



Brett Lane & Associates Pty. Ltd.
Ecological Research & Management

SECOND CROSSING OF THE MURRAY RIVER AT ECHUCA-MOAMA (ECHUCA-MOAMA BRIDGE PROJECT) (EPBC 2013/6850)

PRELIMINARY DOCUMENTATION IN RELATION TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE



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CONTENTS

1.	BACKGROUND INFORMATION	1
1.1.	Purpose of and need for the proposal	4
1.2.	Alignment option analysis	4
1.3.	Assessment under state legislation	5
1.4.	Other actions	5
2.	DESCRIPTION OF THE ACTION	6
2.1.	Scope of works	6
2.2.	Disturbance footprint	7
2.3.	Project Stages	7
2.4.	Overall project timing	7
3.	DESCRIPTION OF THE ENVIRONMENT	9
3.1.1.	Wildlife Connectivity and corridors	9
3.2.	General description of the environment	12
3.3.	Land use	14
3.3.1.	Study area	14
3.3.2.	Local region	14
4.	MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE	15
4.1.	Summary of sources of information	15
4.2.	MNES status in the study area	17
4.2.1.	EPBC Act listed flora species	17
4.2.1.	EPBC Act listed ecological communities	19
4.2.2.	EPBC Act listed fauna species	19
5.	POTENTIAL IMPACTS ON MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE	32
5.1.	Impacts on fauna habitat	32
5.2.	Wildlife connectivity and habitat fragmentation	34
5.2.1.	Habitat fragmentation and loss of connectivity	34
5.2.2.	Barrier effects	34
5.2.3.	Edge effects	34
5.3.	Impacts on aquatic habitat	35
5.4.	Injury and mortality	35
5.4.1.	Construction phase	35
5.4.2.	Operational phase	36
5.5.	Weed invasion impacts	36

5.6.	Pest and pathogen impacts	36
5.6.1.	Pests	36
5.6.2.	Pathogens.....	37
5.7.	Hydrological changes.....	37
5.8.	Noise, vibration and light.....	37
5.9.	Cumulative impacts	38
6.	ASSESSMENTS OF IMPACT SIGNIFICANCE FOR MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE.....	39
7.	PROPOSED AVOIDANCE, MANAGEMENT AND MITIGATION MEASURES	41
7.1.	Avoid and minimise.....	41
7.2.	Vegetation and habitat removal.....	41
7.2.1.	Pre-clearing.....	41
7.2.2.	Exclusion zones.....	42
7.2.3.	Staged habitat removal	42
7.3.	Fauna handling	43
7.4.	Aquatic habitat and riparian zones.....	44
7.5.	Weed management	45
7.6.	Pathogen management	45
7.7.	Re-establishment of native vegetation.....	46
7.8.	Re-use of woody debris	47
7.9.	Re-establishment of habitat connectivity.....	48
7.10.	Mitigation timeframes	48
8.	OTHER APPROVALS AND CONDITIONS	49
8.1.	Approvals under Victorian legislation and guidelines.....	49
8.1.1.	Planning and Environment Act 1987	49
8.1.2.	Flora and Fauna Guarantee Act 1988 (FFG Act)	50
8.1.3.	Environment Effects Act 1978 (EE Act).....	50
8.1.4.	Catchment and Land Protection Act 1994 (CALP Act)	51
8.2.	Approvals under New South Wales legislation and guidelines.....	51
8.2.1.	State environmental planning policies (SEPP's).....	51
8.2.2.	Fisheries Management Act 1994 (FM Act)	51
8.2.3.	Environmental Planning and Assessment Act 1979 (EP&A Act)	52
8.2.4.	Noxious Weeds Act 1993	53
8.3.	Monitoring and enforcement	53

9. CONCLUSION.....	54
10. REFERENCES.....	55

TABLES

Table 1: EPBC Act listed flora species and likelihood of occurrence	18
Table 2: EPBC Act listed fauna identified as occurring or potentially occurring in the study area	21
Table 3: Koala habitat assessment tool appraisal	27
Table 4: Potential impacts on EPBC Act listed fauna species	32
Table 5: Summary of findings for assessments of impact significance for MNES values	39

FIGURES

Figure 1: Project alignment	2
Figure 2: Study area boundary (construction footprint)	3
Figure 3: Habitat connectivity – regional scale.....	10
Figure 4: Habitat connectivity – local scale	11
Figure 5: EPBC Act listed fauna species recorded in or adjacent the study area	20
Figure 6: Study area and proposed fauna habitat removal	33

ATTACHMENTS

Attachment 1: Detailed assessments of impact significance for MNES values.....	58
Attachment 2: Second Murray River Crossing at Echuca-Moama, Detailed Flora and Fauna Assessment, Brett Lane and Associates Report 8194 (2.6)	69
Attachment 3: Mid-West 2 Murray River Crossing at Echuca-Moama, Matters of National Environmental Significance, Brett Lane and Associates Report 8194 (4.4).....	71
Attachment 4: Mid-West 2 Murray River Crossing at Echuca-Moama, Detailed Flora, Fauna, Native Vegetation and Net Gain Assessment, Brett Lane and Associates Report 8194 (3.8)	73
Attachment 5: Echuca-Moama Bridge Project: biodiversity and habitat impact assessment EES report, Brett Lane and Associates Report 8194 (16.10) ..	75
Attachment 6: Second Murray River crossing at Echuca – Moama: biodiversity assessment of alignment in NSW, Brett Lane and Associates Report 8194 (15.5).....	77
Attachment 7: Echuca Bridge Planning Study - Mid West 2 Option Aquatic Flora and Fauna Assessment, GHD Report 31/28726.....	79

Attachment 8: BL&A response letter to the DoE's request for further information on South-eastern Long-eared Bat and Superb Parrot.....	81
Attachment 9: South-eastern Long-eared Bat call analysis information provide by Dr Greg Richards	83
Attachment 10: Peer Review of bat survey by Gration (2015).....	85
Attachment 11: VicRoads standard environmental mitigation measures, construction contract (major) standard Section 177	87

1. BACKGROUND INFORMATION

VicRoads engaged Brett Lane and Associates Pty Ltd (BL&A) to conduct a detailed Flora, Fauna Assessment for the proposed Murray River Crossing at Echuca-Moama, within the Mid-West alignment corridor. This alignment option was chosen from four potential options (Mid-West, Mid-West 2A, Mid-West 2B and No Project), as it was determined to be a better performing option when considering a balance between environmental, social and economic considerations. The alignment is approximately 4.1km in length and utilises existing road infrastructure along part of Warren Street (Echuca-Cohuna Road), has the least amount of vegetation removal and least amount of raised road formation and bridging, impacting on the overall cost of the Project. The preferred alignment is shown in Figure 1.

The Mid-West alignment corridor lies between the intersection of the Murray Valley Highway and Warren Street in Echuca (Victoria), and the Cobb Highway and Perricoota Road intersection in Moama (New South Wales (NSW)). It extends from the Murray Valley Highway along Warren Street before diverting to the northwest where it extends to the west of Victoria Park Oval. It then turns north-east to cross the Murray River before extending north to connect with the Cobb Highway. The construction footprint (i.e. the disturbance area) and the Right of Way (the study area) of the Mid-West alignment corridor is presented in Figure 2.

Based on the analysis of calls recorded during the bat surveys, it was initially determined that the EPBC Act-listed South-eastern Long-eared Bat (also known as Corben's Long-eared Bat) was present within the study area. In May 2013, a Referral under the EPBC Act was submitted to the Federal Minister for the Environment (EPBC Reference 2013/6850) regarding potential impacts on Matters of National Environmental Significance (MNES) within the study area. Attached to that Referral was a detailed report on matters of national environmental significance within the study area (BL&A 2013a, see Attachment 3). Further information responding to several queries regarding the proposal was provided to the Commonwealth Department of the Environment (DoE) in June 2013, in the form of a short letter report (see Attachment 8 to this report).

On the 11th July 2013, the Department decided the project to be a controlled action due to potential impacts on South-eastern Long-eared Bat (*Nyctophilus corbeni*), and that assessment would be required in the form of Preliminary Documentation. A requested variation to the project under Section 156A of the EPBC Act, based on the Mid-West alignment option and excluding the Murray Valley Highway, was issued by DoE on 22 December 2014.

A subsequent peer review (Gration 2015) of the bat survey findings found that the habitat present in the study area was not suitable for South-eastern Long-eared Bat, that the nearest record of this species was 50 km to the west and that the recorded bat calls could not be attributed to this species. As such, the peer review concluded that South-eastern Long-eared Bat was not likely to occur within the study area (Gration 2015). The peer review can be found at Attachment 10.

This Preliminary Documentation report has been prepared to provide all the relevant information to the Commonwealth Department as requested in the Decision on referral, and to allow the Minister, or Delegate, to make an informed

decision on what impacts the proposed action may have on South-eastern Long-eared Bat.

Figure 1: Project alignment





Legend

- Study Area
- Construction footprint

0 150 300 600 Metres

Figure 2: Study area and construction footprint

Project: Murray River Crossing Echuca

Client: VicRoads

Project No.: 8194

Date: 24/11/2014

Created By: J. Sullivan / M. Ghasemi

BL&A

Brett Lane & Associates Pty. Ltd.
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- Solutions

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1.1. Purpose of and need for the proposal

VicRoads, in partnership with New South Wales Roads and Maritime Services (Roads and Maritime), is undertaking planning activities for a second Murray River crossing at Echuca-Moama. The Project, known as the Echuca-Moama Bridge Project would alleviate congestion on the existing bridge and provide an alternate access for residents and improved security of access for the local community, as well as catering for freight and agricultural machinery.

Echuca and Moama are currently linked by a single road bridge across the Murray River with a single carriageway in either direction. The existing bridge was built in 1878 and originally operated as a combined road/rail bridge until 1989, whereby a separate rail bridge was constructed. The nearest alternative road crossings of the Murray River are at Barham, 86 km to the west, Barmah 36 km to the east, or Tocumwal 120 km to the east.

The existing road bridge and its approaches have inherent safety and operational limitations including its inability to carry over-width loads and higher mass limited vehicles used by an increasing proportion of the freight transport industry. Rehabilitation works to upgrade the operational capacity of the existing bridge would require lengthy road closures and would be further complicated by heritage considerations.

The existing bridge does not provide a suitable level of service for the increased volume of light vehicle traffic experienced during peak summer tourist events. Extensive delays are commonly experienced at these times which are easily exacerbated by any minor traffic incidents. This results in sizeable delays and in particular restricts the movement of emergency services vehicles from one town to the other.

Early investigations to provide for a second Murray River Crossing at Echuca-Moama commenced in 1965. Since then, VicRoads has undertaken extensive planning investigations including route options development and environmental impact assessments. Over the past 15 years, five corridors have been considered for an additional Murray River crossing.

As a result of the investigations completed and stakeholder consultation conducted, VicRoads has amassed significant knowledge of existing environmental, social and economic conditions and community values in the Echuca-Moama region.

The construction of the initial alignment is subject to the provision of funding and is expected to take three years to complete. Timing for the ultimate duplication is subject to traffic demands on the road network.

1.2. Alignment option analysis

The Project comprises a Right-of-Way sufficient to build a four lane road and duplicated bridges across both Rivers. The Project includes an elevated roadway and extensive bridging across the Campaspe River and Murray River floodplains, as well as changes to existing approach roads.

VicRoads undertook an assessment of alignment options based upon the information from previous assessments and existing conditions in the area. The result was the selection of a Preferred Alignment option for consideration by

specialists. The alignment, known as the “Mid-West” Option was determined to be a better performing option when considering a balance between environmental, social and economic considerations. The Preferred Alignment is approximately 4.3km in length and utilises existing road infrastructure along part of Warren Street (Echuca-Cohuna Road), has the least amount of vegetation removal and least amount of raised road formation and bridging, impacting on the overall cost of the Project.

The Preferred Alignment extends from the Murray Valley Highway along Warren Street before diverting to the northwest where it extends to the west of Victoria Park Oval. The Preferred Alignment then turns north-east to cross the Murray River before extending north to connect with the Cobb Highway (Figure 1).

1.3. Assessment under state legislation

The proposal is being assessed under both NSW and Victorian state planning legislation. For details of this assessment refer to Section 8 of this document.

1.4. Other actions

The proposal does not relate to any other actions either currently being implemented or anticipated for the future.

2. DESCRIPTION OF THE ACTION

The proposed action involves the removal of native vegetation from the study area to facilitate the construction and operation of the proposed second Murray River Crossing at Echuca-Moama – the Mid-West alignment.

2.1. Scope of works

The following provides a summary of the scope of works.

The main construction activities associated with the Project would comprise:

- Civil and structural works associated with the construction of new elevated roadway and bridges across the Murray and the Campaspe Rivers;
- Construction of earthworks and flood relief structures for the new Link Road across the Murray River and Campaspe River floodplains; and
- Improvements to existing roads and intersections on approaches in Victoria and NSW, including the intersections of Cobb Highway and Mininya Street, and Cobb Highway and Perricoota Road in Moama, including traffic signals where the Cobb Highway intersects with Mininya Street and Perricoota Road in Moama.

Construction activities would include clearing of vegetation, general earthworks (including topsoil stripping, filling and topsoil spreading), relocation of utility services, drainage installation, pavement construction, bridgeworks, landscaping, installation of noise barriers and installation of traffic controls, lighting and signage.

Excavation required for the project is expected to be limited as the majority of the project would be elevated above the existing ground level in order to ensure flood free passage of vehicles. Therefore it is expected that fill will need to be imported to the site and excavation works will be limited to piled foundations for the roadway and bridge structures.

The main operational activity will be ongoing road maintenance consistent with VicRoads and Roads and Maritime Services (Roads and Maritime) practices and standards, including the maintenance of landscape, stormwater drains, retention basins, road pavement, bridges, electrical assets, traffic signals, road furniture and line marking.

More specifically, the Mid-West alignment includes:

- Upgrade works along Warren Street, including line marking and intersection upgrades at Homan Street and Redman Street;
- Provision for the upgrade of an existing service road on the western side of Warren Street between Homan Street and Redman Street;
- Line marking for a dedicated extended right-turn lane for traffic turning into Homan Street;
- Construction of a new 'three-leg' roundabout approximately on Warren Street approximately 120 metres south of Campaspe Esplanade;
- Construction of a new road extending north-west from Warren Street and construction of a new bridge across the Campaspe River and Crofton Street;

- Construction of a new road extending north over part of the former Echuca College site and construction of a new road on protective pavement on the edge of an existing sandhill;
- A new road extending north-east over the western end of the tennis courts and to the north of the Echuca Caravan Park;
- Construction of a new bridge over the Murray River near the existing boat ramp;
- Construction of an elevated road east of the Murray River across Boundart Road, connecting with the Cobb Highway at Meninya Street;
- Signalising the intersection of the Cobb Highway Highway / Meninya Street and Perricoota Road; and
- Construction of Francis Street to intersect with the Cobb Highway and creation of a new signalising intersection.

2.2. Disturbance footprint

The area of land to be disturbed to allow for the construction of the Mid-West alignment is presented in Figure 2 as the construction footprint.

2.3. Project Stages

Initial construction of the Echuca-Moama Bridge would be a single carriageway highway, one lane in each direction, maintaining most existing local road and property access directly or via a new service road. In some instances, local road connectivity may be closed with alternative access arrangements provided.

The proposal to set aside land for possible future construction of a second carriageway to provide a four lane divided carriageway would result in a larger footprint and in some cases wide medians to allow for special intersection treatments to accommodate large turning vehicles.

For this current assessment of impacts on Matters of National Environmental Significance (MNES), the study area allows for the potential future four lane divided highway scenario and assess the largest potential impact resulting from the project. The Project would involve a Planning Scheme Amendment in Victoria that applies a Public Acquisition Overlay to land which is sufficient to include the potential future four lane divided carriageway concept.

2.4. Overall project timing

The construction of the initial alignment is subject to the provision of funding and is expected to take three years to complete. Timing for the ultimate duplication is subject to traffic demands on the road network.

Once planning and environmental approvals are obtained, the two main activity sequences which follow are pre-construction and construction. The timing of commencement construction of the approved option would dependent on the availability of construction funding, but once available the land acquisition and pre-construction activities may commence.

The pre-construction phase would include detailed site investigations, land acquisition and detailed design, and take around six to nine months to complete.

Depending on the method of project delivery, e.g. construct only, or design and construct, detailed design may be undertaken concurrently with land acquisition. Tendering the contract for construction would take around six months until award. Construction of the Project is expected to take up to three years, subject to project funding.

The operational phase would proceed thereafter.

3. DESCRIPTION OF THE ENVIRONMENT

3.1.1. *Wildlife Connectivity and corridors*

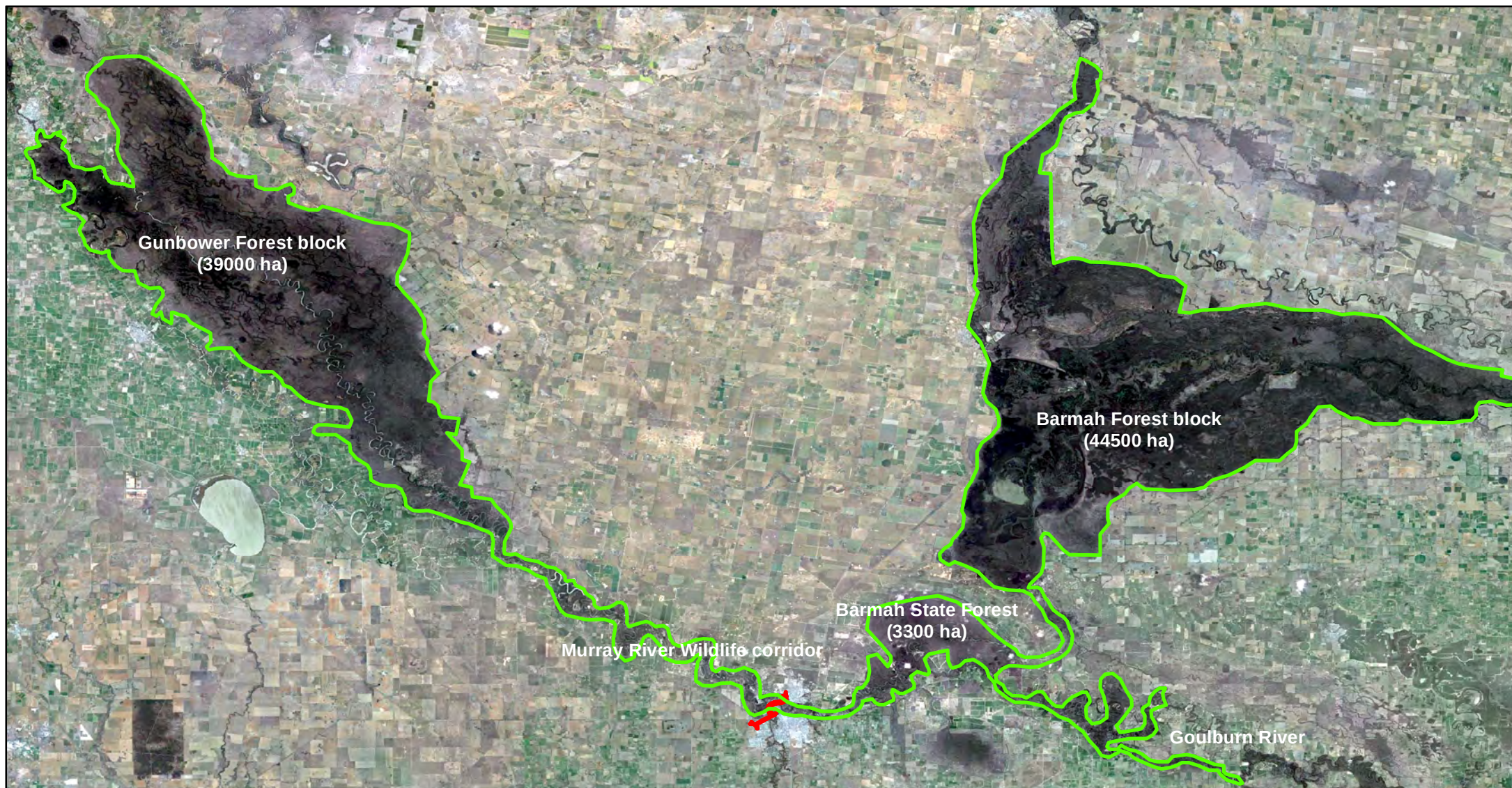
Aerial photography reveals that the native vegetation in the study area constitutes a small portion of a long and often tenuous wildlife corridor between two very large and important areas of native vegetation: to the north-east, the 'Barmah block' (approximately 44500 hectares), which comprises Barmah National Park (NP), Moira NP, Murray Valley NP, Gulpa Island NP and Tuppel NP; to the north-west, the 'Gunbower block' (approximately 39000 hectares), which comprises Gunbower NP, Perricoota State Forest (SF) and Koondrook SF. An important part of the wildlife corridor between Echuca-Moama and the Barmah block is another large area of native vegetation: the Barmah State Forest (approximately 3300 hectares). There are also several other far smaller reserves scattered along the wildlife corridor. The wildlife corridor is approximately 65 kilometres long and is centred on the Murray River and its tributaries and, excluding the Barmah State Forest, ranges in width from over two kilometres to as little as 150 metres (including the river channel). The confluence of the Murray River and Goulburn River is situated in the Barmah State Forest, and native vegetation along the Goulburn River provides another even longer wildlife corridor (approximately 100 kilometres long) through Shepparton and Murchison to the Rushworth State Forest block, some 65 Kilometres south-east of Echuca-Moama. The spatial distribution of the forest blocks and connecting wildlife corridors are presented in Figure 3 and Figure 4. The forest blocks and wildlife corridor in the greater region are situated within a matrix of predominantly cleared agricultural land, which is hostile to all but hardy generalist species, such as common farmland birds.

Terrestrial wildlife habitat in the study area has been reduced to a series of woodland remnants associated with the Murray and Campaspe Rivers. For less mobile species, the current state of the riparian corridor is effectively fragmented, with either cleared land or waterways representing barriers to movement.

The existing Echuca township, approximately five kilometres north to south and 4.5 kilometres east to west, comprises a fairly dense mix of residential areas and business precincts. It is gridded with local and through roads and scattered recreation reserves occur within it. Most of the town lies between the Campaspe and Murray Rivers and the Deakin Main Drain. Just over the border to the north, in New South Wales, occurs Moama, which is similar to Echuca in its geography and land use. Habitats in the two townships are generally of low biodiversity value. Echuca and Moama limit the extent of the Murray River vegetation corridor, placing pressure on biodiversity, which still depend upon the corridor for gene flow.

The proposed road carriageway would impact an approximately 200 metre wide x 2.25 kilometre long section of the wildlife corridor (in NSW and Victoria).

The study area is situated in a section of the corridor, which is already very narrow compared to other sections between the aforementioned core areas. While the Project will reduce the extent of vegetation in this section of vegetation corridor further it is unlikely to reduce gene flow along the corridor below current levels.



