INDIGENOUS DESIGN
ENVIRONMENTAL MANAGEMENT

Report for VicRoads

High Risk-Based Pathway Biodiversity Assessment Report for South Gippsland Black Spur Highway Realignment

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Tim Bowler, William Doherty & Tania Brooker

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Indigenous Design Environmental Management
1635 Main Road, Research
www.iddesign.com.au

Disclaimer

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Debbie McLees – Senior Project Engineer, South Eastern Projects

Paul Quinlan – Team Leader – Project Delivery, South Eastern Projects

Antares Fuhrmann – Graduate Consultant, Indigenous Design Environmental Management

Tom Glover – Graduate Consultant, Indigenous Design Environmental Management

Craig Boase – Assistant Manager, Indigenous Design Environmental Management

Harley Schinagl – Senior Consultant, Indigenous Design Environmental Management

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Executive Summary

Indigenous Design Environmental Management has been commissioned by VicRoads to undertake an assessment of native vegetation and biodiversity values at South Gippsland Highway, Black Spur in regard to a realignment of the highway.

The native vegetation on site was categorised as belonging to three distinct EVC's; EVC 16 – *Lowland Forest*, EVC 18 – *Riparian Forest* and EVC 23 – *Herb-rich Foothill Forest* comprising nine separate patches of native vegetation and twelve habitat zones. The quality of these 12 habitat zones ranged from moderate (HZ9) to significantly modified (HZ4b) with habitat scores ranging from 0.2 to 0.5.

The construction footprint was overlaid across all identified native patches and scattered trees to calculate the habitat zones requiring removal or impacted upon under the proposal. A total of 4.766 hectares of native vegetation is proposed to be removed. This data was forwarded to the Department of Environment Land Water and Planning (DELWP) to generate a *Biodiversity Impact and Offset Requirements Report* (BIOR) in relation to the proposal. This report determined the following:

- The proposal falls within the risk-based pathway of 'high';
- The strategic biodiversity score of all marked (lost) vegetation is 0.444;
- Offset requirements equate to 1.267 'general' Biodiversity Equivalence Units (BEUs) with a minimum strategic biodiversity score of 0.355;
- Offsets must be located within the West Gippsland Catchment Management Authority (WGCMA) boundary or within the South Gippsland Shire Council municipality;
- No 'specific' offset requirements apply.

Of the 20 flora and fauna species listed under the *Environment Protection and Biodiversity Conservation* (EPBC) Act 1999 identified in database searches, 5 of these were initially considered to have a higher than low likelihood of occurrence, being *Eucalyptus strzeleckii* (Strzelecki Gum), *Amphibromus fluitans* (River Swamp Wallaby Grass), *Lathamus discolour* (Swift Parrot), *Litoria raniformis* (Growling Grass Frog) and *Prototroctes maraena* (Australian Grayling). Additional investigations into the presence or impact on 3 species, River Swamp Wallaby Grass, Growling Grass Frog and the Swift Parrot have been completed with recommendations made to reduce any potential impacts. Their likelihood of occurrence has subsequently been amended to Low.

A total of 180 Strzelecki Gum listed as Vulnerable under the EPBC Act are proposed to be impacted by this proposal, with 69 directly requiring removal, 16 outside of the construction footprint 'deemed lost' with Tree Protection Zone (TPZ) impacts greater than 10% and 95 proposed to be translocated. Referral to the Department of Environment and Energy (DoEE) to determine whether the impacts on Strzelecki Gum are a Controlled Action is recommended.

VicRoads has avoided and minimised impacts to significant native vegetation located within the study area through the design and construction process, reducing the proposed impact from approximately 10 hectares in area to approximately 4.766 hectares and from 347 to 180 Strzelecki Gums. Of these 180, 95 are proposed to be translocated as they are small recruits of <1cm DBH. Of

the 16 Strzelecki Gums deemed lost through TPZ encroachment, almost all will remain in situ and some likelihood exists they may continue to remain viable, particularly with the establishment of 'no go' zones around the canopy of the trees.

Two offset strategies are currently being explored. VicRoads can purchase a registered credit extract from the native vegetation credit register that meets the like-for-like requirements or alternatively, VicRoads has an offset site on the Princes Highway at Flynn that could be investigated for suitability as it falls within the same Catchment.

