Cultural Heritage Assessment Report: Yarrabee Solar Project</u> – this report is located within the Yanco-Billabong catchment.	ACHA
NGH	2019	<u>Aboriginal Cultural Heritage Assessment: Yanco Solar Farm</u> – this report is located within the Yanco-Billabong catchment.	ACHA
Virtus Heritage	2020	<u>Finley Solar Farm Due Diligence Assessment</u> – this report is located within the Edward River LGA.	Due Diligence Assessment
NGH Consulting	2020	<u>Aboriginal Due Diligence Assessment – Finely 5WM Solar Farm</u> – this report is located within the Edward River LGA.	Due Diligence Assessment
Dr Sophie Collins	2020	<u>Cultural Heritage Assessment: Roaches Reservoir, Yanco, NSW</u> – this report is located within the Yanco-Billabong catchment.	ACHA
Jacobs	2023	<u>Archaeological Assessment Report for Cheverells Creek Offtake (Draft Report)</u> – this report relates to the Part 5B – Cheverells Creek Offtake project.	ACHA

ARCHAEOLOGICAL SURVEY OF THE PROPOSED WAGGA TO DARLINGTON POINT 330 KV TRANSMISSION LINE

McIntyre (1987) undertook an archaeological survey along the proposed Wagga to Darlington Point 330 KV transmission line. The transmission line was to be 152 kilometres long and 60 metres wide. The areas surveyed were from Yanco Creek to Darlington Point.

Due to very dense grass ground cover surface visibility was poor and restricted to creek banks. Tracks and eroded areas. Most of the survey area was under cultivation during the survey. At the start of the survey permission from landowners had not yet been approved, so the survey needed to be broken into three parts: two major surveys and a brief follow-up (McIntyre 1987, p.10).

All clusters of trees and trees were inspected for scars, and swamp areas including dry swamp crossings and all eroded areas were also closely inspected. It was noted the majority of sites were located close to water or previous water sources (McIntyre 1987, pp.11–12).

The survey located a total of seven scarred trees, three isolated stone artefacts and four occupation sites. Two oven mounds were identified at one of the occupation sites, artefacts and hearths occurred at two and one site contained only a hearth (McIntyre 1987, p.12).

McIntyre (1987, p.12) noted that the majority of the scar trees had oval-shaped scars, and it was not possible to determine what their purpose was, however, many had scars large enough to have been used in the “construction of bark shelters”.

Isolated stone artefacts included a pink quartzite core, a red silcrete flaked piece and a pink quartzite flake piece and a pink quartzite flake was located at one of the occupation sites (Tubbo 6). The artefact scatter located at the occupation site (Tubbo 10) contained two white quartz flake pieces, a red silcrete flake, a white quartz core, and a black basalt flaked piece (McIntyre 1987, p.17).

It was determined that none of these sites would be affected by the works (McIntyre 1987, p.19).

INDIGENOUS CULTURAL HERITAGE ASSESSMENT: EUROLEY BRIDGE REPLACEMENT, MURRUMBIDGEE RIVER SOUTH OF YANCO, SOUTHERN NSW.

Archaeological Consulting (2001) was commissioned by The NSW Roads and Traffic Authority (RTA) to conduct an Aboriginal Cultural Heritage Assessment for the proposed Euroley Bridge replacement over the Murrumbidgee River 3 kilometres south of Yanco.

The area to be assessed was approximately 400m and during the survey, only one Aboriginal site, a scarred tree, was identified. The scarred grey box was located 19 metres east of the existing bridge on the southern bank of the Murrumbidgee River, and would not have been impacted by the works (Archaeological Consulting 2001, p.19).

The author theorises that the lack of archaeologically sensitive landforms is likely the reason for the absence of cultural heritage within the study area (Archaeological Consulting 2001, p.3).

YANCO-MURRUMBIDGEE EFFLUENTS SDL: DESKTOP HERITAGE CONSTRAINTS ASSESSMENT

Biosis (2015) was engaged by RMC Group and Alluvium Consulting to undertake an Aboriginal (Due Diligence) and Historical investigation (desktop) within the Yanco-Murrumbidgee River System as part of an infrastructure modernisation project. This investigation encompassed a majority of the current study area.

Biosis conducted an AHIMs search which identified a total of 370 sites within 5 kilometres of the project area with 84 sites within close proximity to the creeks within the project area a summary of these sites is located in Table 4.7 (Biosis 2015, p.8).

Table 4.7 AHIMS within close proximity of creeks within the project area

Creek in the Project area	No. of Site	Sites Types
Forest Creek	8	Scarred Trees
Yanco Creek	15	Scarred Trees Earth mounds Isolated finds
Colombo and Billabong Creeks	30	Scarred Trees Earth Mounds Isolated Finds Open Camp Sites
Old Man Creek	20	Scarred Trees Earth mounds Isolated Finds Open Campsites
Bundidgerry Creek	11	Massacre Site Open Camp Sites Scarred Tree

Biosis (2015, p.13) recommended that further works could not proceed until there was a further investigation into the Aboriginal cultural heritage of the project area as the area was assessed as having moderate to high archaeological potential.

DENILILQUIN ETHANOL PLANT: Aboriginal and Historical Cultural Heritage Report

This ACHA has been prepared as Dongmun Greentec Pty Ltd proposed to construct and operate an ethanol plant located approximately 5.5km out of Deniliquin.

A search of the AHIMS database was undertaken by Access Archaeology & Heritage on 14 January 2014 that focused on the project area only, no sites were identified. Another search of the AHIMS database was then conducted by AECOM on 13 May 2015 which used a 5km x 5km radius with the project site at the centre. This search identified 102 registered sites, the two most common being Culturally Modified Tree (49%, n=50) and Earth Mound/Hearth (46%, n=47), followed by, Burial (2%, n=2), Artefact Scatter (2%, n=2) and Non-Human Bone and Organic Material (1%, n=1) [AECOM 2015, p.15].

An archaeological survey was initially conducted in November 2014 by Access & Archaeological Heritage in cooperation with representatives of the local Traditional Owners group, the Deniliquin Local Aboriginal Land Council and the Yarkuwa Indigenous Knowledge Centre Aboriginal Corporation. The survey identified five new archaeological sites comprised of three scarred trees, one artefact scatter and one potential hearth. Access Archaeology & Heritage concluded that the history of Aboriginal occupation in the proposed project site was sparse based on the material evidence encountered.

On 25 May 2015, AECOM reinspected the area to confirm the findings of the 2014 assessment. The three culturally modified trees, one 'dispersed hearth' with an isolated artefact and shell fragment and one artefact scatter site were identified within the project site previously by Access Archaeology & Heritage. The sites were not registered in AHIMS at the time of the 2014 assessment, but site cards had since been lodged with OEH and site numbers had not yet been issued. The sites that had been relocated by AOCCEM were the 'potential hearth' including the small fragment of edge ground stone hatchet, artefact scatter and scarred tree. Two of the three scar trees were not re-identified (AECOM 2015, pp.30–36).

AECOM also identified one new site during the survey, which was comprised of two fine-grained siliceous pieces, likely a part of a diffuse 'background scatter' that was spread across much of the project site (AECOM 2015, p.37).

As the Potential Hearth, Lot 234-1, and Open Artefact Scatter, Lot 234-2, were both recorded as a rare find in this local area and it had been advised that Dongmun Greentec Pty Ltd is to avoid impact and integrate interpretation of sites into a new design (AECOM 2015, p.48).

ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT: YARRABEE SOLAR PROJECT

OzArk (2018) was commissioned by SLR Consulting Australia on behalf of Reach Solar Energy to conduct an Aboriginal Cultural Heritage Assessment Report for a proposed solar plant which will cover an area of approximately 2,600 hectares of the 3,000 hectares study area.

A pedestrian survey was conducted covering specific landforms identified as potentially archaeologically sensitive, including areas with remnant trees, high ground including dunes, and areas within 200 metres of watercourses. Overall, 37.3 per cent of the study area was visually inspected including all mature native trees. Access roads were inspected through a combination of vehicular and pedestrian transects, with target areas such as creek crossings and areas of the original ground surface being inspected on foot. Ground surface visibility ranged between 10 per cent to 90% with the average being between 50 and 60 per cent (OzArk Environment & Heritage Management Pty Ltd 2018, pp.24–29).

A total of 25 sites were identified and recorded during the survey, these are summarised by landform and type in Table 4.8.

Table 4.8 Site summary by landform

Landform	Isolated Artefact	Artefact Scatter	Earth mound and Pad	Scarred Tree	Total
Dune	4	7	1	0	12
Remnant Tree Line	3	3	0	2	8
Flat Plain	2	3	0	0	5
Total	9	13	1	2	25

The majority of sites were artefact scatters (n=13), followed by isolated artefacts (n=9), two scarred trees and one earth mound and PAD were also recorded. The majority of sites were located on dunes (n=12), followed by eight sites located within the remnant tree lines and a further five located on flat plains (OzArk Environment & Heritage Management Pty Ltd 2018, p.31).

The majority of the stone artefact consisted of unmodified flakes; however, baked blades and scraper were also recorded. It was also noted that cores appeared infrequently. Raw material consisted of quartz, quartzite and silcrete (OzArk Environment & Heritage Management Pty Ltd 2018, pp.36–36,32).

ABORIGINAL CULTURAL HERITAGE ASSESSMENT: YANCO SOLAR FARM

NGH Environmental (2019) was engaged by ib vogt GmbH (ib vogt) to undertake an Aboriginal Cultural Heritage Assessment Report for a proposed solar farm at Leeton NSW which covers 204 hectares.

An archaeological survey was conducted and was impeded by poor visibility within an orange orchard which was 5% to 25% with the average being 5%, however, visibility improved within a vineyard which was 10% to 100% within the ploughed paddock. A total of approximately 25 kilometres was surveyed in pedestrian transects and it was concluded that the survey had sufficient and effective coverage. No cultural heritage was identified during this survey, however, during a subsequent survey a single dual platform fine-grained red silcrete core with three negative flake scars and secondary reduction was located (NGH Environmental 2019, p.37).

An onsite discussion was held with the archaeologist and RAPs regarding the potential for subsurface deposits. Based on past land use history, landscape appraisal, disturbance and survey results that subsurface investigation was not warranted (NGH Environmental 2019, p.6).

CULTURAL HERITAGE ASSESSMENT REPORT- FINLEY SOLAR FARM

The Cultural Heritage Assessment (CHA) had been prepared by RPS for ESCO Pacific's proposed construction of Finley Solar Farm in the Berrigan Shire Local Government Area. The project area outlined in this assessment is located in Finley NSW (Lot 133 DP752299, Lot 134 DP752299, and Lot 136 DP752299).

An AHIMS search for the CHA was undertaken on 11 August 2017 which compromised a 10 km search area with the project area at the centre. The findings of this search identified that there were 11 Aboriginal sites registered in the area but none in the proposed project area. Of the 11 sites identified, the most common are scarred trees (54.5%, n=6), followed by, Mound (Oven) (36.4%, n=4), and Artefact scatter (9.1%, n=1) (RPS 2017, p.15).

A field inspection had been conducted on 23 June 2017 which identified no Aboriginal sites, no scarred trees, high surface exposure and visibility along channels, and a high level of disturbance and modification associated with agricultural land use. The authors conclude that no Aboriginal objects would be present (RPS 2017, p.18).

FINLEY SOLAR FARM DUE DILIGENCE ABORIGINAL ARCHAEOLOGICAL ASSESSMENT

This Due Diligence assessment was put together by Virtus Heritage for KDC on behalf of Providence Asset Group for the Finley Solar farm project. The location of this project is on the south side of Broockmanns Road, Finley NSW, the project site is known as Lot 61 DP1053533.

This site lies within the boundaries of Cummeragunja Local Aboriginal Land Council (LALC). This assessment states that the Cummeragunja LALC have no objections to the proposed works as they do not expect any material of Aboriginal Heritage significance to be located within the site, however, they stated they would appreciate that appropriate efforts are to be made to identify and protect any unexpected findings. A search of the AHIMS database revealed there were no Aboriginal sites recorded within proximity to the study area. The search was expanded to include a 30 x 30 kilometre radius which resulted in 25 Aboriginal sites being located (Virtus Heritage 2020, p.21).

A site inspection of the project area was carried out on 16 March 2020 by archaeologist, Vanessa Hardy, together with Brett Hamilton (site officer) and Ronald Atkinson from Cummeragunja LALC. The survey team walked sample sections that were approximately 5-8 metres apart. The survey identified that no Aboriginal objects or sites were observed. The Due Diligence recognises that based on the distance from a natural, freshwater source, land use history, as well and disturbance observed, it was concluded that the project area was likely to have low potential for intact sub-surface archaeological deposits or Aboriginal objects (Virtus Heritage 2020, p.30).

ABORIGINAL DUE DILIGENCE ASSESSMENT – FINLEY 5WM SOLAR FARM

To support a Development Application the NGH was commissioned by Bison Energy Australia to perform a due diligence assessment for Aboriginal heritage sites within the subject land (Lot 126 DP752299) for the proposed solar energy system. The land is located within the Berrigan Shire Local Government in the Riverina region of NSW.

A visual inspection was carried out by archaeologist Amy Ziesing on 29 May 2020 which covered the entire proposal area. It was concluded that there were no areas of archaeological cultural heritage or archaeological sensitivity found due to the widespread historic disturbances that were identified, i.e., the installation of channels and canals across the Murray Irrigation Area and laser levelling of pastoral paddocks (NGH Consulting 2020, p.18).

An AHIMS search was undertaken on 1 June 2020 over a 20km radius that was centred on the study area. 35 Aboriginal sites were recorded, but no declared Aboriginal places. Previously recorded sites included modified trees (n=24), Artefact (n=6), Earth Mound/Hearth (n=4) and Artefact/PAD/Burial (n=1). It was identified that none of the sites recorded was located within or adjacent to the study area (NGH Consulting 2020, p.7).

CULTURAL HERITAGE ASSESSMENT: ROACHES RESERVOIR, YANCO, NSW.

Dr Sophie Collins (2020) was engaged by Murrumbidgee Irrigation Ltd. to conduct a cultural heritage assessment at Roaches Reservoir for the proposed modernisation of the supply network.

Visibility across most of the study area ranged from low to moderate to dense ground cover, areas such as cleared agriculture lands, dirt access tracks, constructed dams and areas of sheet erosion had the highest ground surface visibility (Collins 2020, p.34). The survey coverage ranged from 0.6% to 16.8% depending on the survey unit (Collins 2020, p.55).

As part of the cultural heritage assessment, a survey was conducted across the planned works area on foot. The surveyed area had been subject to wide spaced disturbance resulting from broad-scale mechanical levelling. In an area of lower disturbance, eight new sites were identified. These new sites consist of a scarred tree, artefact scatters, three isolated artefacts and three finds associated with PADs a site summary is in Table 4.9 (Collins 2020, pp.2,33). A subsurface investigation was recommended (Dr Sophie Collins 2020, p.63).