Legend

- Study area
- Habitat connectivity

Kilometers

0 5 10 20

Figure 3: Regional scale habitat connectivity

Project: Murray River Crossing Echuca

Client: VicRoads

Project No.: 8194

Date: 15/06/2015

Created By: M. Ghasemi / B. MacDonald

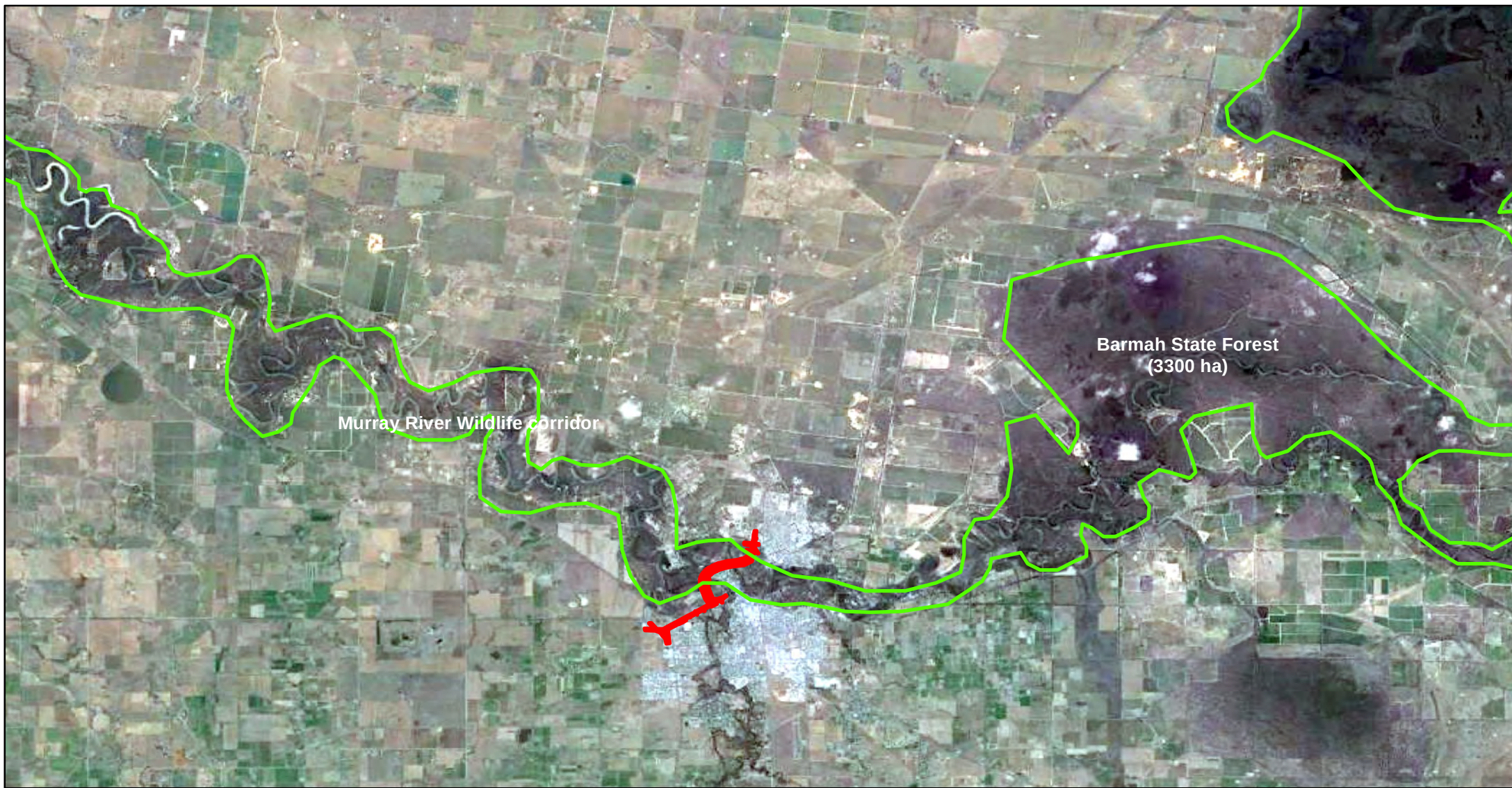
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Legend

- Study area
- Habitat connectivity

0 2 4 8 Kilometers

Figure 4: Local scale habitat connectivity

Project: Murray River Crossing Echuca

Client: VicRoads

Project No.: 8194

Date: 15/06/2015

Created By: M. Ghasemi / B. MacDonald

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3.2. General description of the environment

The study area for this investigation (Figure 2) encompasses the (preferred) Mid-West Corridor of the second Murray River Crossing at Echuca-Moama. This investigation corridor occurs between the intersection of the Murray Valley Highway and Warren Street in Echuca, and the Cobb Highway and Perricoota Road intersection in Moama via a corridor to the north of the Echuca Cemetery and crossing the Murray River to the north of the Echuca Caravan Park.

Most of the study area supported native vegetation, including extensive contiguous areas of Black Box and River Red-gum dominated woodland. Remaining parts of the study area included open roadside areas at either end of the corridor, disturbed open land in the area of the recently removed Echuca Secondary College and existing recreation areas in Echuca (tennis courts, sports oval and netball courts). In NSW, the land between the Murray River and Bounday Road predominantly privately owned and used for passive recreation.

The investigation corridor encompasses approximately 116 hectares of land, extending 4.5 kilometres in length and 400 metres in width at its widest point. Tenure of the study area in Victoria is predominantly public, and mostly serves the purpose of recreation and/or conservation. This includes the larger, accessible areas of bushland either side of the Campaspe River and on the Victorian side of the Murray River. Some small areas are in private ownership and are used for horse grazing and/or passive uses.

The study area is composed throughout of fertile to heavy clay soils on a mostly flat landscape.

Observed vegetation in the Victorian part of the study area consisted of River Red-gum and Black Box dominated woodland with a large number of large old trees. Areas of native vegetation varied in quality throughout the Victorian section of the study area. Large contiguous areas of Black Box dominated woodland exist north of Warren Street. This area supported some of the highest quality vegetation in the Victorian section of the corridor, supporting a sparse, but mostly native understorey.

The areas to the north of the Echuca cemetery as well as either side of the Campaspe River were dominated by River Red-gum. These areas, while supporting several large trees and a contiguous canopy, had a highly disturbed ground layer, distinguished by a dense cover of introduced grasses such as Rye Grass and Great Brome. Indigenous plants including Pale-fruit Ballart, Tangled Lignum and various other herbs and shrubs occurred in these areas at low cover.

An area of semi-arid woodland vegetation distinguished by the presence of the Murray Pine as the main canopy species occurred on a raised area of sandy soil (referred to herein as 'the Sandhill'). While supporting an indigenous canopy of Murray Pines (*Callitris gracilis* subs. *murrayensis*), this area was distinguished by the dense carpet of Bridal Creeper, a highly invasive weed species that has taken over the ground layer.

Further Black Box dominated woodland occurs to the north and south of the Sandhill. The remaining areas of the Victorian side of the study area support River Red-gum Forest, distinguishable by the high occurrence of large old River Red-gums. River Red-gum Forest was recorded to the west of the Sandhill as well as in

a narrow band abutting the Murray River at the northern limit of the Victorian section of the study area.

Few indigenous scattered trees were recorded along roadsides either side of the Murray Valley Highway and Warren Street intersection.

The Victorian section of the study area falls within the North Central CMA and occurs across the boundary of the Victorian Riverina and Murray Fans bioregions. Based on interpretation of DSEs online biodiversity mapping, the Campaspe River has been used as the boundary between the two bioregions, with the Victorian Riverina occurring to the south and the Murray Fans occurring to the north of the Campaspe River.

Observed vegetation on the New South Wales side of the study area consisted of several age cohorts of River Red-gums with the oldest occurring adjacent to the Murray River. Distinct patches of River Red-gum regrowth occurred within this area and are likely to be due to previous disturbance events.

A large area of forested wetland occurred within the north eastern section of the corridor. This area supported a sparse canopy of large River Red-gums with an indigenous understorey component dominated by wetland species including Common Spike-sedge, Poong'ort and various rushes, grasses and herbs. Small billabongs existed within River Red-gum vegetation in the north-eastern part of the study area.

Few indigenous scattered trees were recorded along roadsides either side of the Cobb Highway and Perricoota Road intersection.

The New South Wales section of the study area falls within the Murray CMA and the Murray Fans CMA sub-region and occurs within the Riverina (Murray Scalded Plains and Murray Channels and Floodplains) bioregion.

Aquatic habitats within the study area comprised both the Campaspe and Murray Rivers which dissect the study area as well as two sets of billabongs; a large billabong in Victoria near the Campaspe which was found to be predominantly dry at the time of surveying and a small artificial wetland in New South Wales on private land which was full of water during the surveys.

Detailed descriptions of native vegetation recorded in the study area are provided in the following existing biodiversity reports, which are attached to this report:

- Second Murray River Crossing at Echuca-Moama, Detailed Flora and Fauna Assessment, Brett Lane and Associates (BL&A 2011 (Attachment 2);
- Mid-West 2 Murray River Crossing at Echuca-Moama, Detailed Flora, Fauna, Native Vegetation and Net Gain Assessment, Brett Lane and Associates (BL&A 2013b (Attachment 4);
- Echuca-Moama Bridge Project: biodiversity and habitat impact assessment EES report, Brett Lane and Associates (BL&A 2015) (Attachment 5); and
- Second Murray River crossing at Echuca – Moama: biodiversity assessment of alignment in NSW, Brett Lane and Associates (BL&A 2014) (Attachment 6).

It should be noted that the later two reports contain information that is more up to date than the two earlier reports.

3.3. Land use

3.3.1. Study area

Land use in the study area south of the Murray River appears to be largely passive recreation at present although past disturbance, some severe, was evident near the Murray River where vegetation had been cleared sometime in the past. Sand mining has also occurred in the fluvial sand bed area, rendering it largely devoid of vegetative cover.

Land use in the study area north of the Murray River appears to be predominately residential and commercial, where the vast majority of native vegetation has been previously cleared.

3.3.2. Local region

The greater township of Echuca-Moama has grown considerably in recent times, particularly Echuca, which has resulted in the removal or modification of a considerable amount of native vegetation. By Victorian standards, the area of native vegetation that remains in the township environs is impressive, especially for a town that size. Although much of that native vegetation is protected as park or reserve, a considerable amount is in private ownership, where it is likely to become increasingly degraded.

Native vegetation within the township environs has obviously had a long history of disturbance, as evidenced by its current condition. Given the increasing popularity of Echuca-Moama as a tourist destination, it is envisaged that the condition of native vegetation in the township environs will steadily decline due to increasing public utilisation for recreation activities.

In the greater region, land use is largely agricultural, and mostly intensive.

4. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Matters of national environmental significance (MNES) which may be affected by the proposal are discussed in this section.

4.1. Summary of sources of information

For all MNES discussed in this report, the following sources of information were used to identify and assess these values:

- Database searches and assessment of existing information obtained from within a ten kilometre radius of the development site:
 - Atlas of Victorian Wildlife (AVW);
 - DEPI Biodiversity Interactive Maps;
 - EPBC Act Protected Matters Search Tool (PMST);
 - NSW BioMetric 2.0 Tool;
 - NSW Critical Habitat Register (CHR);
 - NSW Threatened and Protected Fish Species Records Viewer (TPFSRV);
 - The Atlas of New South Wales Wildlife (ANSWW);
 - The New Atlas of Australian Birds;
 - The Victorian Biodiversity Atlas (VBA); and
 - Viridans Flora Information System (FIS).
- Existing biodiversity reports for the proposal:
 - Echuca Bridge Planning Study - Mid West 2 Option Aquatic Flora and Fauna Assessment (GHD 2013 (Attachment 7);
 - Second Murray River Crossing at Echuca-Moama, Detailed Flora and Fauna Assessment, Brett Lane and Associates (BL&A 2011 (Attachment 2);
 - Mid-West 2 Murray River Crossing at Echuca-Moama, Matters of National Environmental Significance, Brett Lane and Associates (BL&A 2013a (Attachment 3);
 - Mid-West 2 Murray River Crossing at Echuca-Moama, Detailed Flora, Fauna, Native Vegetation and Net Gain Assessment, Brett Lane and Associates (BL&A 2013b (Attachment 4);
 - Echuca-Moama Bridge Project: biodiversity and habitat impact assessment EES report, Brett Lane and Associates (BL&A 2015) (Attachment 5); and
 - Second Murray River crossing at Echuca – Moama: biodiversity assessment of alignment in NSW, Brett Lane and Associates (BL&A 2014) (Attachment 6).

It should be noted that the later two BL&A reports (Attachments 5 and 6) contain information that is more up to date than the earlier BL&A reports.

- The above-listed BL&A biodiversity assessments included the following field surveys:
 - General flora and fauna surveys:
 - Flora, native vegetation and fauna assessment: 13/10/2008 to 15/10/2008;
 - Follow up flora and native vegetation assessment: 21/07/2010 to 22/07/2010; and
 - Follow up flora, native vegetation and fauna assessment: 26/09/2011 to 30/09/2011.
 - Targeted flora and fauna surveys:
 - Flora targeted surveys: 06/01/2009 to 08/01/2009 and 21/11/2011 to 23/11/2011 (Victoria and NSW) for the following listed species:
 - Chariot Wheels;
 - Hairy tails;
 - River Swamp Wallaby-grass;
 - Silky Swainson-pea;
 - Slender Darling-pea;
 - Small Scurf-pea; and
 - Western Water Starwort.
 - Spotlighting and call playback for Barking Owl and Masked Owl: 14/10/2008 (Victoria only);
 - Spotlighting and call playback for Bush Stone-curlew and Squirrel Glider, and Diurnal search for Bush Stone-curlew: 06/01/2009 to 08/01/2009;
 - Spotlighting and call playback for Bush Stone-curlew: 26/09/2011 to 27/09/2011 (Victoria and NSW);
 - Spotlighting and call playback for Bush Stone-curlew, Squirrel Glider and Barking Owl: 08/11/2011 to 17/11/2011 (Victoria and NSW);
 - Growling Grass Frog surveys: 13/10/2008 to 15/10/2008, 26/09/2011 to 30/09/2011 and 17/10/2012 to 18/10/2012 (Victoria and NSW);
 - Hair tube trapping for Squirrel Glider: 26/09/2011 to 27/09/2011 and 08/11/2011 to 22/11/2011 (Victoria and NSW);
 - Arboreal cage trapping for Squirrel Glider: 15/10/2012 to 18/10/2012 (NSW only);
 - First bat survey: 08/11/2011 to 22/11/2011 (Victoria and NSW);

- Second bat survey: 24/02/2012 to 14/03/2012 (Victoria and NSW); and
- Hollow-bearing tree survey, particularly for potential Squirrel Glider habitat: 17/10/2012 (NSW only).

For a detailed account of the sources of information used in this report, see the most recent BL&A biodiversity reports for the study area (BL&A 2015 (Attachment 5) & 2014 (Attachment 6)).

4.2. MNES status in the study area

4.2.1. EPBC Act listed flora species

Database searches from the Flora Information System (FIS) of Victoria (Viridans Biological Databases 2014), the Wildlife Atlas of New South Wales (OEH 2011) and the EPBC Protected Matters Search Tool (DSEWPC 2014) indicate that within the search region there are records of, or there occurs potential suitable habitat for nine flora species listed under the Commonwealth EPBC Act. The likelihood of occurrence in the study area of EPBC Act listed flora species is addressed in Table 1. Suitable habitat was considered to exist for four EPBC Act listed flora species within areas of high quality Black Box dominated woodland in Victoria and Forested Wetland in New South Wales based on this assessment. These were:

- Chariot Wheels;
- River Swamp Wallaby-grass;
- Slender Darling-pea; and
- Western Water Starwort.

Targeted flora surveys

Targeted flora surveying was undertaken in areas of suitable habitat in the current study area in January 2009 and in the Mid-West 2 alignment corridor (to the immediate west of the existing study area) in November 2011. The timing of these surveys captured the peak flowering times for all of the above listed species. None of the above listed threatened flora species were recorded during these surveys and therefore they are all considered unlikely to occur. The results of the targeted flora survey are reflected in Table 1.

Table 1: EPBC Act listed flora species and likelihood of occurrence

Common Name	Scientific Name	Conservation Status	Habitat	Flowering period	Likelihood of occurrence in study area
Chariot Wheels	<i>Maireana cheelii</i>	V	Usually found on heavier, grey clay soils with Bladder Saltbush (DEC 2005).	October (end of flowering, start of fruiting)	Not recorded during either of the two targeted surveys. Only the November 2011 survey was conducted during the flowering/fruiting period, which was limited to the MidWest 2 alignment corridor. Considering the species was not detected in that survey (in higher quality vegetation) it is considered – unlikely to occur.
Ridged Spider-orchid (Greencomb Spider-orchid)	<i>Caladenia tensa</i>	E	Eucalyptus and Callitris woodland in well drained sandy loams. Grows among shrubs (Jones 2006).	N/A	Area of sandy soil within the study area is limited to ‘the Sandhill’ behind the old Echuca Secondary College in Victoria. While this area supports a Callitris dominated canopy, the under-storey is highly disturbed and covered by a thick layer of bridal creeper throughout. No suitable habitat – Unlikely to occur.
Red Swainson-pea	<i>Swainsona plagiotropis</i>	V	Grows on flat grassland and in heavy red soil. Occurs in the upper Murray River valley in the south-western plains of NSW and into Victoria (DEC 2005).	N/A	No grassland habitat recorded within the study area – unlikely to occur.
Ridged Water-milfoil	<i>Myriophyllum porcatum</i>	V	Rare and restricted to northern and north western Victoria where it has been recorded growing in temporary waterholes, lagoons, farm dams, and rock holes and on clay pans (Jeanes 1996a).	N/A	Endemic to Victoria. Ground layer of River Red-gum dominated woodland on the Victorian side of the study area is highly degraded and disturbed. No suitable habitat in Victoria. Does not occur in NSW – Unlikely to occur.
River Swamp Wallaby-grass	<i>Amphibromus fluitans</i>	V	Confined to permanent swamps principally along the Murray River between Wodonga and Echuca, uncommon to rare in the south (Walsh 1994).	November to March (Species only emerges when inundated)	Suitable habitat in Forested Wetland habitat in New South Wales. Not recorded during either targeted survey, which were both conducted during flowering period, and most of the suitable habitat was inundated during the November 2011 survey – unlikely to occur.
Slender Darling-pea	<i>Swainsona murrayana</i>	V	In black box and grassland on level plains, floodplains and depressions (DEC 2005). Seasonally inundated flats and around lakes (Jeanes, 1996b).	September to December	Suitable habitat in Black Box Woodland in Victoria and Forested Wetland habitat in New South Wales. Not recorded during either of the two targeted surveys. Only the November 2011 survey was conducted during the flowering/fruiting period, which was limited to the MidWest 2 alignment corridor. Considering the species was not detected in that survey (in higher quality vegetation) it is considered – unlikely to occur.
Spiny Rice-flower	<i>Pimelea spinescens</i> subsp. <i>spinescens</i>	C	Grasslands or open shrublands on basalt derived soils (Entwisle 1996b).	N/A	No suitable grassland habitat recorded within study area – unlikely to occur.
Turnip Copperburr	<i>Sclerolaena napiformis</i>	E	Grasslands on clay-loam soils (DEC 2005).	N/A	No suitable grassland habitat recorded within study area – unlikely to occur.
Western Water-starwort	<i>Callitriche cyclocarpa</i>	V	NSW and Victoria in thick patches in floodwaters (DEC 2005). Mostly aquatic, in damp, swampy places (Jeanes, 1999).	September to December	Suitable habitat in Forested Wetland habitat in New South Wales. Not recorded during either of the two targeted surveys. Only the November 2011 survey was conducted during the flowering/fruiting period, which was limited to the Mid-West 2 alignment corridor. Considering the species was not detected in that survey (in higher quality vegetation) it is considered – unlikely to occur.

C = Critically Endangered; E = Endangered; V = Vulnerable.

4.2.1. EPBC Act listed ecological communities

The review of existing information revealed that the following EPBC Act listed ecological communities were either known to exist in the search region or modelling predicted their occurrence there:

- Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions (endangered);
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (endangered);
- Natural Grasslands of the Murray Valley Plains (critically endangered);
- Weeping Myall Woodlands (endangered); and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (critically endangered).

When compared against the community descriptions and qualifying criteria for the above listed communities, none of the habitat in the study area qualified as an EPBC Act-listed ecological community.

4.2.2. EPBC Act listed fauna species

The review of existing information and current field survey indicate that within the search region 28 EPBC Act listed fauna species (16 bird, four mammal, one reptile, one frog, five fish and one invertebrate) may occur within the study area. Their likelihood of occurrence within the study area is assessed and presented in Table 2. Species that are likely to occur are highlighted.

Of the EPBC Act listed fauna species predicted to occur in the study area, only one species was recorded. This was:

- Rainbow Bee-eater (migratory).

The location of EPBC Act listed fauna species recorded during the investigation is presented in Figure 5. EPBC Act listed fauna species recorded in and adjacent to the study area are discussed in the following sections.

Based on the likelihood of occurrence assessment for EPBC Act listed fauna species, suitable habitat was deemed to occur in the study area for 11 species, including the one recorded. These 11 species are discussed in more detail below. Species considered unlikely to occur based on lack of suitable habitat or lack of recent and regular records from the search region are not highlighted and not discussed further (with the exception of South-eastern Long-eared Bat and Growling Grass Frog).



Legend

Study area

EPBC Listed

+ Rainbow Bee-eater

0 250 500 1,000 Metres

Figure 5: Threatened Fauna Species recorded

Project: Murray River Crossing Echuca

Client: VicRoads

Project No.: 8194

Date: 24/06/2015

Created By: K. Al-Dabbagh / M. Ghasemi

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Table 2: EPBC Act listed fauna identified as occurring or potentially occurring in the study area

Common Name	Scientific Name	Conservation Status	Habitat	Number of Records from databases		Likelihood of Occurrence
				NSW	Vic	
Birds						
Australasian Bittern	<i>Botaurus poiciloptilus</i>	EN	Usually inhabits permanent freshwater wetlands with tall dense vegetation, particularly those dominated by sedges, rush, reeds or cutting grass (Marchant and Higgins 1990).	0	0	No suitable habitat and lack of recent and regular records, unlikely to occur
Australian Painted Snipe	<i>Rostratula australis</i>	VU, M (CAMBA)	Shallow freshwater or brackish swamps, usually inland and often ephemeral, with emergent vegetation such as River Red Gum and Lignum and muddy margins. Uncommon summer visitors to Victoria (Marchant and Higgins 1993; Garnett and Crowley 2000).	0	0	No suitable habitat and lack of recent and regular records, unlikely to occur
Cattle Egret	<i>Ardea ibis</i>	M (JAMBA, CAMBA)	Terrestrial freshwater wetlands and pasture, in association with cattle (Marchant and Higgins 1990).	0	2	No suitable habitat and lack of recent and regular records, unlikely to occur
Eastern Great Egret	<i>Ardea modesta</i>	M (JAMBA, CAMBA)	Variety of wetlands including estuaries and intertidal mudflats; various permanent and ephemeral freshwater, brackish and saline wetlands; shallows of deep permanent lakes (Marchant and Higgins 1990).	0	8	Suitable habitat present in wetland habitats along the Murray River and billabongs, likely to occur
Fork-tailed Swift	<i>Apus pacificus</i>	M (JAMBA, CAMBA, ROKAMBA)	Aerial, over inland plains, sometimes above foothills or in coastal areas, over cliffs and urban areas (Higgins 1999).	0	0	May occasionally fly over the study area, potential to occur
Latham's Snipe	<i>Gallinago hardwickii</i>	M (JAMBA, CAMBA, ROKAMBA, Bonn Convention (A2H))	Occurs in wide variety of permanent and ephemeral wetlands; it prefers open freshwater wetlands with dense cover nearby, such as the edges of rivers and creeks, bogs, swamps, waterholes (Naarding 1983; Higgins and Davies 1996).	0	0	Suitable habitat present in wetlands, however due to lack of any records it is considered unlikely to occur
Malleefowl	<i>Leipoa ocellata</i>	M, VU	Mainly in semi-arid zones in heath and mallee-heath, rarely arid zones. Associated with mallee, particularly floristically rich tall dense mallee of higher rainfall areas (Marchant and Higgins 1993).	0	0	No suitable habitat, unlikely to occur
Plains Wanderer	<i>Pedionomus torquatus</i>	VU	This species inhabits native grasslands with sparse cover, preferring grasslands that include Wallaby Grass and Stipa species. In Victoria no recent records in south east, sporadic reports from Keilor–Werribee Plains. Widespread in small areas in the mallee, most common in northern Victoria between Bendigo and Swan Hill (Marchant and Higgins 1993).	0	2	No suitable habitat, unlikely to occur
Rainbow Bee-eater	<i>Merops ornatus</i>	M (JAMBA)	Usually in open or lightly timbered areas, often near water. Occur in partly cleared land such as farmland and in sand-dunes, both coastal and inland (Higgins 1999).	1	14	Birds observed flying over the study area in woodland habitats, Recorded in the study area
Regent Honeyeater	<i>Anthochaera phrygia</i>	EN, M (JAMBA)	Mainly occurs in dry sclerophyll forests and box-ironbark woodlands with copious flowering eucalypts and/or mistletoes, usually near rivers and creeks on inland slopes of the Great Dividing Range. It can also occur in small remnant patches or isolated clumps of mature flowering trees in farmland, coastal or urban areas. Occur in northern and central Victorian box-ironbark forests. It is now considered extinct in western Victoria (Higgins <i>et al.</i> 2001).	0	0	No suitable habitat and lack of recent and regular records, unlikely to occur
Rufous Fantail	<i>Rhipidura rufifrons</i>	M (Bonn Convention (A2H))	Primarily found in dense, moist habitats. Less often present in dry sclerophyll forests and woodlands (Higgins <i>et al.</i> 2006).	0	0	No suitable habitat and lack of recent and regular records, unlikely to occur

