Cabonne Council

Puzzle Flat Creek, Eugowra - Proposed Levee Bank

Review of Environmental Factors

Issue 1 | 28 January 2015

Job number 230905

Arup
Arup Pty Ltd ABN 18 000 966 165

Arup
Level 17
1 Nicholson Street
Melbourne VIC 3000
Australia
www.arup.com

ARUP

Document Verification

ARUP

Job title		Puzzle Flat Creek, Eugowra - Proposed Levee Bank			**Job number** 230905
Document title		Review of Environmental Factors			**File reference**
Document ref					
Revision	**Date**	**Filename**	Puzzle Creek Revised REF DRAFT 24.2.14.docx		
Draft 1	27 Feb 2014	**Description**	First Draft		
			Prepared by	Checked by	Approved by
		Name	Belinda Hewitt	Natasha Connolly	Claire Moore
		Signature			
Issue 1	28 Jan 2015	**Filename**	Puzzle Creek Revised REF ISSUE 1 28.01.2015.docx		
		Description	Removal of "DRAFT" watermark. No change to report contents.		
			Prepared by	Checked by	Approved by
		Name	Belinda Hewitt	Natasha Connolly	Claire Moore
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
				Issue Document Verification with Document	✓

Contents

		Page
1	**Project overview**	**3**
1.1	Introduction	3
1.2	Purpose of the REF	3
1.3	Summary of works	1
1.4	Location	2
1.5	Description of the existing environment	2
1.6	Consultation	5
Statutory requirements		**8**
1.7	Commonwealth legislation	8
1.8	Relevant NSW legislation and planning instruments	8
1.9	Local planning instruments	11
1.10	Ecologically sustainable development	11
2	**Proposed levee bank project**	**13**
2.1	Project description	13
2.2	Construction methodology	13
2.3	Timing and costing	15
2.4	Alternatives	15
2.5	Justification of preferred option	16
3	**Environmental impact assessment**	**17**
3.1	Noise and vibration	17
3.2	Water quality and hydrology	19
3.3	Contaminated land and hazardous materials	21
3.4	Acid sulphate soils	24
3.5	Biodiversity	25
3.6	Traffic and access	36
3.7	Landscape and visual amenity	37
3.8	Indigenous heritage	38
3.9	Non-indigenous heritage	39
3.10	Air quality	40
3.11	Energy and greenhouse emissions	42
3.12	Waste management	43
3.13	Light spill	44
3.14	Cumulative environmental impacts	44
3.15	Consideration of Clause 228 of EP&A Regulation	46
3.16	Consideration of EPBC Act Factors	49

4 Summary of mitigation measures 50

5 Conclusion 55

References 56

Appendices

Appendix A

EPBC Protected Matters Search Tool - Project Site Summary

Appendix B

Ecological Survey Methodology

Appendix C

Ecological Survey Results: Observed Species

Appendix D

Threatened Species Assessments

Appendix E

Geotechnical specifications

Glossary of abbreviations and definitions

AASS	Actual Acid Sulphate Soil
ABL	Assessment Background Level
AHIMS	Aboriginal Heritage Information Management System
ASS	Acid Sulphate Soil
CEMP	Construction Environmental Management Plan
CLM Act	Contaminated Land Management Act 1997
CLP	Community Liaison Plan
CNVMP	Construction Noise and Vibration Management Plan
Council	Cabonne Council
DP&I	Department of Planning and Infrastructure
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPA	The New South Wales Environmental Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000* (NSW)
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters on national environmental significance, and provides a national assessment and approvals process.
EPL	Environmental Protection Licence
ESD	Ecologically Sustainable Development: development that uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
Heritage Act	*Heritage Act 1977* (NSW)
ICNG	Office of Environment and Heritage Interim Construction Noise Guidelines
Infrastructure SEPP	*State Environment Planning Policy (Infrastructure)* 2007
LEP	Local Environmental Plan. A type of environmental planning instrument made under Part 3 of the EP&A Act
LGA	Local Government Area
NES	National Environmental Significance
NMLs	Noise Management Levels
NOW	NSW Office of Water
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NPWS	National Parks and Wildlife Service
NSW	The State of New South Wales
NV Act	*Native Vegetation Act 2003*
NW Act	*Noxious Weeds Act 1993* (NSW)
OEH	The New South Wales Office of Environment and Heritage
OH&S Act	Occupational Health and Safety Act 2000
OH&S Regulation	Occupational Health and Safety Regulation 2001
PAD	Potential Archaeological Deposit
PASS	Potential Acid Sulphate Soil

POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
The Project	The construction of the proposed flood levee at Eugowra
RBL	Rating Background Level
REF	Review of Environmental Factors
RMS	Roads and Maritime Authority
SEPP	State Environment Planning Policy: environment planning instrument made under Part 3 of the EP&A Act
SIS	Species Impact Statement
SMCMA	Sydney Metropolitan Catchment Management Authority
State and Regional Development SEPP	State Environment Planning Policy (State and Regional Development) 2011
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
WARR Act	*Waste Avoidance and Resource Recovery Act* 2001

1 Project overview

1.1 Introduction

Cabonne Council proposes to construct a new levee bank at Puzzle Flat as a means to reduce the flood risk associated with high rainfall events to the eastern side of Eugowra township, NSW (refer to Figure 1 below).

A levee currently exists at the site; however the structure has been determined to be of inadequate size to provide adequate flood mitigation to Eugowra during significant rainfall events. Hydrological modelling undertaken in the *Review of Eugowra Floodplain Risk Management Study* (Lyall & Associates, 2010) identified flow breakouts from Puzzle Flat Creek during a 100 year ARI flood event; both across a 1 kilometre gap in the levee and also across low points along the existing levee. This has a range of implications including risks associated with human safety and wellbeing, operation of State Emergency Services, and damage to infrastructure and buildings.

The proposed works involve construction of a new levee bank as an extension of the existing levee bank and upgrades to a section of the existing levee bank; thereby extending flood protection to adequately protect the eastern side of Eugowra township.

The proposed works are to be referred to as 'the Project' for the purpose of this Review of Environment Factors (REF).

1.2 Purpose of the REF

The purpose of this Review of Environmental Factors (REF) is to assess the environmental impacts associated with the construction of the Puzzle Creek Levee Bank Project proposed by Cabonne Council. The REF describes the proposed mitigation measures for the works in response to potential environmental impacts, and assesses the project against applicable state and federal environmental legislation.

For the purpose of these works, Cabonne Council is both the proponent and the Determining Authority for this REF under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

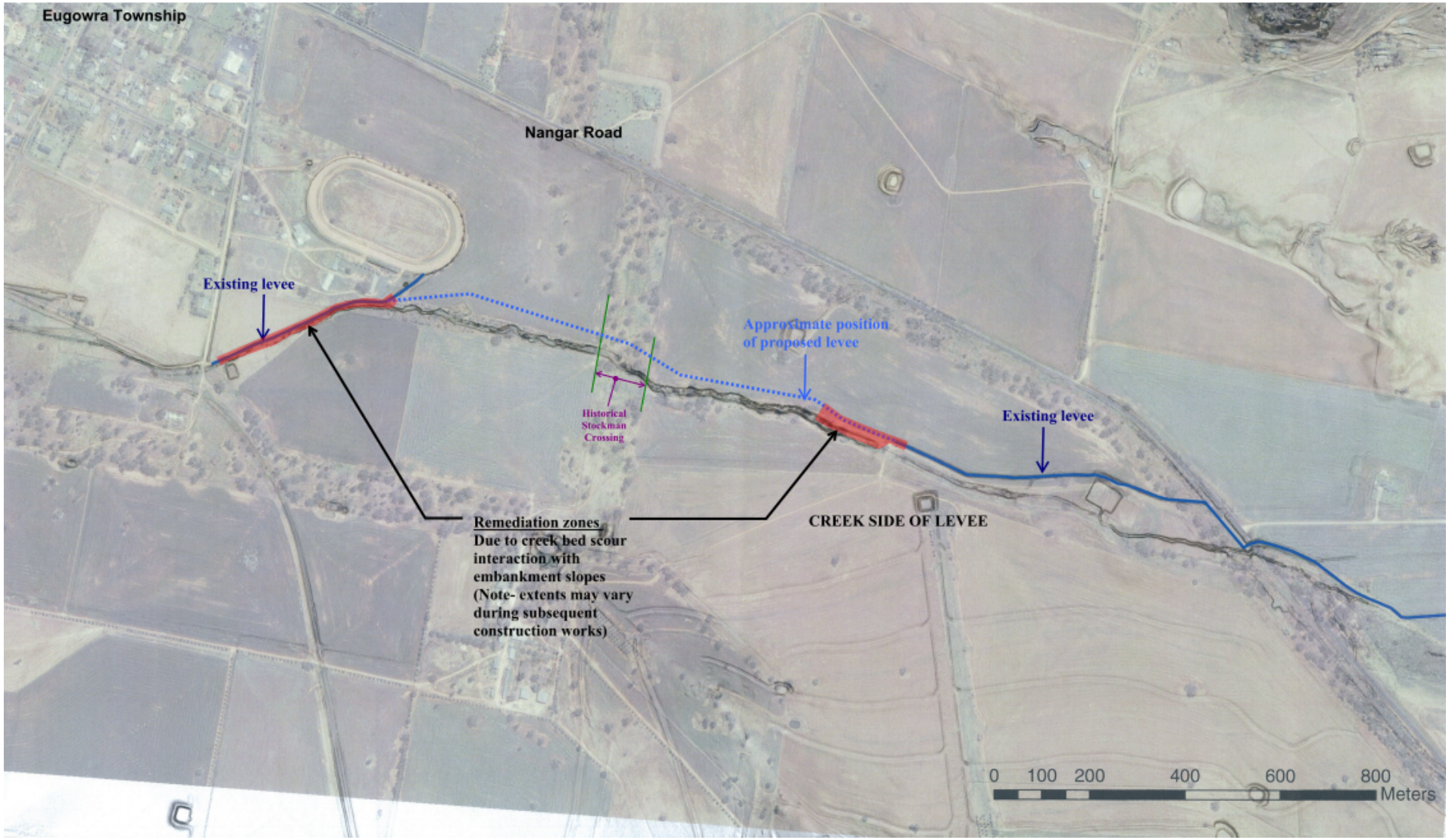

Figure 1 Site aerial showing existing and proposed levee

1.3 Summary of works

Location Name	Puzzle Flat, Eugowra, NSW
Site details	South west of the Euowra township on the Puzzle Flat Creek
Property size	The proposed levee site spans approximately 2.250 km
Site address	Nangar Road, Eugowra 2806
Local Government Area	Cabonne Shire
Catchment	Lachlan
Current zoning	Rural Use 1 (RU-1)

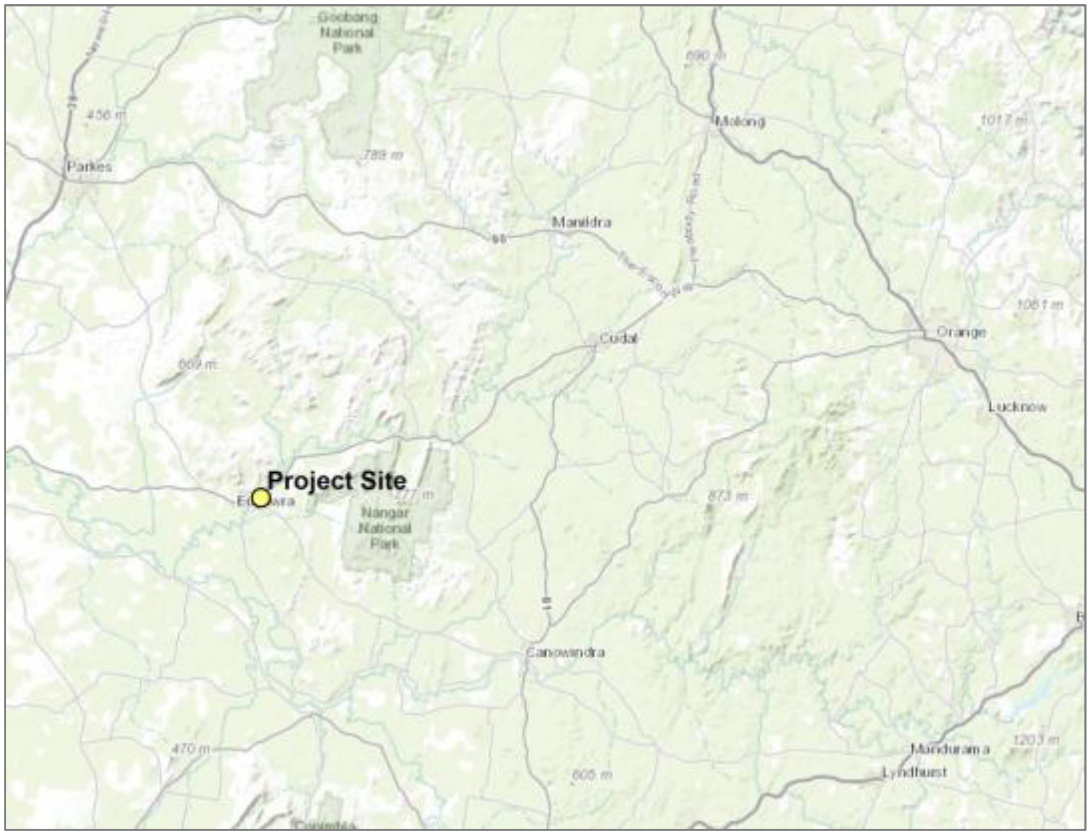

Figure 2 Site location

The proposed works include:

- Construction of a flood levee (as an extension of the existing levee) across a section of land adjacent to the Puzzle Flat Creek approximately 1km in length; and
- Additional various earthworks for upgrade to/ reinforcement of the existing flood levee.

A full description of the proposed works is provided in Section 2. Geotechnical and design advice for the Project is provided in Appendix E.

1.4 Location

The existing site is located to the south east of the Eugowra township on the Puzzle Flat Creek; a minor tributary in the Mandagery Creek floodplain (refer to Figure 1). The site spans several properties which are held privately by a number of landowners. As shown in Figure 3 the nearest residential dwelling is around 500 m from the westernmost boundary of the new levee works and 100m from the site of the existing levee which is to be upgraded.

Vehicle entry to the levee site is possible from Nangar Road, which runs between Eugowra and the township of Canowindra to the east. The main access points for light and heavy vehicles to the site to undertake these works are to be located along Nangar Road adjacent to the project site. The locations of access routes during construction will be determined by the construction contractor in consultation with landowners.

Zoning

The *Cabonne Local Environmental Plan 2012* is the applicable local plan for the area.

The site is located within the Cabonne Shire Local Government Area on land zoned as Rural Use 1 (RU1 – Primary Production), as shown in Cabonne Council Land Zoning Map Sheet LZN_003 and LZN003A (refer to Figure 4 below).

To the west of the Project site, Eugowra township is zoned as Rural Use 5 (RU1 – Village) and Eugowra Harness Racing Club is zoned as Private Recreation (RE2).

1.5 Description of the existing environment

The existing site is a highly modified landscape which has been cleared for agricultural use, including extensive stock grazing and cropping. The geography of the site is generally flat, with some gentle undulation. No residential or other buildings exist within the footprint of the Project site.

The site is dominated grassland, with scattered trees of both native and exotic species. Water and vegetation characteristics are discussed in further detail in Sections 3.2 and 3.5 of this report respectively.