Table 4.9 Site summary

Site Name	Site Type	Description	Landform
ST1- Culturally Scarred Tree	Scarred Tree	A mature Coolabah tree, approx. 15 metres tall. Two scars, likely a single scar separated by regrowth	Amorphous/Highly disturbed area.
RR1- Isolated Artefact	Isolated artefact	A sandstone grindstone fragment with a ground/polished surface with ploughshare damage	Amorphous/Highly disturbed area.
RR2- Artefact Scatter and PAD	Artefact Scatter and PAD	A PAD and surface scatter comprising of at least 16 stone artefacts exposed on a dirt vehicle track. Listed artefacts included silcrete flakes and flake pieces, silcrete core, silcrete backed blade, quartz flakes, chert distal fragment and a quartzite distal fragment. Approx site dimensions 30m x 4m.	Gentle rise, possible former wetland feature
RR3- Isolated Artefact and PAD	Isolated Artefact and PAD	A grey tuff proximal flake segment, approximately 45% cortex on the distal end. Likely associated with RR2	Low-lying swampy zone
RR4- Isolated Artefact	Isolated Artefact	A grey silcrete flake proximal fragment	Amorphous/Highly disturbed area.
RR5- Open Artefact Scatter	Open Artefact Scatter	5 stone artefacts including 2 silcrete flakes, 2 quartz flakes and a black volcanic flake. Approx. site dimensions 4m x 4m.	Low rise adjacent to wetlands
RR6- Open Artefact Scatter and PAD	RR6- Open Artefact Scatter and PAD	4 stone artefacts including 1 FGS flake, 1 quartzite bipolar core with 50% water rolled pebble cortex with crashed ends, 1 silcrete flake and 1 quartz flake. Approx. site dimensions 20 m x 15 m	Gentle rise, possible former wetland feature
RR7- Isolated Artefact	Isolated Artefact	Grey tuff flake	Edge of a drainage channel

ARCHAEOLOGICAL ASSESSMENT REPORT FOR CHEVERELLS CREEK OFFTAKE (DRAFT REPORT)

JACOBS (2023) was commissioned by Water Infrastructure New South Wales to conduct an Archaeological assessment for the Sustainable Diversion Limit Adjustment Mechanism (SDLAM). This reported study area is part of the current study area.

The survey was conducted in two parts with the first survey covering the proposed area subject to ground disturbance and the second to survey the area of the CAZ footprint that was not covered during the first survey (JACOBS 2023, p.79).

The first area to be surveyed was located on the bend of Colombo Creek and was inhibited by a high-water event. The study area had evidence of disturbance in the form of earthworks from previous work, there was also evidence of disturbance from high-velocity water flow due to flooding in the area. No Aboriginal cultural heritage was identified during the first survey (JACOBS 2023, pp.79–83).

The second survey covered an area of 10,951 square metres. This survey resulted in two Aboriginal sites being identified, an isolated artefact and PAD, both of which were located outside the proposed work area, (JACOBS 2023, p.86). The artefact was a silcrete flake that had been longitudinally split, it was theorised that it was exposed during the flooding that occurred during string 2022 (JACOBS 2023, p.86). No other Aboriginal cultural heritage was identified during the first survey.

5 PREDICTIVE MODEL

Austral has used the information produced as part of the archaeological and environmental context sections to formulate a broad predictive model that identifies the type and character of Aboriginal cultural heritage sites that may be present within the study area.

The predictive model is based on the analysis of the following key variables:

- Relationship between site types and their spatial distribution within the landscape.
- Raw site types, raw material types and site densities and their relationship to salient environmental features.
- Information in ethnohistorical sources may indicate important natural resources or landscape features that may have been exploited.
- Potential chronological and spatial relationships between sites

A predictive model has been developed based on the consideration of the variables outlined above that indicate the likely site types that will be encountered during the archaeological survey and archaeological testing.

5.1 ANALYSIS OF KEY VARIABLES

The AHIMS search completed for this project has identified similar trends in Aboriginal site types within the region. Commonly recorded site types in the wider region are Modified Tree (Carved or Scarred) accounting for 37.70% (n=49) followed by Artefacts (23.86%, n=31) and Earth mounds (17.67%, n=23).

It should be noted that any analysis using AHIMS data will be prone to biases as it relates to sites that have been recorded over the past 40 years. During this time, varying methodologies have been used to identify sites and a large portion of the surrounding landscape may have been subject to limited or no assessment. Therefore, site distribution is likely to be reflective of survey methods and patterns and should not be considered a comprehensive list of all Aboriginal sites within a given region.

A summary of Aboriginal heritage site features is included in Table 5.1. and is formed from a 30-kilometre search radius of the study area. This search has been used in the analysis presented in this section.

Table 5.1 Site features recorded within 30 kilometre radius

Feature Type	Total	%
Modified Tree (Carved or Scarred)	49	37.70
Artefact	31	23.86
Earth Mound	23	17.67
Hearth	10	7.70
Burial	4	3.07
Non-Human Bone and Organic Material	4	3.07
Aboriginal Resource and Gathering	3	2.31
Potential Archaeological Deposit (PAD)	3	2.31
Aboriginal Ceremony and Dreaming	1	0.77
Shell	1	0.77
Water Hole	1	0.77
Total	130	100

5.1.1 SOIL LANDSCAPE

The soil landscapes used in the assessment are Mitchell's landscapes, which consider vegetation groups within an area.

The majority of recorded sites are located on the Murrumbidgee Channels and Floodplains (Mbc) soil landscape with 80% (n=104) of the total sites. In comparison, 12.30% (n=16) of sites were recorded in the Murray Channels and Floodplains (Muc) soil landscape and 6.92% (n=9) of sites were recorded in Murrumbidgee Scalded Plains (Mbd). A single site (0.77%) was recorded within the Murray Source-bordering Dunes (Msd) soil landscape.

The distribution of sites in relation to Mitchell Landscapes is displayed in Figure 5.1.

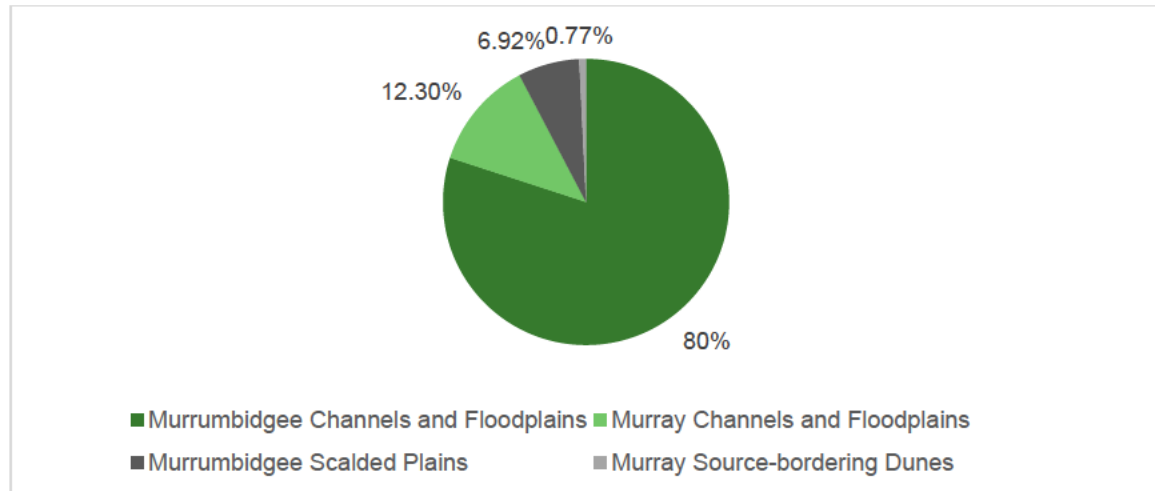


Figure 5.1 Site distribution across Mitchell Landscapes

The number of site features across the Mitchell Landscapes are displayed in Figure 5.2.

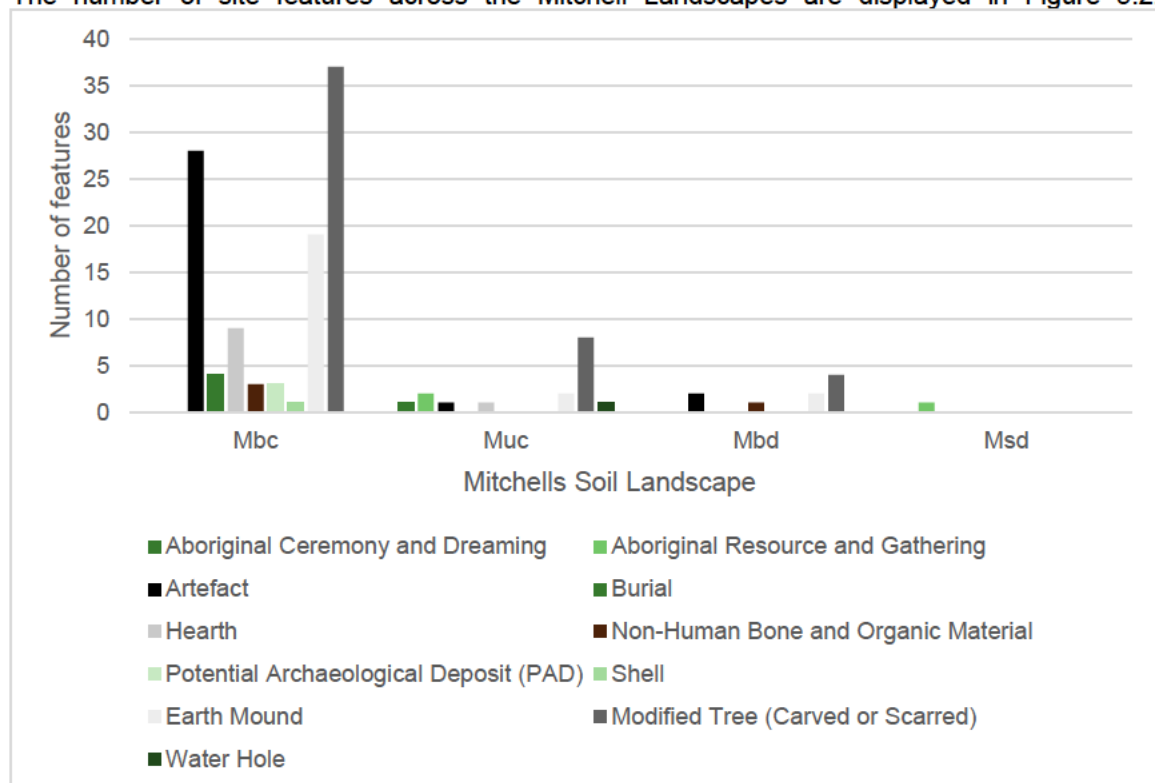


Figure 5.2 Number of features across the Mitchell Landscapes

5.1.2 GEOLOGY

Geological units determine the availability of raw lithic materials for artefact manufacture. As such, these contexts dictate the type, composition, and distribution of sites within a given landscape. Within the 30 kilometres radius of the study area, a total of 3 geological units were identified, these being Alluvial Channel Deposits – Meander Plain Facies, which also contained the largest number of site features (n=81, 80%), Alluvial Floodplain Deposits which holds 34.62% (n=45) of site features and Source-Bordering Dunes, which contained the least amount of site features with a total of 4 (3.08%) [Figure 5.3].

ALLUVIAL CHANNEL DEPOSITS - MEANDER PLAIN FACIES

As the Alluvial Channel Deposits – Meander Plain Facies geological unit contains the largest number of sites, it also contains the largest amount and variety of features. There are a total of 81 (80%) cultural features within this geological unit, with the most common feature being modified trees (carved or scarred) (n=32, 24.61%), followed by earth mounds (n=16, 12.30%) and artefacts (n=14, 10.76%). There are also 5 hearths (3.84%), 3 burials (2.30%), 3 non-human bone and organic materials (2.30%), 2 PADs (1.54%) and 1 each of Aboriginal ceremony and dreaming, shell and water hole (0.77% ea.) recorded within this geological unit.

ALLUVIAL FLOODPLAIN DEPOSITS

A total of 45 (34.62%) cultural features have been recorded within the Alluvial Floodplain Deposit geological unit, with 7 cultural feature types represented. The most common cultural features within this geological unit are modified trees (carved or scarred) and artefacts each representing 11.54% (n=15 ea.) of the total identified features. Earth mounds are the next most common cultural features (n=7, 5.38%), followed by hearths (n=5, 3.85%) and 1 each of burial, non-human bone and organic material and PADs (0.77% ea.).

SOURCE-BORDERING DUNES

A total of 4 (3.08%) cultural features have been recorded within the Source-Bordering Dunes geological unit, with 2 cultural feature types represented. This geological unit contained 2 (1.54%) artefact features and 2 (1.54%) modified trees (carved or scarred).