Common Name	Scientific Name	Conservation Status	Habitat	Number of Records from databases		Likelihood of Occurrence
				NSW	Vic	
Satin Flycatcher	<i>Myiagra cyanoleuca</i>	M (Bonn Convention (A2H))	Tall forests and woodlands in wetter habitats but not in rainforest (Higgins <i>et al.</i> 2006).	0	0	No suitable habitat and lack of recent and regular records, unlikely to occur
Superb Parrot	<i>Polytelis swainsonii</i>	VU	It occurs in riparian River Red Gum forests and adjacent areas of box eucalypt vegetation from the Murrumbidgee and Murray Rivers northwards to the Namoi Valley (Higgins 1999).	2	0	Suitable habitat present, but lack of recent and regular records, potential to occur
Swift Parrot	<i>Lathamus discolor</i>	EN	This species prefers a narrow range of eucalypts in Victoria, including White Box, Red Ironbark and Yellow Gum as well as River Red Gum when this species supports abundant 'lerp'. It breeds in Tasmania and migrates to the mainland of Australia for the autumn, winter and early spring months (Higgins 1999; Kennedy and Tzaros 2005).	1	0	Suitable foraging habitat present when River Red-gum is flowering, but lack of recent and regular records, potential to occur
White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i>	M (CAMBA)	Occurs in maritime habitats, terrestrial large wetlands and coastal lands of tropical and temperate Australia and offshore islands. Its range extends far inland only over large rivers and wetlands (Marchant and Higgins 1993).	0	1	Suitable habitat present along Murray River, may occasionally fly over, but lack of recent and regular records, potential to occur
White-throated Needletail	<i>Hirundapus caudacutus</i>	M (JAMBA, CAMBA, ROKAMBA)	Aerial, over all habitats, but probably more over wooded areas, including open forest and rainforest. Often over heathland and less often above treeless areas such as grassland and swamps or farmland (Higgins 1999).	0	1	May fly over the study area during summer months, potential to occur
Mammals						
Brush-tailed Rock Wallaby	<i>Petrogale penicillata</i>	VU	Rock faces with large tumbled boulders, ledges and caves (Menkhorst 1995).	0	0	No suitable habitat and lack of recent and regular records, unlikely to occur
South-eastern Long-eared Bat (south-eastern form)	<i>Nyctophilus Corbeni</i>	VU	Occurs in a range of inland woodland and shrubland communities including box, ironbark and cypress pine woodlands (Menkhorst 1995, DSEWPC 2013).	1	0	Habitat initially deemed suitable. Targeted surveying undertaken. Initial analysis of recorded calls indicated species was present. Peer Review (Gration 2015) found species was not recorded, nearest reliable record is 50 km distant and habitat is not suitable. Species unlikely to occur .
Koala	<i>Phascolarctos cinereus</i>	VU	Inhabits schlerphyll forests and woodlands on both sides of the GDR. Arboreal, agile climbers and mostly solitary (Menkhorst 1995).	1	0	Suitable habitat present, but lack of recent and regular records, potential to occur
Spot-tailed Quoll	<i>Dasyurus maculatus maculatus</i>	EN	Rainforest, wet and dry forest, coastal heath and scrub and River Red-gum woodlands along inland rivers (Menkhorst 1995).	0	0	No suitable habitat and lack of recent and regular records, unlikely to occur
Reptiles						
Striped Legless Lizard	<i>Delma impar</i>	VU	Tussock grasslands on the volcanic plains often associated with scattered rocks and cracked soils (Cogger 2000).	0	0	No suitable habitat and lack of recent and regular records, unlikely to occur
Frogs						
Growling Grass-frog/Southern Bell Frog	<i>Litoria raniformis</i>	VU	Permanent, still or slow flowing water with fringing and emergent vegetation in streams, swamps, lagoons and artificial wetlands such as farm dams and abandoned quarries (Clemann and Gillespie 2004).	0	0	Suitable habitat in wetlands in the study area, however was not recorded during three targeted surveys, now considered unlikely to occur
Freshwater fish						
Macquarie Perch	<i>Macquaria australasica</i>	EN	Cool, clear water of rivers and lakes. Favours slower moving water (Allen <i>et al.</i> 2002).	0	0	No suitable habitat in the study area, unlikely to occur
Murray Cod	<i>Maccullochella peelii</i>	VU	Slow flowing turbid water of rivers and streams of low elevation; also fast flowing clear upland streams (Allen <i>et al.</i> 2002).	1	0	Suitable habitat along the Murray River and Campaspe River, likely to occur

Common Name	Scientific Name	Conservation Status	Habitat	Number of Records from databases		Likelihood of Occurrence
				NSW	Vic	
Murray Hardyhead	Craterocephalus fluviatilis	EN	Lakes and billabongs, mostly around dense vegetation (Allen et al. 2002).	0	0	Marginal habitat in wetlands along the Murray River and Campaspe River, lack of recent and regular records and not detected in aquatic survey, unlikely to occur
Silver Perch	Bidyanus bidyanus	CE	Rivers, lakes and reservoirs, preferring area of rapid flow. Originally in most of the Murray river, but currently numbers have declined (Allen et al. 2002).	0	0	Suitable habitat along the Murray River and Campaspe River, likely to occur
Trout Cod	Maccullochella macquariensis	EN	Rapidly flowing streams, around the cover of logs and debris, over rocky or gravel bottoms (Allen et al. 2002).	1	0	Marginal suitable habitat along the Murray River and Campaspe River, potential to occur
Invertebrates						
Golden Sun Moth	Synemon plana	CE	Areas that are, or have been native grasslands or grassy woodlands. It is known to inhabit degraded grasslands with introduced grasses being dominant, with a preference for the native wallaby grass being present (DEWHA 2009).	0	0	No suitable habitat and lack of recent and regular records, unlikely to occur

CE – Critic ally endangered; **EN** – Endangered; **VU**– Vulnerable; **M** = Listed migratory species; **(JAMBA)** = Japan-Australia Migratory Bird Agreement; **(CAMBA)** = China-Australia Migratory Bird Agreement; **(ROKAMBA)** = Republic of Korea- Australia Migratory Bird Agreement; **(Bonn Convention (A2H))** = listed under Section of Bonn Convention.

* = The figure is only an estimate based on number of calls (average calls of 1.6/night/site in Nov. And 2.9 calls/night/site in February–March)

Birds

Based on the initial assessment, seven listed threatened bird species were considered likely to occur in the study area. These are discussed below.

Non-migratory birds

Two EPBC Act listed non-migratory bird species were considered to have potential to occur within the study area, due to the presence of suitable habitats; these were:

Swift Parrot (endangered)

The Swift Parrot migrates (but is not listed as a migratory species under the EPBC Act) to Victoria from Tasmania in winter to feed on the flowering eucalypts of the inland slopes of the Great Divide. The species is considered as nomadic in Victoria and NSW, with movements being determined by flowering eucalypts (Emison et al. 1987; Higgins et al. 2001). Although the Swift Parrot may occasionally pass through the study area, it is highly unlikely it would occur regularly or in significant numbers. Within the search region, there are no records of the species in the AVW but one record in the ANSWW, and although the study area contains potential foraging habitat, the preferred food trees of the species in this region, such as Red Ironbark, Grey Box, Yellow Gum and White Box, were absent.

Superb Parrot (vulnerable)

This species occurs mainly in mature healthy River Red-gums in forest growing on river flats along with Yellow Box, Black Box and Cypress Pine (Higgins 1999). Forest and woodlands often contain an open mid-storey of wattles and ballart. It nests in the hollows of large trees (dead or alive), mainly in tall, riparian River Red-gum forest or woodland.

During the initial stages of the project, existing information was reviewed to determine whether Superb Parrot was likely to occur in the study area. Sources included the EPBC Act protected Matters Search Tool (PMST) and the Atlas of Victorian Wildlife (AVW). These sources indicated that the species was likely to occur given the presence of suitable habitat.

In response to the Referral (EPBC Reference 2013/6850) submitted by BL&A in May 2013, the Department of the Environment request further information on the likelihood of occurrence of Superb Parrot in the study area and surrounds. The following incorporates a summary of the response to the request for further information on the status of Superb Parrot in the study area. For the full response, see Attachment 8 to this report.

Two additional databases were searched: the Birds Australia Atlas and Victorian Biodiversity Atlas (VBA). As expected, the Birds Australia Atlas distribution map of Superb Parrot shows that the species has been recorded, albeit at a low reporting rate (i.e. less than 11%).

A search for Superb Parrot records was undertaken from the VBA using a 50 kilometre radius search region with Echuca being the centre point. A total of 337 Superb Parrot records have been recorded within 50 kilometres from Echuca. The majority of these records originate from the Barmah forest block, which is a well-known breeding site for the species. The closest records to the study area were

located 21.5 kilometres north-east. There were no records of Superb Parrot from the VBA within the study area or in the surrounding 20 kilometre radius.

These observations are corroborated by observations from BL&A zoologists. BL&A has undertaken a suite of comprehensive ecological assessments within the study area between October 2008 and October 2012. Zoologists and ecologists have spent approximately 197 hours in the field during daylight hours within the study area covering seven months. 84 percent of the surveys were undertaken by zoologists (i.e. 165 hours of survey time). Although no targeted surveys were undertaken for the species, Superb Parrot was not recorded on any of these occasions.

Native vegetation in the study area and surrounds (which is within the wildlife corridor) were not considered to be core habitat for this species, as it prefers larger intact forests, such as the Barmah and Gunbower forest blocks (see Section 3.1.1 and Figure 3) both of which provide core habitat for Superb Parrot. The closest large area of suitable Superb Parrot habitat occurs approximately eight kilometres to the north-east of the study area, in Barmah State Forest (see Section 3.1.1 and Figure 3) which is centred on the confluence of the Murray River and Goulburn River. Surprisingly though, there were no Superb Parrot records in this forest block in the records databases. The land matrix in which the forest blocks and wildlife corridors are situated is highly cultivated agricultural land that supports little or no native vegetation.

As previously mentioned, the majority of VBA records originated from Barmah forest block, which is a River Red-gum forest. Other records were from similar habitats at lagoons, waterholes and along water courses. Although there is suitable habitat for the species in the study area, the lack of recent and regular records suggests that this species does not regularly occur there. Superb Parrot may occasionally use the wildlife corridor to travel between the Gunbower and Barmah forest blocks, however most movements are recorded to the north of Echuca in NSW through Mathoura.

Migratory Birds

The EPBC Act Protected Matters Search results also identified suitable habitat in the search region for listed migratory bird species protected under this Act.

Most of the migratory species have not been recorded in the search region and habitat for them (wetter forests and gullies) is absent. Therefore it is expected they would not occur regularly in the study area. These species were:

Rainbow Bee-eater (migratory)

The Rainbow Bee-eater is a summer visitor to the region, was recorded within the study area. The bee-eater was not recorded during the initial 2011 survey, probably as it had not yet arrived in the area, but was later recorded during the November 2011 and October 2012 surveys. It has also previously been reported on both sides of the river in the study area (BL&A 2013b). The Rainbow Bee-eater is widespread in Australia and while listed under the EPBC Act as a migratory species, it is not threatened.

White-bellied Sea-eagle (migratory)

This species may occasionally forage along the Murray River in the local region. One record of this species occurs in the search region from 1999. It is mostly a

coastal species, but is also known to occur along the Murray River (Emison et al. 1987). The species is known to build its nests in River Red-gum trees, and as suitable habitat is present, it has potential to occur in the study area. No nests of this species were found during the assessment and it is unlikely to be a resident in the area on regular basis.

Eastern Great Egret (migratory)

Very limited suitable Eastern Great Egret habitat occurs along the Rivers and the billabongs in the vicinity of the study area. While such habitat would be temporally used for foraging, it is unlikely to support breeding activities.

Fork-tailed Swift and White-throated Needletail (migratory)

These two bird species are highly nomadic when in Australia and move in flocks ahead of weather fronts, often over heavily forested areas. These species have the potential to occur in the study area occasionally due to the presence of suitable habitat.

Mammals

Based on the assessment in Table 2, two EPBC Act listed mammal species were considered likely to occur in the study area. The vulnerability of these species to potential impacts from the proposed development is discussed below.

Koala (vulnerable in NSW only)

Koala inhabits sclerophyll forest and woodlands on both sides of the Great Divide (Menkhorst 1995).

The AVW and VBA contained no records of the species and the ANSWW contained one record from the search region, approximately 10 kilometres west of the study area. No Koalas have been detected in or adjacent the study area during any of the extensive flora and fauna field investigations for this project since 2008. This indicates that there is no evidence of either a current or historical population of the Koala in the vicinity of the study area. It is therefore unlikely that a viable population of the species exists in the study area and locality, however, it has the potential to occur.

Based on descriptions of the habitat in the study area, as described in BL&A (2015) - which is attached to this report, an assessment of whether or not this habitat is critical to the survival of the koala was conducted in accordance with the Department of the Environment's referral guidelines for koala (DoE 2014), henceforth referred to as the "Koala Referral Guidelines".

The key element of the Koala Referral Guidelines for determining critical Koala habitat is the Koala Habitat Assessment Tool, which generates a habitat score of between 0 and 10, based on sub-score criteria for five key habitat attributes.

An appraisal of the application of the Koala Habitat Assessment Tool to the study area and surrounds is provided below in Table 3. This resulted in a habitat score of two. The Koala Referral Guidelines stipulate that habitats which score lower than five are not habitats critical to the survival of the koala.

As such, according to the Koala Referral Guidelines, the habitat in the study area and surrounds is not critical to the survival of the koala.

Table 3: Koala habitat assessment tool appraisal

Attribute	Score	Habitat appraisal	
Koala occurrence	0	Desktop	▪ The EPBC PMST report identified the Koala as ‘species or species habitat known to occur within area’, i.e. the study area search region (10 km radius) ▪ The ANSWW (NSW) revealed 1 koala record in a 10 km radius of the site, that being 10 km from the study area ▪ The VBA (Victoria) did not reveal any koala records in a 10 km radius of the site ▪ The AVW (Victoria) did not reveal any koala records in a 10 km radius of the site
		On-ground	No Koalas have been detected in or adjacent the study area during any of the extensive flora and fauna field investigations for this project since 2008. This indicates that there is no evidence of either a current or historical population of the Koala in the vicinity of the study area
Vegetation composition	+2	Desktop	No vegetation mapping was available for the study area In NSW. Victorian EVC mapping suggested that at least 3 EVC’s likely to support River Red-gum would occur in the study area.
		On-ground	Not enough information was collected during the flora and fauna field investigations to confirm whether or not more than 50% of the trees in the study area and surrounds were koala food trees (<i>Eucalyptus camaldulensis</i>). Our estimates based on surrogates suggest it was close to the 50% threshold. As such, on the precautionary principle, a score of 2 was applied.
Habitat connectivity	0	Aerial photography reveals that the native vegetation in the study area constitutes part a long (approximately 65 km) and often tenuous wildlife corridor between two very large and important areas of native vegetation, which combined are more than 80,000 hectares in extent. However, given that there are a number of ‘Koala hostile’ gaps in this habitat within a few kilometres of the study area, on both sides of the Murray River, Koala habitat contiguous with the study area was less than 500	

Attribute	Score	Habitat appraisal
		hectares in extent.
Key existing threats	0	Koala occurrence was scored 0 above, and there is a significant dog and vehicle threat in the vicinity of the study area.
Recovery value	0	Given the lack of Koala records in the study area and surrounds and the degree of Koala habitat fragmentation and anthropogenic activity, it is unlikely that this habitat will be important for achieving the interim recovery objectives, as outlined in the Koala Referral Guidelines. The two very large areas of contiguous habitat, upstream and downstream from Echuca-Moama on the Murray River (the Barmah and Gunbower forest blocks), are far more likely to be important for achieving the interim recovery objectives.
Total	2	Decision: Not habitat critical to the survival of the koala—assessment of significance not required.

South-eastern Long-eared Bat (vulnerable)

Previously known as Greater Long-eared Bat - south eastern form and Corben's Long-eared Bat

The South-eastern Long-eared Bat is listed as vulnerable in NSW (TSC Act), vulnerable in Victoria (DSE 2007) and nationally vulnerable under the EPBC Act. The species has a limited distribution that is restricted around the Murray-Darling Basin in south-eastern Australia. Even within this region the species' distribution is scattered and has been rarely recorded (Turbill & Ellis 2006). The species inhabits a variety of inland woodland vegetation types, including mallee, Bulloke and box eucalypt dominated communities; they roost in tree hollows, crevices, and under loose bark.

Capture rates vary across the states of the species' distribution with the highest rates being in the Brigalow belt and Nandewar bioregion of New South Wales (capture rate of 7 to 9%). Capture rates are comparably lower in Victoria, at 2% around the Hattah-Kulkyne National Park and 0.04% in other parts of Victoria (Schulz and Lumsden 2010).

Records of the species are very limited in Victoria with the closest two records occurring approximately 50 kilometres west of Echuca near Terrick Terrick National Park. These records date from 1992. Other records in Victoria as sourced from the Atlas of Victorian Wildlife include in Hattah-Kulkyne National Park, Murray-Sunset National Park and in Kaniva, near Little Desert National Park.

There was only one South-eastern Long-eared Bat record in the search region; this was in the Atlas of NSW Wildlife database. Considering that this species was only formally described in 2009, and that distinguishing it from the closely related Gould's Long-eared Bat (*Nyctophilus gouldi*) and Lesser Long-eared Bat (*Nyctophilus geoffroyi*) generally requires capture, historical records are likely to be misrepresentative. It is asserted in the Draft South-eastern Long-eared Bat Recovery Plan (Schulz & Lumsden 2012) that South-eastern Long-eared Bat is considered to be potentially absent from the River Red-gum forests along the Murray River (in which the study area is situated), however there is much about the species that remains unknown.

A peer review of the bat surveys undertaken as part of this assessment (Gration 2015) found the nearest reliable record for this species to Echuca was 50 km distant. The consensus between the experts consulted in undertaking the peer review was that suitable habitat for South-eastern Long-eared Bat is not present within proximity to the study area. Furthermore, many of the experts consulted by Gration (2015) had extensive experience undertaking bat trapping in or near Echuca and none had ever recorded South-eastern Long-eared Bat even though it is known to be readily captured when suitable habitat present.

Bat calls recorded in the study area during the two bat surveys were analysed by bat specialist Dr Greg Richards (Greg Richards and Associates Pty Ltd), who initially identified the calls as belonging to South-eastern Long-eared Bat and one or both of the other long-eared bat species (Gould's Long-eared Bat and Lesser Long-eared Bat). For a detailed account of the results of the bat surveys, see Section 4.2.3 of BL&A (2015), which is provided as Attachment 5 to this report.

However, most bat specialists who identify bats through call analysis in Australia believe that it is not possible to reliably distinguish South-eastern Long-eared Bat from Gould's Long-eared Bat and Lesser Long-eared Bat in south-east Australia, and the later two bats

are known to occur in the general Echuca area (pers com, Dr Lindy Lumsden, Principal Research Scientist, Section Leader Wildlife Ecology, Arthur Rylah Institute).

According to Dr Richards, Gould's Long-eared Bat and Lesser Long-eared Bat cannot be distinguished through call analysis alone, so he lumped them together as a complex. However, Dr Richards claims that South-eastern Long-eared Bat can be distinguished from the other two long-eared bats through call analysis, as the call of South-eastern Long-eared Bat has a consistently lower minimum call frequency than the other long-eared bat species, which he demonstrated from published bat call benchmark data and bat call data collected in the study area.

Therefore, according to Dr Richards, the degree of certainty that South-eastern Long-eared Bat was in fact recorded in the study area, was high. See Attachment 9 for further information on the degree of certainty provided by Dr Richards. The EPBC Act Referral was undertaken on the basis of this initial determination by Dr. Richards given the perceived potential for the project to significantly impact the species.

The subsequent peer review of the bat surveys undertaken as part of this assessment (Gration 2015) found that *"the call parameter employed by Dr Greg Richards to identify Nyctophilus corbeni (South-eastern Long-eared Bat) sonograms (minimum frequency of 35kHz) is not a reliable identification parameter. The reference calls of two other species, being Nyctophilus geoffroyi and N. gouldi (captured in the Echuca - Moama region) also display calls at a minimum frequency of 35kHz or lower."*

Six subject matter experts were consulted on whether individual Nyctophilus species could be identified from a specific call parameter. All six experts were of the opinion that with the current technology available for recording bat calls, it is not possible to identify Nyctophilus from their call alone."

Given the results of the peer review and the acceptance of these results by Dr. Richards (pers. comm., April 2015), it is concluded that South-eastern Long-eared Bat is unlikely to be present in the study area. As such, South-eastern Long-eared Bat is unlikely to be significantly impacted upon by the proposed project.

Reptiles

Based on the assessment in Table 2, no EPBCF Act listed reptile species were considered to potentially occur in the study area due to a lack of suitable habitat.

Frogs

Based on the assessment in Table 2, one EPBC Act listed frog species was initially considered to potentially occur in the study area.

Growling Grass Frog (vulnerable)

Known as the Southern Bell Frog in NSW.

Growling Grass Frog occurs in permanent, still or slow flowing water with fringing and emergent vegetation in streams, swamps, lagoons and artificial wetlands such as farm dams and abandoned quarries (Clemann and Gillespie 2004). Growling Grass Frog was considered to potentially occur in suitable water bodies in both the Victorian and NSW components of the study area.

Targeted surveys for Growling Grass Frog were carried out in suitable habitat and at a suitable time of year in and adjacent the study area in October 2008 (NSW only),

September 2011 (VIC and NSW) and October 2012 (NSW only). All but the 2008 survey were carried out in accordance with the Federal significant impact guidelines for Growling Grass Frog (DEWHA 2009b). The results for all the above targeted surveys for Growling Grass Frog were negative.

Considering that the literature review revealed that there were no historic Growling Grass Frog records in the search region (i.e. 10 kilometre radius of the study area) and the targeted survey results were all negative, it was considered that Growling Grass Frog is unlikely to occur in the study area. This assumption is consistent with the directions / requirements of the guidelines.

For a detailed account of the results of the Growling Grass Frog targeted surveys, see Section 4.2.3 of BL&A (2015), which is provided as Attachment 5 to this report.

Freshwater Fish

Based on the assessment in Table 2, three EPBC act listed freshwater fish species were considered likely or potentially to occur in the study area. These were:

- Murray Cod (Vulnerable) - Likely to occur
- Trout Cod (Endangered) – Potential to occur (possibility)
- Silver Perch (Critically endangered) – Likely to occur.

Of these, the relevant databases contained records of Murray Cod and Trout Cod from the search region. While not recorded in the aquatic survey undertaken in the study area (GHD 2015), the above fish species are considered likely or potentially to occur in the rivers passing through the study area.