1 Introduction

1.1 Project Background

Indigenous Design Environmental Management (Indigenous Design) has been commissioned by VicRoads to undertake an assessment of native vegetation and biodiversity values covering a section of the South Gippsland Highway and its surrounds between Koonwarra and Meeniyan. The native vegetation removal is required for a proposed development to realign the South Gippsland Highway at Black Spur to improve safety for road users.

This application follows the information requirements for a 'high' risk-based pathway of assessment under the DELWP *Biodiversity assessment guidelines* (DELWP, 2013).

1.2 Objectives

The objectives of this assessment are to:

- Confirm the risk-based pathway for assessment under the DELWP Guidelines (DELWP, 2013);
- Address all information requirements for the 'high' risk-based pathway including:
    - Detail the location, extent, type and condition of the native vegetation;
    - Present photographs of the native vegetation to be removed;
    - Determine the strategic biodiversity score of the native vegetation to be removed;
    - Determine the habitat importance score of the native vegetation to be removed;
    - Conduct a habitat hectare assessment of native vegetation to be removed;
    - Detail measures taken and considered to minimise any impacts on biodiversity values;
    - Detail the offset requirements and a strategy of how compliant offsets will be secured for the biodiversity impacts on the native vegetation, should a permit be granted for its removal;
- Identify and provide a count of any Flora and Fauna Guarantee (FFG) Act 1988 protected flora species which will require a permit to be removed;
- Identify and provide a count of any EPBC listed flora and fauna impact by the proposal; and
- Identify, locate and provide a count of any *Eucalyptus strzeleckii* (Strzelecki Gum) individuals and provide recommendations on whether the removal of the number of Strzelecki Gums would be considered a 'significant impact' under the *EPBC Act* criteria.

1.3 Site Details

The study area (*Figure 1*) is located approximately 0.5 kilometres from Koonwarra and approximately 120 kilometres southeast of Melbourne, Victoria. It is situated within the South Gippsland Shire and West Gippsland Catchment Management Authority (WGCMA). The project will involve an altered alignment that replaces a 3.4 kilometre section of slow, winding road with a straighter 2.3 kilometre section of road for the South Gippsland Highway.

The study area comprises the proposed alignment of the new section of the highway (Figure 1), plus an additional area which was likely to be required to enable the construction of the roadway. The new section of road will also comprise 2 bridge sections of approximately 130 metres length each that will cross the Tarwin River. The proposal will involve the acquisition of adjoining grazing land, still containing native vegetation.

The predominant land uses surrounding the study area are agricultural, with the recreational South Gippsland Rail Trail running through the site. The majority of native vegetation has been cleared, although remnants still remain in and around the study area, particularly along the Tarwin River which the project traverses, and along the South Gippsland Highway and Rail Trail.

The site is subject to the following planning zones and overlays:

Planning Zones

Road Zone – Category 1 (RDZ1);
Public Park and Recreation Zone (PPRZ);
Public Conservation and Resource Zone (PCRZ);
Farming Zone (FZ).

Planning Overlays

Environmental Significance Overlay – Schedule 2 (ESO2);
Environmental Significance Overlay – Schedule 5 (ESO5);
Heritage Overlay (HO51);
Land Subject to Inundation Overlay (LSIO);
Public Acquisition Overlay 8 (PAO8).

Additional Encumbrances

Areas of 'cultural heritage sensitivity' are located within the study area and any potential impacts of the proposal in relation to this matter must be considered under the *Aboriginal Cultural Heritage Act* 2006.