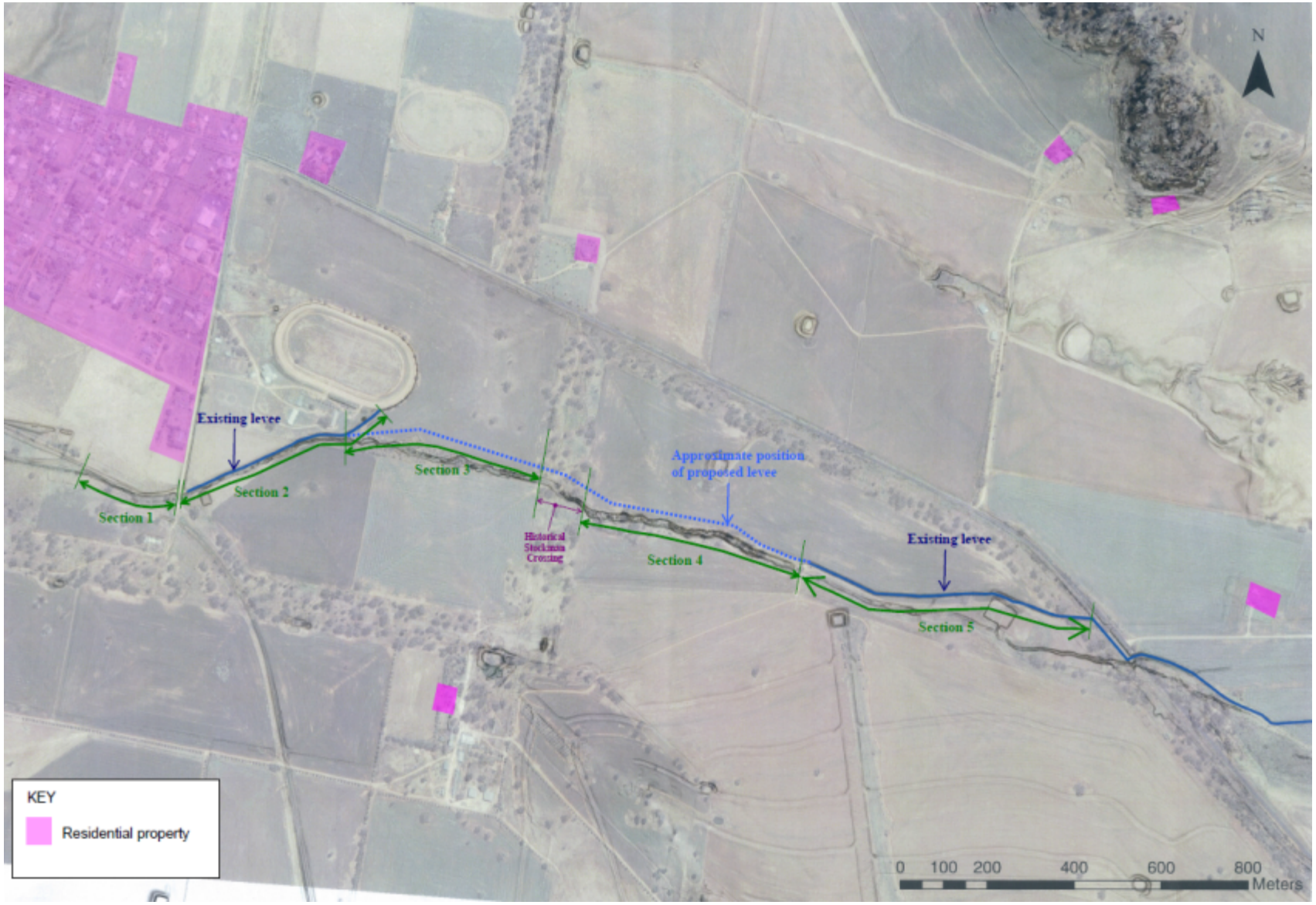

Figure 3 Proximity of residential properties to Project site

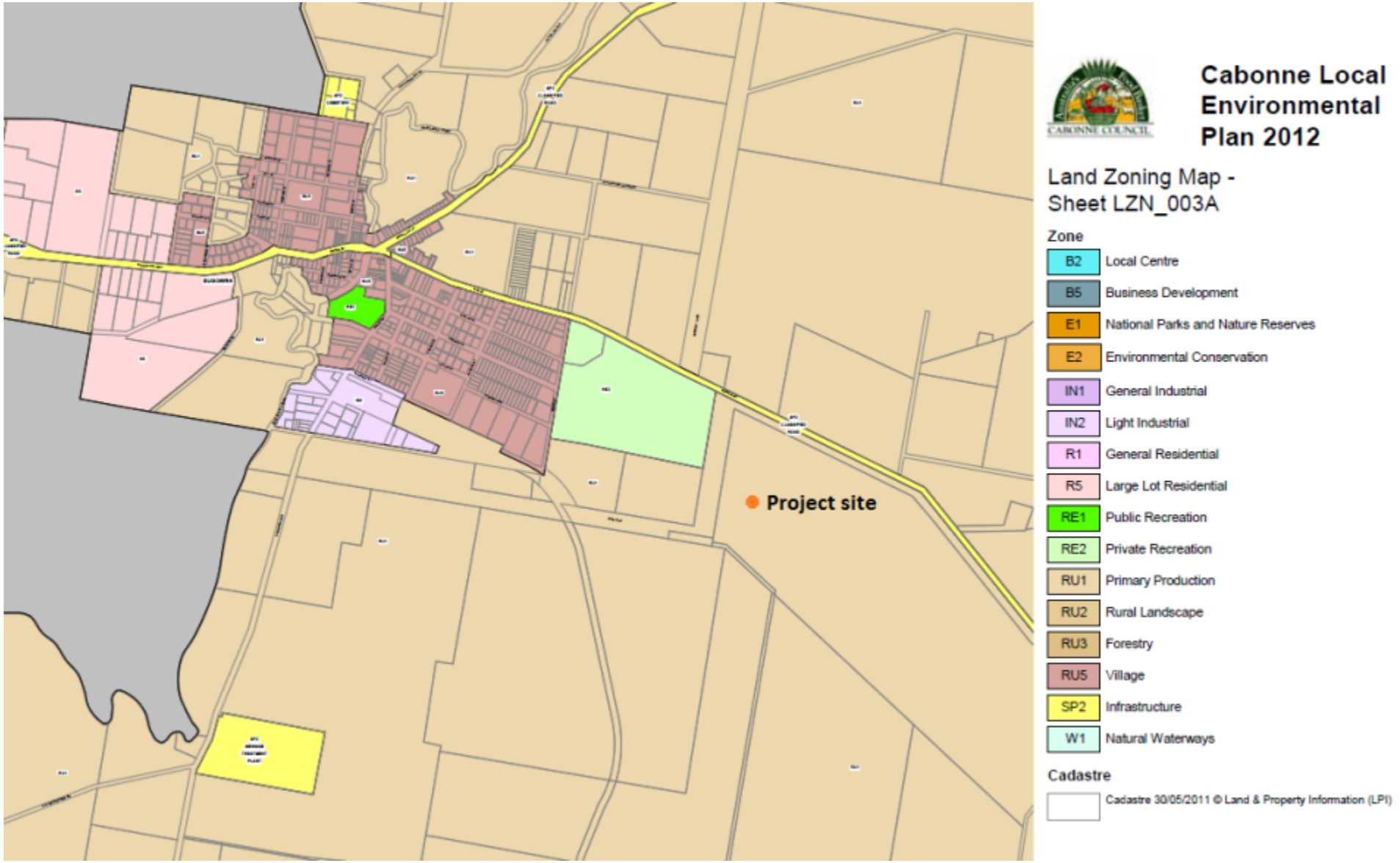

Figure 4 Planning Scheme adjacent to Project site (Cabonne Council Local Environment Plan – 2012)

1.6 Consultation

1.6.1 State Government

NSW Fisheries

NSW Fisheries have been consulted by Cabonne Council regarding environmental impact to Puzzle Creek, and the potential requirement for a Part 7 Fisheries Management Act Permit to undertake these works. A Part 7 Permit is required under the Act for certain activities affecting waterway; including any which involve dredging and reclamation work (refer to Section 1.8.9).

NSW Fisheries have advised that as there will be no significant changes to existing drainage patterns and water flows associated with this project, a Part 7 Permit for dredging and reclamation will not be required.

NSW National Parks and Wildlife Service

The NSW National Parks and Wildlife Service has been consulted by Cabonne Council in relation to potential impacts on protected areas in the region, specifically Nangar National Park. The project site is also near Eugowra Nature Reserve and Back Yamma State Forest.

The closest boundary of Nangar National Park lies approximately 6 km east of the project site (this is shown in Section 3.5.1). Nangar National Park contains a large number of bird species, mammals and ecological communities of state and national significance. The Park is a geographically important conservation reserve for the central west NSW; a stepping stone in a major wildlife corridor consisting of four National Parks along the Lachlan Fold Belt.

Due to proximity to the National Park, improperly managed activities on the project site have the potential to impact the environmental quality, habitat or migratory path of local indigenous species and ecological communities; particularly with respect to air and water quality.

Based on consultation, National Parks and Wildlife Service has no objection to the project if adequate provision is made for the potential flora, fauna and cultural heritage impacts associated with construction and operation. These considerations are outlined in further detail as part of the environmental impact assessment process in Sections 3.5 and 3.8 respectively.

1.6.2 Local Government

The proposed project site sits fully within the Local Government Area of Cabonne Shire. As such, Cabonne Council has undertaken internal consultation to ensure that the project meets the requirements of the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP).

1.6.3 Landowners

The site of the proposed works spans a number of properties, as shown in Figure 5. As part of initial scoping works for the project, Cabonne Council undertook a range of consultation with the relevant landowners and Eugowra community. This consultation included the preparation, distribution and collation of responses to a newsletter/ questionnaire. The results of this community consultation process are as documented in the Review of Eugowra Floodplain Risk Management Study 1999, Cabonne Council.

The proposed works would be undertaken without impacts to the continuance of existing land uses or demolition of any property infrastructure; but will require some property acquisition for easement entitlement.

Further consultation with any potentially affected stakeholders, particularly project site landowners and adjacent landowners with regards to property acquisition and vehicle access arrangements, will be undertaken as necessary before and during construction.

1.6.4 Wider Community

Once the project is underway, Cabonne Council will undertake additional community consultation in any case where works have potential to cause any environmental or socio-economic impacts for the wider community. This includes, but is not limited to:

- Impacts on stock movement to nearby properties;
- Impacts to roadways including road closure and congestion caused by light and heavy construction vehicles; and
- Amenity impacts; particularly noise impacts to neighbouring residents in any scenario where work takes place outside of recommended standard hours (as summarised below in Table 1.

Table 1 Standard working hours, as per the *Interim Construction Noise Guideline*, NSW Department of Environment and Climate Change (2009)

Work type	Recommended standard hours of work
Normal construction	Monday to Friday 7 am to 6 pm Saturday 8 am to 1 pm No work on Sundays or public holidays
Blasting	Monday to Friday 9 am to 5 pm Saturday 9 am to 1 pm No work on Sundays or public holidays

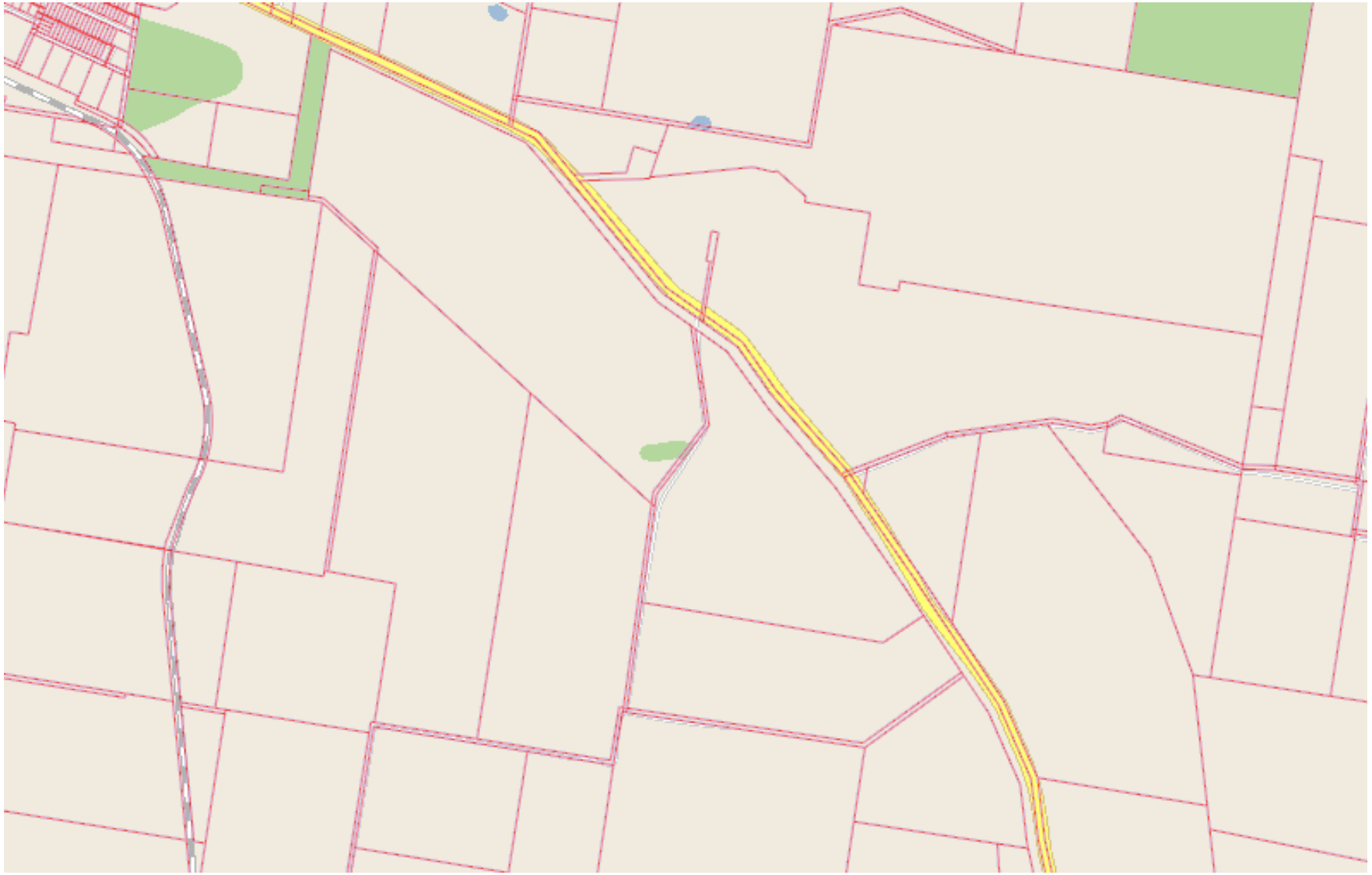

Figure 5 Project site landowner boundaries (*Australian Department of Environment Protected Matters Search Tool)*

Statutory requirements

1.7 Commonwealth legislation

1.7.1 Environment

The *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) has two important functions in protecting the environment. Firstly to provide assessment and approval processes for proposed actions that have national environmental significance and secondly to provide for the conservation of biodiversity and heritage.

Under the EPBC Act matters of national environmental significance (NES) are:

- Impact on World heritage properties;
- Impact on National Heritage Places;
- Impact on Wetlands of International Importance;
- Impact on Commonwealth Listed Threatened Species and Ecological Communities;
- Impact on Commonwealth Listed Migratory Species;
- Involvement of any Nuclear Action;
- Impact on a Commonwealth Marine Area;
- Impact on Commonwealth Land;
- Impact on a water resource, in relation to coal seam gas development and large coal mining development.

Section 3.16 provides a full checklist of matters of NES.

Matters of NES will not be impacted by the proposed works. In particular, the proposed works would not result in the significant loss, modification disturbance, or fragmentation of any habitat resources important for occurring Commonwealth Scheduled Ecological Communities or Fauna species recorded in the vicinity of the Project site.