5. POTENTIAL IMPACTS ON MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

5.1. Impacts on fauna habitat

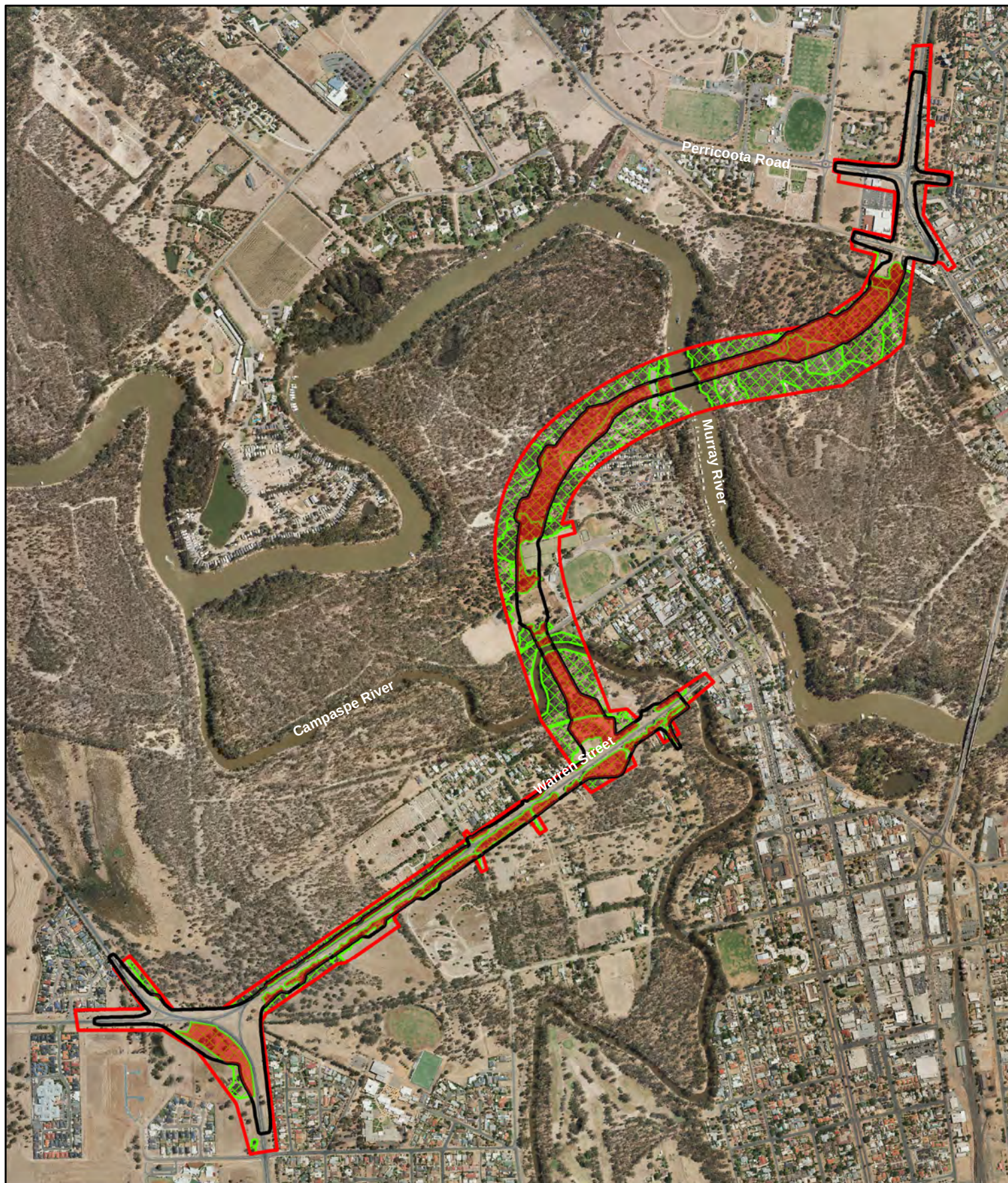
The Proposal would impact on at least 18.738 hectares of fauna habitat in the form of remnant native vegetation (13.658 hectares in Victoria and 5.080 hectares in NSW). This comprised River Red-gum Herbaceous Tall Open Forest and River Red-gum – Black Box Woodland. For further details on the native vegetation and fauna habitat, refer to existing BL&A reports provided as attachments 5 and 6.

The loss of this habitat would potentially impact on 11 EPBC Act listed fauna species. Table 4 provides a summary of potential impacts on these species.

Table 4: Potential impacts on EPBC Act listed fauna species

Species	Breeding habitat loss	Foraging habitat loss	Increased road mortality	Sedimentation and erosion	Shading
Rainbow Bee-eater		X	X		
Superb Parrot		X	X		
Swift Parrot		X	X		
White-bellied Sea-Eagle				X	X
Eastern Great Egret		X	X	X	X
Fork-tailed Swift		X			
White-throated Needletail		X			
Koala		X	X		
Murray Cod	X	X		X	X
Silver Perch	X	X		X	X
Trout Cod	X	X		X	X

Proposed fauna habitat removal is presented in Figure 6 and potential impacts are discussed in more detail below.



Legend

- Study Area
- Alignment option
- Fauna habitat
- Fauna habitat to be removed

0 150 300 600 Metres

Figure 6: Study area and proposed fauna habitat removal

Project: Murray River Crossing Echuca

Client: VicRoads

Project No.: 8194

Date: 24/11/2014

Created By: J. Sullivan / M. Ghasemi

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5.2. Wildlife connectivity and habitat fragmentation

5.2.1. *Habitat fragmentation and loss of connectivity*

The proposed road carriageway would impact an approximately 200 metre wide x 2.25 kilometre long section of native vegetation (in NSW and Victoria), which constitutes part of an important wildlife corridor between the large Barmah and Gunbower forest blocks (Section 3.1.1), thereby potentially increasing fragmentation of habitat in the region – a key threatening process recognised at all regulatory levels. Within the NSW portion of the proposed carriageway, it would also largely isolate an area of native vegetation north of the proposed carriageway, resulting in increased edge effect and potential subsequent degradation.

The proposal would involve the construction of a raised carriage way across 1.1 km of the Murray River floodplain, which would mitigate the effects of habitat fragmentation to some degree, particularly for more mobile terrestrial species, but may remain an effective barrier to more sedentary, less dispersive species.

Mitigation measures have been proposed which would ameliorate some of the potential impacts of habitat fragmentation. These are discussed in Section 7.

5.2.2. *Barrier effects*

The barrier effect of roads acts differentially on different faunal groups and species. For some species, the width of habitat clearing itself acts as a deterrent to crossing, for others, the deterrent is the alien nature of the road surface, or traffic noise, or combinations of the above. Studies in Europe, America and Australia have suggested that road width and traffic intensity are the factors that most influence the severity of barrier effects; large multi-lane carriageways which carry heavy traffic loads present the most severe wildlife barriers, while un-sealed roads through national parks present the least. Small terrestrial species with reduced mobility are affected to a greater degree than larger, more mobile species. The movement of birds and bats is less restricted by roads due to their mobility (Donaldson & Bennett 2004).

The most concerning implications of barrier effects on wildlife is fragmentation and isolation of species populations due to movement inhibition, with consequent impacts on the genetic structure and composition of populations. Reduced gene flow between populations increases the risk of extinction, just as habitat fragmentation is widely acknowledged as a primary cause of faunal extinction globally (Donaldson & Bennett 2004).

As with habitat fragmentation and loss of connectivity (above), the construction of a 1.1 km raised carriage way across the Murray River and Campaspe River floodplains, would mitigate the severity of barrier effects to some degree, particularly for more mobile terrestrial species, but for sedentary and shy and cryptic species, the proposed carriageway may act to isolate populations and may contribute to local faunal extinctions in the long term.

Mitigation measures have been proposed which would ameliorate some of the potential impacts of barrier effects. These are discussed in Section 7.

5.2.3. *Edge effects*

Among other disturbance activities, major road carriageway construction through tracts of intact native vegetation tends to create edge effects which penetrate into native

vegetation to varying distances from the road. Edge effect zones are characterised by altered vegetation structure and floristics (plant species composition) resulting from changes in local environmental conditions due largely to increased exposure and altered run-off characteristics. Such changes are usually negative; invasive introduced plant species often originate from road sides and penetrate into edge effect zones. Problematic edge specialist fauna, such as Noisy Miner, are also likely to become established in edge effect zones, where they disrupt other fauna.

Edge effect zones would develop north and south of the proposed road carriageway, and impact on the adjacent native vegetation communities and fauna habitat, potentially to a distance of 50 metres or more from the carriageway. While edge effects will likely degrade habitat adjacent the proposed carriageway it is unlikely to do so to a level which would place the population of an EPBC Act-listed species at risk of decline.

Mitigation measures have been proposed which would ameliorate some of the potential impacts of edge effects. These are discussed in Section 7.

5.3. Impacts on aquatic habitat

Potential impacts on the Murray River and Campaspe River would include loss or disturbance to riparian vegetation, increased sedimentation and bank erosion, increased rate of water runoff from the road, increased nutrient inputs from road water runoff and shading of the water column and riparian vegetation from the bridges. Natural river flow alteration and obstruction to fish passage would be minimal, as bridge piers will be constructed either side of the river, such that no permanent bridge infrastructure will be located within the river channel. Refer to GHD's aquatic flora and fauna assessment (GHD 2015) for further detail on potential impacts on aquatic habitat of the Murray and Campaspe Rivers. No direct impacts to aquatic habitat are anticipated to occur due to delivery of the Proposal.

Mitigation measures have been proposed which would ameliorate some of the potential impacts on the Murray and Campaspe Rivers. These are discussed in Section 7.

5.4. Injury and mortality

Fauna injury or mortality may occur during the construction phase of the Proposal through the removal of fauna habitat (primarily native vegetation). Injury or mortality are also likely to occur during the operational life of the proposed carriageway, through collision with vehicles. There is also some potential for increased fauna injury and mortality as a result of increased habitat fragmentation and modification.

5.4.1. Construction phase

There is potential for fauna injury and mortality during vegetation clearance. Those at greatest risk are species with low mobility, nocturnal species or species with small home ranges. Such species are least inclined, or unable to disperse rapidly away from the disturbance. These include certain ground-dwelling mammals, microbats, possums and gliders, reptiles, juvenile birds in nests and frogs.

VicRoads and Roads and Maritime have developed best practice procedures to minimise impacts on biodiversity during construction activities. These are discussed in Section 7.

5.4.2. Operational phase

As the majority of carriageway which impacts native vegetation and fauna habitat will be raised on pylons, terrestrial fauna collisions with vehicles would be far lower than if the carriageway were constructed on earthen road formation, as most terrestrial fauna species would be expected to pass under the carriageway. Arboreal mammals (Koala, possums and gliders), birds and bats would be more vulnerable to collision with vehicles.

Within the scope of this assessment, it was difficult to predict the nature and magnitude of increased fauna injury and mortality resulting from vehicle collision. However, considering that the proposed carriageway would constitute an additional road crossing of the wildlife corridor between the Gunbower and Barmah forest blocks (Section 3.1.1), fauna injury and mortality rates, compounded by barrier effects (Section 5.2.2), may be significant for some species which are reliant on dispersal between the forest blocks.

This type of potential impact is unlikely to have a significant impact on the local or regional population of any EPBC Act-listed species likely to occur within the study area.

5.5. Weed invasion impacts

The spread and establishment of invasive weeds, in particular noxious species, as listed under the NSW *Noxious Weeds Act 1993* and the Victorian *Catchment and Land Protection Act 1994*, may occur in the study area during the construction and operation phases of the Proposal. During construction there is potential to disperse noxious weed species and other invasive weed seeds and plant material into adjoining areas of remnant vegetation where such weed species do not currently occur. The most likely causes of weed dispersal are associated with clearing of vegetation, stockpile of contaminated soils and transport of weed propagules via construction vehicles and machinery.

This type of potential impact is unlikely to have a significant impact on the local or regional population of any EPBC Act-listed species in the short to medium term.

Mitigation measures have been proposed which would ameliorate the spread of invasive weeds in the study area. These are discussed in 7.

5.6. Pest and pathogen impacts

5.6.1. Pests

The Proposal has the potential to exacerbate existing impacts on native vegetation and fauna by pest animal species, such as predation by feral cats and the Red Fox and competition for resources by the feral European Rabbit.

The Proposal may contribute to increased levels of predation on native fauna from foxes and cats through the creation of disturbed habitat edges, which facilitate predator movement and predation success rate. Habitat removal will also displace fauna species, rendering them more susceptible to predation.

Habitat modification due to direct clearance and edge effects may favour use of habitat adjacent the proposed carriageway by feral rabbits, which tend to prefer disturbed areas. This may lead to increased competition for food resources between native fauna and rabbits as well as vegetation damage by rabbits.

5.6.2. Pathogens

The Proposal has the potential to facilitate the establishment of deleterious pathogens in the study area. Of particular concern is infection of native plant species by Cinnamon Fungus (*Phytophthora cinnamomi*), which causes root-rot disease and subsequent vegetation dieback. Cinnamon Fungus is spread into new areas by contaminated soil on construction machinery, vehicles and even footwear. There is a risk that Cinnamon Fungus may be introduced into native vegetation in and adjacent the study area during the construction and operational phases of the Proposal.

Chytrid fungus (*Batrachocytrium dendrobatidis*) is a water-borne fungus which causes the disease chytridiomycosis in frogs, and is lethal to a wide variety of Australian frogs. It is spread through cross contamination of water bodies by vehicles and personnel. There is a risk that Chytrid fungus may be introduced into wetlands in and adjacent the study area during the construction phase of the Proposal.

It is unlikely that the proposal would lead to the introduction of any pathogens which may adversely affect the local or regional population of any EPBC Act-listed species.

Mitigation measures have been proposed which would ameliorate the impacts of pest animals and pathogens in the study area. These are discussed in Section 7.

5.7. Hydrological changes

With regard to the hydrology of the Murray River and Campaspe River, particularly flow and flooding characteristics, GHD (2015) conclude that, provided that the Proposal is designed in a manner that does not restrict or impede natural river flows above that currently restricted by the existing bridge upstream, then there will be minimal impact on aquatic habitat due to hydrological changes. Refer to GHD's aquatic flora and fauna assessment (GHD 2012) for further details.

Mitigation measures have been proposed which would ameliorate the impacts of hydrological changes to the Murray and Campaspe Rivers. These are discussed in Section 7.

5.8. Noise, vibration and light

The proposed carriageway would impact a large tract of fauna habitat which is currently subject to only low levels of artificial light, vibration and noise from adjacent urbanised areas. This would significantly increase during the construction and operational phases of the proposal, and may have an influence on the behaviour of some fauna species in the way that they utilise their environment. For example, some species may not tolerate close proximity to noisy and loud roadways, which may reduce their usable area of habitat.

There is potential for impacts to local fauna from noise and vibration during construction, which may compel some species to temporarily avoid habitats adjacent to the proposed works.

The proposed bridges would also result in shading of the Murray River and Campaspe River water columns and riparian vegetation, which would likely modify that vegetation to some extent, and may limit the success of landscaping activities under or near the bridges.

The effects of noise, vibration and light are unlikely to significantly impact any EPBC Act-listed species likely to occur within the study area.

Mitigation measures have been proposed which would ameliorate the impacts of artificial light, vibration and noise associated with the proposal. These are discussed in Section 7.

5.9. Cumulative impacts

Vegetation communities and fauna habitat in and adjacent the study area has apparently been subject to a long history of disturbance following European settlement of the region. Continuing human population growth and subsequent expansion and intensification of land use in and around the Echuca-Moama township have been placing steadily increasing, and often interacting, pressures on vegetation communities and fauna habitat.

The construction of the proposed carriageway may further exacerbate those pre-existing pressures. It would be reasonable to assume that pressures on vegetation communities and fauna habitat in the Echuca-Moama township environs are going to continue to increase.

While The Proposal will remove additional native vegetation, it is unlikely to place a local or regional population of an EPBC Act-listed species at risk of decline in the long term.

6. ASSESSMENTS OF IMPACT SIGNIFICANCE FOR MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

Significance assessments for potential impacts on matters of national environmental significance (MNES) are summarised in Table 5 and the detailed assessments are provided in Attachment 1.

The findings of the significance assessments were that there will most likely be no significant impact on any EPBC Act-listed species likely to occur within the study area.

Table 5: Summary of findings for assessments of impact significance for MNES values

Threatened species or communities	Significant impact criteria (1 ^{3/5})									Likely significant impact?	2Critical habitat?	4Important population?
	a	b	c	d	e	f	g	h	i			
1Critically endangered (CE) and endangered (EN) species or communities												
Swift Parrot (EN)	U	U	U	U	U	U	U	U	U	Unlikely	No	N/A
Silver Perch (CE)	U	U	U	U	U	U	U	U	U	Unlikely	Unlikely	N/A
Trout Cod (EN)	U	U	U	U	U	U	U	U	U	Unlikely	Unlikely	N/A
3Vulnerable species or communities												
Superb Parrot	U	U	U	U	U	U	U	U	U	Unlikely	Unlikely	N/A
Koala	U	U	U	U	U	U	U	U	U	Unlikely	No	No
Murray Cod	U	U	U	U	U	U	U	U	U	Unlikely	Unlikely	N/A
5Migratory species												
Rainbow Bee-eater	U	U	U	X	X	X	X	X	X	Unlikely	N/A	N/A
Fork-tailed Swift	U	U	U	X	X	X	X	X	X	Unlikely	N/A	N/A
White-throated Needletail	U	U	U	X	X	X	X	X	X	Unlikely	N/A	N/A
Eastern Great Egret	U	U	U	X	X	X	X	X	X	Unlikely	N/A	N/A
White-bellied Sea- eagle	U	U	U	X	X	X	X	X	X	Unlikely	N/A	N/A

Table notes: L = Likely significant impact; P = Potential significant impact; U = Unlikely significant impact; X or N/A = Not applicable.

Significant impact criteria:

- 1) An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
 - a) lead to a long-term decrease in the size of a population
 - b) reduce the area of occupancy of the species
 - c) fragment an existing population into two or more populations

- d) adversely affect habitat critical to the survival of a species
 - e) disrupt the breeding cycle of a population
 - f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
 - g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
 - h) introduce disease that may cause the species to decline, or
 - i) interfere with the recovery of the species.
- 2) Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:
- a) for activities such as foraging, breeding, roosting, or dispersal
 - b) for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
 - c) to maintain genetic diversity and long term evolutionary development, or
 - d) for the reintroduction of populations or recovery of the species or ecological community.
- 3) An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
- a) lead to a long-term decrease in the size of an important population of a species
 - b) reduce the area of occupancy of an important population
 - c) fragment an existing important population into two or more populations
 - d) adversely affect habitat critical to the survival of a species
 - e) disrupt the breeding cycle of an important population
 - f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
 - g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
 - h) introduce disease that may cause the species to decline, or
 - i) interfere substantially with the recovery of the species.
- 4) An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:
- a) key source populations either for breeding or dispersal
 - b) populations that are necessary for maintaining genetic diversity, and/or
 - c) populations that are near the limit of the species range.
- 5) An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:
- a) substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
 - b) result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
 - c) seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

7. PROPOSED AVOIDANCE, MANAGEMENT AND MITIGATION MEASURES

The following proposed mitigation measures have been included in this documentation to assist in managing any impacts on Matters of National Environmental Significance (MNES), but only in a general sense. As it was determined that the proposed action will not result in a significant impact on any MNES values identified as potentially occurring in the study area and surrounds, the measures are not specific to MNES values.

These mitigation measures are consistent with those routinely used by Roads and Maritime – the NSW Roads and Traffic Authorities' *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) and *VicRoads standard environmental mitigation measures, construction contract (major) standard Section 177*, henceforth referred to as 'VicRoads Section 177' and provided as Attachment 11 to this report. These mitigation measures are consistent with those proposed in BL&A (2015) (Attachment 5 to this report) for the Victorian component of the proposal and Section 9 of BL&A (2014) (Attachment 6 to this report) for the NSW component.

Mitigation measures proposed in the chapter are subject to the approval of Roads and Maritime Services for the NSW component of the proposal and the approval of VicRoads for the Victorian component.

7.1. Avoid and minimise

The proposed carriageway has been designed to minimise native vegetation clearance where practical and minimise potential impacts on Matters of National Environmental Significance (MNES) either present in the study area or with the potential to occur there.

As discussed in Section 7.1 above, the proposed alignment (Mid-West alignment) was selected through a comprehensive analysis which, among many other considerations, took into account the area and quality of fauna habitat proposed to be removed, i.e. the Mid-West alignment resulted in the least removal of high quality fauna habitat.

7.2. Vegetation and habitat removal

7.2.1. Pre-clearing

The *Construction Environmental Management Plan* (CEMP) for the project will include requirements for the pre-clearing process. Pre-clearing field surveys would be undertaken to identify appropriate management measures to minimise impacts on native flora and fauna and their habitats. Appropriate pre-clearing management measures identified in the field surveys would then be incorporated in the CEMP. The following would need to be adequately addressed during pre-clearing surveys:

- A suitably qualified ecologist is to identify nearby habitat that would be suitable for the release of fauna that may be encountered during the pre-clearing process or habitat removal. This may require consultation with the NSW Office of Environment and Heritage (OEH) and the Victorian Department of Environment, Land, Water & Planning (DELWP). The pre-determined habitat identified for fauna release is to be clearly identified on a map;
- A suitably qualified ecologist should be engaged to undertake the following procedure in the weeks before clearing begins:
 - Confirm the locations of biodiversity features identified in the biodiversity assessment;

- Identify any fauna that have the potential to be disturbed, injured or killed as a result of clearing activities (eg nesting birds or roosting bats or denning marsupials);
- Check for the presence of threatened flora and fauna species that were identified in the environmental assessment as likely to occur. This check should be:
- Conducted by qualified ecologists experienced in fauna handling and the identification of local flora and fauna species; and
 - If possible, undertaken during optimal weather conditions, season and time of day/night for identifying targeted flora and fauna species.
 - Confirm the existing details for all hollow-bearing trees, and identify all trees containing threatened fauna and threatened flora;
- Identify and mark exclusion zones (refer to Section 7.2.2);
- Confirm the location of pre-determined habitat identified for the release of any fauna encountered on site; and
- Submit any updated maps/plans, pre-determined habitat for the release of fauna, habitat features and recommended clearing procedures to the project manager and/or environment manager (or equivalent).
- The following procedure should be followed 24 hours before clearing:
 - Licensed wildlife carers and/or ecologists should capture and/or remove fauna that have the potential to be disturbed, injured or killed as a result of clearing activities. Relocate captured fauna into pre-determined habitat identified for fauna release; and
 - The project manager and/or environment manager should inform clearing contractors of any changes to the sequence of clearing if required. Carry out staged habitat removal as outlined below, in Section 7.2.3.

Refer to the RTA Biodiversity Guidelines (RTA 2011) and VicRoads Section 177 for further details regarding the pre-clearing process with regards to biodiversity protection.

7.2.2. *Exclusion zones*

Exclusion zones to avoid damage to adjacent native vegetation and fauna habitats and prevent the distribution of pests, weeds and disease, are to be identified during the pre-clearance surveys and established prior to the commencement of the construction phase. The surveys should also inform the most appropriate type of exclusion zone demarcation fencing to be employed. The location and type of exclusion fencing to be installed would be identified on plans in the CEMP, including the importance of the values to be protected.

Refer to the RTA Biodiversity Guidelines (RTA 2011) and VicRoads Section 177 for further details regarding the establishment of exclusion zones.

7.2.3. *Staged habitat removal*

Staged habitat removal is to be conducted in at least two stages, so as to allow respite between the initial disturbance of the clearing process and the final removal of habitat. Where practicable, any nests found to be inhabited by native birds or by mammals

(e.g. possums or gliders) shall be removed outside of the species' breeding season. The CEMP will provide instruction on the staged habitat removal requirements. The staged habitat removal procedure, as detailed in the RTA Biodiversity Guidelines (RTA 2011), is summarised as follows:

1. Vet and/or wildlife carers need to be contacted prior to construction commencing to ensure they are willing to assist in treating injured animals if necessary. Their contact details are to be included in the CEMP, and be given to the site manager and clearly displayed in the site office.
2. A licensed wildlife carer and/or ecologist should be on site during habitat removal. Where necessary, fauna encountered during the clearing process are to be relocated to pre-determined habitat identified for fauna release.
3. Non-habitat vegetation is removed first (i.e. shrubs, regrowth, ground cover and non-habitat trees). Allow fauna at least 24 hours to vacate remaining habitat. Ensure that a wildlife carer and/or an ecologist inspects trees before and after felling. Capture and relocate non-injured fauna that are found in any felled trees to pre-determined habitat identified for fauna release.
4. Fell habitat trees carefully using equipment that allows habitat trees to be lowered to the ground with minimal impact (eg claw extension). Do not fell trees towards exclusion zones. Relocate felled habitat trees as per that described in Section 7.8 below.
5. The construction project manager and/or environment manager would ensure that the outcomes of the clearing process are recorded. Reporting is usually the responsibility of an ecologist or environment officer. Reports are to be submitted to relevant personnel (e.g. environment manager or Roads and Maritime regional environment staff).

During vegetation removal, careful consideration should also be given to minimising impacts on bats.