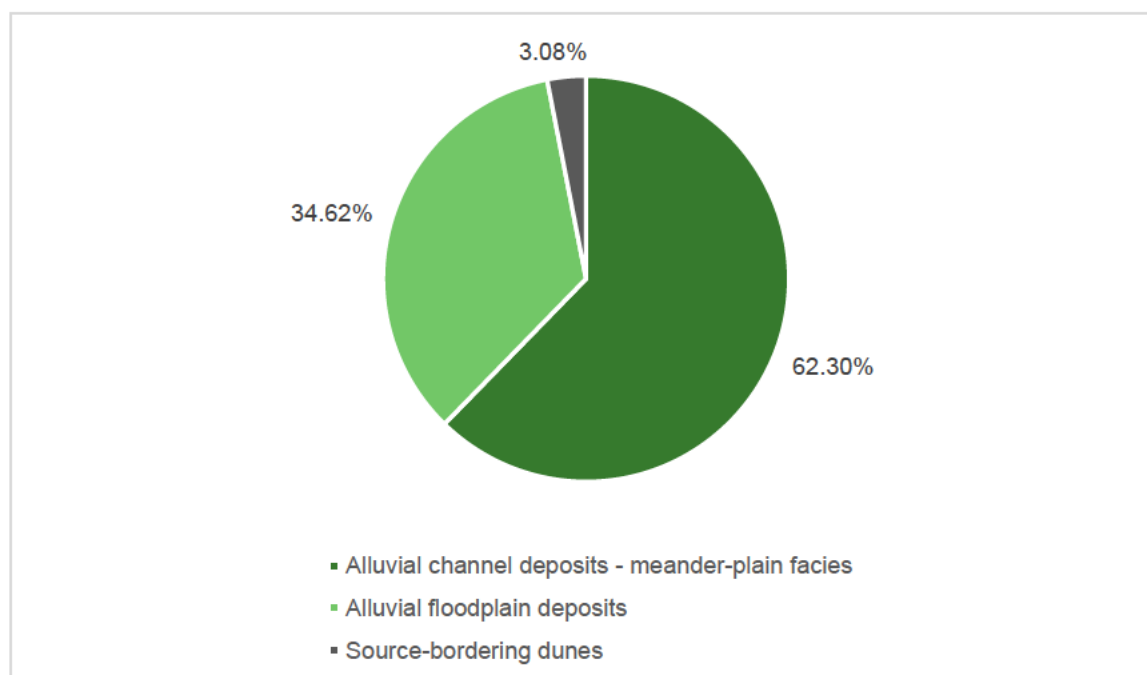


Figure 5.3 Distribution of sites across geological units

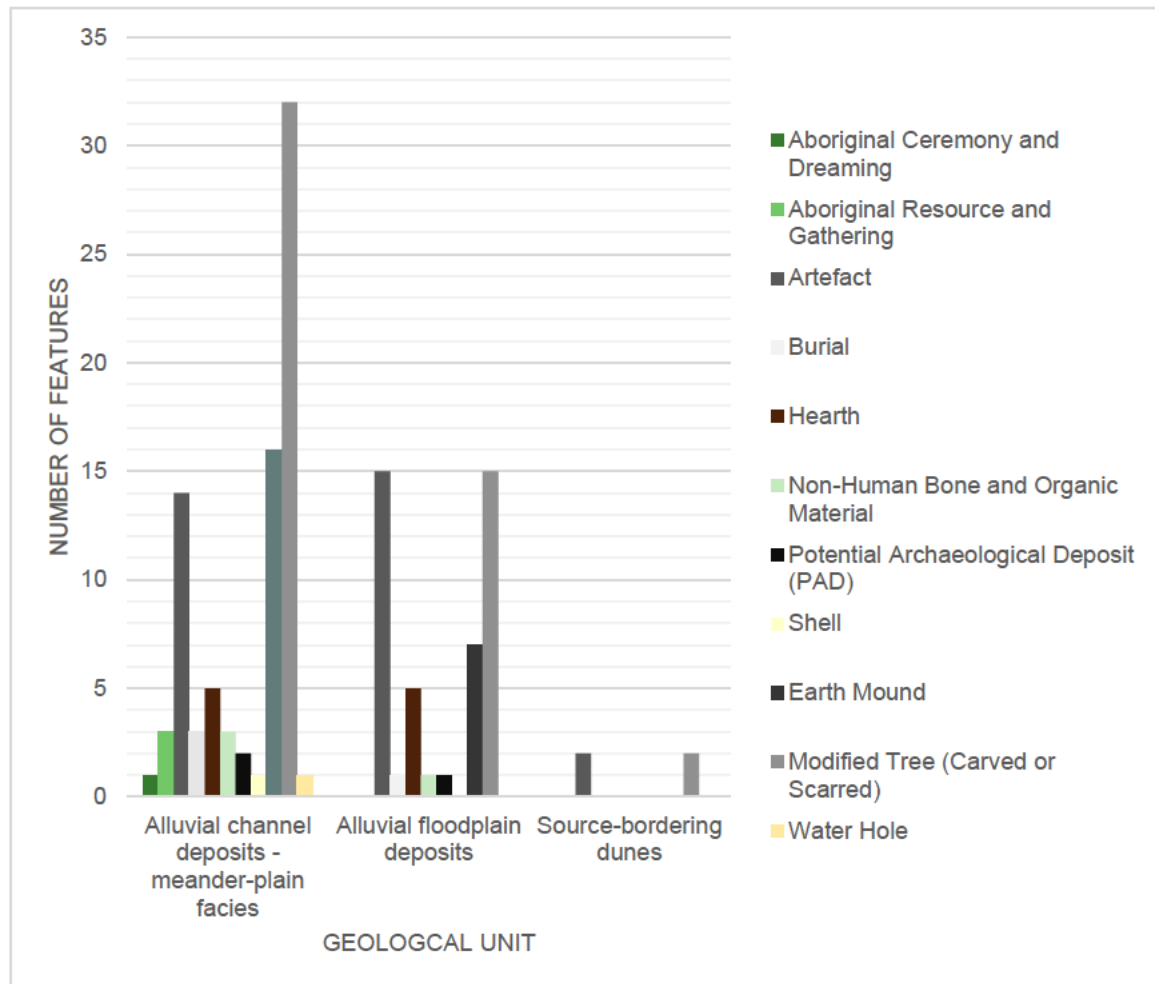


Figure 5.4 Frequency of features across the geological units

5.1.3 HYDROLOGY

Proximity to water is a significant determinant of site location. This is due to the abundance of reliable natural resources and watercourses present for both areas of occupation and travel routes. The Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010c) states that the archaeological sensitivity of an area increases within 200 metres of a watercourse. Within the 30 kilometres buffer zone, a total of 72 (55.38%) of the identified feature types were recorded within 200 metres of a watercourse confirming the statement made in The Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010b) [Figure 5.5].

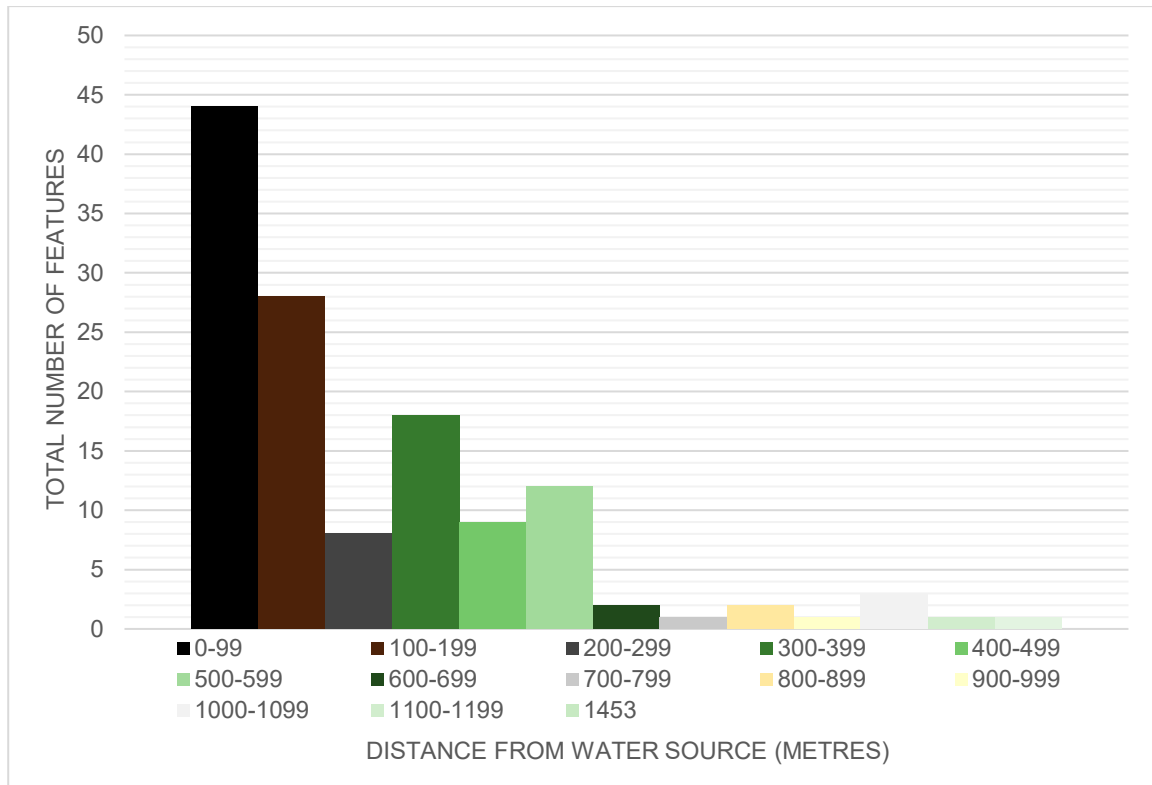


Figure 5.5 The number of sites in relation to their distance from a water source

5.1.4 TOPOGRAPHY

An analysis of the distribution of local sites in comparison to terrain has been undertaken using a spatial tool that classifies landforms using a range of parameters including slope, elevation and form (Stepinski & Jasiewicz 2011, Jasiewicz & Stepinski 2013). An overview of the landform classifications used by the algorithm is detailed in Figure 5.6.

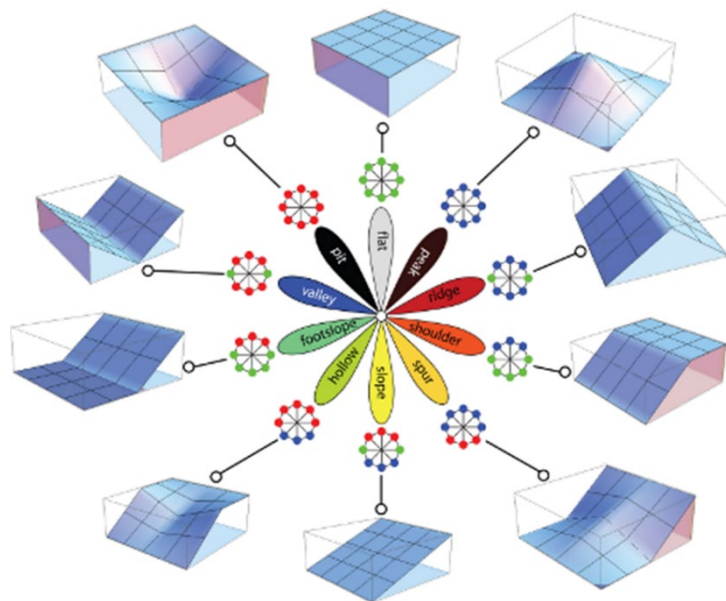


Figure 5.6 Examples of landform definitions by geomorphons

Based on these landform definitions, the majority of recorded features within a 30 kilometre buffer zone are within a flat landform (n=76, 58.46%), followed by shoulder (n=24, 18.46%), ridge (n=12, 9.23%), valley (n=8, 6.15%), footslope (n=4, 3.07%), summit (n=3, 2.30%) slope (n=1, 0.77%) and spur (n=1, 0.77%). Modified tree (carved or scarred) [n=25], artefacts (n=22) and earth mounds (n=12) features were more likely to be identified in a flat landform. However, artefact feature types were identified across all identified landforms in various degrees (Figure 5.7).

Besides being identified in a flat landform, modified trees (carved or scarred) were also recorded in footslopes (n=1), ridge (n=4), shoulder (n=10), spur (n=1), summit (n=2) and valley (n=6) landforms. Artefacts were the only feature type recorded in a depression landform (n=1) [Figure 5.7].

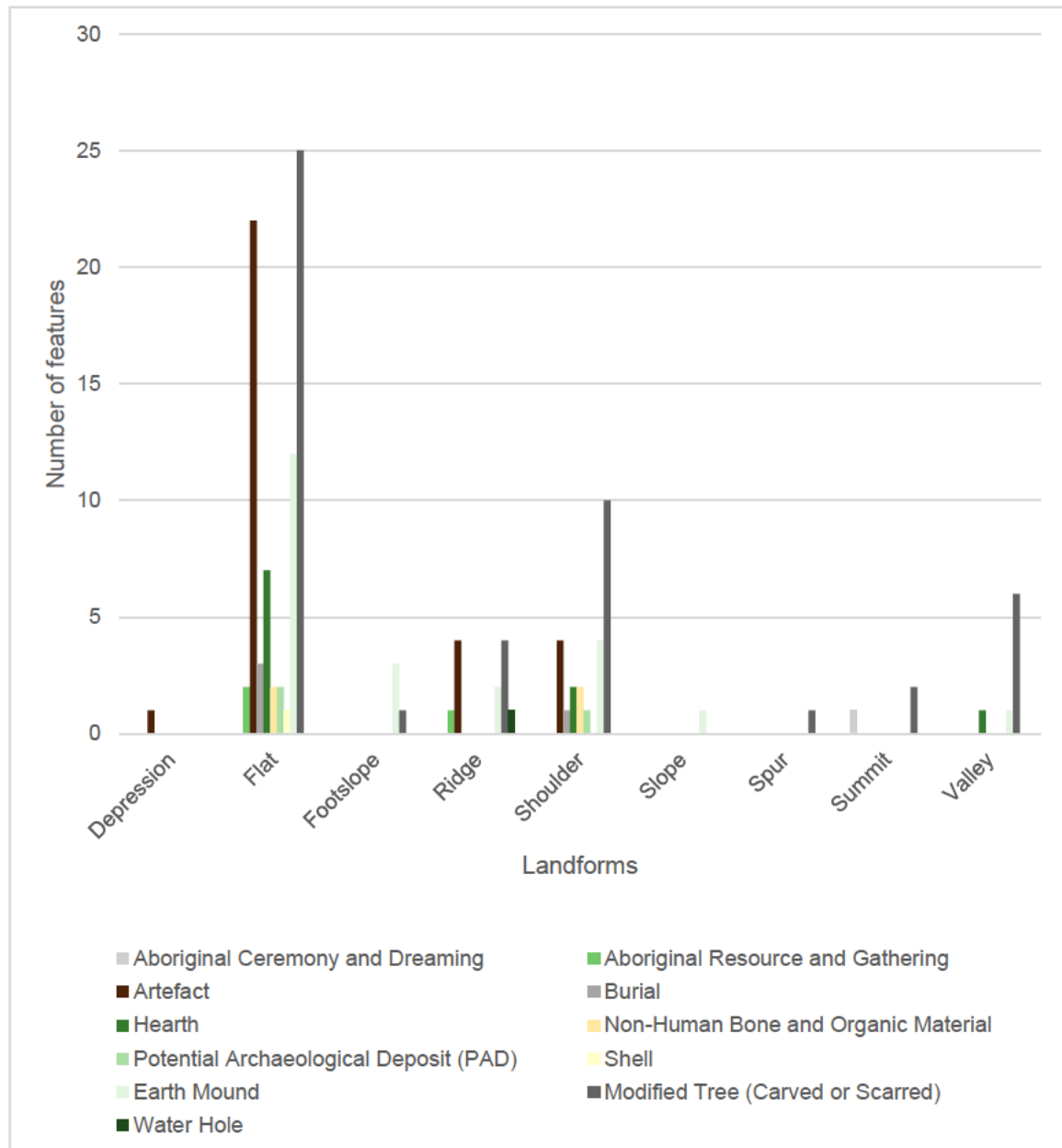


Figure 5.7 Number of feature types by landform

5.2 PREDICTIVE STATEMENTS

In general, an archaeological predictive statement for any study area draws on surrounding environmental data, previous archaeological research and predictive models for Aboriginal occupation. Another essential aspect to predicting the archaeological integrity of a site and something that must be considered is previous land uses of the study area and the degree of disturbance.

In summary, the main trends broadly seen across central NSW are:

- Archaeological sites occur on most landforms.
- Site frequency and density are dependent on their location in the landscape.
- Earth mounds are usually located close to water sources with major confluences being key locations for occupation sites.
- The size of an oven could be as small as one metre in diameter and 100 millimetres high up to as large as 120 metres in diameter and 2 metres high. Oven mound sites commonly consisted of multiple oven features, in and around the oven.
- Shell middens are found close to sources of freshwater shellfish and are usually formed from the depositing of freshwater mussels, but bones and burials can be present.
- The number of scarred trees has been greatly reduced due to logging and would have been associated with areas that have relatively dense populations.
- Burials can be located in occupation sites, such as mounds, middens, and campsites, or in areas that were specifically designated for the burial of human remains, such as dunes and ridges.
- Archaeological material is also present beyond the immediate creek surrounds in decreasing artefact densities.
- Aboriginal scarred trees may be present in areas where remnant old-growth vegetation exists.

While these statements observe general trends in central NSW, forming predictive statements for the associated subregions, based on current and previous models, further refined the generalisations made above. The assessment of the cultural heritage recorded in the Murrumbidgee subregion, through the search of the AHIMS database, past survey results and published articles and reports, have helped to predict what certain site types can be expected within the study area.

Based on the analysis presented in this section, the following predictive statements can be made about the Murrumbidgee subregion:

- The most commonly identified site types within the region are scarred trees, which are often located within the coarsely cracking clays and the scalded plains landform.
- Most sites are associated with either a relic or modern hydrological features, such as creeks, rivers and channels. Most sites are located within 1.3 kilometres of a potential water source.
- Whilst sites may be located in a variety of landform contexts, most sites (59.46%), are located on flat landforms.
- Burials are predominantly located in earth mounds, natural and man-made levees, floodplains related to residential areas and sand rises within 450 metres of water.
- Sites that are associated with Dreaming stories and ceremonies are rare and can only be located through discussion with the Aboriginal community.

6 FIELD METHODS

A site-specific investigation methodology has been developed for the project that complies with the requirements of the Code of Practice (DECCW 2011).