As such, referral to the Minister for Environment, Heritage and the Arts is not required for the Project.

1.8 Relevant NSW legislation and planning instruments

1.8.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principle act concerning the environmental planning and assessment system in NSW.

The project constitutes an 'activity' under the Act and requires the preparation of a review of environmental factors (REF) under Part 5 of the Act with Cabonne Council being the approval authority.

An 'activity' is assessed under Part 5 of the Act (Environmental Assessment), with Cabonne Council being the proponent and the determining authority for the proposed works. In addition to the EP&A Act, *Clause* 228 of the *Environmental Planning and Assessment Regulation 2000* requires certain matters to be considered in an REF. These considerations are provided in later in Section 3.16 of this REF.

1.8.2 State Environmental Planning Policies (SEPP)_

SEPP (Infrastructure) 2007

SEPP (Infrastructure) 2007 aims to facilitate the effective delivery of infrastructure across the State. Under the SEPP, the proposed levee bank works falls under the definition of 'flood mitigation work'. Numeral 50(1) of the SEPP states that development for the purpose of flood mitigation work may be carried out by or on behalf of a public authority without consent on any land.

Hence the proposal is development permitted without consent.

SEPP No. 44 – Koala Habitat Protection

This SEPP encourages the conservation and management of natural vegetation areas that provide habitat for koalas, to ensure permanent free-living populations will be maintained over their present range. The SEPP applies to 107 local government areas in NSW including Cabonne local government area.

The proposed works are not located on land with potential koala habitat or in land core koala habitat.

1.8.3 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) provides for the protection of all threatened plant and animal species, populations and communities or their habitats native to NSW (with the exception of fish and marine plants). In addition, the *TSC Act* provides for the conservation and recovery of threatened species and makes provision for the management of threats to species under the TSC Act.

No threatened species listed under the TSC Act are expected to be impacted as a result of the proposed works. Section 3.5 includes an assessment of potential biodiversity impacts including any potential impact on threatened species. Detailed assessments are provided in Appendix D.

1.8.4 Heritage Act 1977

Statutory registers provide legal protection for heritage items. In NSW legal protection generally comes from the *Heritage Act 1977* and also the EP&A Act. The Heritage Act is administered by the Heritage Council of NSW, with any proposal to modify or impact on an item under protection of the Heritage Act requiring its approval.

A search of applicable heritage registers has been undertaken to locate existing heritage sites in the general vicinity of the site in Eugowra (see Section 3.9). A number of state and local government listed non aboriginal heritage sites are known to exist in the vicinity of Eugowra (within a 10km radius of the site), including Escort Rock (Nangar National Park) and heritage buildings within Eugowra Township. None of these listings are likely to be impacted by the works. Therefore permits for the project under the Heritage Act are not required.

1.8.5 Protection of the Environment Operations (Waste) Regulation 2005

Material from the site that requires removal and which is deemed to be of unsuitable condition for use as fill shall be disposed of offsite as per the waste tracking requirements set out in the *Protection of the Environment Operations (Waste) Regulation 2005*.

Details of waste management required for the site are described in Section 3.12.

1.8.6 Contaminated Land Management Act 1997

Section 60 of the *Contaminated Land Management Act 1997* (CLM Act) imposes a duty on landowners to notify OEH, and potentially investigate and remediate land if contamination is above EPA guideline levels.

The site has not been declared under the CLM Act as being significantly contaminated. Should significant contaminants be identified on the site, OEH would be notified and remediation would be undertaken in accordance with the CLM Act.

1.8.7 Native Vegetation Act 2003

Clearing that is carried out in accordance with an approval issued by a determining authority under Part 5 of the EP&A Act is excluded from the provisions of the *Native Vegetation Act 2003* (NV Act).

As Cabonne Council is a determining authority for the proposed activity and the proposed activity falls under Part 5 of the EP&A Act, approvals or licences under the NV Act are not required.

1.8.8 Noxious Weeds Act 1993

The *Noxious Weeds Act 1993* (NW Act) requires that public authorities control noxious weeds likely to spread to adjoining land. Mitigation measures regarding weeds are provided in Section 2.2 and 3.5.

1.8.9 Fisheries Management Act 1994

Under Part 7, of the NSW *Fisheries Management Act 1994* (FMA), a Permit is required for activities which involve:

- Dredging and reclamation work;

- Temporarily or permanently obstructing fish passage;
- Use explosives and other dangerous substances; or
- Harm marine vegetation.

NSW Fisheries have been consulted by Cabonne Council with regards to the potential requirement for a Part 7 Permit relating to this project. NSW fisheries have advised that as there will be no significant changes to existing drainage patterns and water flows associated with this project, a Part 7 Permit for dredging and reclamation will not be required. However, this proposal is to be considered through a generic 7-part test (refer to section 3.5).

1.9 Local planning instruments

1.9.1 Cabonne Council Local Environmental Plan 2012

The relevant Local Environmental Plan (LEP) is the *Cabonne Local Environmental Plan* (CLEP) *2012*.

The CLEP provides information on the applicable land zonings of the council area, with guidance on applicable land use and development in each of the described zones.

The CLEP zones the area occupied by the proposed flood levy bank as RU1 (Rural Use 1 – Primary Production). The proposed flood levy bank falls under the definition of 'environmental protection works,' and as such does not require development consent within RU1 zone under the planning scheme.

The CLEP also identifies heritage items of local significance in the Cabonne LGA. There are no heritage items within or in direct proximity to these works.

1.10 Ecologically sustainable development

The proposed works are required to be assessed against the principles of Ecologically Sustainable Development (ESD). These commonly agreed principles are summarised below in Table 2.

Table 2 Principles of ESD

Precautionary principle	
Interpretation	The precautionary principle requires that caution be shown in regards to actions that could possibly harm the environment. Lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
Response	Environmental impacts have been considered by undertaking this REF. Where potential impacts have been identified, management measures have been proposed to reduce the risk of environmental degradation (see Section 4).

Intergeneration Equity	
Interpretation	This principle requires that action taken today should take into account the needs and wellbeing of future generations, and should not leave those future generations with an environment or situation which has deteriorated against present conditions.
Response	The environment would not be significantly impacted by the proposed works. Management measures that would reduce the environmental impact of the proposed works are included within this REF (see Section 4).
Conservation of Biological Diversity	
Interpretation	Conservation of biological diversity and ecological integrity should be a fundamental consideration.
Response	Though no threatened species or communities were recorded at the project site, management measures would be put in place to ensure no significant damage to ecology and biological diversity is caused (see Section 4).
Improved Valuation, Pricing and Incentive Mechanisms	
Interpretation	Environmental factors should be included in the valuation of assets and services such as: • Polluter pays; those who generate pollution and waste should bear the cost of management; • Goods and services should be priced based on full life cycle costs, including the use of natural resources and the ultimate disposal of waste. Environmental goals, once established, should be pursued in the most cost effective way to enable those best placed to maximise benefits and minimise costs to develop their own solutions and responses to environmental problems.
Response	The cost of the REF and the required environmental management measures have been incorporated into the overall cost of the project. This ensures that any environmental mitigation required is reflected as part of the true cost of the project. Environmental and waste management costs would also be borne by the proponent.

2 Proposed levee bank project

2.1 Project description

The proposed design for this flood levee Project comprises:

- A clay core minimum 1.5m below the existing ground level over a formation of compacted alluvial (sandy/ silty) clay;
- A non- core zone of compacted fill situated on exposed and compacted (or excavated and replaced with clay fill) subgrade, 0.5m below the existing ground level;
- Upstream slope profile of 3(H):1(V) or matching existing levee slope where upgrade of existing is occuring;
- Downstream slope profile of 2(H):1(V);
- 300mm topsoil;
- Lime- treatment to the upstream clay face; and
- 300mm of wearing course of crushed rockto be provided to levee crest..

2.2 Construction methodology

The indicative type of construction plant and equipment that is likely to be required for construction activities are listed in Table 3 below.

Table 3 Typical construction plant and equipment

Construction activities	Construction plant and equipment
Site establishment	Hiab trucks on and off site
	Material and delivery trucks
	Low loader truck delivering heavy plant
	Light commercial vehicles
Excavation and construction of levee bank	Dump truck
	Water cart (where required)
	10 tonne roller
	Excavator (up to 20 tonne)
	Material and delivery trucks
	Light commercial vehicles

2.2.1 Land access agreements and property impacts

The proposed flood levee works will take place across a number of private landholdings. The proposed works would be undertaken without threat to the continuance of existing land uses or demolition of any property infrastructure; but will require some property acquisition for easement entitlement.

All activities which are to take place on privately held land will need to take place in consultation with the relevant title holders (refer to Section 0 regarding consultation) with regards to earthworks, construction, and vehicle access.

Specific arrangements regarding prevention, mitigation and management of impacts to property, livestock, vegetation or other aspects of the landholdings and are to be agreed with landowners

2.2.2 Site access and egress

The site will be accessed via entry points along Nangar Road. There are no proposed modifications to the public road network associated with this project.

Details regarding entry points and access routes for both light and heavy construction vehicles are to be determined through further consultation with site landowners, with consideration to minimising disruption to current land uses (including agricultural activities), environment and amenity.

Site access routes will not compromise access to neighbouring properties.

2.2.3 Stockpile areas

Suitable stockpile areas will be established at an appropriate point by the construction contractor in consultation with Cabonne Council and any relevant landowners.

The number, size and location of stockpiles required for this Project will be subject to the Contractor's methodology, which is not known in detail at this time. Stockpiled materials may include removed earth, construction materials, gravel, and introduced fill or topsoil.

Wherever practical, stockpiles are to be located on sites which do not contain native vegetation or suitable habitat for native species and communities.

Stockpiles are to be situated and managed so as to not pose any unacceptable environmental risks, with particular consideration to:

- Preventing the spread of weeds by:
  - Ensuring that weeds are not separated from other vegetation which is to be mulched for re-use onsite;
  - Ensuring drain spoil containing pasture grasses is not stockpiled on the site; and
  - Ensuring any topsoil which contains weeds is not stockpiled or spread on the site.
- Preventing sediment release to Puzzle Creek by:
  - Maintaining suitable buffer distances;
  - Installing temporary sediment control fences and berms below the stockpiles prior to commencement of stockpile heaps; and
  - Installing diversion drainage above the stockpiles prior to commencement of stockpile heaps.

2.2.4 Compound site

The construction compound site is to be determined by the construction contractor in consultation with Cabonne Council and any relevant landowners.

The area which has been nominated as the compound site is a previous stockpile site. The site has been subject to high levels of disturbance and does not contain native vegetation or habitat value for native ecological communities.

2.2.5 Material import and export

Material from the site that requires removal and which is deemed to be of unsuitable condition for use as fill would be disposed of offsite as per the requirements set out in the Protection of the Environment Operations (Waste) Regulation 2005. Any such material would first be sorted and classified according to the OEH Waste Classification Guidelines before it is removed offsite. Records of waste removal are to be maintained.

2.3 Timing and costing

Specific details regarding timing and staging of the Project are to be determined by the construction contractor in agreement with Cabonne Council prior to commencement of works.

2.4 Alternatives

The primary alternatives for the Project are outlined below:

Option 1: Construct no flood levee

Hydrological modelling undertaken in 2010 (*Eugowra Floodplain Risk Management Study)* has identified that during a 100 year ARI flood event, a significant flood risk is posed by break-outs from Puzzle Flat Creek, specifically across a 1km gap in the flood levee in addition to low points across the existing levee. The modelling indicated a peak flow rate of 47m^3/s breaking from the channel and flowing towards East Eugowra.

The modelled flooding during the 100 year ARI flood event would pose unacceptable risk to buildings, infrastructure, environment, human safety and wellbeing. The flooding will also significantly compromise the ability of the State Emergency Services in responding during flooding events.

Additionally, failing to provide suitable flood defence will mean that Cabonne Council is committed to an ongoing program of maintenance which would represent a poor use of public funds.

Option 2: Alternative flood levee design

Multiple reviews of design options undertaken by (Flood Mitigation Levee – Puzzle Creek Flat, Eugowra: Review of Council Design for Levee Upgrade Works, Worley Parsons 2012) and Arup (2013 – 2014) have preceded the current design (refer to Appendix E), which represents a suitable option for construction of the flood levee within geotechnical, structural and hydrological constraints.

Altering the design or developing an alternative design is not recommended in terms of ensuring its function and integrity.

2.5 Justification of preferred option

Construction of the flood levee is considered to be justified considering the environmental, economic, and human safety risks associated with not constructing the flood levee.

The proposed design has been justified through thorough independent review and is considered to meet all structural, geotechnical and hydrological requirements.

As outlined in the following sections of this REF, the design does not pose any unacceptable level of risk to the environment, endangered or vulnerable native species or communities.

3 Environmental impact assessment

3.1 Noise and vibration

3.1.1 Existing environment and potential impacts

Construction noise

A review of the site proximity and surrounding land uses has identified that residential receivers lie to the west of the work site, at the South East of Eugowra Township. As shown in Figure 3, this is approximately 100 m from the westernmost boundary of the proposed works.

There is potential for construction noise to travel to adjacent residential receivers, however the noise associated with earth works is not likely to significantly exceed the existing noise associated with heavy machinery use in the surrounding rural environment.

Construction traffic

Construction works associated with this Project will generate additional light and heavy vehicle trips to the site via Nangar Road. Nangar Road is an existing access route to the South Eastern side of Eugowra with a speed limit for 100 km/ hour.

Nangar Road is currently the primary access route for light and heavy vehicles servicing the agricultural land which surrounds the site. Traffic count data from the site indicates that the current average daily traffic volume is 1000 vehicles, of which 14% are heavy vehicles.

Considering current road uses and heavy vehicle component, construction vehicle traffic associated with these works is not likely to make a significant additional contribution to the ambient noise environment.

Vibration

The major potential sources of vibration are associated with the activities of excavation and earthmoving equipment during the construction phase.

Considering the distance of the Project site from the nearest sensitive/ residential receivers, vibration is unlikely to be perceptible at any of these sites during construction phase. Any detectable vibration at these properties will be well below the threshold for cosmetic damage.

Operational noise

Operational noise is not relevant to this Project.

3.1.2 Mitigation measures

The following mitigation measures are recommended to manage noise and vibration impacts during construction:

- The CEMP will include a section to address management and mitigation of noise and vibration, to be implemented in accordance with the *Interim Construction Noise Guideline;*
- The construction methodology, plant and equipment, management of vibration impacts and community consultation protocol is to be reviewed prior to commencing construction. This should be addressed as part of the CEMP;
- If mitigated noise levels at any sensitive receiver site exceed 75 dBA, provide respite periods (e.g. breaks of 1-2 hours) during the day;
- Noise and vibration emissions are to be qualitatively assessed throughout construction with additional measures implemented to reduce noise and vibration impacts where required;
- Quieter and less vibration emitting construction methods are to be used where practical and reasonable;
- Only the equipment necessary for the works are to be used at any time. All equipment/plant is to be turned off when not in use;
- Simultaneous operation of noisy plant and equipment within discernible range of any identified sensitive receiver is to be avoided / limited where possible;
- Where practical, the offset distance between noisy plant and adjacent sensitive receivers is to be maximised;
- Noise-emitting plant should, where possible, be directed away from the nearest sensitive receivers;
- Construction vehicles should use non-"beeper" reversing/movement alarms such as broadband (non-tonal) alarms or ambient noise-sensing alarms where available;
- Plant is to be regularly inspected and maintained to avoid increased noise levels;
- Resilient damping material is to be provided on bin trucks to minimise impact noise from materials loaded on truck;
- Mufflers/silencers are to be fitted to pneumatic tools (e.g. breakers) and residential-grade mufflers are to be used on plant where practical;
- Dampened bits are to be used on impulsive tools such as jackhammers to avoid "ringing" noise;
- Truck drivers are to be informed of designated vehicle routes, parking locations and acceptable delivery hours for the site – particularly regarding minimising impacts to Eugowra township; and
- Night/evening deliveries are to be avoided wherever possible.