7.3. Fauna handling

To prevent injury and mortality of fauna during the clearing of vegetation and drainage of wetlands, an experienced and licensed wildlife carer and/or ecologist would need to be present to supervise the works and capture and relocate fauna if necessary. The following would be implemented to avoid injury and mortality of fauna:

- Contact an animal rescue agency/wildlife care group or vet before works start to ensure they are willing and available to be involved in fauna rescue and assist with injured animals;
- Allow fauna to leave an area without intervention as much as possible;
- Include the procedures to follow if fauna is found or injured on site in project inductions;
- In circumstances where the handling of fauna is completely unavoidable, follow best practice procedures outlined in Guide 9 of the RTA Biodiversity Guidelines (RTA 2011); and
- Keep records of fauna captured and relocated, and report any injury to or death of a threatened species to Roads and Maritime and/or VicRoads environmental staff.

7.4. Aquatic habitat and riparian zones

The proposal would result in some impacts on aquatic habitat, in the study area, including the Murray River and Campaspe River channels and riparian zones. The CEMP would include requirements to minimise impacts on aquatic flora and fauna and their habitats, and to ensure the movement of fish up and downstream is maintained at all times during construction. Best practice management measures are implemented by VicRoads and Roads and Maritime Services during construction road projects. These include the following:

- Avoid activities in aquatic habitats and riparian zones as much as practicable;
- The sensitivity of aquatic habitats and riparian zones and the measures in place to protect them should be regularly communicated to all staff eg during inductions and toolbox talks;
- Protect aquatic habitats and riparian zones where works are not required with exclusion zones;
- The location of aquatic habitat features within or adjacent to the footprint should be clearly identified on environmental management plans;
- Access the waterway so that riparian vegetation removal is minimised and restricted to the minimum amount of bank length required for the construction activity;
- Keep vehicles and machinery away from the banks of a waterway where possible;
- Refuelling of vehicles and plant, and chemical storage and decanting should not take place within 50 metres of aquatic habitats;
- Avoid clearing within the riparian zone during periods when flooding is likely to occur;
- Ensure that any clearing undertaken does not allow the vegetation/trees to fall into the waterway;
- Where feasible, retain the roots of trees on the bank of a waterway in order to maintain bank stability;
- Consult with the NSW Department of Primary Industries (DPI)(Fisheries) or the Victorian Department of Environment, Land, Water & Planning (DELWP) before clearing to identify any trees proposed to be removed that could potentially be used for re-snagging of a waterway;
- Only the minimum number of snags should be disturbed;
- DPI (Fisheries) must be consulted before works commence where snags require lopping, realignment, relocation and/or removal;
- During rehabilitation, stabilise the banks of the waterway through revegetation and/or armouring according to available landscape plans;
- Protect banks from stock and/or human access using appropriate fencing during the rehabilitation and maintenance period of the work site; and
- Remove all temporary works, flow diversion barriers and sediment control barriers within aquatic habitats as soon as practicable and in a manner that does not promote future channel erosion.

Refer to the RTA Biodiversity Guidelines (RTA 2011) and VicRoads Section 177 for further details regarding mitigation of potential impacts on aquatic habitat and riparian zones.

7.5. Weed management

To prevent or minimise the spread of noxious and environmental weed species in and adjacent the study area during and after the construction phase of the proposal, a weed management plan is to be developed and incorporated into the CEMP. Refer to the RTA Biodiversity Guidelines (RTA 2011), VicRoads Section 177 and the *Introductory Weed Management Manual* (Natural Heritage Trust 2004) for guidance on the preparation of the weed management plan.

A site assessment by an ecologist or person trained in weed management and identification would be required to inform the weed management plan, and would involve identification and mapping of weed infestations in and adjacent the study area, particularly noxious species. This would also involve the development of appropriate management actions to be undertaken for each infestation.

The details of the weed management plan would need to be tailored for the site, but should include:

- Type and source of the weed/s;
- Weed management priorities and objectives;
- Sensitive environmental areas within or adjacent to the site;
- Location of weed infested areas;
- Mechanical weed control methods such as slashing or mowing, as well as a range of herbicides to avoid the development of herbicide resistance;
- Measures to prevent the spread of weeds;
- A monitoring program to measure the success of weed management; and
- Communication strategies to improve contractor awareness of weeds and weed management.

7.6. Pathogen management

It is not known whether any pathogens with the potential to impact on the environment and biodiversity are present in and adjacent the study area. There is the potential that such pathogens may be introduced and spread during the construction and operational phases of the proposal. Measures to prevent the introduction and/or spread of pathogens are to be incorporated into the CEMP for the proposal. This should be initiated with a check on the NSW DPI website (www.industry.nsw.gov.au) for the most up-to-date hygiene protocols for each pathogen and for the most recent locations of contamination. The project manager and/or environment manager should ensure the risk of spreading pathogens and the mitigation measures required on site are regularly communicated to staff and contractors eg during inductions and toolbox talks.

Preventative measures to minimise the introduction and spread of pathogens are detailed in the RTA Biodiversity Guidelines (RTA 2011) and VicRoads Section 177 and include:

- Ensure vehicles and footwear are free of soil before entering or exiting the site (i.e. directed to wash down area before entering or exiting the site);
- Provide vehicle and boot wash down facilities; and
- Restrict vehicles to designated tracks, trails and parking areas;

If it is suspected that the site may be harbouring pathogens, testing from a National Association of Testing Authorities (NATA) approved laboratory should be carried out to confirm the presence/absence of pathogens in the soil and/or water. If present, exclusion zones with fencing and signage would need to be established to restrict access to contaminated areas to minimise the spread of the pathogens.

7.7. Re-establishment of native vegetation

Re-establishment of native vegetation would be required in disturbed areas throughout the proposed alignment to re-stabilise bare earth, provide additional habitat for local flora and fauna species and mitigate edge effects in accordance with VicRoads Section 177. To achieve this, a revegetation plan would be developed and incorporated into the CEMP. It should be emphasised that the retention of native through minimisation of the area of the construction footprint will have far better outcomes for biodiversity than over clearing and revegetating. The revegetation plan would need to take into a whole range of site-specific considerations including collection and propagation of local seed, salvage and reuse of topsoil, leaf litter and woody debris, threatened species habitat along with shading caused by the proposed raised carriageway and bridge.

The RTA Biodiversity Guidelines (RTA 2011) provide detailed guidance on the re-establishment of native vegetation for roads projects in NSW, which is summarised as follows:

- Ecologists and landscape architects should work together on the preparation of revegetation plans and specifications that clearly identify the locations of areas to be revegetated;
- Allocate sufficient time for the collection of seed to be used in revegetation and carry out all seed collection in accordance with *RTA Seed Collection QA Specification R176* and the Florabank Guidelines and Model Code of Practice;
- Use experienced and licensed seed collectors to carry out seed collection and where possible, procured plants should be grown from local provenance seed;
- Consideration should be given to a range of characteristics such as species, height and drought tolerance when procuring native plants;
- Planting operations should be in accordance with *RTA Landscape Planting QA Specification R179* and only use plants that have been certified disease free for revegetation works (refer to *Guide 7: Pathogen management*);
- Collect local native topsoils and leaf litter and store for use in revegetation works;
- Soils in areas to be revegetated should match surrounding soil conditions as closely as possible unless adjacent areas are weedy or contaminated;
- Avoid compaction of soils in areas identified for revegetation. Where compaction has occurred, the soil should be loosened;
- When planting consider seasonal risks of frost, drought, flooding and sun exposure to avoid damaging plants and to encourage growth;
- Ensure plant spacing and diversity follows the landscaping plan for the project, reflects local conditions and is dense enough to ensure plants achieve a timely coverage of the ground;

- Consider appropriate shade and drainage conditions when planting. Provide mulching around plants for dry or potentially weedy sites to help retain moisture and suppress weeds; and
- Inspection, monitoring and maintenance of revegetated areas should be conducted in accordance with the landscape management plan. Outline the roles and responsibilities in landscape management and revegetation plans including the schedule for monitoring and maintenance activities.

It should be noted that this revegetation plan would not contribute to any offset requirements as compensation for native vegetation / fauna habitat removal.

7.8. Re-use of woody debris

Woody debris (i.e. dead or living tree trunks, root balls, branches and leaves), which would be removed to facilitate construction of the proposed carriageway, should be re-used, where appropriate, to create new habitat in the development area or enhance habitat adjacent the development area. This should be detailed in the landscape management plan and CEMP. Features of the proposal suitable for woody debris deployment may include coarse woody debris (tree trunks, root balls and larger branches) placement in adjacent remnant native vegetation, under the raised carriageway and bridge or within the Murray River or Campaspe River channels; fine woody debris (smaller branches and leaves) placement as natural mulch for revegetation activities.

Detailed guidance for the re-use of woody debris is provided in the RTA Biodiversity Guidelines (RTA 2011), which is summarised as follows:

- Engage a suitably experienced ecologist to provide advice on the re-use of woody debris to ensure it does not have a negative impact on the receiving environment;
- Separated weeds from native vegetation;
- Do not extend the amount of clearing and grubbing to make up for mulch shortfalls;
- Carry out removal, stockpiling, transportation and relocation of woody debris in a manner that minimises disturbance to native vegetation (including the canopy, shrubs, dead trees, fallen timber and groundcover species);
- Avoid the spread of any weeds or pathogens that may be in the soil when relocating woody debris and bushrock from stockpiles;
- Engage a suitably experienced ecologist to provide advice on positioning woody debris in designated relocation areas;
- Keep topsoil disturbance to a minimum;
- When relocating woody debris, place it evenly across the site;
- Manage stockpiles in accordance with RTA's Stockpile Site Management Guideline, *RTA Environmental Protection (Management System) QA Specification G36*, *RTA Vegetation QA Specification R178* and *VicRoads Section 177*; and
- Prepare a mulch tannin management plan for the project where tannins are likely to be generated.

Re-use of bush rock has not been discussed in this chapter as it does not outcrop in the impact area or surrounds.

7.9. Re-establishment of habitat connectivity

To alleviate the effects of native vegetation clearance on habitat connectivity, such as habitat fragmentation, edge effects and barrier effects, the following measures should be incorporated into the design of the carriageway and CEMP:

- Native vegetation be retained as close to the proposed carriageway as possible;
- Revegetation works should aim to re-create the original vegetation structure and floristics;
- Artificial lighting along the proposed alignment should be kept to a minimum outside of the urban area; and
- Coarse and fine woody debris should be placed under the raised carriageway as fauna 'furniture'.

7.10. Mitigation timeframes

Mitigation measures outlined in this section will be put in place prior to construction (and maintained throughout the operational phase of the project as relevant).

Pest plants at the development site will be monitored and controlled during and post the construction phase of the project as appropriate.

8. OTHER APPROVALS AND CONDITIONS

8.1. Approvals under Victorian legislation and guidelines

The following is a summary of the approvals required under Victorian legislation and guidelines for the proposed action. A detailed account of these approvals is provided in Section 9.3.2 in BL&A (2015), which is provided as Attachment 5 to this report.

8.1.1. *Planning and Environment Act 1987*

Local Provisions

Overlays

A permit is generally required to carry out works and/or remove trees within the portion of the study area that is subject to the Heritage Overlay and Schedule 79 to the overlay.

A permit is also generally required to remove, destroy or lop any native vegetation, including dead vegetation within the portion of the study area that is subject to the Environmental Significance Overlay and Schedule 1 to the overlay.

Approvals are proposed to be obtained via a Planning Scheme Amendment process through the inclusion of an incorporated document to exempt the Project from permit requirements.

State provisions

Planning permit requirements

A planning permit under Clause 52.17 of the Campaspe Planning Scheme would usually be required for the removal of native vegetation. Such approval is proposed to be obtained via a planning scheme amendment process through the inclusion of an incorporated document.

The current proposal would trigger a referral to DELWP as it meets the referral criteria.

Biodiversity Assessment Guidelines requirements

As part of the planning permit application process, the proposed action must meet the provisions of Victoria's *Permitted clearing of native vegetation – Biodiversity assessment guidelines* 'the Guidelines' (DEPI 2013a).

A summary of the requirements of the Guidelines for the proposed action is as follows:

- The proposed action will be assessed under the *moderate* risk assessment pathway;
- For the loss of **3.025** general biodiversity equivalence units (GBEUs), an offset of **4.537** GBEU's would be required. This offset/s:
 - Must be secured prior to the removal of native vegetation. Offsets should be identified through a native vegetation broker;
 - Must be located within the North Central Catchment Management Authority area and/or Shire of Campaspe;
 - Must have a minimum strategic biodiversity score of 0.354; and
 - Cannot occur within 150 metres of any dwellings and associated buildings on the subject land or adjoining properties covered by a BMO or within 50 metres of these structures on all other land occurring within Bushfire Prone Areas.

The process by which the above offset target was calculated is detailed in Attachments 4 and 5 to this report.

A native vegetation offset strategy would need to be developed in consultation with Roads and Maritime to compensate for residual impacts on native vegetation resulting from the proposed action.

8.1.2. Flora and Fauna Guarantee Act 1988 (FFG Act)

The Victorian FFG Act lists threatened ecological communities and flora and fauna species to provide for their protection and management.

The removal of threatened species or communities, or protected flora under the FFG Act from public land requires a licence under the Act. This licence is obtained from DELWP. The FFG Act does not apply to private land.

Threatened ecological communities

One area of native vegetation recorded in the study area, namely the stand of Murray Pines on the sand hill was assessed to determine if was Semi-arid Herbaceous Pine Woodland Community – an FFG Act-listed threatened ecological community. While little information is available on this community, this vegetation did not meet the criteria to be considered the listed community given its weed infested nature. No further consideration has been given to this matter.

Threatened/protected flora species

No flora species listed as threatened under the FFG Act was recorded in the Victorian side of the study area.

For several flora species, while not listed as threatened, are listed as protected under the FFG Act and were recorded on public land within the study area. A license under the FFG Act will be required from DELWP for their removal.

Threatened fauna species

Three fauna species listed under the FFG Act were recorded during the current field surveys. These were the Masked Owl, Squirrel Glider and Yellow-bellied Sheath-tail Bat. A Protected Flora Licence under the FFG Act would be required from DELWP to remove habitat for these species.

8.1.3. Environment Effects Act 1978 (EE Act)

As part of the assessment process, the Project was referred to the Victorian Minister for Planning and on 14th June 2013, from whence it was determined that an Environment Effects Statement (EES) would be required.

Subsequently, a Biodiversity Impact Assessment has been prepared to inform the EES. The EES was required to consider the potential effects of the proposed action on the environment, inform the public and other stakeholders and enable a Ministerial Assessment of the Project to inform decision makers.

The Biodiversity Impact Assessment is provided as BL&A (2015) (Attachment 5 to this report).

8.1.4. Catchment and Land Protection Act 1994 (CALP Act)

The following CALP Act listed noxious weed species were recorded in the study area. All are listed as 'Regionally Controlled' weeds under the Act and as such, the proponent has a responsibility to prevent the growth and spread of these species in the study area as a consequence of The Project.

- African Box-thorn;
- Bridal Creeper
- Horehound;
- Patterson's Curse; and
- Prickly Pear.

8.2. Approvals under New South Wales legislation and guidelines

The following is a summary of the approvals required under NSW legislation and guidelines for the proposed action. For further details of these requirements, see BL&A (2014 & 2015), which are provided as attachments 5 and 6 to this report.

8.2.1. State environmental planning policies (SEPP's)

State Environmental Planning Policy (Infrastructure) 2007

As the proposal is for the construction of new road infrastructure and is to be carried out in NSW by the Roads and Maritime, it is assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and development consent from council is not required.

State Environmental Planning Policy No. 44 (Koala Habitat)

As there was no evidence of either a current or historical population of the Koala in the study area, the habitat there was considered not to be 'core koala habitat' as defined in the SEPP and the provisions of this SEPP therefore do not apply.

8.2.2. Fisheries Management Act 1994 (FM Act)

Several FM Act listed values were either recorded in the study area, or considered likely to occur there. These were:

Threatened fish species

While not detected during the aquatic assessment (GHD 2015), the following fish species were considered possible to occur in the study area:

Trout Cod.

Endangered ecological community (EEC)

The *Aquatic Ecological Community in the Natural Drainage System of the Lower Murray River Catchment* (Murray River EEC) was identified as occurring in the study area as the Murray River Channel and the Flooded Woodland wetland area.

Implications

The significance of impacts on the above listed FM Act values were assessed against the Seven Part Test criteria (see 8.2.3 below), and all were found not to be at risk of a significant impact due to the proposed action.

8.2.3. Environmental Planning and Assessment Act 1979 (EP&A Act)

Native Vegetation

The proposed action would result in the loss of 5.080 hectares of native vegetation from the NSW component of the study area, none of which meets the 70% threshold for an 'over-cleared vegetation type' based on the NSW BioMetric tool.

A native vegetation offset strategy would need to be developed in consultation with VicRoads to compensate for residual impacts on native vegetation resulting from the proposed action.

Offsets to compensate for impacts on native vegetation in NSW have yet to be quantified. This would require a further site assessment by an accredited 'Biobanker' to inform the preparation of a Biobanking Statement, which will be central to the offset strategy.

Threatened Species and communities

The EPA Act sets out a Seven Part Test that determines whether a Species Impact Statement should be prepared under the *Threatened Species Conservation Act 1995* (TSC Act) for a development. The aim of the Seven Part Test is to ascertain whether a proposed project is likely to lead to a significant impact on a threatened species or community that requires more detailed assessment under the TSC Act.

Numerous threatened species and one community were assessed against the relevant criteria of the Seven Part Test as part of the NSW biodiversity assessment. Of these, the proposed action may pose a significant impact on the Squirrel Glider. Roads and Maritime are undertaking further work to develop a habitat linkage and crossing strategy for Squirrel Glider and additional survey work to determine the importance of habitat to be removed and fragmented for this species. It is anticipated that once this additional work has been completed, a Species Impact Statement would not be required for Squirrel Glider.

Key Threatening Processes (KTP's)

Numerous KTP's listed under TSC Act were considered relevant to the proposed action. Of these, four were considered to be directly exacerbated by the proposed action. These were:

- Clearing of native vegetation;
- The degradation of native riparian vegetation along New South Wales water courses;
- Removal of dead wood and dead trees; and
- Loss of Hollow-bearing Trees.

The contribution of the proposed action to these KTP's will be considered during the State approvals process.

Environmental Impact Statement (EIS)

As the project is being assessed under Part 5 of the EP&A Act, an EIS is not relevant and will not be required.

8.2.4. *Noxious Weeds Act 1993*

Under the *Noxious Weeds Act 1993*, all listed noxious weeds in the relevant council area must be controlled to the level stated on the NSW DPI Noxious Weeds database.

Paterson's Curse was the only noxious weed species recorded in the NSW section of the study area and will be controlled to a specified level.

8.3. Monitoring and enforcement

A Construction Environmental Management Plan (CEMP) will be prepared for the proposed action and will include details to ensure all contractors have an understanding of their environmental responsibilities. This will include the mitigation measures described in BL&A (2014 & 2015), (attachments 5 and 6 to this report) to avoid or minimise impacts on biodiversity during and post construction.

9. CONCLUSION

There is either no critical habitat or it is unlikely there would be such habitat for any EPBC Act-listed species likely to occur within the study area.

No important population of any EPBC Act-listed species occurs within the study area.

No EPBC Act-listed ecological community was recorded nor is any likely to occur within the study area.

The findings of the significance assessments were that there will most likely be no significant impact on any EPBC Act-listed matter. Significance assessment findings are summarised in Section 6 and detailed in Appendix 1.

VicRoads and Roads and Maritime have developed best practice procedures to minimise impacts on biodiversity during construction activities. These are discussed in Section 7.

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Attachment 1: Detailed assessments of impact significance for MNES values

No EPBC Act-listed flora species were detected and nor is any expected to occur in the study area. Therefore there are no impacts on any EPBC Act-listed flora species.

No EPBC Act-listed ecological communities were detected and nor is any expected to occur in the study area. Therefore there are no impacts on any EPBC Act-listed ecological communities.

One EPBC Act-listed migratory species — Rainbow Bee-eater — was recorded in the study area but will not be significantly impacted by the Proposal.

Eleven EPBC Act-listed fauna species were deemed to be potentially affected by the proposed development. An evaluation of the Proposal against the significant impact criteria in EPBC Act Policy Statement 1.1 *Matters of national environmental significance – significant impact guidelines* (Department of the Environment 2013) is tabulated below for species recorded within, or considered likely to occur in the study area. No EPBC Act-listed threatened fauna species likely to occur in the study area would be significantly impacted by the Proposal.

The relevant significant impact criteria are as follows (Department of the Environment 2013):

- 1) An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:
 - a) lead to a long-term decrease in the size of a population
 - b) reduce the area of occupancy of the species
 - c) fragment an existing population into two or more populations
 - d) adversely affect habitat critical to the survival of a species
 - e) disrupt the breeding cycle of a population
 - f) modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
 - g) result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat
 - h) introduce disease that may cause the species to decline, or
 - i) interfere with the recovery of the species.
- 2) Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:
 - a) for activities such as foraging, breeding, roosting, or dispersal
 - b) for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
 - c) to maintain genetic diversity and long term evolutionary development, or
 - d) for the reintroduction of populations or recovery of the species or ecological community.
- 3) An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
 - a) lead to a long-term decrease in the size of an important population of a species

- b) reduce the area of occupancy of an important population
 - c) fragment an existing important population into two or more populations
 - d) adversely affect habitat critical to the survival of a species
 - e) disrupt the breeding cycle of an important population
 - f) modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
 - g) result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat
 - h) introduce disease that may cause the species to decline, or
 - i) interfere substantially with the recovery of the species.
- 4) An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:
- a) key source populations either for breeding or dispersal
 - b) populations that are necessary for maintaining genetic diversity, and/or
 - c) populations that are near the limit of the species range.
- 5) An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:
- a) substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species
 - b) result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
 - c) seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species."