6.1 SURVEY METHODOLOGY

The survey was conducted on 13 July 2023 by Nicole Monk (Senior Archaeologist, Austral) with assistance from Madelaine Firth (Archaeologist, Austral), John 'Gubba' Woods, David Clarke (DCCEEW), Tracy Hamilton, Brandon Cooper, Riley Parsons Cooper (Yarkuwa), Clinton Edwards, Roland Atkinson (Cummeragunja), Anthony Jones and Lorraine Parsons (DLALC). Two additional surveys were also undertaken for the project, the first of which included the Wanganella Bypass Flood Channel, conducted on 8 December 2023 by Carmen Baulch (Graduate Archaeologist, Austral) with assistance from John 'Gubba' Woods (DCCEEW), Anthony Jones and Lorraine Parsons (DLALC). The second additional survey was of an additional 225 metres of proposed electricity supply lines associated with Hartwood Weir, conducted on 23 May 2024 by Madelaine Firth (Archaeologist, Austral), with assistance from Emily Ford, John 'Gubba' Woods (DCCEEW) and Warren Parsons (DLALC).

6.1.1 SURVEY OBJECTIVES

The objectives of the survey were to:

- Complete a systematic survey that targets areas that have been identified as having the potential to contain Aboriginal heritage values.
- Identify and record Aboriginal archaeological sites visible on the ground surface and areas of PADs.
- Re-identify previously identified Aboriginal archaeological sites during prior surveys within the study area.
- Ground-truthing the previous consultant's survey to confirm the sites and PADs for inclusion in this ACHA.

6.1.2 SAMPLING STRATEGY

The survey methodology was designed to optimise the investigation of areas where archaeological materials may be present and visible, as well as the investigation of the broader archaeological potential of all landform elements present within the study area, which included creek lines and floodplains.

The specific survey methodology developed for this assessment was guided by the survey requirements as set out in Requirements 5 to 10 of the Code of Practice (DECCW 2011) and based upon consideration of the overall landform pattern within the study area, known landform elements (after Speight 2009) and the location of the previously identified sites. The survey targeted all landforms (including each occurrence of a specific landform type that will be impacted) that will potentially be impacted.

6.1.3 SURVEY METHODS

The archaeological survey consisted of pedestrian traverses completed by 11 team members. A key survey variable is ground visibility, which considers the amount of ground surface that is not covered by any vegetation; and exposure, which defines areas where dispersed surface soils and vegetative matter afford a clear assessment of the ground, were assessed across the study area and within each landform element. Overall survey coverage and calculated survey effectiveness were recorded. Note that the effectiveness of the field survey was largely dependent on the degree of ground surface visibility. Where surface visibility was restricted by dense vegetation cover, the potential for PADs was assessed, particularly in association with those landforms identified within the predictive model as more likely to contain Aboriginal archaeological sites. The potential of these areas and all landform elements within the study area was considered against available evidence of land disturbance.

Photographs were taken of all survey units and landforms as well as representative surface visibility, and where present, surface exposures, soil profiles and disturbances relevant to the interpretation of the stratigraphic conditions and archaeological potential within each survey unit.

7 ARCHAEOLOGICAL RESULTS

The following section outlines the results of the archaeological investigations conducted within the study areas.

7.1 ARCHAEOLOGICAL SURVEY RESULTS

7.1.1 VISIBILITY

In most archaeological reports and guidelines, visibility refers to GSV and is usually a percentage estimate of the ground surface that is visible and allows for the detection of (usually stone) artefacts that may be present on the ground surface (DECCW 2011). GSV throughout the study areas ranged from 0 to 60%, with an average of 40%.

7.1.2 EXPOSURE

Exposure refers to those parts of the surveyed landforms whose topsoil has visibly been removed due to naturally occurring erosion or man-made disturbances. Usually expressed as a percentage of the total land surface, it is a theory predicting the nature of geomorphological change (DECCW 2011). Exposure ranged from 10 to 20% throughout the study area, with an average of 15%.

7.1.3 DISCUSSION OF RESULTS

The most significant disturbance in the study area is comprised of informal tracks, fence posts, the pre-existing Hartwood Weir and its associated prior works, such as borrow pits, and introduced construction material and fill. Photographs of prior disturbance within the study area are provided from Figure 7.1 to Figure 7.57.

The survey covered all 7 impact areas, as well as the access tracks to both the Hartwood Weir, Forest Creek Block Bank and Wanganella Bypass Flood Channel study areas.



Figure 7.1 North-view of Hartwood Weir informal vehicle/proposed access track.

Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.2 North view of informal vehicle track disturbance along Billabong Creek.
Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.3 North view of channel and levy disturbance near Hartwood Weir.
Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.4 South view of informal vehicle track and clearing disturbance near Hartwood Weir.

Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.5 East-facing view of existing Hartwood Weir and associated disturbance.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.6 North-facing view of clearing and vehicular disturbance near Hartwood Weir.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.7 North-east facing view of clearing and vehicular disturbance.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.8 South-facing view of previously used borrow pit site.

Photograph taken on 13 July 2023 by Madelaine Firth.

HARTWOOD WEIR ACCESS TRACK AND CULVERT

During the survey of the proposed Hartwood Weir access track and culvert, the floodplain was recorded as the only landform (Figure 7.10 and Figure 7.11). As well as the access track to the construction zone, a potential turnaround area for heavy vehicles was also surveyed (Figure 7.12 and Figure 7.13). Recorded vegetation included grass, while on average, GSV was noted at 10% and exposure at 0%. The disturbance was also significant within the survey unit, consisting of fencing, power poles, a channel bank and prior agricultural and pastoral practices.



Figure 7.9 South-facing view of proposed Hartwood Weir access track location.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.10 East-facing view of proposed Hartwood Weir access track location.

Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.11 West-facing view of proposed Hartwood Weir access track location.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.12 East-facing view of proposed Hartwood Weir turn-around.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.13 South-west-facing view of the proposed Hartwood Weir turning circle.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.14 Clay ball identified during a prior survey at Hartwood Weir study area.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.15 North-east facing view of potential hearth with clay ball and heat retaining material at Hartwood Weir study area.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.16 West-facing view of proposed Hartwood Weir laydown area and relocated proposed access track.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.17 North-facing view of the proposed Hartwood Weir laydown area and relocated proposed access track.

Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.18 West-facing view of previously identified heat retainer material at Hartwood Weir.

Photograph taken on 13 July 2023 by Nicole Monk.

During the survey of the proposed access track, two areas previously identified by 3Rivers as a hearth and PAD were revisited. The heat-retaining material, previously recorded as a hearth and presented in Figure 7.14, Figure 7.15 and Figure 7.18, was discussed on-site between Austral archaeologists and DLALC and CLALC representatives. This discussion included an evaluation of the possible heat retainers, which appeared to have been created from natural processes, such as the burning of cleared vegetation, rather than by human actions and the forming of the heat retainers by hand. The land where the suspected sites were located was the edge of cleared land and on a flood plain, which supports the position that the sites are not cultural. Cleared trees are often pushed into piles at the edge of cleared land and burned. This process often bakes clay soils and termite nests within the trees, creating hearth-like remains. Additionally, the floodplain landform is not suitable for long term occupation due to inundation. This group discussion concluded that this hearth was not of cultural origin and therefore there was no Aboriginal archaeological potential.

The PAD and scarred tree were, however, confirmed as cultural following an on-site discussion between Austral archaeologists and DLALC and CLALC representatives and were subsequently registered (Hartwood Weir Scarred Tree and PAD [AHIMS #54-3-0055]). However, one scar tree identified within the Hartwood Weir construction zone was determined to be a historical survey marker tree associated with the construction of the Hartwood regulator. The scar was directly in line with the centre line of the regulator and contained steel axe marks within the scar's centre. Based upon on-site discussion between Austral archaeologists, DLALC and CLALC representatives, the context of the tree's location and the presence of the steel axe marks within the scar, it was determined that the scar tree was not of Aboriginal cultural origin.

HARTWOOD WEIR CONSTRUCTION LAYDOWN ZONE

The laydown zone, presented in Figure 7.16 and Figure 7.17, was surveyed during the walk over of the proposed access track and culvert. The landform was noted as a floodplain in the western portion and a creek line in the eastern portion of the proposed laydown zone. Vegetation identified within the proposed area included river red gum and black box, while GSV was recorded at 20% and exposure at 10%. Disturbances noted included informal and formal vehicle tracks and vegetation clearance. No Aboriginal cultural material was identified.

HARTWOOD WEIR CONSTRUCTION ZONE

The Hartwood Weir construction zone survey commenced in the western portion of the study area, to the west of Billabong Creek (Figure 7.19). The landform was identified as a creek line, with vegetation including river red gum, black box and Bathurst burr. The GSV was recorded as 10%, while the exposure was 0%, and the main disturbances noted were the Hartwood Weir and a previously used borrow pit. One Modified tree and one hearth were identified on the western and eastern creek banks, further discussed in Section 7.2.



Figure 7.19 North-east-facing view of access track within Hartwood Weir construction zone.

Photograph taken 13 July 2023 by Nicole Monk.

HARTWOOD WEIR BORROW PIT

The Hartwood Weir Borrow Pit is located within an agricultural property, with farming activities occurring both within and adjacent to the proposed borrow pit. The landform was identified as a floodplain, with vegetation including low-lying grasses, with no shrubs or trees present within the study area. Introduced weeds including prickly paddy melons (*Cucumis myriocarpus*) are located throughout the study area and are present throughout much of the landscape. The GSV was recorded at 20% and exposure at 10%, while the main disturbances noted were nearby informal vehicle tracks and vegetation clearance. No Aboriginal cultural heritage was located within the proposed borrow pit.



Figure 7.20 South-facing view of the proposed Hartwood Weir Borrow Pit area.

Photograph taken on 13 July 2023 by Madelaine Firth.

HARTWOOD WEIR ELECTRICITY SUPPLY LINE

The additional 225 metres of the electricity supply line for the Hartwood Weir is located within the private agricultural property of Whiporie Park. The landform was identified as a floodplain with a mostly cleared landscape containing sparse salt bushes, introduced and native low-lying grasses, as well as some black box and river red gum trees along the creek line. The GSV was recorded as low, ranging from 15 to 20%, and exposure was extremely low at <1%. Main disturbances include an existing powerline along Conargo Road, major agricultural clearing activities and the use of the area as an informal access track. No Aboriginal cultural heritage was located within the proposed electricity supply line.

Photographs from the survey of the proposed Hartwood Weir electricity supply line are presented from Figure 7.20 to Figure 7.22.



Figure 7.21 North-facing view of the proposed Hartwood Weir electricity supply line.
Photograph taken on 24 May 2024 by Madelaine Firth.



Figure 7.22 South-facing view of the proposed Hartwood Weir electricity supply line.
Photograph taken on 24 May 2024 by Madelaine Firth.



Figure 7.23 North-facing view of cleared Forest Creek floodplain and creek line.

Photograph taken on 24 May 2024 by Madelaine Firth.

FOREST CREEK BLOCK BANK CONSTRUCTION ZONE

The Forest Creek Block Bank construction zone survey commenced in the western portion of the study area, to the west of Forest Creek. The landforms were identified as a floodplain and creek bank, with vegetation including river red gum and black box. The GSV was recorded at 20% and exposure at 10%, while the main disturbances noted were informal vehicle tracks and vegetation clearance. Photographs from the survey of the proposed construction zone are presented from Figure 7.24 to Figure 7.29.



Figure 7.24 North-facing view of the proposed Forest Creek Block Bank construction zone.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.25 West-facing view of the proposed Forest Creek Block Bank construction zone.

Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.26 South-facing view of the proposed Forest Creek Block Bank construction zone.

Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.27 South-facing view of the proposed Forest Creek Block Bank construction zone.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.28 South-facing view of the proposed Forest Creek Block Bank construction zone.

Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.29 East-facing view of the proposed Forest Creek Block Bank construction zone.

Photograph taken on 13 July 2023 by Madelaine Firth.

Two previously recorded scarred trees were re-identified, with one being within the construction zone (Forest Creek Block Bank Scarred Tree 2 [AHIMS # 54-3-0033], presented in Figure 7.30, and one north-west of the construction zone (Forest Creek Block Bank Scarred Tree 3 [AHIMS # 54-3-0034], presented in Figure 7.31. Along with this, one unregistered scarred tree was identified, described in further detail within Section 7.2.



Figure 7.30 South-facing view of previously recorded Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0033).

Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.31 South-facing view of previously recorded Forest Creek Block Bank Scarred Tree 3 (AHIMS # 54-3-0034).

Photograph taken by 3Rivers.

FOREST CREEK BLOCK BANK LAYDOWN ZONE

The Forest Creek Block Bank laydown zone survey commenced in the south-eastern portion of the impact area. The landform was identified as a floodplain, with vegetation including black box and heavy grass coverage (Figure 7.32). The GSV was recorded at 10% and exposure at 0%, while the main disturbances noted were informal vehicle tracks and vegetation clearance. No Aboriginal cultural heritage material was identified within the proposed impact area.



Figure 7.32 North-east-facing view of proposed Forest Creek Block Bank laydown zone.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.33 West-facing view of proposed Forest Creek Block Bank laydown zone.

Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.34 South-west-facing view of the proposed Forest Creek Block Bank laydown zone.

Photograph taken on 13 July 2023 by Nicole Monk.

FOREST CREEK BLOCK BANK ACCESS TRACK

During the survey of the proposed Forest Creek Block Bank access track, floodplain and creek banks were recorded as the two landforms (Figure 7.35 and Figure 7.37). Recorded vegetation included grass and black box, while on average, GSV was noted at 20% and exposure at 10%. The disturbance was also significant within the survey unit, consisting of prior vegetation clearing and informal vehicle track construction.



Figure 7.35 North-facing view of the start of the proposed access track to Forest Creek Block Bank construction and laydown zones.

Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.36 South-facing view of the proposed access track route.

Photograph taken on 13 July 2023 by Madelaine Firth.

During the survey of the proposed Forest Creek Block Bank access track, a potential earth mound was identified, located on the creek bank of Forest Creek. This is shown in Figure 7.37.



Figure 7.37 South-facing view of potential earth mound.

Photograph taken on 13 July 2023 by Nicole Monk.

Austral archaeologists and Aboriginal representatives from DLALC and CLALC were not able to confirm the area as a PAD or earth mound. Following consultation and discussion with the on-site representatives from DLALC, CLALC and DCCEEW, it was determined that the proposed access track would be relocated to the opposing side of the laydown area. This proposed area is shown in Figure 7.38.



Figure 7.38 South-east-facing view of adjusted proposed access track.

Photograph taken on 13 July 2023 by Nicole Monk.

WANGANELLA WEIR SOUTHERN ACCESS TRACK

During the survey of the proposed southern Wanganella weir access track, floodplain and creek banks were recorded as the two landforms (Figure 7.39 and Figure 7.41). Recorded vegetation included grass and black box, while on average, GSV was noted at 20% and exposure at 10%. The disturbance was also significant within the survey unit, consisting of prior vegetation clearing and informal vehicle track construction.

A prior survey by a different consultant identified two potential hearths within the proposed southern access track location. This was re-identified by Austral during the pedestrian survey of the access track, with an on-site discussion with the RAPs determining that it is not of cultural origin. These are identified in Figure 7.43 and Figure 7.44.



Figure 7.39 West-facing view of Wanganella Weir access track.
Photograph taken on 14 July 2023 by Madelaine Firth.