3.2 Water quality and hydrology

3.2.1 Existing environment

The proposed works are located within the Lachlan River catchment area, which is managed by the Lachlan Catchment Management Authority (Lachlan CMA). At a more localised level, the proposed works are located within the Puzzle Flat Creek catchment, located approximately 1km south-east of the Eugowra town centre. This catchment is comprised predominantly of undeveloped agricultural land. The town of Eugowra is located downstream from the site and the levee extends to properties on the edge of the town.

Puzzle Flat Creek is a small tributary of Mandagery Creek, which it flows into approximately 1km downstream from the site. Mandagery Creek flows into the Lachlan River approximately 10km to the south-west of the site.

Flood mapping produced by Arup identified that the site is situated in flood-prone land, and would be affected by a 100 year Average Recurrence Interval (ARI) flood event.

The site presently has a small flood levee running parallel to Puzzle Flat Creek, There is no stormwater infrastructure supporting the existing flood levee. Currently overland stormwater flows into Puzzle Flat Creek through a gap in the existing levee on the northern side, and flow into the creek unobstructed on the southern side.

Previous flood studies have identified that the site and town of Eugowra are at risk of flooding from Puzzle Flat Creek and Mandagery Creek. The Review of Eugowra Floodplain Risk Management Study (2010) prepared by Lyall & Associates proposed that the existing levee be raised and extended to reduce the impact of significant flooding events to the surrounding properties.

Whilst the site is considered to be within flood-prone land, the potential for flooding of the site is considered to be low as the majority of the works will be carried out on the northern side of the existing levee, which is protected from any flows within Puzzle Creek. No works will be required to be carried out from within Puzzle Flat Creek, reducing the risk of altering flows in the creek during construction.

Potential construction risks include:

- Impact on the local flood regime;
- Increased erosion and sedimentation as a result of high rainfall or flood events occurring during the construction period;
- Pollutants generated onsite transported by stormwater runoff and contaminating soils and watercourses;
- Erosion and sedimentation at the site and downstream caused by vegetation removal, stormwater movement or wind over exposed surfaces;
- Vegetation removal and associated soil disturbance;
- Increased turbidity of stormwater;
- Increased sediment load in runoff, increased sedimentation of drainage lines; and

- Pollution from stockpiles, refuelling and chemical storage activities within the nominated stockpile sites.

Potential operational risks include:

- Increase in flood levels within the Puzzle Flat Creek catchment on the southern side of the proposed levee; and
- Increased ponding on the northern side of the proposed levee as a result of overland flows being unable to drain into Puzzle Flat Creek.

The proposed stormwater drainage situation will remain similar to the existing following construction of the proposed levee. There is no proposed increase in the impervious area of the site. The general stormwater drainage design philosophy has been to match the existing stormwater flows where possible, with the exception of providing flooding protection for the area on the northern side of the proposed levee.

There may be some increase in the flood area on the southern side of Puzzle Flat Creek, however as this area is on predominantly on undeveloped land, it is expected that there will be no adverse impacts from the construction of the proposed levee compared with the existing scenario.

It is considered that if the mitigation measures outline in this REF are adhered to, the project would neither contribute to nor be at significant risk from flooding events.

3.2.2 Mitigation measures

The following mitigation measures are recommended to manage water quality and hydrology impacts during construction and following completion of the proposed levee:

- An erosion and sediment control plan is to be prepared in accordance with Landcom's (2004) *Managing Urban Stormwater: Soils and Construction* prior to the commencement of construction. The plan is to be updated and managed throughout as relevant to the activities during the construction phase;
- Erosion and sediment control measures and structures are to be implemented before, during and after construction activities;
- Erosion and sediment control measures are to be regularly inspected (particularly following rainfall events) to ensure their on-going functionality;
- Erosion and sediment control measures are to be left in place until the works are complete and areas are stabilised;
- Undertaking construction works should be avoided during rainfall (or whilst the ground remains sodden) wherever practical;
- Hydro-mulching is to be placed on disturbed ground to regenerate grass and reduce erosion at appropriate sites;

- Vehicles and machinery are to be properly maintained and routinely inspected to minimise the risk of fuel/oil leaks;
- All fuels, chemicals and hazardous liquids are to be stored within an impervious bunded area in accordance with Australian standards and EPA Guidelines;
- Construction plant, vehicles and equipment are to be refuelled off-site, or in a designated refuelling area;
- Adequate water quality and hazardous material procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) are to be implemented during the construction of the Project. All staff are to be made aware of the location of the spill kit and be trained in its use;
- In the event of an incident works are to cease and the NSW Office of Environment and Heritage (OEH) are be notified of any incidents resulting in environmental harm as per Part 5.7 of the *Protection of the Environment Operations Act 1997*.

Operational

- Some minor stormwater infrastructure has been designed to help drain water trapped on the northern side of the proposed levee into Puzzle Flat Creek to provide ponding.

3.3 Contaminated land and hazardous materials

3.3.1 Existing environment

Desktop review indicates that there are no known contaminated soil sites on the Project site.

Geotechnical investigations at the site (Arup 2013 and Worley Parsons 2012) have confirmed that the site subsurface conditions are characterised by alluvial deposits of sand, clayey sand, sandy clay, and highly dispersive silty clay. The existing levee is comprised of silty clay to sandy clay. Dispersion parameters of the soil indicate its significant potential for erosion.

The project site is classified as alluvial soil within the *Soil Landscapes of the Forbes 1:250,000 Sheet map* (Department of Land & Water Conservation, Sydney). A search of the NSW EPA contaminated land records did not identify any contaminated sites in the vicinity of the Project site.

The Project site has been used extensively for agricultural purposes including dryland cropping and grazing; as such there is some potential for agricultural soil contamination onsite. No visual cues for significant soil contamination have been identified in soil investigations to date.

3.3.2 Potential impacts

Potential impacts relating to soil contamination associated with this Project include:

- Disturbance and mobilisation of agricultural and horticultural contaminants in site soil such as organochlorine pesticides, other pesticides and arsenic;
- Fuel spills from diesel storage areas onsite, during refuelling activities, from accidents or due to inappropriate storage onsite; and
- Accidents or leaks of chemicals or hazardous materials.

3.3.3 Mitigation measures

The following mitigation measures are recommended to manage potential contamination impacts during the construction phase of this Project:

- A Construction Environmental Management Plan (CEMP) is to be put in place by the construction contractor, including procedures for the isolation and clean-up of any spills or discovery of contamination on the site;
- Excavation and subsoil disturbance is to be minimised wherever possible to reduce the risk of unearthing contaminated material;
- The handling, storage and transport of hazardous materials and waste is to be undertaken in accordance with the National Code of Practice and the relevant Material Safety Data Sheet (MSDS) for the product;
- Receiving facilities for any spoil or building material generated from the site are to be appropriately licenced under the PoEO Act 1997 to receive the required waste type;
- Any reuse of spoil onsite is to undergo contamination testing and classification as necessary in accordance with PoEO Act 1997;
- Emergency spill kits are to be accessible at all times during construction, are to be used immediately following any contamination incident according to established procedures for isolation and clean-up of spills, and all staff are to be provided with the necessary training in relation to use of spill kits;
- Should significant contaminants be identified on the site, the NSW OEH are to be notified and remediation is to be undertaken in accordance with the *Contaminated Land Management* (CLM) *Act 1997*;
- If existing material is required to be removed from site, it is to be assessed for contamination and treated or disposed of in accordance with relevant statutory requirements, as administered by the NSW OEH;
- Refuelling of construction vehicles and machinery is to be undertaken offsite at a fuel station or within a site compound area;
- Any fuel stored onsite is to be stored within an adequately bunded area; and
- If any complaints are received in relation to pollution from the project, these complaints are to be stored in Cabonne Council's complaints database for four years, and be produced to the EPA on request.

It should be noted that the main document which provides a framework for investigating and managing contaminated land in NSW, including contaminated agricultural land, is the *Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites*, prepared by the Australian

and New Zealand Environment and Conservation Council (ANZECC) in 1992. If any contaminated material or potential contaminated material is identified at the Project site, all assessment and management is to be undertaken in accordance with these Guidelines.

3.4 Acid sulphate soils

3.4.1 Existing environment

The project site is located on an area which is classified as having low probability of acid sulphate soil risk according to the CSIRO Australian Soil Resource Information System (ASRIS).

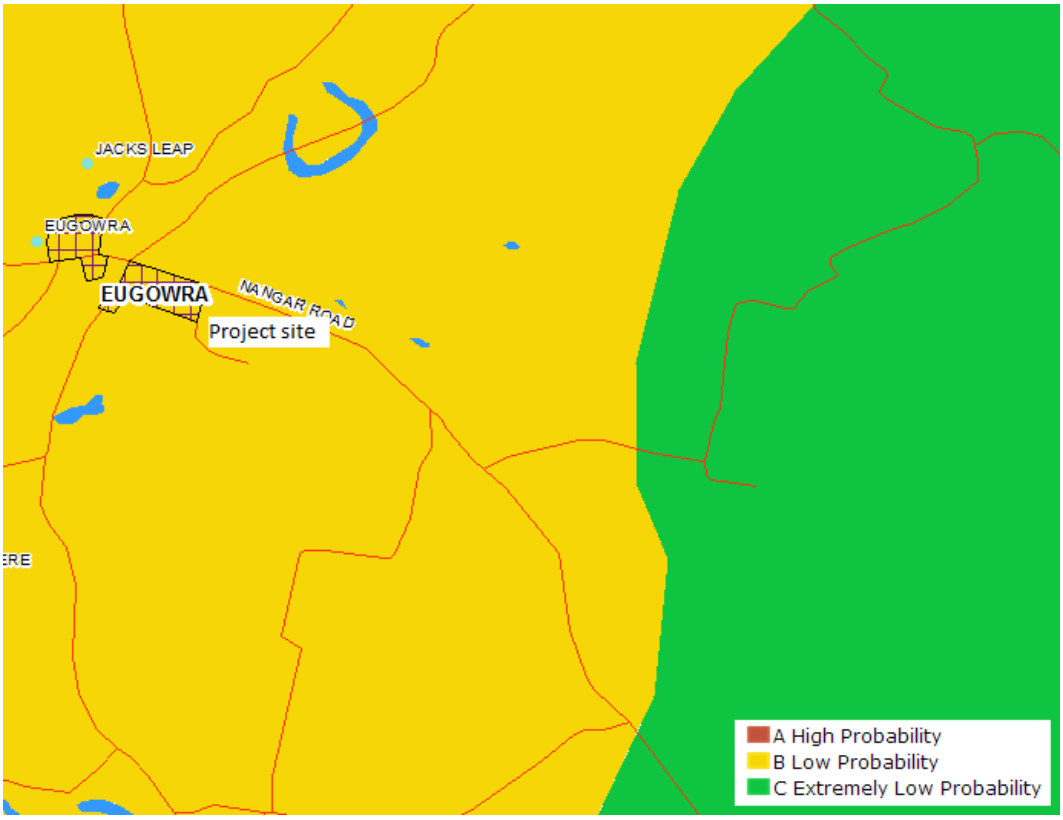

Figure 6 Acid sulphate soil risk (*Australian Soil Resource Information System, CSIRO*)

3.4.2 Potential impacts

Acid sulphate soils pose a risk to the environment due to their potential to oxidise when excavated or disturbed, leading to potential pollution of land, surface waters or groundwater. Potential acid sulphate soils (PASS) that are naturally occurring pose a risk only when disturbed or dewatered.

There is a potential risk of excavating PASS as part of the construction work proposed (during excavation of the site and construction of the levee core).

There also exists a risk to uncover or dewater actual acid sulphate soils (AASS) which have been previously used as fill, and by doing so provide a new pathway for contamination.

The risk of disturbing ASS is expected to be low, as the clay core of the proposed levee design sits only 1.5m below ground level.

3.4.3 Mitigation measures

The following mitigation measures are proposed to reduce the potential for acid sulphate soil impacts during construction:

- Excavation depths and volumes are to be minimised wherever possible;
- Construction contractors are to be capable to appropriately identify ASS in the event it is disturbed;
- Spoil stockpiles are to be located out of drainage lines, and treated or removed from site as soon as practicable;
- In the event that ASS are discovered or suspected onsite, a preliminary soil assessment, consultation with council, and potentially an Acid Sulphate Soil management Plan would be required to be developed. The NSW Acid Sulphate Soils Management Advisory Committee (ASSMAC) Guidelines (1998) would be consulted, with these guidelines including detail of ASS treatments onsite, ASS handling and disposal procedures.

3.5 Biodiversity

3.5.1 Existing environment

3.5.1.1 Site summary

Due to the history of land development and intensive agricultural land use, the native vegetation in the vicinity of the proposed works has been subject to high levels of previous disturbance. The site is characterised by cleared horticultural land, agricultural grazing (dominated by introduced grass species) and scattered trees of both native and exotic origin.

The relevant section of the Cabonne LEP (2012) showing existing terrestrial ecology map is shown in Figure 12. Some fragments of indigenous woodland vegetation are located near to the Project Site, most notably Box Eucalypt-Cypress Pine Woodlands and White Box, Grey Box, Fuzzy Box, Yellow Box, and Blakely's Red Gum Woodlands. Originally, the site would have hosted a mix of Ecological Vegetation Classes (EVCs) dominated by Floodplain Transition Woodlands, Inland Riverine Forests and Western Slopes Dry Sclerophyll Forests. The reconstructed native vegetation distribution is shown in Figure 13.

There are a number of important reserves located nearby to the site, which are shown in Figure 11 and summarised below in Table 4. The existing parks and significant biodiversity areas listed above all lie well outside of the disturbance footprint of the proposed works.

Table 4 Parks and reserves with proximity to the Project site

Type of reserve	Name	Description	Distance from closest boundary to Project site (approx.)
National Park	Nangar National Park	Nangar National Park contains a large number of bird species, mammals and ecological communities of state and national significance. The Park is a geographically important conservation reserve for the central west NSW; a stepping stone in a major wildlife corridor consisting of four National Parks along the Lachlan Fold Belt.	6 km
State Forest	Back Yamma State Forest	A State Forest managed by the Forestry Corporation of NSW. The forest is predominantly white cypress (*Callitris glaucophylla*) with a variety of Eucalypts; mainly *E. microcarpa* (grey box) *and E. melliodora* (yellow box). There are some patches containing *E. albens* (white box). A number of small areas that may be White Box/Yellow Box/Blakelys Red Gum Endangered Ecological Community or Grey Box EEC have also been identified.	15 km
Registered Nature Reserve	Eugowra Nature Reserve	Eugowra Nature Reserve consists of dry sclerophyll forest, with sparse undergrowth (0.5m-1m high).	7 km

There are no World Heritage Areas, National Heritage Areas, National Parks, State Conservation Areas or State Forests within 1.5km of the proposed works area.

State Environmental Planning Policy (SEPP) No. 44 – Koala Habitat Protection (06.01.95) applies to the Project site; however the study area also does not constitute ‘core Koala habitat’ or ‘potential Koala habitat’ as defined by SEPP 44.

Searches of the National Parks and Wildlife Service (NPWS) Atlas of NSW Wildlife and the EPBC Protected Matters Search Tool revealed 24 listed threatened fauna species, three threatened plant species, and three endangered ecological communities (EECs) that are predicted to occur within a 10km radius of the proposed works.

The EPBC Protected Matters Search Tool identified 17 bird species listed under the EPBC Act as migratory and/or marine that are predicted to occur within 10km of the project site. Based on the habitat quality of the site, it is unlikely that any of the identified migratory bird species would be reliant on the site for breeding, foraging, roosting or migratory stop-overs.