Critically endangered or endangered MNES values

Swift Parrot (endangered):

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
a) Lead to a long-term decrease in the size of a population	The Swift Parrot migrates to Victoria from Tasmania in winter to feed on the flowering eucalypts of the inland slopes of the Great Divide. The species is considered as nomadic in Victoria, with movements being determined by flowering eucalypts (Emison <i>et al.</i> 1987; Higgins <i>et al.</i> 2001). Although the Swift Parrot may occasionally pass through the study area, it is highly unlikely it would occur regularly or in significant numbers. Therefore, very few individuals would be exposed to impacts across a very small proportion of the available habitat in the Echuca region.	Unlikely	N/A	N/A
b) Reduce the area of	As the species does not occupy this area	Unlikely	N/A	N/A

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
<i>occupancy of the species</i>	regularly and it lacks many of its preferred food trees, the project will not reduce the usual area of occupancy for the species.			
<i>c) Fragment an existing population into two or more populations</i>	The study area is in an area where the species occurs infrequently and it will not fragment any population of this species.	Unlikely	N/A	N/A
<i>d) Adversely affect habitat critical to the survival of a species</i>	Habitats critical to the survival of Swift Parrot have been identified in the National Swift Parrot Recovery Plan (Saunders & Tzaros 2011) as 'priority habitats'. While habitat in the study area and search region has not been identified as priority Swift Parrot habitat in Victoria, priority habitat has been identified in the Murray CMA in NSW. However, such habitat would most likely be the Gunbower and Barmah forest blocks north-west and north-east of the search region. As such, habitat in the study area is unlikely to be habitat critical to the survival of Swift Parrot.	Unlikely	Unlikely	N/A
<i>e) Disrupt the breeding cycle of a population</i>	While the removal of hollow trees may present a potential impact to the Swift Parrot, the parrot breeds in south eastern Tasmania, so disruption to its breeding cycle will not occur.	Unlikely	N/A	N/A
<i>f) Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i>	For the reasons explained above, the site is not a habitat regularly used by the parrot. Therefore, the proposal is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Unlikely	N/A	N/A
<i>g) Result in invasive species that are harmful to critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat</i>	The proposal is unlikely to initiate or facilitate the invasion of any species harmful to Swift Parrot.	Unlikely	N/A	N/A
<i>h) Introduce disease that may cause the</i>	The proposal is unlikely to introduce any disease that may cause Swift Parrot to decline.	Unlikely	N/A	N/A

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
<i>species to decline</i>				
<i>i) Interfere with the recovery of the species</i>	The project does not occur in an area where work on the parrots' recovery is likely to be implemented, given that the area is not part of the regularly occupied habitats of the species. Therefore, the proposal will not interfere with the recovery of the parrot population.	Unlikely	N/A	N/A
Overall assessment of likelihood of significant impact		Unlikely	Unlikely	N/A

Freshwater fish

Silver Perch (critically endangered) and Trout Cod (endangered)

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
<i>a) Lead to a long-term decrease in the size of a population</i>	It is unlikely that the proposed development would have an impact on populations of these fish species. The minor disturbances expected during construction would still allow abundant access underneath the bridge and there are expected to be no impediments to fish passage or net loss of fish habitat.	Unlikely	N/A	N/A
<i>b) Reduce the area of occupancy of the species</i>	It is unlikely that the proposed development would have an impact on the occupancy of these fish species, as the minor disturbances expected during construction would still allow abundant access underneath the bridge.	Unlikely	N/A	N/A
<i>c) Fragment an existing population into two or more populations</i>	The proposed development would not significantly alter passage in the waterway and hence the fragmentation of populations of these fish species is unlikely to occur.	Unlikely	N/A	N/A
<i>d) Adversely affect habitat critical to the survival of a species</i>	Minimal habitat is expected to be impacted within the waterway (if any at all) and the disturbance footprint of the proposed works would be insignificant in comparison to available surrounding habitat. Works are not proposed to occur in-stream, however, any required removal of in-stream habitat (such as snags) would be reinstated once the works have been completed.	Unlikely	Unlikely	N/A
<i>e) Disrupt the</i>	Works are not proposed to occur in-stream and	Unlikely	N/A	N/A

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
<i>breeding cycle of a population</i>	will not impact any habitat during the key breeding/migration period (spring to early summer).			
<i>f) Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i>	Little, if any habitat would be removed or destroyed in the construction process, therefore fish species are unlikely to decline.	Unlikely	N/A	N/A
<i>g) Result in invasive species that are harmful to critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat</i>	It is unlikely that an invasive aquatic species would be introduced during the construction process, with barge use the only likely vector for transportation of introduced species, any vessels used would likely be local and if not, would be subject to usual interstate quarantine processes.	Unlikely	N/A	N/A
<i>h) Introduce disease that may cause the species to decline</i>	The proposal is unlikely to introduce any disease that may cause these fish species to decline.	Unlikely	N/A	N/A
<i>i) Interfere with the recovery of the species</i>	It is unlikely the proposal would affect the recovery of these fish species in any way, with only minor impacts expected, if any at all.	Unlikely	N/A	N/A
Overall assessment of likelihood of significant impact		Unlikely	Unlikely	N/A

Vulnerable MNES values

Superb Parrot

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
<i>a) Lead to a long-term decrease in the size of an important population of a species</i>	This species occurs mainly in mature healthy River Red-gums in forest growing on river flats along with Yellow Box, Black Box and Cypress Pine (Higgins 1999). The species' stronghold in the region includes Barmah-Millewa Forest, within approximately 20km of the study area. The centre of the Victorian population occurs in	Unlikely	N/A	N/A

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
	habitats further east along the Murray River, associated with the Barmah – Millewa forests. It is possible that this species may occasionally occur in the study area due to the presence of suitable foraging habitat but numbers are unlikely to be significant. The Superb Parrot National Recovery Plan (Baker-Gabb 2011) does not single out important populations of Superb Parrot, and it is inferred from this that the species exists as a more or less single population throughout its range. In conclusion, the proposal is unlikely to lead to a decline in the Superb Parrot population as its core habitat in the region is well east of the study area.			
<i>b) Reduce the area of occupancy of an important population</i>	The proposal will likely result in some reduction in the area of occupancy of Superb Parrot through the removal of some of its potential habitat. However, as core Superb Parrot habitats lie further to the east at the Barmah–Millewa forests, the proposal will have a negligible effect on the area of occupancy of the species.	Unlikely	N/A	N/A
<i>c) Fragment an existing important population into two or more populations</i>	While the proposal will result in some fine-scale habitat fragmentation, it will not result in fragmentation of the Superb Parrot population, given its long distance mobility.	Unlikely	N/A	N/A
<i>d) Adversely affect habitat critical to the survival of a species</i>	The Superb Parrot National Recovery Plan (Baker-Gabb 2011) broadly describes areas of habitat critical to the survival of Superb Parrot in terms of breeding and foraging habitat. As there are no Superb Parrot breeding records in the vicinity of the study area. While the study area does support Superb Parrot foraging habitat, it was considered marginal in comparison to the large core foraging habitats in the Barmah–Millewa forests. As such, the habitat in and adjacent the study area would not be critical to the survival of Superb Parrot. Therefore, no adverse effects on critical habitat are anticipated to occur as a result of the proposal.	Unlikely	Unlikely	N/A
<i>e) Disrupt the breeding cycle of an important population</i>	The parrot nests in the hollows of large trees (dead or alive), mainly in tall, riparian River Red-gum forest or woodland. While the removal of large hollow trees from the study area may present a potential impact to the Superb Parrot, all known nesting sites are from the Barmah–	Unlikely	N/A	N/A

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
	Millewa forests, with no records from in or near the study area. Therefore, the proposal is unlikely to disrupt the breeding cycle of Superb Parrot.			
<i>f) Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i>	For the reasons explained above, the site is not a core habitat for Superb Parrot. Therefore, the proposal will not modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.	Unlikely	N/A	N/A
<i>g) Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</i>	The proposal is unlikely to initiate or facilitate the invasion of any species harmful to Superb Parrot.	Unlikely	N/A	N/A
<i>h) Introduce disease that may cause the species to decline</i>	The proposal is unlikely to introduce any disease that may cause Superb Parrot to decline.	Unlikely	N/A	N/A
<i>i) Interfere substantially with the recovery of the species</i>	The proposal would not occur in an area where work on the parrots' recovery is likely to be implemented, given that the area is not part of the core range of the species. Therefore, the proposal is unlikely to interfere with the recovery of the Superb Parrot population.	Unlikely	N/A	N/A
Overall assessment of likelihood of significant impact		Unlikely	Unlikely	N/A

Koala

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
<i>a) Lead to a long-term decrease in the size of an important population of a species</i>	Given the paucity of historical Koala records in the search region (one record in the ANSWW), members of any population that may periodically inhabit the study area would not meet any of the Department of the Environment's criteria of an 'important population' (Department of the Environment 2013). Therefore, the proposal would be	Unlikely	N/A	No

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
	unlikely to lead to a long-term decrease in the size of an important Koala population.			
<i>b) Reduce the area of occupancy of an important population</i>	As stated above, any koala inhabiting the study area would not be part of an important population. Therefore, the proposal would unlikely reduce the area of occupancy of an important Koala population.	Unlikely	N/A	No
<i>c) Fragment an existing important population into two or more populations</i>	As stated above, any koala inhabiting the study area would not be part of an important population. Therefore, the proposal would unlikely fragment an existing important Koala population.	Unlikely	N/A	No
<i>d) Adversely affect habitat critical to the survival of a species</i>	Application of the Koala Habitat Assessment Tool (Department of the Environment's referral guidelines for koala (DoE 2014) to the study area and surrounds resulted in a score of two (see Section 4.2.2 above). The Koala Referral Guidelines stipulate that habitats which score lower than five are not habitats critical to the survival of the koala. As such, there would be no adverse effects on habitat critical to the survival of Koala.	Unlikely	No	N/A
<i>e) Disrupt the breeding cycle of an important population</i>	As stated above, any koala inhabiting the study area would not be part of an important population. Therefore, the proposal would unlikely disrupt the breeding cycle of an important Koala population.	Unlikely	N/A	No
<i>f) Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i>	As Koala has rarely been recorded in the search region, and the NSW recovery plan does not indicate that the region is important for the species, it is unlikely that modification, destruction, removal, isolation or a reduction in the availability or quality of habitat in the study area would cause a decline in the overall population of the Koala.	Unlikely	N/A	N/A
<i>g) Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</i>	The proposal is unlikely to initiate or facilitate the invasion of any species harmful to Koala.	Unlikely	N/A	N/A

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
<i>h) Introduce disease that may cause the species to decline</i>	The proposal is unlikely to introduce any disease that may cause the Koala to decline as a species.	Unlikely	N/A	N/A
<i>i) Interfere substantially with the recovery of the species</i>	The proposal would not occur in an area where work on Koala recovery is likely to be implemented, given that the area is not part of the core range of the species. Therefore, the proposal is unlikely to interfere with the recovery of the Koala population.	Unlikely	N/A	N/A
Overall assessment of likelihood of significant impact		Unlikely	No	No

Murray Cod

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
<i>a) Lead to a long-term decrease in the size of an important population of a species</i>	It is unlikely that the proposed development would have an impact on an important population of Murray Cod. The minor disturbances expected during construction would still allow abundant access underneath the bridge and there are expected to be no impediments to fish passage or net loss of fish habitat.	Unlikely	N/A	Likely
<i>b) Reduce the area of occupancy of an important population</i>	It is unlikely that the proposed development would have an impact on the occupancy of an important population of Murray Cod, as the minor disturbances expected during construction would still allow abundant access underneath the bridge.	Unlikely	N/A	Likely
<i>c) Fragment an existing important population into two or more populations</i>	The proposed development would not significantly alter passage in the waterway and hence the fragmentation of an important population of Murray Cod is unlikely to occur.	Unlikely	N/A	Likely
<i>d) Adversely affect habitat critical to the survival of a species</i>	Minimal habitat is expected to be impacted within the waterway (if any at all) and the disturbance footprint of the proposed works would be insignificant in comparison to available surrounding habitat. Works are not proposed to occur in-stream, however, any required removal of in-stream habitat (such as snags) would be reinstated once the works have	Unlikely	Unlikely	N/A

Significant impact criterion	Assessment	Significant impact likelihood	Critical habitat?	Important population ?
	been completed.			
e) <i>Disrupt the breeding cycle of an important population</i>	Works are proposed to be undertaken outside of the key Murray Cod breeding/migration period (spring to early summer).	Unlikely	N/A	Likely
f) <i>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i>	Little, if any habitat would be removed or destroyed in the construction process, therefore Murray Cod are unlikely to decline as a species.	Unlikely	N/A	N/A
g) <i>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</i>	It is unlikely that an invasive aquatic species would be introduced during the construction process, with barge use the only likely vector for transportation of introduced species, any vessels used would likely be local and if not, would be subject to usual interstate quarantine processes.	Unlikely	N/A	N/A
h) <i>Introduce disease that may cause the species to decline</i>	The proposal is unlikely to introduce any disease that may cause Murray Cod to decline as a species.	Unlikely	N/A	N/A
i) <i>Interfere substantially with the recovery of the species</i>	It is unlikely the proposal would affect the recovery of Murray Cod in any way, with only minor impacts expected, if any at all.	Unlikely	N/A	N/A
Overall assessment of likelihood of significant impact		Unlikely	Unlikely	N/A

Migratory bird species

Rainbow Bee-eater, Fork-tailed swift, White-throated Needletail, Eastern Great Egret and White-bellied Sea-eagle

Significant impact criterion	Assessment	Significant impact likelihood
<i>a) Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species</i>	It is highly unlikely that the proposal would modify, destroy or isolate an area of important habitat for these migratory birds, as habitat in the study area does not meet any of the Department of the Environment's criteria for 'important habitat for a migratory species' for these migratory birds (Department of the Environment 2013).	Unlikely
<i>b) Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species</i>	As above, habitat in the study area is not important habitat for these migratory birds.	Unlikely
<i>c) Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species</i>	The study area and surrounds is highly unlikely to host an ecologically significant proportion of the populations of these migratory birds at any given time. Therefore, the proposal is unlikely to seriously disrupt the lifecycle of these birds.	Unlikely
Overall assessment of likelihood of significant impact		Unlikely

Attachment 2: Second Murray River Crossing at Echuca-Moama, Detailed Flora and Fauna Assessment, Brett Lane and Associates Report 8194 (2.6)

Attachment 3: Mid-West 2 Murray River Crossing at Echuca-Moama, Matters of National Environmental Significance, Brett Lane and Associates Report 8194 (4.4)

Attachment 4: Mid-West 2 Murray River Crossing at Echuca-Moama, Detailed Flora, Fauna, Native Vegetation and Net Gain Assessment, Brett Lane and Associates Report 8194 (3.8)

Attachment 5: Echuca-Moama Bridge Project: biodiversity and habitat impact assessment EES report, Brett Lane and Associates Report 8194 (16.10)

Attachment 6: Second Murray River crossing at Echuca – Moama: biodiversity assessment of alignment in NSW, Brett Lane and Associates Report 8194 (15.5)

Attachment 7: Echuca Bridge Planning Study - Mid West 2 Option Aquatic Flora and Fauna Assessment, GHD Report 31/28726

Attachment 8: BL&A response letter to the DoE's request for further information on South-eastern Long-eared Bat and Superb Parrot

Attachment 9: South-eastern Long-eared Bat call analysis information provide by Dr Greg Richards

Attachment 10: Peer Review of bat survey by Gration (2015)

**Attachment 11: VicRoads standard environmental mitigation measures, construction contract (major)
standard Section 177**

SECTION 177 - ENVIRONMENTAL MANAGEMENT (Major)

This section specifies the minimum environmental management obligations relating to the work to be constructed under this Contract. Additional contract specific requirements may be included in Section 100.

PART A - ENVIRONMENTAL MANAGEMENT
PART B - WATER QUALITY
PART C - AIR QUALITY
PART D - EROSION AND SEDIMENT CONTROL
PART E - CONTAMINATED SOILS AND MATERIALS
PART F - WASTE AND RESOURCE USE
PART G - FUELS AND CHEMICALS
PART H - NOISE AND VIBRATION
PART I - FLORA AND FAUNA
PART J - CULTURAL HERITAGE
PART K - REPORTING
PART L - AUDITS
PART M - REFERENCES

PART A - ENVIRONMENTAL MANAGEMENT

177.A1 INTRODUCTION

Works under the Contract shall be undertaken so that impacts on the environment are avoided or minimised. The Contractor shall ensure that the environmental objectives and measures outlined in the relevant State and Federal legislation are complied with.

The Contractor shall prepare a project specific Environmental Management Plan for the management of activities that impact on the environment in accordance with this specification.

~~##(strikethrough the following paragraph where the project is not identified as containing high environmental risk – seek advice from Operation Services):~~ Work under the Contract includes activities which VicRoads has assessed as having potentially high environmental risk. The Contractor shall ensure a strong focus on environmental management is maintained whilst executing the work under the Contract, including the provision of staff with appropriate environmental skills and experience to manage these risks.

177.A2 DEFINITIONS

Ancillary Works Area – an area outside the defined Limit of Works where activities are undertaken that support the Contractor in the delivery of the project. This may include the establishment of site compounds, borrow areas, temporary sedimentation basins, and temporary works.

Contaminated Material – the presence of any chemical substance or waste that exists above the natural background level of the land or water and represents, or potentially represents an adverse health or environmental impact.

Cultural Heritage – Aboriginal heritage as defined in Section 4 of the *Aboriginal Heritage Act 2006 (Vic)* and cultural heritage and archaeological relic as defined in Section 3 of the *Heritage Act 1995 (Vic)*, including Aboriginal artefacts, scarred trees, burial sites, and historic bridges and buildings.

Cultural Heritage Advisor – a person who is appropriately qualified in a discipline directly

related to the management of cultural heritage, such as anthropology, archaeology or history; or has extensive experience or knowledge in relation to the management of cultural heritage.

Cultural Heritage Management Plan (CHMP) – an overview of the heritage values of the project area and an outline of management processes and initiatives to be implemented to avoid or minimise impacts on those values during the course of the project.

Environmental Management Plan (EMP) – contractor's document that provides an overview of the environmental management processes to be utilised for work under the Contract, including procedures to protect the beneficial uses of the environment and details proposals/actions to be undertaken and controls to be implemented for the management of individual stages of work (defined by work activity and/or location) that impact on the environment.

Environmental Improvement Plan (EIP) – a plan prepared for approval of EPA to address the use of non-potable water and/or contaminated materials. The plan identifies potential risks to human and animal health, the environment and surrounding land use areas and details management options to mitigate the risks.

Environmental Incident – an event which results in or has the potential to result in the environmental requirements in this Contract being breached and occurs at any location where works under the Contract are performed.

Noise Sensitive Receptors – uses that may be affected by construction noise. During daytime hours this may include aged care homes, hospitals, schools, kindergartens, libraries and other noise sensitive community buildings.

Rain Event – when rainfall results in an off-site discharge, and/or when on-site construction activities are ceased due to rain, and/or rainfall occurs that requires monitoring as defined in the Rainfall Intensity Chart attached as Attachment A to this Section 177.

Tree Protection Zone - in accordance with AS 4970-2009 the Tree Protection Zone is the area enclosed by a radial distance from the centre of the trunk that is 12 times trunk diameter to a maximum of 15 metres. The trunk diameter is measured at 1.4 metres above ground.

Waterway – includes waterways as defined in the *Water Act 1989* and any natural collection of water (other than water collected and contained in a private dam or a natural depression on private land) whether or not the flow is continuous, as well as tidal and coastal water and groundwater.

177.A3 ENVIRONMENTAL MANAGEMENT PLANS

The Contractor shall be responsible for the preparation, implementation and other arrangements associated with the Environmental Management Plan (EMP). The EMP shall include, as a minimum:

- (a) a statement of scope and purpose and the environmental objectives;
- (b) a schedule of environmental elements that are expected to be affected by the works under the Contract including an outline of proposed mitigation treatments and proposed timeframes;
- (c) the identification of work activities and an assessment of their potential impacts and associated risks to on-site and off-site environmental receptors (e.g. community, land uses, waterways, flora and fauna, cultural heritage, etc.) including times when the Contractor is not on site, including but not limited to matters covered in this specification;

- (d) processes and responsibilities for -
 - preparation and implementation of the EMP,
 - reporting and investigation of environmental incidents or complaints relating to any environmental issue under the Contract,
 - implementing an adaptive approach for the review and update of the EMP in conjunction with the assessment of the adequacy of the on-site implementation of controls and procedures as works progress and/or following non-conformances, complaints, or previously unidentified issues, and
 - after hours response including arrangements for containing environmental damage and attendance on site in the event of an emergency;
- (e) legal and other requirements - details of approvals, licences and permits necessary and their associated conditions to meet statutory requirements;
- (f) competence, training and awareness - an induction and training plan to ensure that all site personnel (including subcontractors) understand the EMP and are aware how the EMP is to be implemented in relation to the works, including any possible emergency response procedures;
- (g) operational control – the EMP shall document environmental procedures to manage all identified environmental elements to avoid or mitigate impacts. The procedures shall address the environmental protection requirements, including the requirements, where relevant, in Section 177 Parts B to H and any specific environmental requirements in Section 100. These procedures shall include inspection and monitoring;
- (h) scaled drawing(s) that clearly show the location and extent of environmental controls, modifications to existing control devices and monitoring locations;
- (i) emergency preparedness and response - an emergency response procedure shall include processes for managing any environmental emergency on site, such as contacting relevant stakeholders and clean-up of the site;
- (j) nonconformity, environmental incidents and corrective and preventative action procedures;
- (k) audit - a documented process for audit of the EMP against the contract requirements, including the effectiveness of on-site environmental protection measures.

An EMP shall be prepared for any works undertaken in an ancillary works area.

HP The Contractor shall submit to the Superintendent for review an EMP not less than two weeks prior to the commencement of work. The EMP shall be submitted together with the signed 'Declaration – Environmental Plan Verification' in accordance with Clause 177.L1(a).

HP Work shall not commence until the:

- **Superintendent is satisfied that the EMP meets the requirements of the specification for that stage of work;**
- **controls detailed in the EMP relevant to that stage of work are implemented.**

Control measures identified in the EMP shall be installed prior to works commencing, or at the programmed timing for their implementation. Control measures shall be maintained in working order for the duration of the associated works.

177.A4 TRAINING

- (a) Prior to commencement of works on-site, the Contractor shall ensure that all personnel are informed of the environmental issues and specific risks associated with the project and the required management and mitigation measures to address these risks.
- (b) Environmental Protection Awareness Workshop

Prior to commencement of works on-site, the Contractor shall ensure that personnel directly involved in the development and implementation of EMPs, EIPs, and the monitoring, installation and maintenance of control measures for this Contract attend an environmental workshop to review the environmental issues associated with the site. The Contractor shall liaise with the Superintendent to determine the agenda of the workshop.

177.A5 PERMITS

The Contractor shall be responsible for obtaining all necessary permits and approvals from the relevant authorities, other than those already obtained by VicRoads. Copies of all relevant documentation relating to permits and approvals obtained by the Contractor shall be provided to the Superintendent within one week of their receipt and prior to any works relating to the permit commencing. Copies of all permits and approvals will be kept on site.

The Contractor shall be responsible for implementing any conditions identified in any permits whether obtained by VicRoads or the Contractor. All permits and associated conditions shall be identified in the EMP.

177.A6 DEVELOPMENT, IMPLEMENTATION AND MONITORING OF ENVIRONMENTAL MANAGEMENT PLANS

The Contractor shall engage a suitably experienced and skilled environmental management professional to prepare the Environmental Management Plan and manage and monitor all environmental issues and environmental treatments implemented during construction. The individual shall be full time on site and shall:

##(choose one of the following options and STRIKETHROUGH the option not required

Option 1 – for use where a project is assessed as containing low, medium or high absolute environmental risk;

Option 2 – for use where a project has been assessed as containing extreme absolute environmental risk(s) associated with significant environmental issues.)

:##(Option 1 – delete this author note before finalising document):

- have demonstrated competence and suitable experience in environmental management in a construction environment; and
 - have successfully completed a nationally accredited training course which addresses management practices for erosion and sediment control (Green Card or equivalent).
- ##(Option 2 – delete this author note before finalising document):
- have the environmental management requirements of the Contract as their sole responsibility;
 - have a minimum of five years experience in environmental management, with a minimum of two years environmental management experience in a road construction environment;
 - have demonstrated competence and suitable experience in environmental management in a construction environment with high environmental risks and/or complex environmental issues;
 - be eligible for membership with the Environment Institute of Australia and New Zealand (EIANZ), Engineers Australia or other appropriate affiliation;
 - have successfully completed a nationally accredited training course which addresses management practices for erosion and sediment control (Green Card or equivalent).

Evidence to demonstrate conformance with these requirements shall be provided to the Superintendent in conjunction with the submission of the Environmental Management Plan in accordance with Clause 177.A3.

PART B - WATER QUALITY

177.B1 WATER

(a) General

The quality of water in waterways shall not be detrimentally impacted by runoff from the site.

(b) Monitoring

(i) General

Water quality and rainfall shall be monitored for the parameters identified in Table 177.B1.01 during all stages of construction to ensure that the water quality in the receiving waterways:

- does not vary between the upstream and downstream limits of the work site during the construction period (where upstream results become the background limits). The allowable variation between results shall be no more than twice the measurement uncertainty of the instrument; or
- is as agreed between the Contractor, the Superintendent and Environment Protection Authority Victoria (EPA).

The Contractor shall possess equipment on site that is capable of providing instantaneous monitoring of parameters as required in Table 177.B1.01. All equipment associated with monitoring shall be maintained and calibrated in accordance with the manufacturer's or equipment supplier's requirements.

*** **Table 177.B1.01 Construction Monitoring**

Parameter	Method
Turbidity – NTU	Measure with onsite meter
Electrical Conductivity (EC) – $\mu\text{S}/\text{cm}$	Measure with onsite meter
pH	Measure with onsite meter
Dissolved oxygen (DO) – mg/L	Measure with onsite meter
Temperature - °C	Measure with onsite meter
Litter (definition, including solid inert waste)	Visual (prevent litter from entering waterways and drainage systems)
Oils and Greases	Visual (No visible free oil or greases)
Rainfall	Measure with onsite meter capable of logging rainfall at a minimal interval of 10 minutes.
## Other parameters specific to the project:	## :

(ii) Dewatering

Water quality monitoring shall be undertaken when dewatering ponded water to receiving waterways or drainage infrastructure.

The quality of ponded water to be dewatered to receiving waterways shall not exceed 30 NTU or shall be equal to or better than the water quality in the receiving waterways if the turbidity in the receiving waterway is less than 30 NTU.

*** The pH of ponded water to be dewatered shall be within the range of ~~##~~ (strikethrough the pH range that is not applicable, as defined in EPA Publication 960 – Section 4.4 Dewatering (Figure 37): ##6.4 - 7.7: ##6.5 - 8.3:.