Figure 7.40 East-facing view of Wanganella Weir access track.
Photograph taken on 14 July 2023 by Madelaine Firth.



Figure 7.41 North-facing view of Wanganella Weir access track and existing weir location.

Photograph taken on 14 July 2023 by Madelaine Firth.



Figure 7.42 East-facing view of Wanganella Weir access track.

Photograph taken on 14 July 2023 by Madelaine Firth.



Figure 7.43 North-facing view of the first potential hearth site.

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.44 North-east-facing view of the second potential hearth site.

Photograph taken on 13 July 2023 by Nicole Monk.

WANGANELLA WEIR NORTHERN ACCESS TRACK

During the survey of the proposed northern Wanganella weir access track, floodplain and creek banks were recorded as the two landforms (Figure 7.45 and Figure 7.46). Recorded vegetation

included grass and black box, while on average, GSV was recorded as good at 60% and exposure at 40%. The disturbance was also significant within the survey unit, consisting of prior vegetation clearing and informal vehicle track construction, as well as the nearby prior construction of the existing Wanganella Weir.

One modified tree was identified within proximity to the proposed northern access track (AHIMS # 54-2-0264). This is detailed in Section 7.2.



Figure 7.45 **West-facing view of the proposed northern access track.**

Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.46 East-facing view of the proposed northern access track.

Photograph taken on 13 July 2023 by Madelaine Firth.

FOREST CREEK BLOCK BANK CONSTRUCTION ZONE

The Forest Creek Block Bank construction zone survey commenced in the western portion of the study area, to the west of Forest Creek. The landforms were identified as a floodplain and creek bank, with vegetation including river red gum and black box. The GSV was recorded at 60% and exposure at 40%, while the main disturbances noted were nearby informal vehicle tracks, vegetation clearance and the prior construction and existing utilities associated with the Wanganella Weir. Photographs from the survey of the proposed construction zone are presented from Figure 7.47 to Figure 7.49.

One modified tree was located outside of the proposed Wanganella Weir construction zone (AHIMS # 54-2-0263). This is detailed in Section 7.2.



Figure 7.47 South-facing view of existing Wanganella Weir and construction zone.
Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.48 South-facing view of proposed Wanganella Weir construction zone.
Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.49 North-facing view of the proposed Wanganella Weir construction zone.

Photograph taken on 13 July 2023 by Madelaine Firth.

WANGANELLA BYPASS FLOOD CHANNEL AND ACCESS TRACK

The Wanganella Bypass Flood Channel survey commenced in the southern portion of the study area, to the west of Forest Creek. The landforms were identified as a floodplain, creek bed and creek bank, with vegetation including introduced weeds and black box. The GSV was recorded at 10-50% and exposure at 10-20%, while the main disturbances noted were nearby informal vehicle tracks, vegetation clearance, cattle grazing, and the prior construction of a tip to the south of the study area. A survey of the access track followed which was heavily disturbed by vehicle movement and informal gravel road construction. Photographs from the survey of the proposed Wanganella Bypass Flood Channel are presented from Figure 7.50 to Figure 7.57.

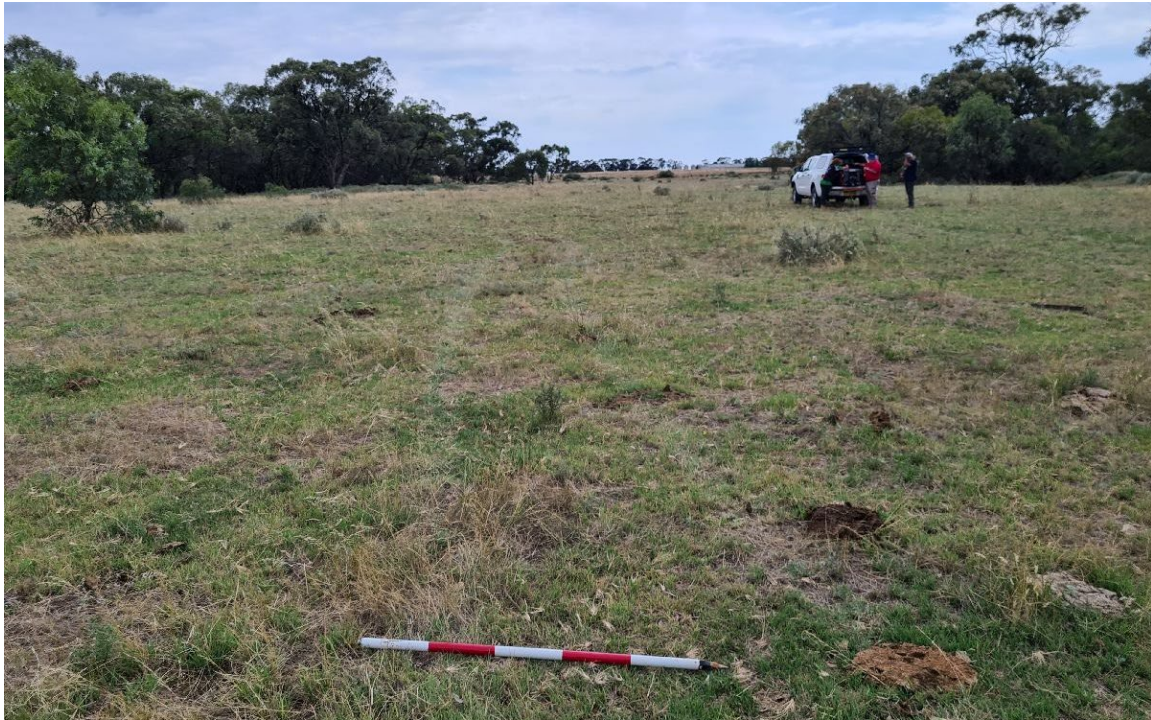


Figure 7.50 North-facing view to the south of the Wanganella Bypass Flood Channel study area.

Photograph taken 8 December 2023 by Carmen Baulch.



Figure 7.51 South-facing view to the south of the Wanganella Bypass Flood Channel study area.

Photograph taken 8 December 2023 by Carmen Baulch.



Figure 7.52 West-facing view to the north of the Wanganella Bypass Flood Channel study area.

Photograph taken 8 December 2023 by Carmen Baulch.



Figure 7.53 South-facing view to the north of the Wanganella Bypass Flood Channel study area.

Photograph taken 8 December 2023 by Carmen Baulch.



Figure 7.54 South-east facing view to the northeast of the Wanganella Bypass Flood Channel study area, showing disturbance in the form of an informal track.

Photograph taken 8 December 2023 by Carmen Baulch.



Figure 7.55 West-facing view to the east of the Wanganella Bypass Flood Channel study area.

Photograph taken 8 December 2023 by Carmen Baulch.



Figure 7.56 South-facing view of the northern portion of the access track to the south of the Wanganella Bypass Flood Channel study area.

Photograph taken 8 December 2023 by Carmen Baulch.



Figure 7.57 Northeast-facing view of the southern portion of the access track to the south of the Wanganella Bypass Flood Channel study area.

Photograph taken 8 December 2023 by Carmen Baulch.

The surveys identified 3 landforms present within the study area, consisting of floodplains, creek banks and creek beds from the Forest and Billabong Creeks.

A description of these results, as they relate to the survey units and observed landforms within the study area can be seen in Table 7.1 and Table 7.2.

Table 7.1 Survey coverage

Survey unit	Landform	Survey unit area (m ²)	Visibility (%)	Exposure (%)	Effective coverage area (m ²)	Effective coverage (%)
Hartwood Weir Construction Zone	Creek bank	48,365	10	10	483.65	1.0
Hartwood Weir Borrow Pit	Floodplain	6,993	20	10	139.86	2.0
Hartwood Weir Laydown Zone	Floodplain	5,650.25	20	10	113.005	2.0
Hartwood Weir Access Track	Floodplain	2,590	10	10	25.90	1.0
Forest Creek Block Bank Construction Zone	Floodplain	2,716.73	20	10	54.33	2.0
	Creek bank	1,203.50	20	10	24.07	2.0
Forest Creek Block Bank Laydown Zone	Floodplain	2,560	20	10	51.20	2.0
Forest Creek Block Bank Access Track	Floodplain	772.25	20	10	15.45	2.0
Wanganella Weir Southern Access Track	Floodplain	1,845	20	10	36.90	2.0
Wanganella Weir Northern Access Track	Floodplain	9,287.35	60	40	2,228.96	24.0
Wanganella Weir Construction Zone	Creek bank	5,864.39	<5	10	29.32	0.5
	Floodplain	24,554.56	60	40	5,893.09	24.0
Wanganella Bypass Flood Channel and Access Track	Floodplain	23,218	10	10	232.18	1.0
	Creek bank	21,478	20	10	429.56	2.0
	Creek bed	15,159	50	20	1,515.9	10.0

Table 7.2 Landform summary

Landform	Landform area (m ²)	Area effectively surveyed (m ²)	% of landform effectively surveyed	No. sites	No. artefacts / features
Floodplain	56,969.14	8,558.69	15.02	6	6
Creek bank	55,432.89	537.04	0.97	4	4
Creek bed	15,159	1,515.9	10.0	0	0

The pedestrian surveys included seven (7) construction zones and four (4) access tracks across four (4) different study areas, including the Hartwood Weir, Forest Creek Block Bank, Wanganella Weir and Wanganella Bypass Flood Channel. Despite the limitations of survey effectiveness, such as GSV and exposure, 10 sites were identified and one was unable to be re-located. Two (2) sites were previously identified and registered on AHIMS, comprising Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0033) and Forest Creek Block Bank Scarred Tree 3 (AHIMS # 54-3-0034).

Two (2) other sites were identified during previous surveys undertaken by 3Rivers but not registered on AHIMS. Following Austral's survey, six (6) modified trees, three (3) earth mounds and one (1) PAD and modified tree were identified and registered. One (1) other site was previously recorded and registered (Forest Creek Block Bank Scarred Tree 3 [AHIMS # 54-3-0034]) but was unable to be relocated during Austral's survey.

Of the ten (10) sites identified by Austral, 60% (n=6) were located on a floodplain landform, adjacent to either Forest or Billabong Creek. These sites consisted of two (2) earth mounds and four (4) modified trees. The remaining 40% (n=4) included one (1) earth mound, one (1) hearth, one (1) modified tree and one (1) PAD and modified tree were located on a creek bank landform.

In summary, the main site feature recorded within the study areas was scarred trees (n=6, 60%), which were present within 7 of the sites. Modified trees are an easily visible site type in the landscape and are not dependent on ground conditions to be observed. The high number of modified trees does not necessarily reflect the occurrence of this site type concerning other site types due to the visibility, exposure and disturbance limitations of the surveys. The results of the surveys are provided in Figure 7.58 to Figure 7.61.

7.2 IDENTIFIED ABORIGINAL SITES

A total of 10 sites were identified as part of Austral's archaeological survey, with six (6) newly identified sites, two sites previously registered on AHIMS and two previously identified but not registered. One site was recorded by 3Rivers but was not identified as part of Austral's fieldwork. Furthermore, an additional historical survey marker tree was identified. As the survey marker tree was identified as not being of Aboriginal cultural origin, it will not be discussed any further within this report.

An archaeological survey of all four study areas was completed by Austral. The sites identified as part of this investigation are outlined in Table 7.3.

Table 7.3 Survey units and identified Aboriginal sites

AHIMS No.	Site name	Feature(s)	Survey Unit	Landform
AHIMS # 54-3-0031	Forest Creek Block Bank Scarred Tree 2	Modified Tree (Carved or Scarred)	Forest Creek Block Bank Construction Zone	Floodplain
AHIMS # 54-3-0057	Forest Creek Block Bank Scarred Tree 4	Modified Tree (Carved or Scarred)	Forest Creek Block Bank Construction Zone	Floodplain
AHIMS # 54-3-0058	Forest Creek Block Bank Earth Mound 1	Earth Mound (Hearth)	Forest Creek Block Bank Access Track	Creek bank
AHIMS # 54-3-0059	Hartwood Weir Scarred Tree 4	Modified Tree (Carved or Scarred)	Hartwood Weir Construction Zone	Creek bank
AHIMS # 54-3-0061	Hartwood Weir Hearth	Hearth	Hartwood Weir Construction Zone	Creek bank
AHIMS # 54-3-0055	Hartwood Weir Scarred Tree and PAD	Modified Tree (Carved or Scarred) and Potential Archaeological Deposit (PAD)	Hartwood Weir Access Track	Creek bank
AHIMS # 54-3-0054	Hartwood Weir Earth Mound 1	Earth Mound (Hearth)	Hartwood Weir Access Track	Floodplain
AHIMS # 54-3-0056	Hartwood Weir Earth Mound 2	Earth Mound (Hearth)	Hartwood Weir Access Track	Floodplain
AHIMS # 54-2-0263	Wanganella Scarred Tree 1	Modified Tree (Carved or Scarred)	Wanganella Weir Construction Zone	Floodplain
AHIMS # 54-2-0264	Wanganella Scarred Tree 3	Modified Tree (Carved or Scarred)	East of Wanganella Weir Construction Zone	Floodplain

FOREST CREEK BLOCK BANK SCARRED TREE 2 (AHIMS # 54-3-0031)

Site type	Modified Tree
Centroid	
Site Extent	10 m X 10 m

Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031) was re-identified during the pedestrian survey. Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031) is situated on a floodplain adjacent to Forest Creek, on the south-eastern boundary of the Forest Creek Block Bank construction zone. The healthy and standing black box is in good condition with a girth and an oval-shaped scar measuring 380 millimetres long, 250 millimetres wide and at a height of 350 millimetres above the ground. The overgrowth of the scar measures 150 millimetres (Figure 7.62). Figure 7.62 contains a representative image indicating the landscape context and cultural material identified within Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031).



Figure 7.62 South-facing-view of Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031), re-located during pedestrian survey of Forest Creek Block Bank.

FOREST CREEK BLOCK BANK SCARRED TREE 3 (AHIMS # 54-3-0034)

Site type	Modified Tree
Centroid	
Site Extent	10 m X 10 m

Forest Creek Block Bank Scarred Tree 3 (AHIMS # 54-3-0034) was re-identified during the pedestrian survey. Forest Creek Block Bank Scarred Tree 3 (AHIMS # 54-3-0034) is situated on a floodplain north-west of the Forest Creek Block Bank construction zone. The healthy and standing black box is in good condition with a girth and an oval-shaped scar measuring 3 metres long, 700 millimetres wide and at a height of 900 millimetres above the ground. The overgrowth of the scar measures 80 millimetres (Figure 7.63).



Figure 7.63 South-facing-view of Forest Creek Block Bank Scarred Tree 3 (AHIMS # 54-3-0034), re-located during pedestrian survey of Forest Creek Block Bank.

FOREST CREEK BLOCK BANK SCARRED TREE 4 (AHIMS # 54-3-0057)

Site type	Modified Tree
Centroid	
Site Extent	10m x 10m

Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) was identified during the pedestrian survey of the Forest Creek Block Bank construction zone study area (Figure 7.64). Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) is situated on a floodplain adjacent to Forest Creek, on the south-eastern border of the construction zone and approximately 15 metres north-east of Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031). The healthy and standing black box is in good condition with a girth of 2.67 metres and an oval-shaped scar measuring 530 millimetres long, 200 millimetres wide, and at a height of 500 millimetres above the ground. The overgrowth of the scar measures 300 millimetres (Figure 7.64).