3.5.1.2 Ecological communities

In order to determine the ecological values contained within the proposed Project site, an ecological survey was undertaken by a Cabonne Council Environmental Officer. Methodology for this survey is provided in Appendix B and detailed results including full lists of observed flora and fauna are provided in Appendix B. The main findings of the survey are as follows:

- 17 native bird species were observed on site, of which one is a listed vulnerable species (*Polytelis swainsonii* – Superb Parrot);
- Three mammal species were observed on site: of these two were native species (Grey Kangaroo, Echidna);
- 13 native tree species were observed onsite;
- 6 native shrub species were observed onsite; and
- 15 grass species were observed onsite, of which seven were introduced species and eight were native species.

It is noted that Superb Parrot, a listed vulnerable species, was identified on site during the ecological survey. However due to the highly modified nature of the site and its surroundings, and the sparse distribution of native vegetation on the site, it is considered unlikely that the site forms significant or crucial habitat for the Superb Parrot or other threatened fauna species.

The key ecological species which were identified in the vicinity of the Project site through both site and desktop survey have been identified below according to ecological community type.

Figure 7 Cleared agricultural land

Figure 8 Box Eucalypt-Cypress Pine Woodlands

Figure 9 White Box, Grey Box, Fuzzy Box, Yellow Box, and Blakely's Red Gum Woodlands

Figure 10 Ephemeral Puzzle Flat

Cleared Agricultural Land

This is a highly modified plant community of the region (shown in Figure 7) which dominates the flatter and undulating landscapes across the project site that have been cleared for grazing and cropping purposes. Native diversity over this environ is poor due to impacts from grazing by livestock and cropping activities.

Box Eucalypt Cypress Pine Woodland

This vegetation community features the native species *E. melliodora, E.blakleyi, E.sparsifolia, E.dealbata, E.polyanthemos, E.albens, E.sideroxylon, Callitris glaucophylla,* and *Callitris endlicheri* (refer to Figure 8).

It occurs on both sides of the existing road corridor and extends Dry Sclerophyll Forest hillsides and exhibits the characteristic structure of the Box-Cypress Pine environ of close to widely spaced trees with an open canopy and comprising of a range of acacias and eucalypt tree species. The conservation value of this community is high; the basis of this is it provides extensive connecting resources for a wide range of native flora and fauna species of the locality.

White Box, Grey Box, Fuzzy Box, Yellow Box and Blakely's Red Gum Woodlands

Remnants of Gum Woodland community characterised by White Box (*E.albens*) Grey Box (*E.microcarpa*) Fuzzy Box (*E. conica*) Yellow Box (*E. melliodora*) and Blakely's Red Gum (*E. blakleyi*) Woodlands were identified in the higher and lower sectors of the study area (refer to Figure 9).

These endangered transitional or ecotonal vegetation alliances have been highly modified due to invasion from introduced pasture grasses. This community exhibits characteristic discontinuous cover of trees of medium height (10- 30m), in which the canopies are clearly separated.

Ephemeral Puzzle Flat

Ephemeral areas of Puzzle Flat are dominated by Riparian Woodland species including *E. melliodora*, *E. blakleyi*, and *E. microcarpa*

Waterway characteristics of this community were classified during site survey according to NSW Department of Primary Industries Guidelines (*Fish Passage Requirements for Waterway Crossings*, 2003) as Class 4 Fish Habitat, according to the following definition:

> *Named or unnamed waterway with intermittent flow following rain events only, little or no defined drainage channel, little or no flow or free standing water or pools after rain events (e.g. dry gullies or shallow floodplain depressions with no permanent aquatic flora present).*

The basis for this classification is the absence of large pools, snags, and other preferred habitat, values for aquatic species.

Endangered and Vulnerable Bird Species

Ecological assessment including consideration of habitat requirements, essential behaviour patterns and distribution has been undertaken to identify the following endangered and vulnerable bird species which may be associated with the direct vicinity of the Project Site:

- Square Tailed Kite (*Lophoictinia isura*);
- Brown Treecreeper (*Climacteris picumnus*);
- Barking Owl (*Ninox connivens*); and
- Superb Parrot (*Polytelis swainsonii*).

Microchiroptern Bat Species

Ecological assessment including consideration of habitat requirements, essential behaviour patterns and distribution has been undertaken to identify the following endangered and vulnerable bird species which may be associated with the direct vicinity of the Project Site:

- Little Pied Bat (*Chalinplobus picatus*);
- Yellow Bellied Sheathtail Bat (*Saccolaimus flaviventris*); and
- Greater Long-eared Bat (*Nyctophilus timoriensis*).

3.5.2 Potential impacts

Potential impacts (or lack thereof) to site ecology and biodiversity are summarised below according to ecological community type.

Cleared Agricultural Land

- Disturbance to approximately 1474m^2 of land associated with obtaining fill material from suitable locations onsite: the small scale of this disturbance is unlikely to significantly reduce or impact on viable agricultural land requirements throughout this locality or region; and
- Weed spread and weed invasion resulting from construction activities.

Box Eucalypt Cypress Pine Woodland

- This ecological community does not exist within the ground impact zone of the proposed levee bank and it will not be impacted by this Project.

White Box, Grey Box, Fuzzy Box, Yellow Box and Blakely's Red Gum Woodlands

- This ecological community does not exist within the ground impact zone of the proposed levee bank and it will not be impacted by this Project.

Ephemeral Puzzle Flat

- Disturbance or removal of vegetation including regrowth tree plantings and introduced grasses (*Phalaris*, Yellow Burr, clover and Patterson's Curse) will occur over an area of approximately 13,898 m^2 due to levee bank works;
- Minimal disturbance to native habitat, populations and communities is expected to occur due to the poor existing quality of habitat within the area of disturbance;
- Weed spread and weed invasion resulting from construction activities.

It is noted that ephemeral areas of the site are likely to be capable or retuning to its current ecological state swiftly after the proposed works are complete due to the regenerative capacity of those species and communities identified onsite.

Endangered and Vulnerable Bird Species

- Minimal disturbance will occur to endangered/ vulnerable bird species;
- Minimal suitable habitat for endangered/ vulnerable bird species will be cleared; and
- Minimal habitat fragmentation or isolation of suitable habitat will occur for endangered/ vulnerable bird species.

It is noted that desktop assessment undertaken according to the NSW DECC *Threatened Species Assessment Guidelines* 2007 (refer to Appendix D) indicates:

- No impacts to primary habitat including Box-cypress woodland and dry slerophyll forest hillsides;
- No expected impacts to the conservation status of endangered/ vulnerable bird species including Square Tailed Kite, Brown Treecreeper, Barking Owl, and Superb Parrot; and
- No expected regional extinction or significant displacements of endangered/ vulnerable bird populations will occur.

Microchiroptern Bat Species

- Minimal disturbance will occur to Microchirotern Bat species;
- Minimal suitable habitat for Microchirotern Bat species will be cleared; and
- Minimal habitat fragmentation or isolation of suitable habitat will occur for Microchiroptern bat species.

It is noted that desktop assessment undertaken according to the NSW DECC *Threatened Species Assessment Guidelines* 2007 (refer to Appendix D) indicates:

- No impacts to primary habitat including Box-cypress woodland and dry slerophyll forest hillsides;
- No expected impacts to the conservation status of endangered/ vulnerable Microchiroptern bat species including Square Tailed Kite, Brown Treecreeper, Barking Owl, and Superb Parrot; and
- No expected regional extinction or significant displacements of Microchiroptern bat species (including Little Pied Bat, Yellow Bellied Sheathtail Bat and Greater Long-eared Bat) populations will occur.

Figure 11 Proximity of site to parks and nature reserves

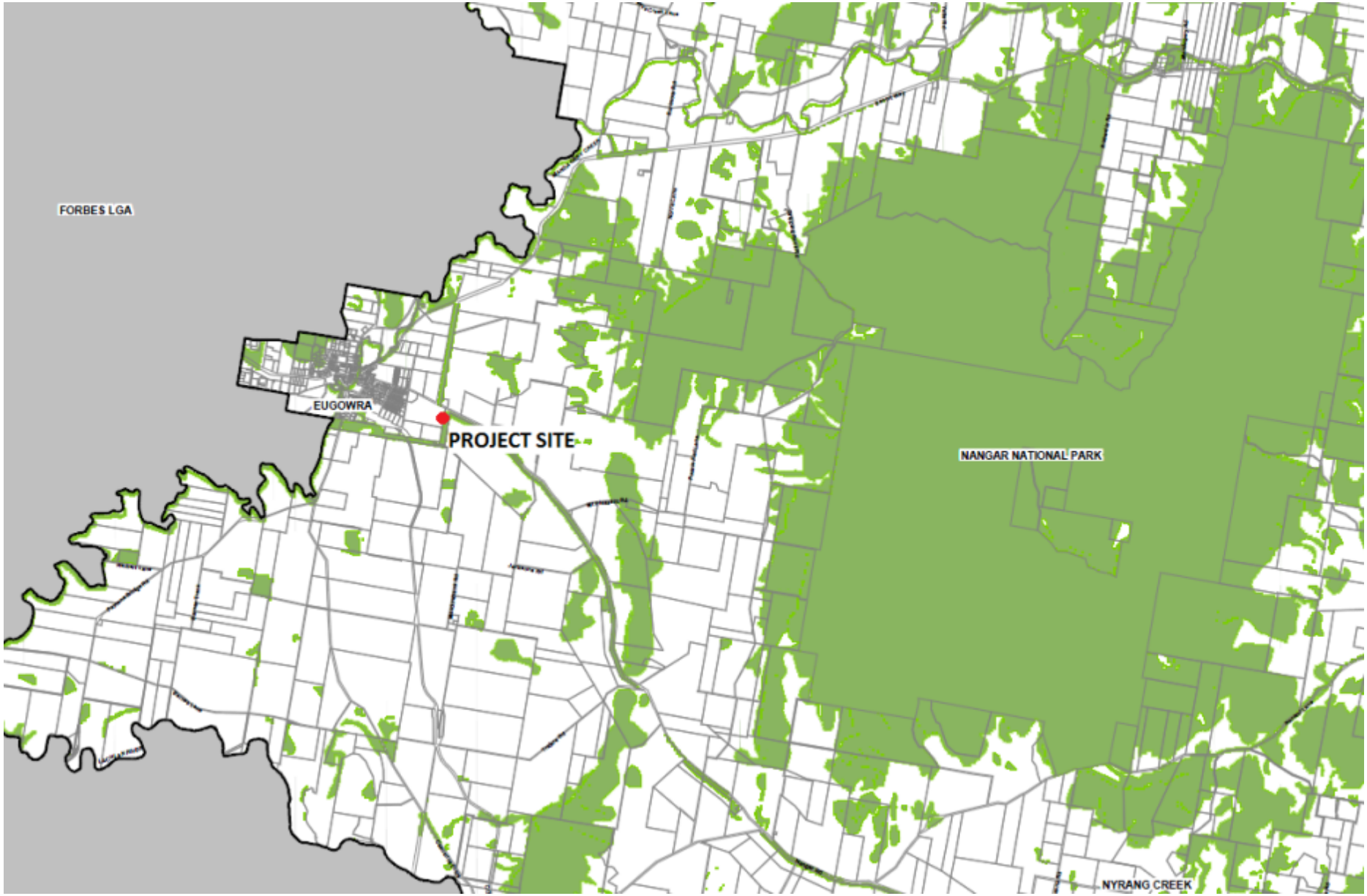

Figure 12 Terrestrial ecology map for Cabonne Council (Cabonne Council Local Environment Plan – 2012)

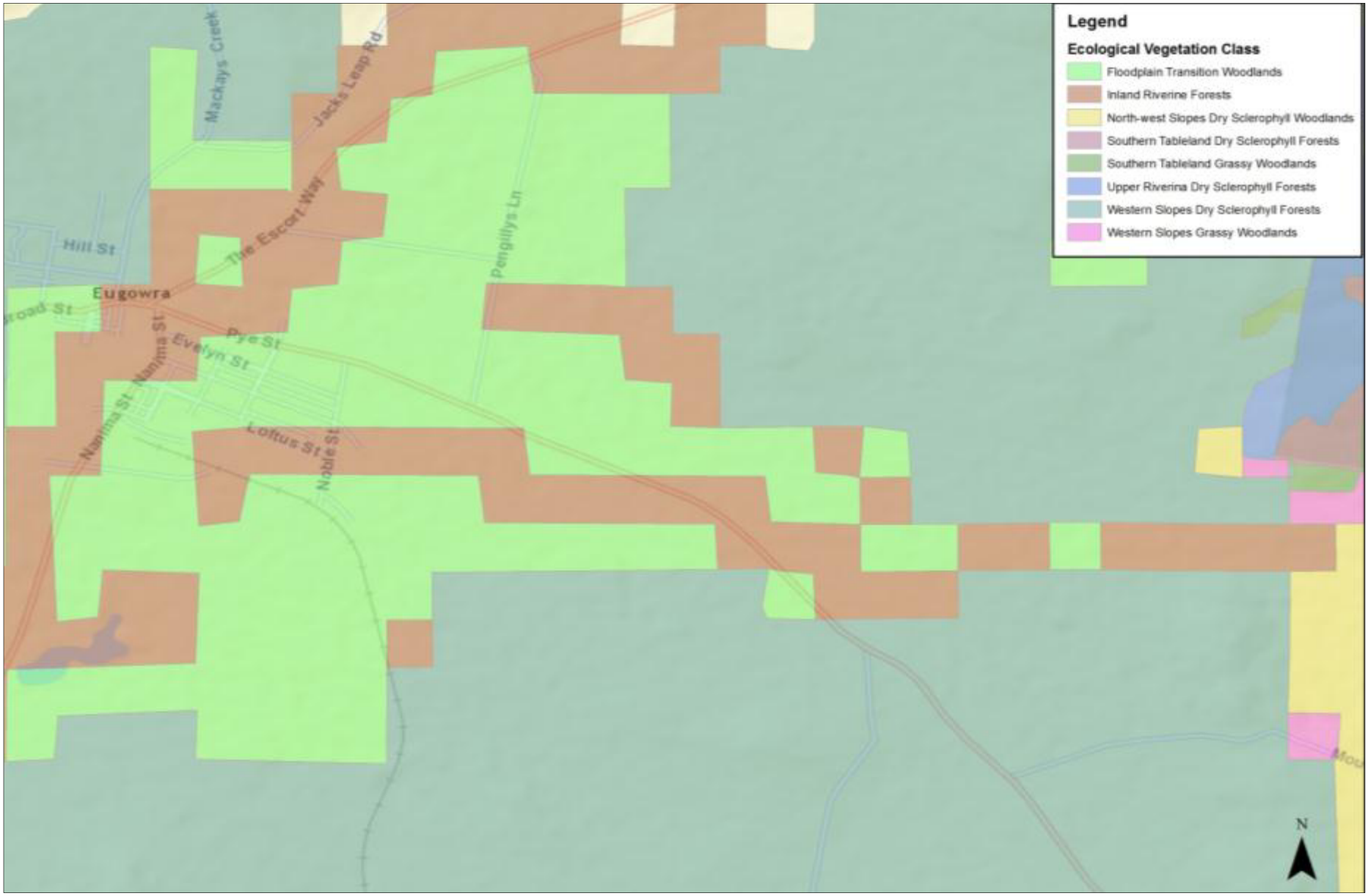

Figure 13 Reconstruction and extent distribution of pre-European native vegetation

3.5.3 Mitigation measures

The following measures are proposed to limit impacts on ecological species and communities during construction:

- A Construction Environmental Management Plan (CEMP) is to developed including specific details on measures to manage biodiversity impacts;
- Revegetation of suitable areas of the site with native species would be undertaken to compensate for the removal of existing vegetation;
- Ongoing weed maintenance would be undertaken across the site during and after clearing activities;
- The loss of fauna would be guarded against during clearing. This could include visual inspections of vegetation and potential habitat prior to removal;
- Construction and excavation footprint is to be minimised;
- The design is to be optimised to retain trees and other vegetation wherever practical;
- Clear marking such as barrier fencing is to be placed around any vegetation that is to be retained, prior to the commencement of construction;
- Appropriate weed control measures are to be undertaken prior to construction in areas in which high densities or infestations of weeds occur;
- Earth-working equipment is to be cleaned of excess soil prior to arrival and prior to departure from work areas, to minimise the spread of weed seeds, weed propagules and plant pathogens;
- Disturbed areas are to be kept to a minimum and would be revegetated as soon as possible; and
- Any revegetation works are be conducted by a suitably qualified and experienced contractor.