(iii) Bypass Pumping

Water quality monitoring shall be undertaken when bypass pumping water around works that is being undertaken within a waterway.

(iv) Locations

Monitoring shall be carried out:

- in waterways upstream and downstream of the limits of the site;
- at appropriate locations in waterways within the site including immediately upstream and downstream of each point source (or flow) entering along the length of waterways within the project site.

Details of all monitoring locations shall be maintained on the scaled drawings associated with the EMP. Monitoring sites must be accessible during all on-site activity and in all weather conditions.

Monitoring for dewatering activities will be undertaken:

- at the ponded water at the pump intake; and
- in the receiving waterways immediately upstream and downstream of the discharge point (within the mixing zone of the waterway and discharged water); or
- at the pump outlet where dewatering occurs into drainage infrastructure.

Monitoring for bypass pumping activities will be undertaken at locations immediately upstream and downstream of the pumping activity in the waterway.

(v) Timing

Monitoring shall be undertaken:

- immediately prior to work commencing;
- *** • ## (edit as appropriate): daily / weekly / other;
- for each rain event as follows -
 - within one hour of commencement of rain event during working hours,
 - every four hours for periods of continuous rain during working hours, and
 - within 12 hours of a rain event, outside working hours;
- immediately prior to the commencement of and then hourly during dewatering and bypass pumping activities.

177.B2 GROUNDWATER**(a) General**

The beneficial uses of groundwater shall not be adversely affected.

An assessment of the potential impact of the work under the Contract shall determine the beneficial uses to be protected as provided for in *State Environmental Planning Policy (Groundwaters of Victoria)* and *State Environmental Planning Policy (Waters of Victoria)* when groundwater is:

- expected to be encountered during works under the Contract – as part of the development of the EMP;
- unexpectedly encountered during works under the Contract – immediately after identification of the presence of groundwater.

The Contractor shall consider the beneficial uses, quality and quantity of groundwater when determining the ongoing management of groundwater (i.e. reuse, discharge, aquifer recharge). Such consideration shall be completed prior to the completion of related design and prior to commencement/continuation of related construction activities.

Where groundwater is unexpectedly encountered, a management plan shall be developed and implemented to manage the groundwater and protect beneficial uses in accordance with the requirements of the EPA. The Contractor shall undertake monitoring in accordance with the requirements of the EPA.

Groundwater encountered on site shall be assessed for the opportunity for reuse as a non-potable water source for the duration of the Contract if no higher fit for purpose use can be identified.

(b) Monitoring Locations

The Contractor shall undertake a visual assessment of the site for groundwater daily during all excavation activities.

177.B3 NON-POTABLE WATER**(a) General**

Non-potable water sources shall be utilised as the primary source of water for all activities unless the Contractor can demonstrate to the Superintendent's satisfaction that the use of non-potable water is not practicable and feasible.

Where non-potable water is used an Environmental Improvement Plan shall be developed in accordance with VicRoads guidelines (refer Table 177.M1.01) and shall include the management of all activities related to the sourcing, transport, storage and use of the non-potable water.

The Contractor shall meet the following requirements, and include appropriate measures to meet these requirements in the Environmental Improvement Plan:

- (i) the transport, storage and use of non-potable water shall be in accordance with the Environment Improvement Plan prepared for the contract;
- (ii) the use of non-potable water shall not result in any off-site discharge, either as run-off or airborne.

(b) Monitoring

Monitoring shall be undertaken in accordance with the Environmental Improvement Plan.

PART C - AIR QUALITY

177.C1 AIR QUALITY

(a) General

All work under the Contract shall comply with the following requirements:

- emissions of odorous substances or particulates shall not create or be likely to create objectionable conditions for the public;
- materials of any type shall not be disposed of through burning;
- material that may create a hazard or nuisance dust shall be covered during transport; and
- dust generated from road construction activities shall not create a hazard or nuisance to the public, shall not disperse from the site or across roadways, nor interfere with crops, stock or any other dust-sensitive receptors.

(b) Plant and Equipment

All work under the Contract shall comply with the following requirements:

- emissions of visible smoke to the atmosphere from construction plant and equipment shall not be for periods greater than 10 consecutive seconds;
- where practicable all heavy duty diesel engines must be fitted with Selective Catalytic Reduction (SCR) and diesel particulate filters.

(c) Monitoring

(i) General

Monitoring shall comply with the following requirements:

- insoluble solids from any air quality monitoring station, as measured by a dust deposit gauge in accordance with the requirements of AS 3580.10.1, shall not exceed 4 g/m²/month or 2 g/m²/month above the background measurement, whichever is the lesser;
- directional dust gauges that comply with the equipment requirements of AS 2724.5 shall be installed alongside each air quality monitoring station. Directional dust gauges shall be orientated such that one of the collecting cylinders is directed towards the construction activities;
- directional dust shall be measured as insoluble solids in accordance with AS 3580.10.1 for each of the four collecting cylinders. Directional dust gravimetric results shall be expressed as the percentage of the total directional dust gauge catch for each cylinder;
- dust deposition and directional dust monitoring shall be supplemented with continuous monitoring using a portable laser light scattering instrument, or equivalent, to allow changes to dust control measures if the PM₁₀ 1 hour average concentration exceeds 120 µg/m³;
- no less than ##(edit as appropriate):one/two/three/other portable laser light scattering instruments shall be operational daily while undertaking construction activities;
- portable laser light scattering instrument(s) shall provide a visible and logged alarm and SMS notification if the 1 hour average criterion of 120 µg/m³ is exceeded;
- the portable light scattering instrument shall be calibrated and maintained in accordance with manufacturer's instructions with calibration and maintenance records retained and made available to the Superintendent upon request. Daily records shall include checks of instrument zero and flow rate.

(ii) Location of Monitoring Equipment

Dust deposit gauges and directional dust gauges shall be established in accordance with the requirements of AS 3580.1.1.

One dust deposit gauge shall be installed and maintained as a background reference station. The reference station shall be in close proximity to the site, but unaffected by works under the Contract.

No less than ## (edit as appropriate): two/four/six/other monitoring stations shall be located where roadworks are likely to have the greatest impact on adjacent properties or create nuisance/inconvenience to the public.

The location of portable laser light scattering instrument(s) shall be adaptive to changes in wind direction or construction activity.

Portable laser light scattering instrument(s) shall be located downwind of road construction activities or adjacent to a sensitive receptor when in proximity to the works.

All monitoring stations to be located such that they are secure from vandalism and tampering at all times.

(iii) Results

Results of dust deposition and directional dust monitoring shall be submitted to the Superintendent within 24 hours of receipt from the laboratory.

Daily results of continuous monitoring including the location(s) of the instrument shall be made available upon request.

A daily visual assessment of the site for airborne dust and vehicle emissions shall be undertaken at locations where works are being carried out and records maintained of these inspections.

Hourly wind speed and wind direction data that correlates to the site location shall be obtained and maintained in the Contractor's records and made available to the Superintendent upon request.

(iv) Timing

Sampling frequency for dust deposition and directional dust is based on the risk of generation of nuisance dust and is season dependent. Dust deposition and directional dust sampling frequency shall comply with Table 177.C1.01.

Table 177.C1.01

Period	Sampling Frequency
November to March	14 day consecutive period
April to October	30 day consecutive period

PART D - EROSION AND SEDIMENT CONTROL

177.D1 EROSION AND SEDIMENT CONTROL

(a) General

All exposed surfaces shall be free of or treated to minimise erosion.

Erosion and sediment controls shall include:

- minimising the amount of exposed erodible surfaces during construction including the staging of works;
- prompt temporary and/or permanent progressive revegetation of the site as work proceeds;
- *** • prompt covering of exposed surfaces (including batters and stockpiles) that would otherwise remain bare for more than 28 days. Cover may include mulch, erosion control mat or seeding with sterile grass;
- installation, stabilisation and maintenance of catch and diversion drains that segregate water runoff from catchments outside of the construction site from water exposed to the construction site;
- installation and maintenance of erosion and sedimentation controls, established in accordance with EPA best practice guidelines for the treatment of sediment laden run-off resulting from construction activities;
- adequately control and route runoff within the construction site to the appropriate sedimentation controls; and
- where trees are required to be removed more than two months in advance of any construction works, remove only that part of the tree that is above ground level and where possible allow the roots to remain intact beneath the ground surface to assist with erosion control.

(b) Work in/near Waters

Works shall be programmed and managed to avoid work in waters. Where work in waters is unavoidable, procedures shall be developed and implemented to satisfy the requirements of the specification and as required by any permits from the responsible authority(s).

Where construction activities are undertaken in, near or over waters, the EMP shall address the protection of beneficial uses in accordance with any permit, the *State Environmental Planning Policy (Waters of Victoria)* and best practice guidelines.

(c) Sedimentation Basins

Sedimentation basins shall be utilised as the primary sediment control for the works unless the Contractor can demonstrate to the Superintendent's satisfaction that the implementation of a sedimentation basin is not technically feasible for the works.

Where sedimentation basins are proposed as control measures, basins shall be designed to contain flows from a rainfall event having an Average Recurrence Interval of not less than two years and six hours duration when allowing for a 30% reduction in capacity as a result of sediment accumulation.

Sedimentation basins shall be modelled and sized to manage rainfall intensities and soil characteristics specific to the region and for any material that is imported to the site. The sizing and modelling of sedimentation basin(s) shall consider the expected works and associated area of disturbance within catchment area(s) within the site.

The sizing and modelling of temporary sedimentation basins shall be undertaken using recognised 'best practice' modelling techniques or '*VicRoads Temporary Sedimentation Basin Design Tool*'.

Spillways shall be designed for an event having an Average Recurrence Interval of five years.

An independent hydraulic consultant who has demonstrated competence and suitable experience in the design of temporary sedimentation basins shall complete and sign a declaration in accordance with Attachment C to this Section 177. The declaration shall accompany submission of the sedimentation basin designs to the Superintendent.

HP The Contractor shall submit to the Superintendent the sedimentation designs and the associated independent verification declarations not less than two weeks prior to the commencement of construction of the temporary sedimentation basin.

Sedimentation basins shall be cleaned out whenever the accumulated sediment has reduced the capacity of the basin by 30% or more, or whenever the sediment has built up to a point where it is less than 500 mm below the spillway crest, whichever occurs earlier.

The Contractor shall maintain the capacity of the sedimentation basin and shall ensure compliance with Clause 177.B1(b)(ii) if dewatering to a waterway.

(d) Stockpiles

Where soil is stockpiled on site, such stockpiles shall be located, where possible, to provide a clearance of not less than 10 m from waterways. Where it is not possible to provide a clearance of 10 m, the stockpile shall be above the normal high water level of the waterways and additional protection shall be provided to prevent the stockpiled material entering the waterways.

(e) Monitoring

The Contractor shall inspect the whole site for instances of soil erosion or scour and the effectiveness of erosion and sedimentation controls:

- at intervals not more than seven days;
- within one hour of the commencement of any runoff resulting from rain events during working hours;
- every four hours during periods of continuous rain during working hours;
- within 12 hours of a rain event outside working hours.

Any defects and/or deficiencies in control measures identified by monitoring undertaken shall be rectified immediately and these control measures shall be cleaned, repaired and augmented as required to ensure effective control.

PART E - CONTAMINATED SOILS AND MATERIALS

177.E1 CONTAMINATED SOILS AND MATERIALS

(a) General

All work under the Contract shall comply with the following requirements:

- soils or materials shall not be contaminated as a consequence of work under the Contract;
- materials imported to the site shall be free from contamination;
- contaminated materials shall only be reused on site following approval from the Superintendent and EPA;
- contaminated materials to be reused on site as part of the Contract shall be temporarily stored and managed to minimise any impact on the site or surrounding environment;
- the importing, transport and disposal of contaminated soils or materials off-site shall be undertaken in accordance with relevant legislation and State Environment Protection Policies;
- disposal of contaminated materials off-site (where required) shall be undertaken in accordance with relevant legislation and State Environment Protection Policies.

(b) Sites of Known Contamination

Table 177.E1.01 lists known contaminated sites.

*** **Table 177.E1.01**

Contamination type	Chainage / AMG grid reference / location / Drawing No.
## e.g. hydrocarbons, heavy metals, PCBs:	## e.g. AAV 7822/935: ## e.g. E:321900, N:5828525: ## e.g. Drawing Number:
##:	

(c) Discovery of Contaminated Material

The discovery of contaminated material on the site during works shall be managed in accordance with VicRoads and EPA Guidelines. In the event that contaminated material is encountered on the site, the Contractor shall:

- notify the Superintendent and where applicable EPA;
- undertake comprehensive sampling and analysis to determine the type levels and extent of contamination in accordance with current VicRoads and EPA guidelines;
- investigate the opportunity to reuse the contaminated soil and/or material as a fill material on site;
- ensure that any proposed reuse and/or disposal methods are acceptable to the Superintendent and EPA.

(d) Use of Contaminated Material

The use of contaminated material in the Works shall be subject to the approval of the Superintendent and EPA. The Contractor shall follow procedures and best practice containment and management techniques in VicRoads and relevant EPA documentation when such materials are reused on site.

Prior to the use of any contaminated material on the site, the contractor shall verify that the proposed use is in accordance with legislative requirements. Where directed an EIP or other documentation shall be prepared in liaison with EPA and the Superintendent.

Where any contaminated material is used in the works, records shall be kept of the source, type of contamination, volume of contaminated material incorporated, the locations placed and all investigations undertaken. The location of contaminated material incorporated into the site shall be identified in the 'As Constructed' drawings. Copies of all documentation including the EIP are to be forwarded to the Superintendent.

A copy shall also be forwarded to the Superintendent for inclusion in VicRoads Contaminated Site Register.

(e) Monitoring

The Contractor shall undertake a visual assessment of the site for contaminated soils and materials at the following intervals:

When stripping:	Daily
During excavations:	Daily
When importing filling material:	Daily

(f) Acid Sulfate Soils

(this clause only applies to projects that are to be undertaken in areas where Acid Sulfate soils have been identified – only strikethrough all of (f) if sufficient investigation has determined that it is not relevant and there is no likelihood of its occurrence):
The locations identified in Table 177.E1.02 have been identified as having the potential for the presence of acid sulphate soils. A specific environmental management plan to minimise the risk of disturbance and/or to manage its treatment and offsite removal must be prepared and approved by the EPA prior to review by the Superintendent.

***** Table 177.E1.02 Acid Sulfate Soils**

Site Location	Chainage / AMG grid reference / Location
	##E [insert grid reference e.g. 321900]: ##N [insert grid reference e.g. 5828525]: ## refer to Volume 3 – Drawings; or reports as required:

Wherever possible the locations identified above should be avoided. Where this is not possible, minimising disturbance may involve:

- planning to arrange and minimise construction in such a way so that it limits the amount of excavation of acid sulfate soil required;
- locating aspects of the contract on the part of a land where acid sulfate soils are buried deepest, so the amount of acid sulfate soil removed is reduced;
- using construction methods and site management procedures that do not leave acid sulfate soils exposed to air without treatment; and/or
- aligning and designing linear infrastructure in tidal areas so that natural water flows (both surface and groundwater) are not blocked.

If acid sulfate soil is disturbed, it must be treated.

PART F - WASTE AND RESOURCE USE

177.F1 WASTE AND RESOURCE USE

(a) General

The generation of waste materials shall be managed in accordance with the hierarchy, to avoid, reuse, recycle or dispose of waste material. The Contractor shall be responsible for the management of any waste produced in performing the work under the Contract.

All work under the Contract shall comply with the following requirements:

- the nature of wastes generated as a consequence of works under the Contract shall be identified;
- wastes shall be stored prior to reuse or disposal to minimise any impact on the site or surrounding environment;
- where approval is granted to incorporate recycled materials into the works, the Contractor shall maintain appropriate records of the type of material and its location;
- vehicles transporting waste shall be covered and appropriately licensed.

Where recycling facilities are available, the materials shall be managed in accordance with Table 177.F1.01.

Table 177.F1.01 Resource Management Requirements

Material	Waste Management Option
Asbestos	EPA licensed landfill
Asphalt	Recycle or reuse - not to landfill
Concrete and concrete washings	Recycle or reuse - not to landfill
Contaminated soil	Recycle or reuse on site if opportunity exists If removed from site, transported by an EPA licensed contractor and disposed in accordance with EPA regulations
Felled woody vegetation (except fragments of noxious or environmental weeds capable of regeneration)	Mulched for reuse, or used for habitat logs
Woody weed fragments capable of regeneration	Burial on site (deeper than 500 mm and not in fill, pavement or other critical areas), composting, or disposal to landfill
Formwork	Reuse or dispose to landfill
Plastics (Recycle Nos. 1, 2, 3, 4, 5, 6, 7)	Recycling facility - not to landfill
Metal	Recycle or reuse - not to landfill
Oil containers and lead acid batteries	Recycling facility - not to landfill
Packaging materials	Recycle where possible or dispose to landfill
Empty paint tins	Recycling facility - not to landfill
Petroleum products from spills (absorbed in spill kit material or contaminated soil)	Recycle or reuse with rehabilitation of contaminated soils if opportunity exists Transported by an EPA licensed contractor and disposed in accordance with EPA regulations
Timber (untreated)	Recycle - not to landfill
Litter	Recycle or dispose to landfill
Office waste	Recycle where possible or dispose to landfill
Other waste excluding the above wastes	Recycle or reuse if opportunity exists

(b) Monitoring

The Contractor shall monitor the whole site for instances of inappropriate waste management or disposal at intervals of not more than 7 days.

PART G - FUELS AND CHEMICALS

177.G1 FUELS AND CHEMICALS

(a) General

Any leakage or spillage of any fuels or chemicals shall not have a detrimental environmental impact.

The EMP shall include specific procedures to mitigate the effect on the environment from fuels and chemicals, including herbicides and pesticides. Such procedures shall include:

- nominated fuel and chemical storage areas that comply with Dangerous Goods (Storage and Handling) Regulations 2012 and EPA Bunding Guidelines (EPA Publication 347) including the placarding of compounds and bulk storage containers;
- nominated points for the refuelling and fluid top up of vehicles and plant which shall be undertaken in a designated area at least 20 m from any drainage point or waterways;
- provision of readily accessible and maintained spill kits for the purpose of cleaning up chemical, oil and fuel spillages on the site at all times;
- ensuring that personnel trained in the efficient deployment of the spill kits are readily available in the event of spillages; and
- a contingency plan that shall address the containment, treatment and disposal of any spill.

(b) Monitoring

Fuel and chemical storages and equipment fill areas shall be monitored for compliance at intervals of not more than 7 days.

PART H - NOISE AND VIBRATION

177.H1 NOISE

The mitigation of construction noise shall include:

- hours of work shall be between 7am and 6pm weekdays and Saturday;
- construction vehicles and equipment shall have appropriate measures fitted and be effectively maintained to minimise engine noise;
- noisy equipment shall be enclosed where possible;
- establishment of temporary noise attenuation barriers where appropriate;
- scheduling noisy work practices (e.g. pile driving) to minimise likelihood of community annoyance; and
- use of smart movement alarms for vehicles particularly when working in proximity to noise sensitive receptors or where working outside normal hours.

177.H2 VIBRATION

(a) General

All work under the Contract shall be undertaken utilising construction methodologies that will minimise vibration disturbance to the community and avoid damage to buildings and/or structures.

Vibration generated through construction plant and equipment or blasting (Clause 177.H3 – Blasting) shall not de-stabilise the existing ground condition especially if work is carried out in the vicinity of any natural slopes or embankment.

Construction methodologies shall be utilised to ensure that vibration does not exceed the peak vibration criteria in Table 177.H2.01 and/or criteria set by a responsible authority for a specified structure/asset that falls within its responsibility.

(b) Monitoring

Where directed by the Superintendent, vibration monitoring shall be undertaken to ensure that construction activities do not pose the potential for damage to surrounding buildings.

Monitoring shall be undertaken to assess the potential vibration impacts on buildings in accordance with German Standard DIN 4150, part 3 - 1999 (Effects of Vibration on Structures).

Peak vibration velocities shall not exceed the criteria in Table 177.H1.01

Table 177.H2.01 Vibration Criteria for Assessing Potential for Damage to Buildings

Type of Structure	Peak Vibration Velocity at foundation (mm/s)
Reinforced or framed structures. Industrial and heavy commercial buildings	20
Unreinforced or light framed structure. Residential or light commercial type buildings	5
Structures that because of their sensitivity to vibration do not correspond to those listed above and are of great intrinsic value (e.g. heritage listed buildings).	3

(c) Results

Vibration monitoring results shall be submitted to the Superintendent within 24 hours being obtained.

177.H3 BLASTING**(a) General**

The contractor shall undertake blast monitoring to ensure that blasting activities do not pose the potential for damage to surrounding buildings or structures and to minimise disturbance to the community.

The contractor shall ensure that:

- vibration generated by blasting does not exceed the criteria set out in Table 177.H3.01; and
- blasting overpressure does not exceed 133 dBL.

(b) Monitoring

Monitoring of blasting activities shall be undertaken in accordance with Section J.3.2 of AS 2187.2-2006 (Explosives - Storage and use - Use of explosives), at locations relevant to sensitive buildings agreed with the Superintendent.

The peak component particle velocity of predominant pulse shall not exceed the criteria in Table 177.H3.01.

Table 177.H3.01 Transient Ground Vibration Criteria for Assessing Potential for Damage to Buildings

Type of Structure	Peak Vibration Velocity (mm/s)
Reinforced or framed structures Industrial and heavy commercial buildings	50
Unreinforced or light framed structure Residential or light commercial type buildings	15
Structures that because of their sensitivity to vibration do not correspond to those listed above and are of great intrinsic value (e.g. heritage listed buildings).	3

(c) Monitoring Results

Monitoring results of blasting for activities shall be submitted to the Superintendent within 24 hours.

PART I - FLORA AND FAUNA

177.I1 FLORA AND FAUNA

(a) General

All work under the Contract shall comply with the following requirements:

- avoid, minimise and offset (where appropriate) the removal of native vegetation during construction;
- avoid injury to fauna or damage to protected vegetation or habitat; and
- the discovery of significant flora and fauna sites, species or habitat not previously identified shall be managed to protect flora and fauna.

(b) Permits and Approvals

The permits and/or approvals identified in Table 177.I1.01 have already been obtained, or are being obtained by VicRoads. Works under the contract shall comply with all permits and approvals and associated conditions.

*** **Table 177.I1.01 Flora and Fauna Permits Obtained by VicRoads**

Site/Species	Permit/Approval Number	Issuing Authority
Flora		
# # :		
Fauna		
# # :		

Permits from relevant authorities must be obtained prior to disturbance of flora/fauna sites or relocation of native fauna affected by works under the Contract.

(c) Protection of Flora and Fauna Sites

Works shall not damage, disturb or otherwise adversely impact:

- vegetation or habitat sites and areas of significance listed in Table 177.I1.02;
- any other significant vegetation or habitat sites, not listed in Table 177.I1.02, that are not required to be removed for permanent works; and
- any significant native flora/fauna sites or habitat discovered during works under the Contract without prior approval from the Superintendent and obtaining all relevant permits.

*** Table 177.I1.02

Vegetation/Habitat Site	Chainage/AMG Grid Reference/Location
##[insert site detail, e.g. State significant species]:	##E [insert grid reference e.g. 321900]: ##N [insert grid reference e.g. 5828525]: ##or refer to Volume 3 – Drawings or flora/fauna reports as required:
##:	##:

All personnel working on site shall be trained in the identification of:

- flora or habitat sites listed in Table 177.I1.02, and other vegetation/habitat sites that are not to be damaged or disturbed;
- likely significant flora and fauna species which may be present and the actions required for their management if encountered.

All sites nominated in Table 177.I1.02 and any additional existing vegetation and native fauna habitat identified to be retained, shall be identified as 'No-Go Zones' and protected by temporary fencing and signage. All fencing of 'No-Go Zones' shall as a minimum be:

- erected a minimum of 1 m beyond the boundary of the habitat to be protected, or at the tree protection zone;
- constructed of star picket and paraweb with one wire support;
- signage installed on the temporary fencing at intervals no less than 20 m apart stating 'No-Go Zone – No Unauthorised Access'; and
- retained in place for the duration of construction activities.