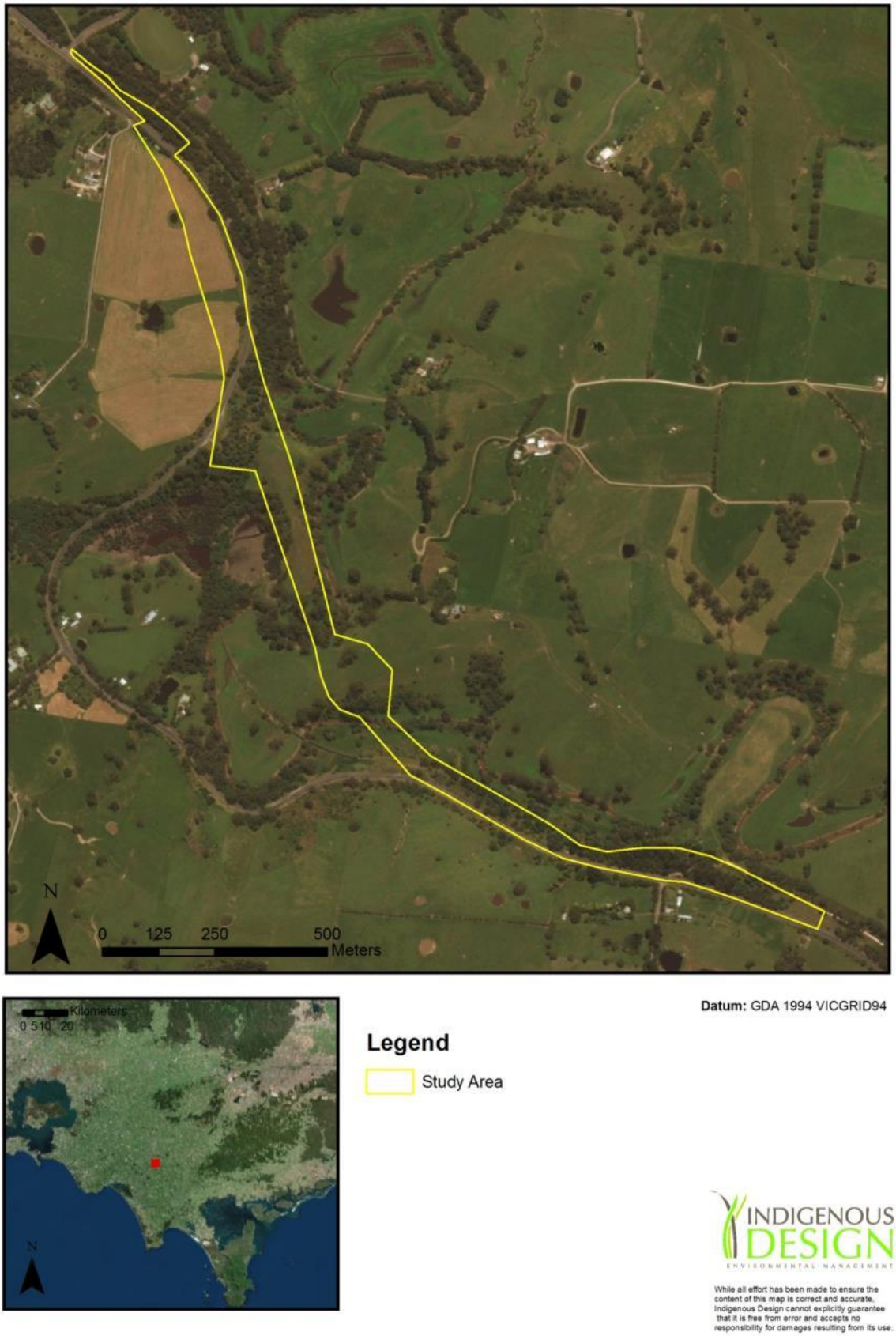

Figure 1: Study area

2 Description of Methods

2.1 Data and Literature Review

The DELWP's Native Vegetation Information Management System (DELWP, 2017a) was used to determine the location risk and therefore the risk-based pathway for assessment of this proposal.

The DELWP's *Biodiversity Interactive Map* (DELWP, 2017b) was used to gain the following information:

- An insight into the overall distribution of native vegetation on the site and the Ecological Vegetation Class (EVC) to which any remnant vegetation may belong;
- The 'landscape context score' applicable to a particular habitat zone; and
- Guidance on the strategic biodiversity and habitat importance scores of vegetation located on-site.

Prior to field assessments the following resources were used to determine if any taxa listed or protected under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act), or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) have been, or potentially could be, located at the site:

- DELWP's *Victorian Biodiversity Atlas* (VBA) (DELWP, 2017g); and
- The Commonwealth's Protected Matters Search Tool (DoE, 2017a).

2.2 Field Survey

Field surveys of the site were undertaken during April through to July 2017. During these surveys, all flora present on the site was recorded and vegetation quality assessments were carried out using the methods described below.