3.6 Traffic and access

3.6.1 Existing environment

The site is located off of Nangar Road, which is the route between south eastern Eugowra and the township of Canowindra with a speed limit of 100 km per hour. The western edge of the site is located approximately 100 m from the south eastern border of the Eugowra Township.

Traffic surveys indicate that the annual average traffic volume is 1000 vehicles per day, of which 14% are heavy vehicles. The road services residents in addition to acting as the primary route for agricultural and horticultural land in the vicinity of the project site. Traffic growth is predicted to occur at a rate of 2% per annum.

3.6.2 Potential impacts

Closure of Nangar Road or interruption of other access routes is not expected to take place at any time during construction.

Expected light and heavy construction vehicle traffic volumes are expected to vary across the construction phase. Considering the low existing volume of traffic and high proportion of heavy vehicles, construction traffic is not expected to have a significant detrimental impact or cause large levels of congestion for users of Nangar Road.

With regards to access routes between Nangar Road and the construction site, best access routes will be confirmed by the construction contractor upon consultation with landowners to ensure that impacts to existing land uses, access, environment and amenity are minimised.

3.6.3 Mitigation measures

The following mitigation measures are proposed to manage traffic and transport impacts:

- Construction traffic management considerations are to be included in the CEMP, including the management of construction vehicles for all stages of construction in the vicinity of the site, measures to ameliorate the impact of the construction traffic on the network, and measures to limit the impact of construction traffic on the local network;
- The impacts of construction traffic on the local road network and the impacts on intersection operation is to be minimised by ensuring construction vehicle traffic movements take place outside of peak road traffic periods and outside of school peak periods where feasible;
- Road closure is be avoided during construction wherever practical;
- The queuing and idling of construction vehicles in residential streets is to be minimised;
- An emergency response plan is to be developed for construction traffic incidents;

- During project inductions, all heavy vehicle drivers are to be provided with the emergency response plan for construction traffic incidents;
- Access to all properties at and adjacent to the works is to be maintained during construction, unless otherwise agreed with relevant property owners;
- As part of the establishment of access routes between Nangar Road and the construction site, assessment and any necessary upgrades to vehicle paths are be undertaken by the contractor to ensure that the existing infrastructure is capable of hosting an increased vehicle load.

3.7 Landscape and visual amenity

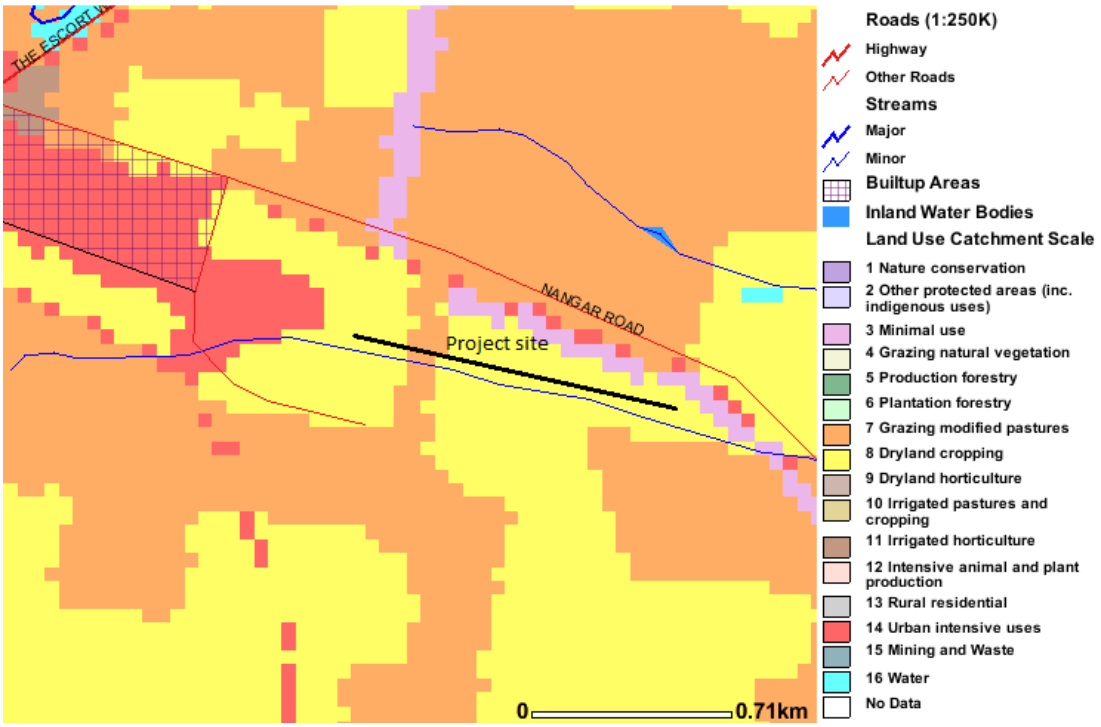

Figure 14 Site land uses (*Australian Soil Resource Information System, CSIRO*)

3.7.1 Existing environment

The site is located across land which is utilised as grazing pasture and dryland cropping. The site features a highly modified agricultural landscape which is dominated by non-native grasses and scattered native and non-native trees. The site features are demonstrated in the aerial photograph shown in Figure 1. As detailed in Section 3.1 and Figure 3, the nearest residential property is located 100m from the site.

Some areas of the project site may be visible from residential properties to the south east of Eugowra Township. There is unlikely to be significant visual impact to these receivers as the work will take place in an agricultural environment where heavy machinery is already frequently used. The work site will primarily only contain an earth mound which will be relatively consistent with the surrounding rural environment. Any visual impact will be temporary in nature.

3.7.2 Potential impacts

The visual impact of the construction works would be temporary in nature. As the site is located in a rural area, the visual impacts would be generally restricted to staff and contractors onsite and agricultural land users. Drivers using Nangar Road may experience temporary visual impacts relating to some aspects of the construction works.

Visual impacts associated with construction are likely to include:

- Removal of existing vegetation;
- Construction fencing and hoarding;
- Operation and storage of construction plant and equipment;
- Compound sites;
- Soil and materials stockpiling sites; and
- Temporary site signage.

Heavy vehicle access to the site will occur via the Nangar Road. This is a rural road which has a low traffic volume, of which 14% of traffic is already made up of heavy vehicles. Therefore, changes to the use and visual impact of this area during construction are considered to be minor.

3.7.3 Mitigation measures

The following mitigation measures are proposed to manage any visual amenity impacts during construction:

- Revegetation of suitable areas of the site with grass and native vegetation species where appropriate may be undertaken to compensate for the removal of existing vegetation;
- Temporary hoardings, barriers, traffic management and signage is to be removed from the site and road network when no longer required; and
- Landscaping and materials used in the Project are to be complementary to the existing locality and landscape.

3.8 Indigenous heritage

3.8.1 Existing environment

A basic search of the NSW Aboriginal Heritage Information Management System (AHIMS) was undertaken in February of 2014, which concluded that there are no Aboriginal sites or Aboriginal places known in the immediate vicinity of the Project site.

An initial field survey of the Project site was also undertaken in 2013 by a Cabonne Council Environmental Officer, which indicated no obvious Aboriginal sites (scarred trees) in the vicinity of the project site.

Due to the AHIMS result, site visit and the highly modified existing condition of the site, the project is not expected to have any impact on Indigenous heritage items.

3.8.2 Potential impacts

Due to there being no Aboriginal sites or heritage places known in the immediate vicinity of the site, and the history of the site as being highly disturbed, there is a low risk of uncovering or disturbing a previously unknown indigenous heritage item as a result of the works.

3.8.3 Mitigation measures

Proposed mitigation measures include:

- If unexpected archaeological items or items of Aboriginal heritage significance are discovered during the construction of the project, all works are to cease and appropriate advice will be sought from relevant stakeholders, including the NPWS Western Region Office Dubbo and Local Aboriginal Land Councils.

3.9 Non-indigenous heritage

3.9.1 Existing environment

Desktop searches of the following heritage registers have been undertaken:

- Aboriginal Heritage Information Management System (AHIMS) Aboriginal sites database;
- National Heritage List;
- Commonwealth Heritage List;
- National Trust of Australia;
- Register of the National Estate;
- State Heritage Register; and
- Cabonne Local Environmental Plan (2012).

A number of state and local government listed non aboriginal heritage sites are known to exist in the vicinity Eugowra (within a 10km radius of the site), including Escort Rock (Nangar National Park) and heritage buildings within Eugowra Township. None of these listings are likely to be impacted by the works.

Heritage items in the immediate area are listed within a 10km radius of the site are summarised below in Table 5 below.

Table 5 Listed non-indigenous heritage sites within 10km of the Project

Item	Listing	Significance	Potential impact
Ben Hall Sites – Escort Rock	NSW State Heritage Register ID No 01827	State significant	None
CBC Bank (former)	Cabonne database no. 1271632	Locally significant	None
Eugowra Police Station	State government database no. 4180103	Locally significant	None

3.9.2 Potential impacts

No potential impact to Non-Indigenous heritage is associated with this Project.

3.9.3 Mitigation measures

No potential impact to Non-Indigenous heritage is anticipated as a result of the project. Nevertheless, the following mitigation measure is proposed:

- If any previously unrecorded items or unanticipated archaeological deposits are identified within the project site during construction, work likely to impact on the deposit is to cease immediately and Cabonne Council is to be notified. Where required, further archaeological work and/or consents w be obtained for the unanticipated archaeological deposits prior to works recommencing at the location.

3.10 Air quality

3.10.1 Existing environment

The Cabonne LGA falls within the Central Tablelands region for air quality monitoring. OEH undertakes air quality monitoring for five key air pollutants: ozone (O3), nitrogen dioxide (NO2), carbon monoxide (CO), sulphur dioxide (SO2) and particulates less than 10 micrometres in diameter (PM10), as well as providing an hourly and daily regional air quality index. A review of air quality data from February 2013 – February 2014 for the nearest monitoring site (Bathurst) indicates that air quality in the region is good.

Exhaust fumes with local traffic are the major likely source of air pollution at the site and given low traffic volumes (approximately 1000 vehicles per day) and no queuing or idling at this location, the emissions are assumed to be minor or negligible.

Intermittent air emissions are likely to be associated with agricultural and horticultural practices in the area, such as dust from tilling or cropping activities.

The closest residential receiver to the site is approximately 100 m from the westernmost boundary of proposed works (refer to Figure 3).

3.10.2 Potential impacts

Air quality impacts during construction of the works would include temporary impacts associated with dust particles. Anticipated sources of dust and dust-generating activities include:

- Excavation and levelling of the site for construction of the levee;
- Dust generated from the loading and transfer of material from trucks;
- General construction works;
- Stockpiling activities.

Dust emissions are likely to be similar in nature to those produced during agricultural/ horticultural activities such as cropping and tilling which already take place on the site and its surrounds.

Other potential air quality impacts include;

- Emissions of CO, NOx, SO2, PM10, VOCs, and PAH compounds associated with the combustion of diesel fuel and petrol from construction plant and equipment.

There are no operational air quality impacts or emissions associated with this Project.

3.10.3 Mitigation measures

The following mitigation measures are recommended to manage air quality impacts during construction:

- Activities with the potential to cause substantial emissions would be identified in the CEMP. Work practices which minimise emissions during these activities would be investigated and applied where reasonable and feasible;
- Dust would be visually monitored and where necessary the following measures implemented:
    - Apply water (or alternate measures) to exposed surfaces that are generating dust (where this does not pose any risks associated with surface overflow to Puzzle Creek);
    - Appropriately cover loads on trucks transporting material to and from the construction site. Securely fix tailgates of road transport trucks prior to loading and immediately after unloading; and
    - Prevent where possible, or remove, mud and dirt being tracked onto sealed road surfaces.
- Ensure plant and machinery is regularly checked and maintained in a proper and efficient condition;
- Disturbed areas would be stabilised as soon as practical to prevent or minimise wind-blown dust. Site rehabilitation would be undertaken progressively as soon as practicable within given areas;

- Vehicle and machinery movements during construction would be restricted to designated areas; and
- All site vehicles and machinery would be switched off or throttled down to a minimum when not in use.

3.11 Energy and greenhouse emissions

3.11.1 Existing environment

Greenhouse gases (GHG) attributable to the project may be assigned as either Scope 1, Scope 2 or Scope 3 emissions depending on their sources. These categories and the likely sources as a result of the project are described in Table 6.

Table 6 GHG emissions

Emission	Definition	Likely sources
Scope 1 emissions	Direct emissions generated on site	• Construction plant and equipment • Clearance of vegetation
Scope 2 emissions	Use of steam, heat or power on site where emissions are generated off site (usually in a power plant)	• Electricity use in mechanical and electrical systems including lighting
Scope 3 emissions	Downstream emissions from supply chain Upstream emissions from use of product	• Embodied energy in construction materials • Transport of materials to and from site • Embodied energy in maintenance materials

Due to the scale and temporary nature of the construction works, greenhouse gas emissions associated with this Project are not expected to be significant.

There are no operational greenhouse gas emissions associated with this Project.

3.11.2 Mitigation measures

The following mitigation measures are proposed to manage energy and greenhouse gases during construction:

- Energy (fuel/electrical) efficiency is to be considered by the construction contractor when selecting equipment;
- Where practical and otherwise feasible, the construction contractor should maximise use of biofuels (biodiesel, ethanol, or blends such as E10 and B80), to reduce greenhouse gas emissions from construction plant and equipment;
- All cleared vegetation (except for weeds) is to be mulched or composted for re-use, preferably onsite; and
- Local materials are be used where possible, to reduce transport-related emissions.

3.12 Waste management

Waste management during the construction phase is to be undertaken in accordance with the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act). The objectives of the WARR Act are to:

- Encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development;
- Ensure that resource management options are considered against a hierarchy of the following order:
  - Avoidance of unnecessary resource consumption;
  - Resource recovery (including reuse, reprocessing, recycling and energy recovery); and
  - Disposal.
- Provide for the continual reduction in waste generation;
- Minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste;
- Ensure that industry shares with the community the responsibility for reducing and dealing with waste;
- Ensure the efficient funding of waste and resource management planning, programs and service delivery;
- Achieve integrated waste and resource management planning, programs and service delivery on a State-wide basis; and
- Assist in the achievement of the objectives of the PoEO Act.

The construction of the proposed works is likely to generate the following major waste streams:

- Earthworks spoil;
- Vegetation waste;
- General waste, including food and other wastes generated by construction workers.

3.12.1 Mitigation measures

The following mitigation measures are proposed to manage waste:

- The CEMP will address construction waste management and shall:
  - Identify all potential waste streams associated with the works;
  - Identify the need to avoid the unnecessary use of resources;
  - Identify opportunities to minimise the use of resources, and to reuse, recover and recycle materials;

  - Outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities; and
  - Ensure disposal would be undertaken in accordance with the PoEO Act.
- Working areas would be maintained, kept free of rubbish and cleaned up at the end of each working day; and
- Records of waste generated and how much waste has been recycled to be kept for Waste Reduction and Purchasing Policy (WRAPP) reporting requirements.