The Contractor shall ensure the No-Go Zone includes the full Tree Protection Zone. Where encroachment within the Tree Protection Zone is unavoidable the contractor shall:

- engage a suitably qualified arborist (with a minimum qualification of Australian Qualification Framework Level 5, Diploma of Horticulture (Arboriculture) to assess the potential impact on the trees;
- the arborist assessment shall include the botanical name, diameter at a height of 1.4 metres, useful life expectancy, the tree location and whether the proposed impact on any Tree Protection Zone will significantly impact the future health of the tree(s). The assessment shall recommend whether the tree can be retained with mitigation measures or whether it should be removed.

The arborist assessment shall be approved by the Superintendent prior to the commencement of vegetation removal.

HP

Prior to removing any vegetation or habitat, the Contractor shall arrange an on-site inspection with the Superintendent and other relevant authorities to confirm and clearly identify and mark trees, vegetation or habitat to be removed, consistent with the Contract drawings and any relevant permits and shall fence and sign all sites nominated as No-Go Zones.

Plant, equipment, material or debris shall not be driven, dragged, placed or stored within the No-Go Zones. Vegetation management activities required to protect vegetation quality may be undertaken in No-Go Zones.

(d) Removal of Flora and Protection of Fauna

A suitably qualified ecologist with the appropriate permits/licenses shall be present on site during the removal of vegetation to:

- identify and examine any native fauna habitat including trees (including hollow bearing trees) and/or fallen logs affected by works under the Contract to identify, capture and relocate fauna identified within the zone to be cleared; and
- provide advice on alternative fauna habitat sites.

If appropriate, relocation of any fauna or nests shall be made to adjacent habitat and shall be undertaken in accordance with the requirements of the Department of Environment and Primary Industries. Where practicable, any nests found to be inhabited by native birds or by mammals (e.g. possums or gliders) shall be removed outside of the species' breeding season.

Any targeted vegetation removal from within the No-Go Zones shall be undertaken utilising methods that avoid impact on any other flora or habitat within the No-Go Zone.

Pruning of any vegetation to be retained shall be undertaken by a suitably qualified practicing arborist (minimum Australian Qualification Framework Level 3, Certificate III Horticulture (Arboriculture)).

(e) Discovery of Significant Flora or Fauna

In the event that significant flora or fauna is discovered, the Contractor shall immediately cease operation and notify the Superintendent.

An appropriately qualified ecologist shall be engaged to accurately identify and provide advice for the management of the discovered significant flora or fauna species.

The Contractor shall submit to the Superintendent for approval a procedure/management plan that has been approved by the relevant authority to manage the flora or fauna species.

(f) Damage to Protected Vegetation

Where damage to flora or fauna habitat has occurred as the result of work under the Contract, the Superintendent reserves the right to direct the Contractor to repair or offset the vegetation and/or provide fauna habitat to an equivalent or better quality in accordance with the Department of Environment and Primary Industries documents '*Permitted clearing of naïve vegetation – Biodiversity assessment guidelines*' and '*Native vegetation gain scoring manual*'.

(g) Monitoring

The Contractor shall undertake monitoring of the condition of flora and fauna habitat sites and protective measures at the sites at the following intervals:

When construction activities are occurring in the vicinity of the sites:	Daily
At other times:	At least every 7 days
# # :	# # :

177.I2 WEEDS, PESTS AND DISEASES**(a) General**

Declared noxious weeds, pests and diseases (also referred to as pathogens) shall not be introduced to the site, spread through the site, or removed from the site (if present) as a consequence of work under the Contract.

The Contractor shall prevent the spread of declared noxious weeds, pests and diseases within the site and off-site through the implementation of controls that shall include the:

- treatment of declared noxious weeds prior to the commencement of any ground disturbing activities and in response to their identification through monitoring of the site;
- management of noxious weeds and soil pathogens potential within imported materials;
- provisions for cleaning plant and equipment at the following times -
 - prior to arrival on site,
 - prior to departure from site, and
 - prior to movement within the site from infested to non-infested areas;
- location of cleaning areas;
- use of a vehicle and machinery hygiene log book.

(b) Cinnamon Fungus ## (this clause only applies to projects that are to be undertaken in high risk infested zone / area - strikethrough all of (b) if this is not relevant):

Topsoil shall not be removed from the site.

Plant involved in the initial earthworks shall be cleaned and then disinfected with a suitable disinfectant applied with a high pressure pump spray prior to leaving the site.

(c) Phylloxera ## (this clause only applies to projects that are to be undertaken in Phylloxera Infected Zones as identified by the Phylloxera and Grape Industry Board of South Australia website mapping - strikethrough all of (c) if this is not relevant):

Contractors shall contact the Department of Environment and Primary Industries (DEPI) to discuss and develop an agreed procedure for the movement and protocol requirements of plant and equipment within the Phylloxera Infected Zone.

(d) Monitoring

*** The site shall be monitored for the presence of weeds and pests at intervals of not more than ## (edit as appropriate): weekly/fortnightly/other.

PART J - CULTURAL HERITAGE

177.J1 CULTURAL HERITAGE

(a) General

Cultural heritage sites and areas of cultural significance shall not be damaged, disturbed or otherwise adversely impacted unless an appropriate authorisation has been obtained.

Aboriginal Cultural Heritage

~~##~~ strikethrough one of the following *** options:

*** The Contractor shall undertake all works under the Contract in accordance with the requirements set out in the Cultural Heritage Management Plan (CHMP) ##(insert the name of the CHMP):. The requirements set out in Clauses 177.J1(d), (e) (f) and (g) are not applicable for the management of Aboriginal Cultural Heritage as these requirements are addressed in the CHMP.

*** A Cultural Heritage Management Plan has not been prepared for the works under this Contract. Works shall comply with any cultural heritage management procedures or initiatives outlined in an Aboriginal cultural heritage agreement or Aboriginal cultural heritage permit listed in Table 177.J1.01.

Historical Archaeological Heritage

The work under the Contract shall be undertaken to comply with any Historical Archaeological Heritage permit or consent relevant to the project. Historical Archaeological Heritage shall be protected from unauthorised disturbance during site establishment and construction.

(b) Permits and Approvals

The permits and/or approvals identified in Table 177.J1.01 have already been obtained, or are being obtained by VicRoads. The Contractor shall comply with the terms and conditions of these permits and approvals.

*** **Table 177.J1.01 Heritage Permits and Approvals Obtained by VicRoads
(including Cultural Heritage Management Plans)**

Site	Permit/Approval Number	Issuing Authority
Aboriginal Cultural Heritage		
##:		
Historical Archaeological Heritage		
##:		

(c) Cultural Heritage Sites

Table 177.J1.02 lists known cultural heritage sites.

*** **Table 177.J1.02**

Site	Reference Number	Chainage/ AMG grid reference/ location
Aboriginal Cultural Heritage		
## e.g. Isolated artefact scatter:	## e.g. AAV 7822/935:	## e.g. E:321900, N:5828525:
Historical Archaeological Heritage		
## e.g. Dry-stone wall, stone shed foundations:	## e.g. H7822/0271:	##e.g. E:322650, N:5831175:

(d) Protection of Cultural Heritage

A 'No-Go Zone' shall be established for identified Cultural Heritage sites that are to be protected during the work under the contract. Temporary fencing of 'No-Go Zones' shall be:

- constructed of, as a minimum, star pickets, single strand of wire at the top and paraweb;
- located at the maximum practical distance from the site with a minimum of 1 m beyond the limit of the Cultural Heritage site; and
- retained in place for the duration of the construction period (until Practical Completion), or until removal of the Cultural Heritage from the site.

Signage shall be installed on the temporary fencing at intervals no less than 20 m apart stating 'Protected Area – No Unauthorised Access'.

(e) Discovery of Cultural Heritage

The following procedure will apply in the event of the discovery i.e. uncovering and/or identification of any cultural heritage during construction:

- work at the location to be suspended;
- immediate notification of the Superintendent;
- the site shall be isolated by a 'No-Go Zone' as specified in Clause 177.J1(d), pending completion of an evaluation of the cultural heritage and the determination of an appropriate course of protective action;
- within 24 hours notify the relevant approval authorities of the discovery of cultural heritage and its location;
- work greater than 50 m away from the area in which the cultural heritage was uncovered and/or identified may recommence and continue. Work in areas less than 50 m from the cultural heritage site may proceed if agreed by the relevant approval authority, and in consultation with any other relevant cultural heritage stakeholders and the Superintendent;

- the Contractor shall engage a cultural heritage advisor to evaluate the nature, extent and significance of the cultural heritage;
- the Contractor shall consult with the Superintendent, relevant approval authorities and the Contractor's cultural heritage advisor to determine the process to be followed to manage the discovered cultural heritage and how to proceed with the works. The Superintendent's agreement shall be obtained for the proposed process for management of the discovered cultural heritage prior to implementation;
- the Contractor shall obtain the relevant cultural heritage approvals prior to any disturbance of cultural heritage discovered during construction and shall comply with all conditions of any such approvals. Removal of any cultural heritage from the site shall be undertaken in accordance with statutory requirements and relevant cultural heritage approval conditions;
- works may recommence in the relevant area if:
 - the conditions of the cultural heritage approval have been met, or
 - works can resume without risk to the discovered cultural heritage.

(f) Discovery of Human Remains During Construction

The following procedure will apply in the event of the discovery of suspected human remains:

- all activity in the vicinity shall stop;
- the remains must be left in place, and protected from harm or damage;
- immediately notify the local office of Victoria Police or the State Coroner's Office and the Superintendent of the discovery;
- if there are reasonable grounds to believe that the remains are Aboriginal human remains, report the discovery (including the particulars of the location and nature of the human remains) to Aboriginal Affairs Victoria; and
- implement an appropriate impact mitigation or salvage strategy as determined by the responsible authority and if relevant, in consultation with any Aboriginal person or body with an interest in the Aboriginal human remains.

(g) Monitoring

The Contractor shall undertake a visual assessment of the site for cultural heritage during ground disturbing activities.

The condition of heritage sites and protective measures at the sites shall be monitored at the following intervals:

When construction activities are occurring within 10 m of the sites:	Daily
At other times:	At least every 7 days

PART K - REPORTING

177.K1 REPORTING

(a) General

All environmental monitoring results and all non-conformance reports relating to environmental performance and current status shall be submitted to the Superintendent monthly or as agreed by the Superintendent.

The Contractor shall submit to the Superintendent copies of the data/information listed in Table 177.K1.01. This data/information shall include both the data for the latest reporting period and a summary of use to date in the Contract.

Table 177.K1.01

Data/Information	Frequency
Pollution Infringement Notices or Pollution Abatement Notices and/or any notices of prosecution	Within 24 hours of receipt by the Contractor.
Statutory documents obtained by the Contractor as part of the project (e.g. permits)	Within one week of receipt by the Contractor.
Results of any air quality and water quality monitoring undertaken as part of the project	Monthly
Itemised quantities of any materials nominated within the sustainability attributes schedule. This includes both materials in the pavement material and other sustainability categories.	Quarterly
Itemised quantities and types of materials sent off-site including prescribed waste certificates	Quarterly
Itemised quantities and sources of all water used on-site	Quarterly

(b) Notice of Authority Inspections

The Contractor shall notify the Superintendent within 24 hours of all environmental inspections, correspondence and/or discussions with the EPA or other authorities.

The Contractor shall allow site access to authorities, however must do so in a manner that protects the health and safety of the authority representatives.

177.K2 ENVIRONMENTAL INCIDENTS

In the event that an environmental incident occurs in relation to the work under the Contract, the Contractor shall:

- take immediate action to avoid continuance of the incident (which may include cessation of work), and to minimise the effect of the incident on the environment, as outlined in any Environmental Management or Environmental Improvement Plans;
- immediately notify the Superintendent and EPA Pollution Watch (Tel. 1300EPAVIC) and other responsible authorities of the incident (or by 9am the next working day if the incident occurs outside working hours); and
- submit to the Superintendent for review an incident report within 7 days of the incident. The incident report shall include photographs where available and cover details of the incident and the proposed corrective action to avoid a re-occurrence.

PART L - AUDITS

177.L1 ENVIRONMENTAL AUDITS AND SURVEILLANCE

(a) Independent Auditing of the Environmental Management Plan Prior to the Commencement of Works

The Contractor shall arrange an audit of the Environmental Management Plan prior to the commencement of Works.

The environmental audit shall be undertaken by an environmental auditor that:

- is listed on VicRoads 'Register for Pre-qualified Contractors and Consultants' for the level 'Environmental Auditing (Construction)';
- is independent of the Contractor (a specialist in the employ of the Contractor is not acceptable); and
- has no involvement in the development of the Contractor's EMP for the works under this Contract.

The Contractor's Environmental Management Plan shall be audited to ensure compliance with this Specification and to verify that the EMP will be sufficient to protect the beneficial uses.

The auditor shall complete and sign a declaration in accordance with Attachment B to this Section 177. The declaration shall accompany submission of the documents to the Superintendent.

(b) Surveillance and Audits During Construction

The Superintendent will arrange surveillance and audits to verify the effectiveness of the Environmental Management Plan and compliance with this Specification.

The Contractor shall co-operate with any reasonable requests by the Superintendent or from relevant environmental agencies to undertake environmental audits and or surveillance activities of the Contract.

All non-conformances arising from an audit shall be addressed by the Contractor. The Contractor shall take immediate action to address any significant environmental non-conformance identified by an audit.

If the Contractor does not take action to address a non-conformance, the Superintendent may act to resolve the non-conformance and the cost of such action shall be deducted from moneys due or becoming due to the Contractor.

PART M - REFERENCES

177.M1 REFERENCES

Environment protection shall be implemented in accordance with, but not limited to, the references listed in Table 177.M1.01. The reference shall be the edition or version current at the time of closing of tenders.

Table 177.M1.01 References

STATUTORY GUIDELINES / PUBLICATIONS	
Australian and New Zealand Environment and Conservation Council - Australian and New Zealand Guidelines for Fresh and Marine Water Quality	
Environment Protection Authority Publication 275 – Construction Techniques for Sediment Pollution Control	
Environment Protection Authority Publication 347 – Bunding Guidelines	
Environment Protection Authority Publication 448 – Classifications of Wastes	
Environment Protection Authority Publication 480 – Environmental Guidelines for Major Construction Sites	
Environment Protection Authority Publication 464.2 – Guidelines for Environmental Management - Use of Reclaimed Water	
Environment Protection Authority Publication 669 – Groundwater Sampling Guidelines	
Environment Protection Authority Publication 960 – Doing It Right On Subdivisions	
Environment Protection Authority Publication 1178 – Off-site Management and Acceptance to Landfill	
Environment Protection Authority Publication 1254 – Noise Control Guidelines	
Environment Protection Authority Publication 1436 to 1442 - Industrial Waste Fact Sheet Series	
Industrial Waste Resource Guidelines (IWRG701): Sampling and analysis of waters, wastewaters, soils and waste	
State Environment Protection Policy (Air Quality Management)	
State Environment Protection Policy (Groundwaters of Victoria)	
State Environment Protection Policy (Prevention and Management of Contaminated Land)	
State Environment Protection Policy (Waters of Victoria) and schedules	
Department of Environment and Primary Industries – Permitted clearing of native vegetation Biodiversity assessment guidelines	
Department of Environment and Primary Industries – Native vegetation gain scoring manual	
VICROADS DOCUMENTS	
VicRoads Sustainability and Climate Change Policy	
VicRoads Environmental Risk Management Guidelines	
VicRoads Integrated Water Management Guidelines	
VicRoads Contaminated Land (Planning, Construction and Maintenance) Guidelines	
VicRoads Cultural Heritage Guidelines	
VicRoads Biodiversity Guidelines	
VicRoads Noise Guidelines - Construction and Maintenance Works	

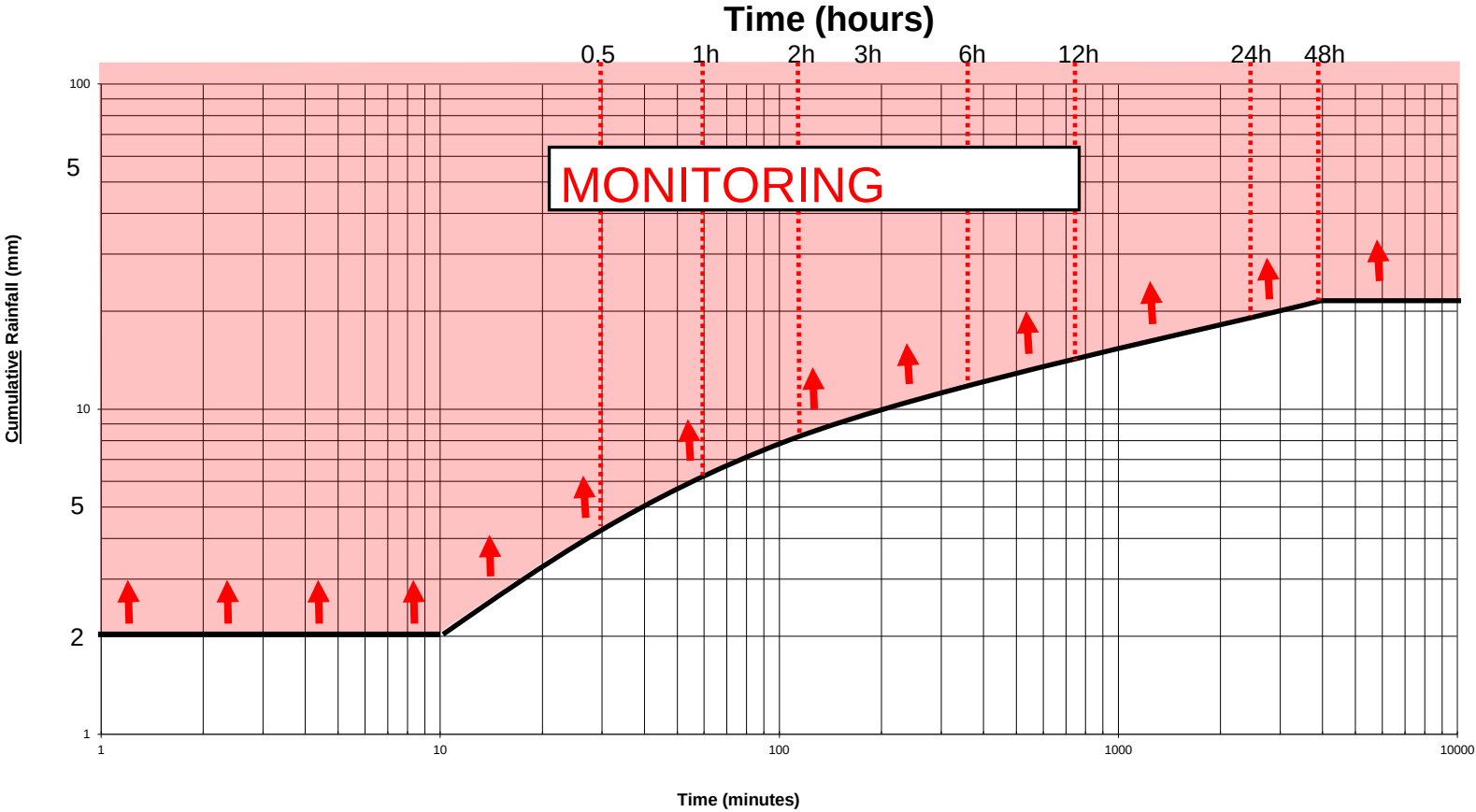
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Table 177.M1.01 References ... continued

AUSTRALIAN STANDARDS	
AS 2187.2 Explosives - Storage and use - Use of explosives	
AS 2436 – Guide to noise and vibration control on construction, demolition and maintenance sites	
AS 3580.10.2 Methods for sampling and analysis of ambient air – Determination of particulate matter – impinged matter – gravimetric method	
AS 3580.10.1 Methods for sampling and analysis of ambient air. Method 10.1 Determination of particulate matter – Deposited matter – Gravimetric method	
AS 3580.9.6 Methods for sampling and analysis of ambient air. Method 9.6 Determination of suspended particulate matter—PM10 high volume sampler with size selective inlet—Gravimetric method	
AS 3580.9.7 Methods for sampling and analysis of ambient air. Method 9.7 Determination of suspended particulate matter—PM10 dichotomous sampler — Gravimetric method	
AS 3580.9.8 Methods for sampling and analysis of ambient air. Method 9.8 Determination of suspended particulate matter — PM10 continuous direct mass method using a tapered element oscillating microbalance analyser	
AS 3580.9.9 Methods for sampling and analysis of ambient air. Method 9.9 Determination of suspended particulate matter — PM10 low volume sampler — Gravimetric method	
AS 3580.9.11 Methods for sampling and analysis of ambient air. Method 9.11 Determination of suspended particulate matter — PM10 beta attenuation monitors	
AS 3580.14 Methods for sampling and analysis of ambient air – meteorological monitoring for ambient air quality monitoring applications	
ADDITIONAL REPORTS AND TOOLS	
Austroroads Guide to Road Design - Part 6B: Roadside Environment and VicRoads Supplement to AGRD Part 6B	
Best Practice Erosion and Sediment Control – International Erosion Control Association	
Engineers Australia - Australian Runoff Quality – A guide to Water Sensitive Urban Design	
Melbourne Water (2005) WSUD Engineering Procedures: Stormwater	
VicRoads Carbon Gauge Calculator	
VicRoads Temporary Sedimentation Basin Design Tool	
VicRoads Project Environment Protection Strategy ##(insert name, date and version):	
German Standard DIN 4150, part 3 – 1999 Effects of Vibration on Structures	
##(insert report names relating to Flora and Fauna studies):	
##(insert report names relating to Cultural Heritage studies):	
##(insert report names of other relevant pre-construction investigations):	
##(insert any other relevant references):	

RAINFALL INTENSITY CHART

RAIN EVENT - MONITORING TRIGGER



ATTACHMENT B TO SECTION 177**DECLARATION
ENVIRONMENTAL PLAN VERIFICATION**

VicRoads Contract ##[Contract No]: – ##[description]:

Name of Contractor :

Environmental Plan(s):.....

..... (Document Reference)

I

of

in my capacity as Consultant to the above named company certify that:

(a) I am an environmental professional who -

- (i) has demonstrated competence and suitable experience in the application of environmental controls and environmental management procedures in a construction environment;
- (ii) is listed on VicRoads 'Register for Pre-qualified Contractors and Consultants' for the level 'Environmental Auditing (Construction)';
- (iii) is independent of the Contractor (a specialist in the employ of the Contractor is not acceptable); and
- (iv) has had no involvement in the development of the Contractors' Environmental Management Plan for the works under this Contract.

(b) I have visited the Site and areas where work under the Contract will be carried out and familiarised myself with works to be undertaken under the Contract.

(c) I have reviewed and assessed the above document/s and it/they -

- (i) address the environmental requirements of the works to be carried out under the above Contract,
- (ii) satisfies all relevant legislative and regulatory requirements,
- (iii) complies with all applicable Codes of Practice and EPA Guidelines,
- (iv) addresses all the requirements of VicRoads 'Environmental Management Guidelines' and other relevant VicRoads guidelines.

(d) In signing this declaration, I endorse the above document as adequate and fit for purpose.

Signed

Name (please print)

On behalf of **(Company)**

Date

ATTACHMENT C TO SECTION 177

DECLARATION
TEMPORARY SEDIMENTATION BASIN VERIFICATION

VicRoads Contract ##[Contract No]: – ##[description]:

Name of Contractor :

Name of Consulting Company :

Document(s) Description and Reference Nos.:

.....

Area/stream/sensitive uses intended for protection by temporary sedimentation basin:

.....

.....

.....

I

of

in my capacity as an Independent Consultant to the above named construction contractor
 certify that:

- (a) I have reviewed and assessed the above document(s) for the control of water runoff from the site associated with a 1:2 ARI (39.35% AEP) over a 6 hour duration and verify that the proposed temporary sedimentation basin(s) has/have been designed as a containment/treatment pond (strikethrough as appropriate) and -
- (i) will address the requirements of the works (and the catchment) to provide environmental protection for the catchment, and
 - (ii) are modelled in accordance with industry recognised 'best practice' methodology for design of sedimentation basins;
- (b) in signing this declaration I endorse the above document(s) as adequate and fit for purpose.

Signed

.....

Name (*please print*)

.....

On behalf of

.....

(Company)

Date

.....