Figure 7.64 East-facing view of Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057)

Site type	Earth Mound (Hearth)
Centroid	
Site Extent	41m x 27m

Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058) was identified during the pedestrian survey along the Forest Creek Block Bank access track (Figure 7.65). This was recorded previously by a prior consultant as a hearth and isolated artefact but was not registered on AHIMS. The isolated artefact was not re-identified during Austral's pedestrian survey. Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058) is located on the Forest Creek bank and extends 41 metres in length and 27 metres in width, comprising mainly clay balls which were used as an indicator for the extent of the earth mound (Figure 7.66).



Figure 7.65 North-facing view of identified earth mound site.

Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.66 Exposed clay balls within the identified earth mound site.

Photograph taken on 13 July 2023 by Madelaine Firth.

HARTWOOD WEIR SCARRED TREE 4 (AHIMS # 54-3-0059)

Site type	Modified Tree
Centroid	
Site Extent	10 m x 10 m

Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) was identified during the pedestrian survey of the Hartwood Weir construction zone study area (Figure 7.67). Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) is situated on the creekbank of Billabong Creek, within the construction zone and approximately 25 metres west of the proposed Hartwood Weir structure. The healthy and standing black box is in good condition with a girth of 2.5 metres and an oval-shaped scar measuring 410 millimetres long, 110 millimetres wide and at a height of 1 metre above the ground. The overgrowth of the scar measures 115 millimetres (Figure 7.67).



Figure 7.67 East-facing view of Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059).

Photograph taken on 13 July 2023 by Madelaine Firth.

HARTWOOD WEIR SCARRED TREE AND PAD (AHIMS # 54-3-0055)

Site type	Modified Tree and PAD
Centroid	
Site Extent	10 m x 11 m

Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055) were identified during the pedestrian survey of the Hartwood Weir construction zone study area (Figure 7.68). The Scarred Tree (AHIMS # 54-3-0055) is situated on the creekbank of Billabong Creek, outside of the construction zone. The healthy and standing black box is in good condition with a girth of 1.8 metres and an oval-shaped scar measuring 620 millimetres long, 350 millimetres wide and at a height of 980 millimetres above the ground. The overgrowth of the scar measures 120 millimetres (Figure 7.68). The PAD was identified as a raised area surrounding the tree. This PAD was established due to the raised area being undisturbed and its association with the scarred tree (Figure 7.69).



Figure 7.68 East-facing view of Hartwood Weir Scarred Tree 5 (AHIMS # 54-3-0055).
Photograph taken on 13 July 2023 by Madelaine Firth.



Figure 7.69 Hartwood Scarred Tree and PAD in the foreground.

Photograph taken on 13 July 2023 by Madelaine Firth.

HARTWOOD WEIR EARTH MOUND 1 (AHIMS # 54-3-0054)

Site type	Earth Mound
Centroid	
Site Extent	15.8 m x 11.1 m

Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) was identified during the pedestrian survey near the construction zone study area. Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) is located on the Billabong Creek bank and extends 15.8 metres in length and 11.1 metres in width. Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) was heavily vegetated by weeds and native grasses that are different to the vegetation in the rest of the study area. The vegetation was used as an extent of the sight as it signifies the soil conditions associated with earth mounds (Figure 7.70).



Figure 7.70 Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054).

Photograph taken on 13 July 2023 by Madelaine Firth.

HARTWOOD WEIR EARTH MOUND 2 (AHIMS # 54-3-0056)

Site type	Earth Mound
Centroid	
Site Extent	13.5 m x 10.5 m

Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056) was identified during the pedestrian survey near the construction zone study area. Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056) is located on the Billabong Creek bank and extends 13.3 metres in length and 10.2 metres in width. Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056) was heavily vegetated by weeds and native grasses that are different to the vegetation in the rest of the study area. The vegetation was used as an extent of the sight as it signifies the soil conditions associated with earth mounds (Figure 7.71).



Figure 7.71 Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056).

Photograph taken on 13 July 2023 by Madelaine Firth.

HARTWOOD WEIR HEARTH (AHIMS # 54-3-0061)

Site type	Hearth
Centroid	
Site Extent	1 m x 1 m

Hartwood Weir Hearth (AHIMS # 54-3-0061) was identified during the pedestrian survey of the construction zone study area, on the eastern bank of Billabong Creek (Figure 7.72). Hartwood Weir Hearth (AHIMS # 54-3-0061) is located on the Billabong Creek bank and extends 1 metre in length and 1 metre in width based on the distribution of clay balls. Hartwood Weir Hearth (AHIMS # 54-3-0061) was majorly visible and exposed due to the disturbance from erosion (Figure 7.73).



Figure 7.72 North-facing view of landform of Hartwood Weir Hearth (AHIMS # 54-3-0061).

Photograph taken on 13 July 2023 by Nicole Monk.



Figure 7.73 Representative exposure, visibility and clay contents of Hartwood Weir Hearth (AHIMS # 54-3-0061).

Photograph taken on 13 July 2023 by Madelaine Firth.

WANGANELLA WEIR SCARRED TREE 1 (AHIMS # 54-2-0263)

Site type	Modified Tree
Centroid	
Site Extent	10 m X 10 m

Wanganella Weir Scarred Tree 1 (AHIMS # 54-2-0263) is situated in a floodplain landform within the construction zone study area. Wanganella Weir Scarred Tree 1 (AHIMS # 54-2-0263) is situated on a floodplain adjacent to Billabong Creek, within the construction zone. The healthy and standing black box is in good condition with a girth of 1.6 metres and an oval-shaped scar measuring 300 millimetres long, 150 millimetres wide, and at a height of 930 millimetres above the ground. The overgrowth of the scar measures 300 millimetres.

Figure 7.74 contains a representative image indicating the landscape context and cultural material identified within Wanganella Weir Scarred Tree 1 (AHIMS # 54-2-0263).



Figure 7.74 North-facing view of Wanganella Weir Scarred Tree 1 (AHIMS # 54-2-0263).

Photograph taken on 13 July 2023 by Madelaine Firth.

WANGANELLA WEIR SCARRED TREE 3 (AHIMS # 54-2-0264)

Site type	Modified Tree
Centroid	
Site Extent	10 m X 10 m

Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264) is situated in a floodplain landform just outside the construction zone study area. Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264) is situated on a floodplain adjacent to Billabong Creek. The dying and standing black box is in poor condition with a girth of 1.8 metres and an oval-shaped scar measuring 300 millimetres long, 200 millimetres wide, and at a height of 1.1 metres above the ground. The overgrowth of the scar measures 300 millimetres.

Figure 7.75 contains a representative image indicating the cultural material identified within Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264).



Figure 7.75 North-facing view of Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264).
Photograph taken on 13 July 2023 by Madelaine Firth.

7.3 LIMITATIONS

Limitations during the pedestrian survey included low GSV and exposure, which may limit the identification of surface Aboriginal cultural heritage.

8 ANALYSIS AND DISCUSSION

The following section presents an analysis and discussion of the results of the archaeological investigation.

8.1 ARCHAEOLOGICAL ANALYSIS

The study area has been heavily disturbed by large-scale regulation works in the 20th century that not only resulted in the installation of infrastructure but also included large channel works. As a result of these works, there has been significant disturbance in the study area which has removed the potential for further sites to exist within the impact areas. There is no archaeological material located that can be analysed.

8.2 DISCUSSION

Aspects of the landscape contain many cultural features and sites. The Riverina is recognised for the abundance of earth mounds that can be found concerning rivers and creeks that meander across the floodplain, but there are also a great number of scarred trees and burials identified in the landscape.

The archaeological survey completed by Austral evaluated the study areas of Hartwood Weir, Forest Creek Block Bank, Wanganella Weir and Wanganella Bypass Flood Channel. As a result 10 Aboriginal sites were identified, comprising 6 scarred trees, 3 earth mounds, 1 hearth and a scarred tree and PAD. One scarred tree previously recorded by 3Rivers has also been included. All sites were concentrated on the creek banks or floodplains of the surrounding watercourses, such as the Forest and Billabong Creeks. The site types identified within the study areas are consistent with the predictive modelling prepared for this report and from across the local area more broadly, with the most prominent site types being modified trees (n=49, 37.7%) with earth mounds (n=23, 17.67%) and hearths (n=10, 7.7%) also commonly recorded. PADs are also identified within the predictive model but are less common within the region (n=3, 2.31%).

The most common site type within the predictive modelling region was modified trees, which were also the most prominent site type identified during the pedestrian surveys (n=6, 60%). A majority of these modified trees were located on the creek banks of the study areas' associated watercourses. The predictive modelling is consistent with the identified modified trees within the study areas, as these are commonly occurring along non-perennial streams, such as the Forest and Billabong Creeks. Seventy-two modified trees were identified in the predictive model as being within 200 metres of a water source. All scarred trees identified during the survey of the study areas were located within 50 metres of a water source.

Within the locality of the study areas, earth mounds are a common site feature located on creek banks or floodplains. They are considered to have formed from repeated earth oven cooking events over long periods (Ross et al. 2019). Characteristics of earth mounds include a mounded, circular or oval shape, often less than 500 millimetres high, containing lumps of burnt clay or stone and small fragments of charcoal. Earth mounds may also contain shells, animal bones, stone tools and human ancestral remains. Land that has been extensively modified by ploughing, earth mounds may appear as stained earth; however, these stains can also be created by more modern agricultural burning practices. Archaeological investigations indicate that genuine earth mounds are the accumulation of multiple earth ovens that used clay as a heat retainer on which vegetables and meats were cooked (Pardoe & Martin 2001). The identified earth mounds were mainly located on floodplains, meaning that they are more likely to be subject to laser levelling, ploughing and continuous clearing, consistent with the predictive modelling.

The archaeological context surrounding the study areas shows that modified trees and earth mounds are the dominant site features within the region. The presence of artefacts suggests some occupation and toolmaking within the study areas but is less common. This is also consistent with the most prominent site features within the study areas covering Hartwood Weir, Forest Creek Block Bank and Wanganella Weir. Overall, the results of the surveys show high-intensity land use within the study areas by Aboriginal people, consistent with the predictive model.

Figure 8.1 to Figure 8.5 show the archaeological sensitivity of the study area.

9 CULTURAL HERITAGE VALUES

An assessment of significance seeks to determine and establish the importance or value that a place, site or item may have to the community at large. The concept of cultural significance is intrinsically connected to the physical fabric of the item or place, its location, setting and relationship with other items in its surrounds. The assessment of cultural significance is ideally a holistic approach that draws upon the response these factors evoke from the community.

9.1 BASIS FOR THE ASSESSMENT

The significance values provided in the Australia ICOMOS *Charter for the Conservation of Places of Cultural Significance* (the Burra Charter) are considered to be the best practice heritage management guidelines in Australia (Australia ICOMOS 2013a). The Burra Charter defines cultural significance as:

“...aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects. Places may have a range of values for different individuals or groups.” (Australia ICOMOS 2013a, p.2)

The Burra Charter significance values are outlined in Table 9.1; these are frequently adopted by cultural heritage managers and government agencies as a framework for a more holistic assessment of significance.

Table 9.1 Definitions of Burra Charter significance values (Australia ICOMOS 2013b)

Value	Definition
Aesthetic	Refers to the sensory and perceptual experience of a place. That is how a person responds to visual and non-visual aspects such as sounds, smells and other factors having a strong impact on human thoughts, feelings and attitudes. Aesthetic qualities may include the concept of beauty and formal aesthetic ideals. Expressions of aesthetics are culturally influenced.
Historic	Refers to all aspects of history. For example, the history of aesthetics, art and architecture, science, spirituality and society. It therefore often underlies other values. A place may have historic value because it has influenced, or has been influenced by, a historic event, phase, movement or activity, person or group of people. It may be the site of an important event. For any place the significance will be greater where the evidence of the association or event survives at the place, or where the setting is substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of such change or absence of evidence.
Scientific	Refers to the information content of a place and its ability to reveal more about an aspect of the past through examination or investigation of the place, including the use of archaeological techniques. The relative scientific value of a place is likely to depend on the importance of the information or data involved, on its rarity, quality or representativeness, and its potential to contribute further important information about the place itself or a type or class of place or to address important research questions.
Social	Refers to the associations that a place has for a particular community or cultural group and the social or cultural meanings that it holds for them.

Value	Definition
Spiritual	Refers to the intangible values and meanings embodied in or evoked by a place which give it importance in the spiritual identity, or the traditional knowledge, art and practices of a cultural group. Spiritual value may also be reflected in the intensity of aesthetic and emotional responses or community associations and be expressed through cultural practices and related places. The qualities of the place may inspire a strong and/or spontaneous emotional or metaphysical response in people, expanding their understanding of their place, purpose and obligations in the world, particularly in relation to the spiritual realm. The term spiritual value was recognised as a separate value in the Burra Charter, 1999. It is still included in the definition of social value in the Commonwealth and most state jurisdictions. Spiritual values may be interdependent on the social values and physical properties of a place.

In addition to the Burra Charter significance values, other criteria and guidelines have been formulated by other government agencies and bodies in NSW to assess the significance of heritage places in NSW. Of particular relevance to this assessment are the guidelines prepared by the Australian Heritage Council and the Department of the Environment, Water, Heritage and the Arts (DEWHA), and Heritage NSW (Australian Heritage Council & DEWHA 2009, DECCW 2011, OEH 2011, NSW Heritage Office 2001).

The Guide (OEH 2011, p.10) states that the following criteria from the NSW Heritage Office (2001, p.9) should be considered:

- **Social value:** Does the subject area have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons?
- **Historic value:** Is the subject area important to the cultural or natural history of the local area and/or region and/or state?
- **Scientific value:** Does the subject area have the potential to yield information that will contribute to an understanding of the cultural or natural history of the local area and/or region and/or state?
- **Aesthetic value:** Is the subject area important in demonstrating aesthetic characteristics in the local area and/or region and/or state?

OEH (2011, p.10) states that when considering the Burra Charter criteria, a grading system must be employed. Austral will use the following grading system to assess the cultural values of the study area and its constituent features. These are outlined in Table 9.2.

Table 9.2 Gratings used to assess the cultural values of the study area

Grading	Definition
Exceptional	The study area is considered to have rare or outstanding significance values against this criterion. The significance values are likely to be relevant at a state or national level.
High	The study area is considered to possess considerable significant values against this criterion. The significance values are likely to be very important at a local or state level.
Moderate	The study area is considered to have significance values against this criterion; these are likely to have limited heritage value but may contribute to broader significance values at a local or State level.
Little	The study area is considered to have little or no significance values against this criterion.

9.2 ASSESSMENT OF SIGNIFICANCE

The following section addresses the Burra Charter significance values regarding the overall study area.

9.2.1 AESTHETIC SIGNIFICANCE VALUES

Aesthetic values refer to the sensory, scenic, architectural and creative aspects of the place. These values may be related to the landscape and are often closely associated with social and cultural values.

Portions of the Forest Creek Block Bank, Hartwood Weir, Wanganella Weir and Wanganella Bypass Flood Channel study areas are located on waterways that consist of Billabong and Forest Creeks. The rest of the study area has been developed for agriculture and provides access to the area. There is always an aesthetic value to waterfronts and rural areas, however, the clearing of the floodplains and the presence of water infrastructure reduces this across most of the study area.

Based on this assessment, the study area is considered to have **low** aesthetic significance values.

9.2.2 HISTORIC SIGNIFICANCE VALUES

The assessment of historic values refers to associations with particular places associated with Aboriginal history. Historic values may not be limited to physical values but may relate to intangible elements that relate to memories, stories or experiences.