Any waste oil or contaminated waste (including contaminated fill) will be disposed of according to EPA Guidelines.

3.13 Light spill

3.13.1 Existing environment

The site is located in a rural setting and is not directly adjacent to any residential areas. There is no significant existing night lighting associated with the site.

3.13.2 Potential impacts

Construction activities are anticipated to take place generally within daylight hours. Any need for night lighting during construction phase is to be determined by the construction contractor.

Any night lighting impacts associated with construction will be temporary in nature. Night lighting may have a temporary impact on local fauna, and is unlikely to be of major nuisance to the nearest residential properties, the closest of which is 100 m from the Project site.

No permanent lighting will be installed as part of the project.

3.13.3 Mitigation measures

Should the installation of temporary lighting be deemed to be required by the construction contractor, the following mitigation measure is to be followed:

- Light spill is to be minimised by directing any construction lighting into the construction areas and ensuring the site is not over-lit.

3.14 Cumulative environmental impacts

During construction, the works would be coordinated with other construction activities in the area to minimise cumulative construction impacts such as traffic and noise. There are no other known major construction works which will occur concurrently in the vicinity of the site; however this should be reconfirmed by the construction contractor and Cabonne Council directly prior to commencement of construction activities.

It is considered the cumulative environmental impacts with surrounding activities during construction would be negligible. Should it be identified at a later stage in the development process that cumulative impacts may occur, these would be addressed and managed appropriately.

There are no cumulative environmental impacts (such as impacts to the hydrological regime of Puzzle Creek) associated with this Project past construction phase.

3.15 Consideration of Clause 228 of EP&A Regulation

This REF has been prepared in accordance with the requirements of the EP&A Act and EP&A Regulation 2000. To demonstrate consideration of likely impacts of the works on the environment, an assessment has been undertaken against the factors listed in Clause 228 (2) of the EP&A Regulation 2000 (refer to Table 14).

Table 7 Clause 228 Checklist

Factor	Potential Impacts (Y/N)	Where in the REF?
Any environmental impact on a community?	Yes. The proposed works would be undertaken without threat to the continuance of existing land uses or demolition of any property infrastructure, but will require some property acquisition for easement entitlement. The potentially affected community during construction activity alone would be restricted to residents in the immediate locality and road users with some small delays in traffic movements from works activities; however these impacts are not predicted to result in adverse economic impacts or changes to community patterns or lifestyles.	Sections 0, 1.6.4, 3.5.3, 3.7
Any transformation of a locality?	No. The project is unlikely to result in the transformation of the locality. Minor removal of vegetation of low biodiversity value will take place within an agricultural setting. The proposal would not significantly modify any existing natural features of the local landform.	Sections 3.5, 3.7
Any environmental impact on the ecosystems of the locality?	No. Surveys of vegetation and habitat remaining on the road reserve and adjacent cypress/woodland sclerophyll forest hillsides suggest that the proposal would not compromise the structural and functional diversity status of any habitat or ecological community of the locality.	Section 3.5
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	No. In a local context, the value of the Box Eucalypt Cypress Pine Woodland which adjoins the site is significant although modified. However, the aesthetic, recreational and environmental quality or value of the Woodland will remain unchanged as the proposal involves no significant vegetation impacts to this area.	Section 3.5
Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or	No. The project would not impact on any locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value.	Section 3.8, 3.9

Factor	Potential Impacts (Y/N)	Where in the REF?
other special value for present or future generations?		
Any impact on the habitat of protected fauna (within the meaning of the National Parks and Wildlife Act 1974)?	No. The proposal will not significantly impact on the habitats of any protected or endangered fauna population as to alienate movement, limit dispersal corridors, or remove significant amounts of habitat essential for the conservation of any endangered fauna populations.	Section 3.5
Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in air?	No. Based on assessment of available habitat present at the locality and the small scale of the proposed works it is considered no species of animal plant or other form of life, whether living on land in water or in the air would be endangered by the proposal.	Section 3.5
Any long term effects on the environment?	No. The proposed works involve the removal of regrowth tree plantings with introduced grasses from open agricultural land and roadside batters without the need to significantly disturb vegetation or habitat of conservation significance. Beyond the construction phase the activities would not result in on-going environmental effects apart from positive environmental effects associated with improved flood mitigation for East Eugowra.	Section 3.5
Any degradation of the quality of the environment?	No. There would be no long-term degradation of the quality of the environment, as the proposed works would not significantly alter the landform or vegetation features characteristic of this area. There is potential for some short-term impacts on the environment associated with construction activities including noise, dust, traffic impact and visual amenity. These short-term impacts during the construction phase would be managed in accordance with this REF and would not continue into the operation phase.	Section 3
Any risk to the safety of the environment?	Yes. Risks to the safety of the environment would be greatest during the construction phase, particularly in relation to traffic management and potential for erosion and sedimentation. A CEMP would be prepared and implemented to reduce risks to acceptable levels. There would be an improvement to the safety of the environment on completion of the proposal due to the improved flood mitigation aspects of the proposed works.	Section 3
Any reduction in the range of beneficial uses of the environment?	No. During the period of the proposed works, there would be no reduction in beneficial uses as the road would remain open to traffic and roadside access will continue to be	Section 3.5.3

Factor	Potential Impacts (Y/N)	Where in the REF?
	available even if limited at times. Once the proposed works are complete there would be no residual effect on the surrounding land use.	
Any pollution of the environment?	Yes The project may result in some short term noise and air pollution. These impacts would be appropriately managed and mitigated through the implementation of the mitigation measures listed in this REF and the CEMP.	Sections 3.1, □
Any environmental problems associated with the disposal of waste?	No Resource and waste management mitigation measures would be included in the CEMP to control, monitor and manage waste generated during construction and to minimise the potential for environmental harm associated with waste disposal. In particular, any suitable vegetation removed from the project site would be spread on the proposed levee were appropriate to facilitate a stabilized landscape function.	Section 3.12
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply?	No The project would place a negligible demand on resources and not result in any resources becoming short in supply.	N/A
Any cumulative environmental effect with other existing or likely future activities?	No No significant development has been identified in the vicinity of the proposed depot therefore cumulative impacts resulting from the project are considered minor.	Section 3.14
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	No The proposed works would not impact on coastal processes or coastal hazards. This project is not located in the vicinity of any coastal areas. As appropriate mitigation measures would be implemented to minimise any downstream impacts for the Lachlan catchment.	N/A

3.16 Consideration of EPBC Act Factors

This REF has been prepared in accordance with the requirements of the EPBC Act. Under the environmental assessment provisions of the EPBC Act, matters of National Environmental Significance are required to be considered with regards to the proposed works. These matters are considered in Table 8.

Table 8 Matters of National Environmental Significance

Factor	Potential Impacts
Any Environmental Impact on a World Heritage Property?	No. There are no World Heritage properties in proximity to the site and therefore no impacts are anticipated.
Any Environmental Impact on National Heritage Places?	No. There are no National Heritage Places located within the vicinity of the site. The proposed works would not impact on any such heritage items.
Any Environmental Impact on Wetlands of International Importance?	No. The closest Wetland of International Importance is located approximately 362km from the site (Macquarie Marshes Ramsar Site). Banrock station wetland complex is located The proposed works are unlikely to have any impact on these wetlands.
Any Environmental Impact on Commonwealth Listed Threatened Species and Ecological Communities?	No. It is unlikely that the proposed works would impact on threatened species populations. The site of the proposed works is highly disturbed and contains isolated trees and poor native habitats. The planned tree removal would not affect any Commonwealth listed species (refer to Section 3.5).
Any Environmental Impact ion Commonwealth Listed Migratory Species?	No. Due to the lack of appropriate habitat at the site for migratory species that are predicted to occur within the locality, the proposed works would not impact on any of these species.
Does any part of the Project involve Nuclear Action?	No.
Any Environmental Impact on a Commonwealth Marine Area?	No. The proposed works would not impact on any Commonwealth Marine Areas.
Any impact on Commonwealth Land?	No. The works would not occur on Commonwealth Land, nor would the works have any negative effect on any such land.

4 Summary of mitigation measures

A summary of mitigation measures proposed for the project is provided in Table 9. As there are no operational environmental impacts associated with this Project, all mitigation measures are associated with the construction phase.

Table 9 Summary of mitigation measures in construction

Noise and Vibration
• A Construction Noise and Vibration Management Plan (CNVMP) is to be prepared and implemented by the construction contractor in accordance with the Interim Construction Noise Guideline; • The construction methodology, plant and equipment, management of vibration impacts and community consultation protocol is to be reviewed prior to commencing construction. This should be addressed as part of the CNVMP. • If mitigated noise levels exceed 75 dBA, provide respite periods (e.g. breaks of 1-2 hours) during the day. • Noise and vibration emissions are to be qualitatively assessed throughout construction with additional measures implemented to reduce noise and vibration impacts where required; • Only the equipment necessary for the works are to be used at any time. All equipment/plant is to be turned off when not in use; • Simultaneous operation of noisy plant and equipment within discernible range of any identified sensitive receiver is to be avoided / limited where possible; • Where practical, the offset distance between noisy plant and adjacent sensitive receivers is to be maximised; • Noise-emitting plant should, where possible, be directed away from the nearest sensitive receivers; • The recommended safe work distance for vibration intensive plant (Table 9 of the REF) is to be followed at all times; • Construction vehicles should use non-“beeper” reversing/movement alarms such as broadband (non-tonal) alarms or ambient noise-sensing alarms where available; • Workers and contractors are to be properly trained to use equipment in ways to minimise noise; • Plant is to be regularly inspected and maintained to avoid increased noise levels; • Resilient damping material is to be provided on bin trucks to minimise impact noise from materials loaded on truck; • Mufflers/silencers are to be fitted to pneumatic tools (e.g. breakers) and residential-grade mufflers are to be used on plant where practical; • Dampened bits are to be used on impulsive tools such as jackhammers to avoid “ringing” noise; • Truck drivers are to be informed of designated vehicle routes, parking locations and acceptable delivery hours for the site – particularly regarding minimising impacts to Eugowra township; and • Night/evening deliveries are to be avoided wherever possible.
Water quality and hydrology
• An erosion and sediment control plan is to be prepared in accordance with Landcom’s (2004) Managing Urban Stormwater: Soils and Construction prior to the commencement of construction. The plan is to be updated and managed throughout as relevant to the activities

during the construction phase;

- Erosion and sediment control measures and structures are to be implemented before, during and after construction activities;
- Erosion and sediment control measures are to be regularly inspected (particularly following rainfall events) to ensure their on-going functionality;
- Erosion and sediment control measures are to be left in place until the works are complete and areas are stabilised;
- Undertaking construction works should be avoided during rainfall (or whilst the ground remains sodden) wherever practical;
- Hydro-mulching is to be placed on disturbed ground to regenerate grass and reduce erosion at appropriate sites;
- Vehicles and machinery are to be properly maintained and routinely inspected to minimise the risk of fuel/oil leaks;
- All fuels, chemicals and hazardous liquids are to be stored within an impervious bunded area in accordance with Australian standards and EPA Guidelines;
- Construction plant, vehicles and equipment are to be refuelled off-site, or in a designated refuelling area;
- Adequate water quality and hazardous material procedures (including spill management procedures, use of spill kits and procedures for refuelling and maintaining construction vehicles/equipment) are to be implemented during the construction of the Project. All staff are to be made aware of the location of the spill kit and be trained in its use;
- In the event of an incident works are to cease and the NSW Office of Environment and Heritage (OEH) are be notified of any incidents resulting in environmental harm as per Part 5.7 of the Protection of the Environment Operations Act 1997.

Contaminated land and hazardous materials

- A Construction Environmental Management Plan (CEMP) is to be put in place by the construction contractor, including procedures for the isolation and clean-up of any spills or discovery of contamination on the site;
- Excavation and subsoil disturbance is to be minimised wherever possible to reduce the risk of unearthing contaminated material;
- The handling, storage and transport of hazardous materials and waste is to be undertaken in accordance with the National Code of Practice and the relevant Material Safety Data Sheet (MSDS) for the product;
- Receiving facilities for any spoil or building material generated from the site are to be appropriately licenced under the PoEO Act 1997 to receive the required waste type;
- Any reuse of spoil onsite is to undergo contamination testing and classification as necessary in accordance with PoEO Act 1997;
- Emergency spill kits are to be accessible at all times during construction, are to be used immediately following any contamination incident according to established procedures for isolation and clean-up of spills, and all staff are to be provided with the necessary training in relation to use of spill kits;
- Should significant contaminants be identified on the site, the NSW OEH are to be notified and remediation is to be undertaken in accordance with the Contaminated Land Management (CLM) Act 1997;
- If existing material is required to be removed from site, it is to be assessed for contamination and treated or disposed of in accordance with relevant statutory requirements, as administered by the NSW OEH;
- Refuelling of construction vehicles and machinery is to be undertaken offsite at a fuel station or

within a site compound area; • Any fuel stored onsite is to be stored within an adequately bunded area; and • If any complaints are received in relation to pollution from the project, these complaints are to be stored in Cabonne Council's complaints database for four years, and be produced to the EPA on request.
Acid Sulphate Soils
• Excavation depths and volumes are to be minimised wherever possible; • Construction contractors are to be capable to appropriately identify ASS in the event it is disturbed; • Spoil stockpiles are to be located out of drainage lines, and treated or removed from site as soon as practicable; • In the event that ASS are discovered or suspected onsite, a preliminary soil assessment, consultation with council, and potentially an Acid Sulphate Soil management Plan would be required to be developed. The NSW Acid Sulphate Soils Management Advisory Committee (ASSMAC) Guidelines (1998) would be consulted, with these guidelines including detail of ASS treatments onsite, ASS handling and disposal procedures.
Biodiversity
• A Construction Environmental Management Plan (CEMP) is to developed including specific measures to manage biodiversity impacts; • Revegetation of suitable areas of the site with native species would be undertaken to compensate for the removal of existing vegetation; • Ongoing weed maintenance would be undertaken across the site during and after clearing activities; • The loss of fauna would be guarded against during clearing. This could include visual inspections of vegetation and potential habitat prior to removal; • Construction and excavation footprint is to be minimised; • The design is to be optimised to retain trees and other vegetation wherever practical; • Clear marking such as barrier fencing is to be placed around any vegetation that is to be retained, prior to the commencement of construction; • Appropriate weed control measures are to be undertaken prior to construction in areas in which high densities or infestations of weeds occur; • Earth-working equipment is to be cleaned of excess soil prior to arrival and prior to departure from work areas, to minimise the spread of weed seeds, weed propagules and plant pathogens; • Disturbed areas are to be kept to a minimum and would be revegetated as soon as possible; and • Any revegetation works are be conducted by a suitably qualified and experienced contractor.
Traffic and access
• A Construction Traffic Management Plan (CTMP), which describesthe management of construction vehicles for all stages of construction in the vicinity of the site, is to be prepared by the construction contractor prior to the commencement of construction. This plan is to include measures to ameliorate the impact of the construction traffic on the network and detail measures to limit the impact of construction traffic on the local network; including management of pedestrians should construction activities be located nearby to pedestrian routes; • The impacts of construction traffic on the local road network and the impacts on intersection operation is to be minimised by ensuring construction vehicle traffic movements take place

outside of peak road traffic periods and outside of school peak periods where feasible; • No road closure is to take place during construction; • The queuing and idling of construction vehicles in residential streets is to be minimised; • An emergency response plan is to be developed for construction traffic incidents; • During project inductions, all heavy vehicle drivers are to be provided with the emergency response plan for construction traffic incidents; • Access to all properties at and adjacent to the works is to be maintained during construction, unless otherwise agreed with relevant property owners; • If existing access routes are to be used between Nangar Road and the construction site, assessment and any necessary upgrades are be undertaken by the contractor to ensure that the existing infrastructure is capable of hosting an increased vehicle load.
Landscape and visual amenity
• Revegetation of suitable areas of the site with grass and native vegetation species where appropriate may be undertaken to compensate for the removal of existing vegetation; • Temporary hoardings, barriers, traffic management and signage is to be removed from the site and road network when no longer required; and • Landscaping and materials used in the Project are to be complementary to the existing locality and landscape.
Indigenous heritage
• If unexpected archaeological items or items of Aboriginal heritage significance are discovered during the construction of the project, all works are to cease and appropriate advice will be sought from relevant stakeholders, including the NPWS Western Region Office Dubbo and Local Aboriginal Land Councils.
Non indigenous heritage
• If any previously unrecorded items or unanticipated archaeological deposits are identified within the project site during construction, work likely to impact on the deposit is to cease immediately and Cabonne Council is to be notified. Where required, further archaeological work and/or consents w be obtained for the unanticipated archaeological deposits prior to works recommencing at the location.
Air quality
• Activities with the potential to cause substantial emissions would be identified in the CEMP. Work practices which minimise emissions during these activities would be investigated and applied where reasonable and feasible; • Dust would be visually monitored and where necessary the following measures implemented: - Apply water (or alternate measures) to exposed surfaces that are generating dust (where this does not pose any risks associated with surface overflow to Puzzle Creek); - Appropriately cover loads on trucks transporting material to and from the construction site. Securely fix tailgates of road transport trucks prior to loading and immediately after unloading; and - Prevent where possible, or remove, mud and dirt being tracked onto sealed road surfaces. • Ensure plant and machinery is regularly checked and maintained in a proper and efficient condition; • Disturbed areas would be stabilised as soon as practical to prevent or minimise wind-blown

dust. Site rehabilitation would be undertaken progressively as soon as practicable within given areas; • Vehicle and machinery movements during construction would be restricted to designated areas; and • All site vehicles and machinery would be switched off or throttled down to a minimum when not in use.
Energy and greenhouse emissions
• Energy (fuel/electrical) efficiency is to be considered by the construction contractor when selecting equipment; • Where practical and otherwise feasible, the construction contractor should maximise use of biofuels (biodiesel, ethanol, or blends such as E10 and B80), to reduce greenhouse gas emissions from construction plant and equipment; • All cleared vegetation (except for weeds) is to be mulched or composted for re-use, preferably onsite; and • Local materials are be used where possible, to reduce transport-related emissions.
Waste management
• The CEMP will address construction waste management and shall: - Identify all potential waste streams associated with the works; - Identify the need to avoid the unnecessary use of resources; - Identify opportunities to minimise the use of resources, and to reuse, recover and recycle materials; - Outline methods of disposal of waste that cannot be reused or recycled at appropriately licensed facilities; and - Ensure disposal would be undertaken in accordance with the PoEO Act. • Working areas would be maintained, kept free of rubbish and cleaned up at the end of each working day; and • Records of waste generated and how much waste has been recycled to be kept for Waste Reduction and Purchasing Policy (WRAPP) reporting requirements.
Light spill
• Light spill is to be minimised by directing any construction lighting into the construction areas and ensuring the site is not over-lit.

5 Conclusion

This REF has been prepared to fulfil the requirement of Section 111 of the EP&A Act that Cabonne Council examines and takes into account to the fullest extent possible, all matters affecting or likely to affect the environment as a result of the project.

The benefits of the project are considered to outweigh the environmental impact of the project. This REF has considered and assessed these impacts in accordance with clause 228 of the EP&A Regulation and the requirements of the EPBC Act. These impacts would be effectively managed through the preparation and implementation of a CEMP and the site specific mitigation measures identified in Section 5. As a result, the potential environmental impacts are not considered to be significant.

References

Acid Sulfate Soils Management Advisory Committee (ASSMAC) *Guidelines* 1998

Australian Government Department of Environment, 2013. Protected Matters Search Tool: http://www.environment.gov.au/webgis-framework/apps/pmst/pmst.jsf

Cabonne Council, 2012. *Cabonne Local Environment Plan*

CSIRO, 2013. Australian Soil Resource Information System: http://www.asris.csiro.au/

CSIRO, 1999. *Urban Stormwater: Best Practice Environmental Management Guidelines.*

Department of Environment and Conservation Information and Assessment Section North-West Branch, Dubbo, 2006. *Reconstructed and Extant Distribution of Native Vegetation in the Lachlan Catchment.*

Department of Planning (2013). NSW State Heritage Register

Department of Sustainability, Environment, Water, Population and Communities, (2013). Australian Heritage Database

Environment Protection Authority, 2009. *Interim Construction Noise Guideline*

Environmental Protection Authority. 1999. *Assessment, classification and management of liquid and non-liquid wastes.*

King, DP 1998. *Soil Landscapes of the Forbes 1:250,000 Sheet map, Department of Land & Water Conservation*, Sydney

Lyall & Associates 2010. *Review of Eugowra Floodplain Risk Management Study 1999*, prepared for Cabonne Council.

Lyall & Macoun Consulting Engineers (1999), 'Eugowra Floodplain Risk Management Study', prepared for Cabonne Council.

National Pollutant Inventory (accessed February 2014). http://www.npi.gov.au/

New South Wales Department of Environment and Climate Change, 2007. Threatened Species Assessment Guidelines

NSW Department of Primary Industries, 2013 Update. *Policy and guidelines for fish habitat conservation and management.*

NSW Department of Primary Industries, 2003. *Fish Passage Requirements for Waterway Crossings*, 2003.

New South Wales Government. 1998. Environmental Management Systems Guidelines

Office of Environment and Heritage, April 2013. Aboriginal Heritage Information Management System

Office of Environment and Heritage, 2013. *Atlas of NSW Wildlife Database*

Office of Environment and Heritage, 2009. *Interim Construction Noise Guideline*

Office of Environment and Heritage, 2003. *Waste Avoidance and Resource Recovery Strategy*

Standards Australia, 2010. AS 2436: *Guide to noise and vibration control on construction, demolition and maintenance sites*

Appendix A

EPBC Protected Matters Search Tool - Project Site Summary

Appendix B

Ecological Survey Methodology

B1 Ecological Survey Methodology

A site ecological survey was undertaken by a Cabonne Council Environmental Office in 2012. The following methodology has been provided by Cabonne Council:

B1.1 Flora

The "Random Meander Method" described by Cropper (1993) is considered the most effective for detecting plant species of conservation significance. It involves walking randomly throughout the study area and recording every tree and plant species seen. Limitations to this method include the desiccation of many plants due to their short life cycle, and the likelihood of some species being overlooked due to their inconspicuous vegetative parts.

B1.2 Fauna

Prior to undertaking of any fieldwork, databases were studied to identify potential endangered and vulnerable fauna. These species are ones, which may utilize the study area on occasion or permanently but were not observed during the site visit. This approach therefore increases the probability of considering the impacts of the proposed road works on likely and known fauna species, particularly those of conservation concern.

B1.3 Survey Limitations

Climatic conditions were considered suitable for the general survey carried out. The information provided in this document interprets on-site conditions for the study area. The report should be read with an understanding that it is a general interpretation of the study area based on a specific survey, data sets and local knowledge of the Cabonne Council Environmental officer who undertook the survey.

Appendix C

Ecological Survey Results:
Observed Species

C1 Observed Flora

C1.1 Tree species

Genus & Species	Common Name
Eucalyptus conica	Fuzzy Box
Eucalyptus camaldulensis	River Red Gum
Eucalyptus microcarpa	Grey Box
Eucalyptus melliodora	Yellow Box
Eucalyptus blakelyi	Blakely's Red Gum
Eucalyptus albens	White Box
Eucalyptus polyanthemos	Red Box
Eucalyptus dealbata	Tumbledown Red Gum
Eucalyptus sideroxylon	Iron Bark
Eucalyptus sparsifolia	Stringy Bark
Brachychiton populneus	Kurrajong
Callitris glaucophylla	White Cypress-pine
Callitris endlicheri	Black Cypress-pine

C1.2 Shrubs

Genus & Species	Common Name
Acacia deanei	Deane's Wattle
Acacia implexa	Hickory Wattle
Acacia leucociada	Northern Silver Wattle
Acacia decora	Western Golden Wattle
Maireana microphylla	Eastern Cottonbush
Hardenbergia violacea	Happy Wanderer

C1.3 Native Grasses

Genus & Species	Common Name
Themeda triandra	Kangaroo Grass
Danthonia spp	Wallaby Grass
Bothriochloa macra	Redgrass
Elymus scaber	Common Wheat Grass
Chloris truncate	Windmill Grass
Austrostipa scabra	Spear Grass
Poa sieberiana	Snow Grass
Eragrostis brownie	Common Lovegrass

C1.4 Introduced Grasses

Genus & Species	Common Name
Phalars aquatica	Phalaris
Trifolium sp	Clover
Euchium plantagineum	Pattersons curse
Bromus diandrus	Great broom
Carthamus lanatus	Saffron Thistle
Alf alfa	Lucerne
Marrubium vulgare	Horehound

C2 Observed Fauna

C2.1 Birds

Genus & Species	Common Name
Aquila audax	Wedge-tailed Eagle
Falco berigora	Brown Falcon
Falco cenchroides	Nankeen Kestral
Gymnorhina tibicen	Magpie
Cracticus torquatus	Grey Butcherbird
Cracticus nigrogularis	Pied Butcherbird
Dacelo novaeguineae	Kookaburra
Platycercus eximus	Eastern Rosella
Psephotus haematonotus	Red-rumped Parrot
Polytelis swainsonii	**Superb Parrot* vulnerable**
Leptolophus hollandicus	Cockatiel
Cacatua roseicapilla	Galah
Cacatua galerita	Sulpher-crested Cockatoo
Coracina novaehollandiae	Black faced cuckoo-shrike
Chenonetta jubata	Maned Duck
Ceophaps lophotes	Crested Pigeon
Phaps chalcoptera	Bronzewing Pigeon

C2.2 Mammals

Genus & Species	Common Name
Macropus gigantius	Grey Kangaroo
Lepus capensis	Brown Hare
Tachyglossus aculeatus	Echidna

Appendix D

Threatened Species Assessments

D1 Threatened Species Assessment: Threatened and Endangered Bird Species

A 7-Part Test for has been undertaken in accordance with the NSW Department of Environment and Climate Change *Threatened Species Assessment Guidelines* (2007) for the following threatened bird species with regards to the Project Site:

- Square Tailed Kite (*Lophoictinia isura*)
- Brown Treecreeper (*Climacteris picumnus*)
- Barking Owl (*Ninox connivens*)
- Superb Parrot (*Polytelis swainsonii*)

Results are summarised below in Table 10.

Table 10 Seven Part Test: threatened bird species

Consideration	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.	The ground impact area of the proposed works area exhibits a disturbed environ from road usage and agricultural practices (Appendix 3) providing little habitat resources for the above listed species. More intact and less disturbed Woodland and Box-Cypress Sclerophyll Forest habitats that exhibit roosting, feeding, breeding, dormancy, migration and dispersal needs and are crucial to the survival of these species were observed outside the boundaries of the proposed works area. It is noted that these will not be impacted or modified upon as to disrupt the life cycle of these species such that viable local populations are likely to be placed at risk of extinction.
In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.	The listed species Square Tailed Kite, Brown Treecreeper Barking Owl and Superb Parrot, are not listed as an Endangered Population under schedule 1 of the Threatened Species Conservation Act 1995.
In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: • Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be	The actions proposed would not compromise the extent or occurrence of any ecological community as to place it at risk of extinction.

placed at risk of extinction, or • Is likely to substantially and adversely modify the composition of the ecological community such that its occurrence is likely to be placed at risk of extinction.	
In relation to the habitat of a threatened species population or ecological community: • The extent to which habitat is likely to be removed or modified as a result of the action proposed, and • Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and • The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	The proposed works would not significantly modify or isolate any area of known interconnecting habitat or proximate areas of habitat. The existing links between roadside environs and, box-cypress sclerophyll forest hillsides evident at the locality would not be broken to an extent where potential flora and fauna distribution would be adversely affected. The area to be impacted upon is not significant in habitat resources for these fauna species that its disturbance would place these populations at risk of extinction.
Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	The area is not listed as critical habitat under Part 3 Division 1 of the Threatened Species Conservation Act 1995.
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	The proposed works are consistent with a recovery or threat abatement plan by considering the habitats present within the roadside reserve and adjoining agricultural land and designing the proposed levee to ensure that structural and functional diversity are preserved at the locality. Irrespective of this, the listed species Square Tailed Kite, Brown Treecreeper, Barking Owl, and Superb Parrot would not be reliant on the impacted area such that their habitats or populations would be reduced by the actions of the proposed works.
Whether the action proposed constitutes or is of a Key Threatening Process or is likely to result in the operation of, or increase the impact of a Key Threatening Process.	The removal or disturbance of regrowth tree plantings with introduced vegetation and the small scale of this action is not considered to remove or fragment any resources significant for these species, as to result in the operation of or increase the impact of a key threatening process at this locality.

D2 Threatened Species Assessment: Microchiropteran Bat Species

A 7-Part Test for has been undertaken in accordance with the NSW Department of Environment and Climate Change *Threatened Species Assessment Guidelines* (2007) for the following Microchiropteran bat species with regards to the Project Site:

- Little Pied Bat (*Chalinplobus picatus*)
- Yellow Bellied Sheathtail Bat (*Saccolaimus flaviventris*)
- Greater Long-eared Bat (*Nyctophilus timoriensis*)

Results are summarised below in Table 11.

Table 11 Seven Part Test: Microchiropteran bat species

Consideration	Response
In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.	The proposed works are not considered to have an adverse effect on the life cycle of these vulnerable bat species such that viable local populations are to be placed at risk of extinction. The area to be disturbed is not considered to constitute a significant habitat necessary for the conservation of these species.
In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.	The listed species Little Pied Bat, Greater Long-eared Bat and Yellow-bellied Sheathtail-bat are not listed as an Endangered Population under Schedule 1 of the Threatened Species Conservation Act 1995.
In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: • Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or • Is likely to substantially and adversely modify the composition of the ecological community such that its occurrence is likely to be placed at risk of extinction.	The actions proposed would not significantly compromise the extent or occurrence of any Ecological Community such that its occurrence is likely to be placed at risk of extinction.
In relation to the habitat of a threatened	The proposal will not significantly modify or remove

species population or ecological community: • The extent to which habitat is likely to be removed or modified as a result of the action proposed, and • Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and • The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	habitat identified at the locality as being essential to the conservation of these listed bat species. Existing links between these box cypress woodlands and dry sclerophyll hillsides would not be fragmented, broken, or isolated by the proposed works as to adversely affect flora and fauna distribution at the locality. The area to be impacted upon exists as disturbed road shoulders and cleared agricultural land exhibiting limited habitat resources for these vulnerable bat species that its disturbance would place these populations at risk of extinction.
Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).	The area is not listed as critical habitat under Part 3 Division 1 of the *Threatened Species Conservation Act 1995.*
Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.	It is considered after a review of the study literature the proposal would not impede a recovery or threat abatement plan for the listed species within the locality or region.
Whether the action proposed constitutes or is of a Key Threatening Process or is likely to result in the operation of, or increase the impact of a Key Threatening Process.	The disturbance and removal of regrowth tree plantings with introduced grasses from roadside batters and agricultural land and given the small scale of this operation is not considered to remove or fragment any resources significant for these species such that the extent of these resources would be reduced as to result in the operation of, or increase the impact of a key threatening process at this locality.

Appendix E

Geotechnical specifications