During the mid-1800s, pastoral stations within the region were mainly used for livestock, most notably for sheep and cropping. Water at the stations was supplied through water holes and dams along the creeks and constructed water tanks and dams within the station. The land has been cleared for agricultural and pastoral practices.

The region today remains rural and used for mixed farming activities, including grazing and cropping, with the study area situated within farmland. Much of the study area is currently wooded and contains informal tracks that have been used for the transport of vehicles and stock next to both Forest and Billabong Creeks. However, no historic sites have been registered within or in proximity to the study area.

Based on this assessment, the study area is considered to have **low** historic significance values.

9.2.3 SCIENTIFIC SIGNIFICANCE VALUES

Scientific significance generally relates to the ability of archaeological objects or sites to answer research questions that are important to the understanding of the past way of life of Aboriginal people. Australia ICOMOS (2013b, p.5) suggests that to appreciate scientific value, the following question is asked: *“Would further investigation of the place have the potential to reveal substantial new information and new understandings about people, places, processes or practices which are not available from other sources?”*.

In addition to the above criteria, The Guide (OEH 2011, p.10) also suggests that consideration is given to the Australian Heritage Council and DEWHA (2009) criteria, which are particularly useful when considering scientific potential:

- **Research potential:** does the evidence suggest any potential to contribute to an understanding of the area and/or region and/or state’s natural and cultural history?
- **Representativeness:** how much variability (outside and/or inside the subject area) exists, what is already conserved, and how much connectivity is there?
- **Rarity:** is the subject area important in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practised? Is it in danger of being lost or of exceptional interest?
- **Education potential:** does the subject area contain teaching sites or sites that might have teaching potential?

An assessment of the scientific significance of the Aboriginal sites located within the study area is outlined in Table 9.3.

Table 9.3 Scientific significance of Aboriginal sites in the study area

Site name	AHIMS No.	Assessment of significance	Grading
Forest Creek Block Bank Scarred Tree 2	54-3-0031	Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031) is a scarred tree in good condition and is not associated with any other sites. This form of scar tree is common within the surrounding region; however, scar trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031) has a moderate scientific value at a local level.	Moderate
Forest Creek Block Bank Scarred Tree 3	54-3-0034	Forest Creek Block Bank Scarred Tree 3 (AHIMS # 54-3-0034) is a scarred tree in good condition and is not associated with any other sites. This form of scarred tree is common within the surrounding region; however, scarred trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Forest Creek Block Bank Scarred Tree 3 (AHIMS # 54-3-0034) has a moderate scientific value at a local level.	Moderate
Forest Creek Block Bank Scarred Tree 4	54-3-0057	Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) is a scarred tree in good condition and is not associated with any other sites. This form of scarred tree is common within the surrounding region; however, scarred trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) has a moderate scientific value at a local level.	Moderate
Forest Creek Block Bank Earth Mound 1	54-3-0058	Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058) contains a high scientific value at a local level. This earth mound is isolated from other earth mounds and is fairly uncommon within the surrounding region. Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058) contains both educational and research potential as well as being a representative example of an earth mound.	High
Hartwood Weir Scarred Tree 4	54-3-0059	Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) is scarred in good condition and is not associated with any other sites. This form of scarred tree is common within the surrounding region; however, scarred trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) has a moderate scientific value at a local level.	Moderate

Site name	AHIMS No.	Assessment of significance	Grading
Hartwood Weir Scarred Tree and PAD	54-3-0055	Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055) contains two components; a scarred tree in good condition, and an associated potential archaeological deposit (PAD). This type of associated site is uncommon within the surrounding region, and, although scar trees are a declining cultural site since they are dependent on the life of the tree, the associated PAD contains both educational and research potential. Therefore, Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055) has a high scientific value at a local level.	High
Hartwood Weir Earth Mound 1	54-3-0054	Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) contains a high scientific value at a local level. This earth mound is isolated from other earth mounds and is fairly uncommon within the surrounding region. Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) contains both educational and research potential as well as being a representative example of an earth mound.	High
Hartwood Weir Earth Mound 2	54-3-0056	Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056) contains a high scientific value at a local level. This earth mound is isolated from other earth mounds and is fairly uncommon within the surrounding region. Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056) contains both educational and research potential as well as being a representative example of an earth mound.	High
Hartwood Weir Hearth	54-3-0061	Hartwood Weir Hearth (AHIMS #54-3-0061) is an isolated hearth located close to Billabong Creek. Hartwood Weir Hearth (AHIMS # 54-3-0061) contains a moderate scientific value at a local level. This hearth is isolated and is a common site type within the surrounding region. Hartwood Weir Hearth (AHIMS # 54-3-0061) contains limited educational and research potential and is a representative example of a hearth.	Moderate
Wanganella Weir Scarred Tree 1	54-2-0263	Wanganella Weir Scarred Tree 1 (AHIMS # 54-2-0263) is scarred in good condition and is not associated with any other sites. This form of scarred tree is common within the surrounding region; however, scarred trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) has a moderate scientific value at a local level.	Moderate
Wanganella Weir Scarred Tree 3	54-2-0264	Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264) is scarred in good condition and is not associated with any other sites. This form of scarred tree is common within the surrounding region; however, scarred trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) has a moderate scientific value at a local level.	Moderate

9.2.4 SOCIAL AND SPIRITUAL SIGNIFICANCE VALUES

As social and spiritual significance are interdependent, Austral has undertaken a combined assessment of these values. The Consultation Requirements specify that the social or cultural values of a place can only be identified through consultation with Aboriginal people.

No submissions were received from RAPs during the completion of the project, nor within the Stage 4 consultation period.

Based on this assessment, the study area is considered to have low social and spiritual significance values.

9.3 STATEMENT OF SIGNIFICANCE

Statements of significance for identified Aboriginal sites within the study area are presented in Table 9.4. The statements of significance have been formulated using the Burra Charter significance values and relevant NSW guidelines (DECCW 2011, OEH 2011, Australia ICOMOS 2013a).

Table 9.4 Statements of significance for Aboriginal sites in the study area

Site name (AHIMS #)	Statement of significance
Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031)	Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031) is a scarred tree in good condition and is not associated with any other sites. This form of scar tree is common within the surrounding region; however, scar trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031) has a moderate scientific value at a local level.
Forest Creek Block Bank Scarred Tree 3 (AHIMS # 54-3-0034)	Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) is a scarred tree in good condition and is not associated with any other sites. This form of scarred tree is common within the surrounding region; however, scarred trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) has a moderate scientific value at a local level.
Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057)	Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) is a scarred tree in good condition and is not associated with any other sites. This form of scar tree is common within the surrounding region; however, scar trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) has a moderate scientific value at a local level.
Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058)	Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058) contains a high scientific value at a local level. This earth mound is isolated from other earth mounds and is fairly uncommon within the surrounding region. Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058) contains both educational and research potential as well as being a representative example of an earth mound.
Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059)	Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) is a scarred tree in good condition and is not associated with any other sites. This form of scar tree is common within the surrounding region; however, scar trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) has a moderate scientific value at a local level.
Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055)	Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055) contains two components; a scarred tree in good condition, and an associated potential archaeological deposit (PAD). This type of associated site is uncommon within the surrounding region, and, although scar trees are a declining cultural site since they are dependent on the life of the tree, the associated PAD contains both educational and research potential. Therefore, Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055) have a high scientific value at a local level.

Site name (AHIMS #)	Statement of significance
Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054)	Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) contains a high scientific value at a local level. This earth mound is isolated from other earth mounds and is fairly uncommon within the surrounding region. Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) contains both educational and research potential as well as being a representative example of an earth mound.
Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056)	Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056) contains a high scientific value at a local level. This earth mound was found in association with Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0054). Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056) contains educational and research potential as well as being a representative example of an earth mound.
Hartwood Weir Hearth (AHIMS # 54-3-0061)	Hartwood Weir Hearth (AHIMS # 54-3-0061) contains a low scientific value at a local level due to its small size and limited clay content. This hearth is isolated from other hearths in the local area and is commonly found within the surrounding region. Hartwood Weir Hearth (AHIMS # 54-3-0061) contains some educational and research potential.
Wanganella Weir Scarred Tree 1 (AHIMS # 54-2-0263)	Wanganella Weir Scarred Tree 1 (AHIMS # 54-2-0263) is a scarred tree in good condition and is not associated with any other sites. This form of scar tree is common within the surrounding region; however, scar trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) has a moderate scientific value at a local level.
Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264)	Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264) is a scarred tree in good condition and is not associated with any other sites. This form of scar tree is common within the surrounding region; however, scar trees are a declining cultural site since they are dependent on the life of the tree. It offers very little educational or research potential. Therefore, Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059) has a moderate scientific value at a local level.

Heritage NSW specifies the importance of considering cultural landscapes when determining and assessing Aboriginal cultural values. The principle behind this is that *'For Aboriginal people, the significance of individual features is derived from their inter-relatedness within the cultural landscape. This means features cannot be assessed in isolation and any assessment must consider the feature and its associations in a holistic manner'* (DECCW 2010c).

Based on the archaeological survey of the study area, the Hartwood Weir, Forest Creek Block Bank and Wanganella Weir study areas are considered to have **moderate** archaeological potential.

10 IMPACT ASSESSMENT

This section outlines, according to Heritage NSW guidelines, the potential harm that the proposed activity may have on identified Aboriginal objects and places within the study area (DECCW 2011, OEH 2011).

10.1 LAND USE HISTORY

The study area is found within an area under constant artificial change. As the region was being settled by pastoralists in the 1880s, large areas of forests were cleared of trees and shrubs for grazing and cropping. Most of these pastoral leases concentrated on wool production leading to a large number of sheep occupying the area. The result of clearing, ploughing and the introduction of hoofed mammals has led to the deflation of the soil and increased erosion. To protect animals, crops and farming infrastructure from flooding, and as part of irrigation practices, private levees have been constructed by individual farms. The location of the study area is within proximity to where water was pumped, under leases, to irrigate the surrounding area.

As a result of these previous activities, there would have been large-scale land clearance that would have included land levelling and tree removal. This would have destroyed, harmed and relocated sites from their *in-situ* context.

The region today remains rural and used for mixed farming activities, including grazing and cropping, with the study area situated within farmland. Much of the study area is cleared with regrowth along creek banks and sentinel trees. It contains informal tracks that have been used for the transport of vehicles and stock next to both Billabong and Forest Creeks.

Table 10.1 Summary of past land use within the study area, and the potential impacts on archaeological resources

Past land uses	Potential impacts on archaeological resources
Historical land clearance	Loss of mature native trees, shrubs and grasses would lead to the potential loss of scarred trees, increased erosion and potential dispersal or disturbance of surface and subsurface artefacts across the predominantly gently sloping terrain of the study area.
Agriculture	The effect of grazing and cropping on the land has led to the disturbance of archaeological sites. The grazing of animals can cause the movement of surface artefacts, especially in areas where intensive grazing practices are used. Ploughing practices have had a significant effect on archaeological sites since they bring sub-surface archaeology to the surface and cause the levelling and disturbance of earth mounds and hearths. The addition of European agricultural practices to the region has led to an increase in erosion and deflation of the soil.
Construction of property access tracks and fencing	The construction, use and maintenance of property tracks and fence lines result in the ground surface being disturbed and can enable erosions to become severe. Grading of these areas can cause artefacts and sites to be heavily disturbed, if not destroyed. The continued use of this infrastructure can cause surface artefacts to move from their original context.

Past land uses	Potential impacts on archaeological resources
Construction of water management infrastructure	The construction of water management infrastructure involves the excavation of channels and dams as well as the construction of walls and embankments to ensure their capacity to hold water. This has a high impact on surface and subsurface archaeology. The construction of levee banks has similar effects on archaeological sites. The construction of regulators, weirs and other infrastructure that controls the natural flow of creeks can cause sites to become inundated, making it difficult to assess the conditions of affected sites. The impact of inundation on archaeological sites has not been fully studied, but it is considered to have a moderate to high impact on sites, though the removal of water from the environment also has a detrimental effect on certain sites.

10.2 PROPOSED ACTIVITY

The proposed works include removing the Hartwood and Wanganella weirs, constructing new regulators along Billabong Creek, and building the Forest Creek Block Bank. A borrow pit will be established northwest of Hartwood Weir to supply construction materials, with access provided via an existing unsealed track, which may be upgraded with grading, gravel, or widening as needed. Additionally, a mitigation channel will be constructed at the Wanganella Bypass Flood Channel to manage flooding. Ancillary facilities such as site offices, waste disposal areas, and materials storage may also be located within the study areas.

Details of the proposed activity are shown in Table 10.2

Table 10.2 Proposed Activity

Study Area	Proposed Works
Hartwood Weir	Replace the existing 1916 regulator with a new regulator. The works include: - Concrete piers with maintenance bulkhead slots - Automated layflat gates across the crest of the structure to assist with flow management and downstream fish passage - A low turbulence 'keyhole' type vertical slot fishway with allowances for variable headwater to provide upstream fish passage - Automated sidewinder gates within the vertical slot fishway to allow for variable headwater conditions - Fixed concrete crests on the opposite side of the gates to the vertical slot fishway - Concrete apron downstream of the structure - Concrete wingwalls upstream and downstream of the structure - Access from a trafficable deck for maintenance (Hartwood Regulator only) - Crushed rock maintenance pads, access and turnaround areas adjacent to the structure - Rock beaching upstream and downstream of structure for erosion protection - Control house - Sheet pile cut-off walls beneath the structure - Fencing of the structures to prevent public access - SCADA control system - An existing privately owned borrow pit on lot 56 / DP756322 near Hartwood Weir would be extended to provide material for the construction of Hartwood Regulator and Forest Creek block bank
Forest Creek Block Bank	- The existing Block Bank was constructed of clay and rock in an excavated channel with the current structure in poor condition. - Replaced with a similar earthen structure in the same location

Study Area	Proposed Works
Wanganella Weir	• Replace the existing 20th century fixed crest weir with a new regulator. • Replace the existing 1916 regulator with a new regulator. • Concrete piers with maintenance bulkhead slots • Automated layflat gates across the crest of the structure to assist with flow management and downstream fish passage • A low turbulence 'keyhole' type vertical slot fishway with allowances for variable headwater to provide upstream fish passage • Automated sidewinder gates within the vertical slot fishway to allow for variable headwater conditions • Fixed concrete crests on the opposite side of the gates to the vertical slot fishway • Concrete apron downstream of the structure • Concrete wingwalls upstream and downstream of the structure • Pedestrian walkway access part way across Wanganella Regulator structure to facilitate housing of gate actuators and for maintenance • Walkway grating over gates to facilitate operations and maintenance • Crushed rock maintenance pads, access and turnaround areas adjacent to the structure • Rock beaching upstream and downstream of structure for erosion protection • Control house • Sheet pile cut-off walls beneath the structure • Fencing of the structures to prevent public access • SCADA control system
Wanganella Flood Bypass Channel	• constructed to reduce potential upstream flooding • impacts from the Wanganella Regulator. The channel would enable flood waters to drain between the • billabongs in the Wanganella Reserve during flood events
All study areas	• Access to the regulators would require permanent tracks for maintenance and some additional tracks to support construction only. Track upgrades include a new drainage culvert at Hartwood. • Removal of vegetation, trimming • Laydown • Site sheds • Parking • Power supply – both overhead and underground with a 20 metre clearance, connecting the structures to the grid

10.3 ASSESSING HARM

This section outlines the assessment process for addressing potential harm to Aboriginal objects and/or places within the study area, as outlined by Heritage NSW (OEH 2011, p.12).

10.3.1 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

An objective of the NPW Act, under Section 2A(1)(b)(i) is to conserve “*places, objects and features of significance to Aboriginal people*” through applying the principles of ecologically sustainable development (ESD) (Section 2A(2)). ESD is defined in Section 6(2) of the *Protection of the Environment Administration Act 1991* (NSW) as “...*the effective integration of social, economic and environmental considerations in decision-making processes*”. ESD can be achieved with regard to Aboriginal cultural heritage, by applying the principle of inter-generational equity, and the precautionary principle to the nature of the proposed activity, with the aim of achieving beneficial outcomes for both the development and Aboriginal cultural heritage.

INTERGENERATIONAL EQUITY

The principle of intergenerational equity is that the present generation ensures the health, diversity and productivity of the environment for the benefit of future generations. The Department of Environment and Climate Change (DECC), now Heritage NSW, states that in terms of Aboriginal cultural heritage “*intergenerational equity can be considered in terms of the cumulative impacts to Aboriginal objects and places in a region. If few Aboriginal objects and places remain in a region (for example, because of impacts under previous AHIPs), fewer opportunities remain for future generations of Aboriginal people to enjoy the cultural benefits of those Aboriginal objects and places.*” (DECC 2009, p.26).

The assessment of intergenerational equity and understanding of cumulative impacts should consider information about the integrity, rarity or representativeness of the Aboriginal objects and/or places that may be harmed and how they illustrate the occupation and use of the land by Aboriginal people across the locality (DECC 2009, p.26).

Where there is uncertainty over whether the principle of intergenerational equity can be followed, the precautionary principle should be applied.

PRECAUTIONARY PRINCIPLE

Heritage NSW defines the Precautionary Principle as “*if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing cost-effective measures to prevent environmental degradation*” (DECC 2009, p.26).

The application of the precautionary principle should be guided through:

- A careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment.
- An assessment of the risk-weighted consequences of various options.

DECC (2009, p.26) states that the precautionary principle is relevant to the consideration of potential impacts on Aboriginal cultural heritage, where:

- The proposal involves a risk of serious or irreversible damage to Aboriginal objects and/or places or to the value of those objects and/or places.
- There is uncertainty about the Aboriginal cultural heritage values, scientific, or archaeological values, including concerning the integrity, rarity or representativeness of the Aboriginal objects or places proposed to be impacted.

Where either of the above is likely, a precautionary approach should be taken, and all effective measures implemented to prevent or reduce harm to Aboriginal cultural heritage values.

10.3.2 TYPES OF HARM

When considering the nature of harm to Aboriginal objects and/or places, it is necessary to quantify direct and indirect harm. The types of harm, as defined in the Guide (OEH 2011, p.12), are summarised in Table 10.3. These definitions will be used to quantify the nature of harm to identified

Aboriginal objects and/or places that have been identified as part of this assessment. The Code states that the degree of harm can be either total or partial (DECCW 2010b, p.21).

Table 10.3 Definition of types of harm

Type of harm	Definition
Direct harm	May occur as the result of any activity that disturbs the ground including, but not limited to, site preparation activities, installation of services and infrastructure, roadworks, excavating detention ponds and other drainage or flood mitigation measures, and changes in water flows affecting the value of a cultural site.
Indirect harm	May affect sites or features located immediately beyond, or within, the area of the proposed activity. Examples of indirect impacts include but are not limited to, increased impact on art in a shelter site from increased visitation, destruction from increased erosion and changes in access to wild food resources.

10.4 IMPACT ASSESSMENT

This ACHA has included a programme of investigations that have characterised the nature, extent and significance of Aboriginal sites within the study area.

As part of the pedestrian survey undertaken throughout the Hartwood Weir, Forest Creek Block Bank, Wanganella Weir and Wanganella Bypass Flood Channel study areas, 10 Aboriginal sites were identified by Austral, consisting of one (1) previously identified AHIMS sites and 10 newly registered sites. These sites comprise 6 modified trees, 2 earth mounds, 1 hearth and one modified tree and associated PAD. An evaluation of harm to the Aboriginal sites identified as part of the ACHA is summarised in Table 10.4.

Table 10.4 Assessment of harm to identified Aboriginal sites

Site name / AHIMS No.	Type of harm	Degree of harm	Consequence of harm
Forest Creek Block Bank Scarred Tree 2 / AHIMS # 54-3-0031	Direct	Partial	Partial loss of value
Forest Creek Block Bank Scarred Tree 3 / AHIMS # 54-3-0034*	None	None	No loss of value
Forest Creek Block Bank Scarred Tree 4 / AHIMS # 54-3-0057	Direct	Partial	Partial loss of value
Forest Creek Block Bank Earth Mound 1 / AHIMS # 54-3-0058	None	None	No loss of value
Hartwood Weir Scarred Tree 4 / AHIMS # 54-3-0059	Direct	Whole	Total loss of value
Hartwood Weir Scarred Tree and PAD / AHIMS # 54-3-0055	None	None	No loss of value
Hartwood Weir Earth Mound 1 / AHIMS # 54-3-0054	None	None	No loss of value
Hartwood Weir Earth Mound 2 / AHIMS # 54-3-0056	None	None	No loss of value
Hartwood Hearth / AHIMS # 54-3-0061	Direct	Whole	Total loss of value
Wanganella Weir Scarred Tree 1 / AHIMS # 54-2-0263	None	None	No loss of value
Wanganella Weir Scarred Tree 3 / AHIMS # 54-2-0264	Direct	Whole	Total loss of value

*This site was not relocated as part of Austral's survey but has been included due to the location of the site and the proximity to works.

11 AVOIDING AND MINIMISING HARM

The Burra Charter advocates a cautious approach to change: “*do as much as necessary to care for the place and to make it useable, but otherwise change it as little as possible so that its cultural significance is retained*” (Australia ICOMOS 2013a, p.1). Based on this principle, this section identifies the measures that have been taken to avoid harm and what conservation outcomes have been achieved through the preparation of this ACHA.

11.1 DEVELOPMENT OF PRACTICAL MEASURES TO AVOID HARM

The study areas are located in farmland historically used for grazing, agriculture, and transporting vehicles and livestock across the creek. Prior water infrastructure constructed within the study areas has also greatly disturbed the landforms. As such, most impacts on the area have been caused by human development, with previous agricultural and pastoral processes having limited but not insignificant effects on the Aboriginal cultural material that was likely to be present in the numerous study areas. The proposed works will involve replacing the Hartwood Weir, Wanganella Regulator and Forest Creek Block Bank, as well as the associated borrow pit, access tracks, construction zones and laydown areas. It will also involve the construction of a mitigation channel for flood efforts at the Wanganella Bypass Flood Channel study area.

To avoid harm to Aboriginal cultural material, careful planning and management will be essential. Ground disturbance will be minimized wherever possible, and areas with potential cultural significance will be closely monitored. Strategies such as altering construction methods and rerouting access tracks will be implemented to protect any Aboriginal heritage identified within the study areas. Where unavoidable, mitigation measures such as archaeological salvage or the creation of protective buffer zones around sensitive sites will be employed to preserve the cultural integrity of the area.

This will result in harm to Aboriginal cultural material in areas of ground disturbance should it be present within the study area.

11.2 APPLICATION OF PRINCIPLES OF ESD AND CUMULATIVE IMPACTS

The Guide to Reporting requires this ACHA to consider the effects of cumulative impacts under the principles of ESD. These principles are outlined in Section 10.3. In essence, this requires the

acknowledgement that while a single development might have minimal impact, it forms part of an urbanisation process which results in the widespread loss of environmental and cultural resources.

The townships and suburbs surrounding Forest and Billabong Creeks have been subject to progressive and continuing agricultural and pastoral practices, which have and will continue to place pressure on the archaeological resources within the region. To assess whether the proposed impacts from the project will have a broader impact on the cultural resources of the region, Austral has undertaken an analysis of AHIMS sites associated with current or previous AHIPs based on the results of the extensive AHIMS search completed for this project.

The results demonstrate that none of the sites within the designated local search area have been subject to AHIPs. This data indicates that all the sites have an extremely high conservation rate along Billabong and Forest Creeks.

The Riverina is a region that will be subject to progressive urbanisation over time, and this will place pressure on the archaeological resources within the region. To qualify whether the proposed impacts from the project will have a broader impact on the cultural resources of the region, Austral undertook an analysis of AHIMS sites in relation to their current or future zoned use. The purpose of this analysis is to determine the volume of AHIMS sites that are located within zonings that have or are likely to be subject to progressive development. This assumes that sites that are located within land zoned for residential (R1 - R5), business (B1 - B5) and industrial (IN1 - IN4) purposes are more likely to have been harmed or may be under threat of harm. Conversely, sites that are zoned for environmental (E1 - E5), recreational (RE1 - RE2) and rural (RU1 - RU6) purposes are more likely to be subject to conservation.

Table 11.1 Analysis of number of AHIMS sites in relation to land zoning

Land Zone Classification	No. of Sites by Zone	% Sites by Zone
RU1 (Rural)	13	100.0
Total	13	100.0

This analysis indicates that all the AHIMS sites (n=13, 100%) are located within zonings which are likely to facilitate conservation outcomes and there are minimal threats to the conservation of sites. This analysis does appear to indicate that locally, 100% of the AHIMS sites identified are being conserved rather than destroyed.

11.3 STRATEGIES TO MINIMISE HARM

As most of these sites are located on the boundary of the area of proposed works and not in areas of construction they can be avoided. Due to this further subsurface assessment of the study area, through test excavation would result in the unnecessary impact to cultural heritage within the study area.

Within the current study area, the proposed works have been revised to minimise harm to Aboriginal sites present, including:

- The Hartwood Weir, Wanganella Weir, Forest Creek Block Bank and Wanganella Bypass Flood Channel Channel study areas have been carefully selected. The location of the construction zones either already has an existing crossing or is heavily disturbed. These selections aim to avoid impacting undisturbed creek banks and floodplains, as well as adjacent areas that would be required to create new accesses.
- The sites proposed to be impacted through either minor impact, include:
 - Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031)
 - Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057)
- The sites proposed to be impacted through major impacts such as their removal and/or destruction include:
 - Hartwood Weir Hearth (AHIMS # 54-3-0061)
 - Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059)
 - Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264)

These sites have had their surrounding landscapes impacted and disturbed by previous developments, pastoral practices, and informal access tracks, as well as being common representations of their site types.

- An Aboriginal Cultural Heritage Management Plan (ACHMP) is recommended to be prepared for the sites under threat. However, under the ACHMP, these sites may have the potential to be preserved during the undertaking of the proposed works.
- Borrow pit, construction zone and laydown zones have been carefully selected with the input of the cultural heritage team to identify locations with low cultural heritage potential.
- Access to all sites and borrow pits is via existing access tracks only to reduce the potential for disturbance.

12 RECOMMENDATIONS

The following recommendations are derived from the findings described in this ACHA. The recommendations have been developed after considering the archaeological context, environmental information, consultation with the local Aboriginal community, the findings of the archaeological survey and the predicted impact of the planning proposal on archaeological resources.

It is recommended that:

1. All ground-disturbing works to the following earth mounds and potential archaeological deposit (PAD) site must be avoided, specifically:
 - Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058),
 - Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055),
 - Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) and
 - Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056),

Traditional Owners must be involved in monitoring works to ensure the protection of these sites from the proposed works. Specific site protection conditions include:

- i. Four Aboriginal cultural heritage sites are in close proximity to the access tracks. Prior to the commencement of works these sites must be fenced off using temporary flagging to ensure no disturbance occurs, specifically:
 - Forest Creek Block Bank Earth Mound 1 (AHIMS # 54-3-0058),
 - Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055),
 - Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) and
 - Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056),
- ii. All vehicles must keep to the access tracks.
- iii. An exclusion line using bollards is to be erected to the south of Hartwood Weir Earth Mound 1 (AHIMS # 54-3-0054) and Hartwood Weir Earth Mound 2 (AHIMS # 54-3-0056) to ensure that no vehicles drive in close proximity to sites.
2. The following culturally modified (scar) trees are to have no ground-disturbing works within the canopy dripline, damage to their trunks or limbed removed and/or damaged this includes
 - Hartwood Weir Scarred Tree and PAD (AHIMS # 54-3-0055),
 - Wanganella Weir Scarred Tree 1 (AHIMS # 54-2-0263) and
 - Forest Creek Block Bank Scarred Tree 3 (AHIMS # 54-3-0034)
- i. Temporary flagging must be erected to ensure the preservation of these sites and Traditional Owners must be involved in monitoring works to ensure the protection of these sites from the proposed works.
3. Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059), Hartwood Weir Hearth (AHIMS # 54-3-0061), Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031), Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264) and Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057) will be impacted by the proposed works and are to be managed in accordance with recommendations 4, 5 and 6 below.
4. The Conditions of Approval must state that impacts the following sites must be managed under the preparation of an Aboriginal Cultural Heritage Management Plan (ACHMP):
 - Hartwood Weir Scarred Tree 4 (AHIMS # 54-3-0059): digital recording of the tree using LIDAR scanning and casting of the scar; followed by careful removal of the tree avoiding damage to the cultural modification of the tree,

- Hartwood Weir Hearth (AHIMS # 54-3-0061): including archaeological salvage of the site with RAPs present,
 - Forest Creek Block Bank Scarred Tree 2 (AHIMS # 54-3-0031): trimming to be conducted by qualified arborist and under supervision of RAPs,
 - Forest Creek Block Bank Scarred Tree 4 (AHIMS # 54-3-0057): trimming to be conducted by qualified arborist and under supervision of RAPs, and
 - Wanganella Weir Scarred Tree 3 (AHIMS # 54-2-0264) digital recording of the tree using LIDAR scanning and casting of the scar; followed by careful removal of the tree avoiding damage to the cultural modification of the tree.
5. The ACHMP at a minimum, must include protocols for:
 - i. Minimisation and managing the impacts of the project on heritage items within the disturbance area.
 - ii. Protecting the heritage items outside the project disturbance area.
 - iii. Managing the discovery of human remains or previously unidentified heritage items based on Water NSW's unexpected finds protocol.
 - iv. Ensuring any workers on site receive suitable heritage inductions prior to carrying out any work on site.
 - v. Monitoring and reporting on the effectiveness of any mitigation measures and any heritage impacts of the project.
 - vi. Maintaining and managing reasonable access for registered Aboriginal parties (RAPs) to heritage items on site.
 - vii. Conducting further archaeological and heritage assessments in any disturbance areas where this assessment has not already been carried out.
 - viii. Be developed in consultation with RAPs and Heritage NSW.
 6. This assessment covers the harm to all known cultural heritage sites. In the event that unexpected finds occur during the proposed construction activities, an unexpected finds process must be followed. This process will be developed as part of the recommended ACHMP prior to the proposed works' commencement.
 - i. If human skeletal remains are encountered, all work must cease immediately and NSW Police must be contacted, they will then notify the Coroner's Office. Following this, if the remains are believed to be of Aboriginal origin, then the Aboriginal stakeholders and Heritage NSW must be notified.
 7. It is recommended that DCCEEW continues to inform the Aboriginal stakeholders about the management of Aboriginal cultural heritage within the study area throughout the completion of the project. The consultation outlined as part of this ACHA is valid for six months and must be maintained by the proponent for it to remain continuous. If a gap of more than six months occurs, then the consultation will not be suitable to support an ACHMP for the study areas.
 8. A copy of this report should be forwarded to all Aboriginal stakeholder groups who have registered an interest in the project.

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14 APPENDICES

Please see appendices in Volume 2 associated with this report.