2.2.1 Vegetation Assessment

Native vegetation is defined in the Victoria Planning Provisions (Definitions – Clause 72) as *'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'*. DEPI's *Biodiversity Assessment Guidelines* (DELWP, 2013) (the Guidelines) further defines native vegetation into two categories: 'remnant patches' and 'scattered trees' outlined below:

A 'remnant patch' of native vegetation is either:

- An area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native; or
- Any area with three of more native canopy trees (mature trees greater than three metres in height) where the canopy foliage cover is at least 20 per cent of the area.

A 'scattered tree' is:

- A native canopy tree that does not form part of a remnant patch.

(DELWP, 2013)

Following these definitions all native vegetation on site was categorised as either 'remnant patches' or 'scattered trees'.

Remnant patches were further categorised into EVCs and furthermore into habitat zones. These areas were GPS mapped and assessed using the habitat hectare method described by DSE (2004) in the *Vegetation Quality Assessment Manual – Guidelines for applying the habitat hectares scoring method - Version 1.3.*

2.3 Loss Calculation Methodology

2.3.1 Remnant Patches

The following methodology has been applied in calculating the native vegetation impact for the proposal:

- All areas of native vegetation assessed as a 'remnant patch' contained within the construction footprint as advised by VicRoads have been assessed as 'lost'. These areas of are shown in *Maps 1a* and *1b* as 'Habitat Zones'.

2.3.2 Scattered Trees

All scattered trees on site were identified, GPS mapped or surveyed and had their Diameter at Breast Height (DBH) recorded. Additionally, their respective Tree Protection Zone (TPZ) in relation to the planned works was also calculated. In line with DELWP's standards, the TPZ of scattered trees "is a specific area above and below the ground, with a radius 12 x the Diameter at Breast Height" (DELWP, 2011). Where impacts are greater than 10% of the calculated TPZ for trees outside the study area then that entire tree's canopy coverage has been added to the area of native vegetation marked for removal given the adjacent patch quality score and 'deemed lost'. The impacts are considered to equate to a loss of the tree unless a qualified arborist can confirm that no significant damage will be caused.

Under the Guidelines (DELWP, 2013) large trees in patches are accounted for in the overall condition score of remnant patches, whilst the value of scattered trees are assigned a default area and condition score.

2.3.3 Rare and Threatened Species Impacts

Under the Guidelines (DELWP, 2013) the presence of individuals or potential habitat for rare or threatened flora and fauna is assessed through the use of modelled data. Any threatened species habitat deemed to be affected by the modelling is accounted for in the specific offset requirements for the project as provided in the *Biodiversity Impact and Offset Requirements* (BIOR) report prepared by DELWP in relation to the project.

2.4 Limitations

The main assessment was undertaken in April and May of 2017. It is, therefore, possible that some annual, deciduous or dormant taxa may not have been visible. Additionally, some taxa have not been identified to specific or infraspecific rank due to the absence of flowering, or other material typically used for identification.

3 Ecological Values

3.1 Vegetation Condition

The native vegetation present is linked to larger patches of Riparian Scrub and Forest that are connected by the Tarwin River, Black Spur Creek and other smaller creeks in the area that feed into the Tarwin River.

The dominant canopy species in the area is Strzelecki Gum with scattered *Eucalyptus cypellocarpa* (Mountain Grey Gum), *Eucalyptus viminalis* (Manna Gum), *Eucalyptus obliqua* (Messmate Stringybark) and large *Eucalyptus globulus* (Blue Gum) with this canopy layer measuring to 30 metres in height. An increase in canopy cover can be found in the northern section of the site especially bordering the Tarwin River, with higher canopy cover coinciding with low diversity and coverage of understorey species.

The middle storey is located mainly in the north and south of the site and is densely dominated by native species including *Acacia melanoxylon (*Blackwood) and *Acacia dealbata* (Silver Wattle). A diverse shrub layer occurs where canopy species are sparse including *Solanum aviculare* (Kangaroo Apple), *Bursaria spinosa* (Sweet Bursaria), *Goodenia ovata* (Hop Goodenia) and *Kunzea ericoides* (Burgan) being the most common species present.

The ground storey is dominated in most areas by exotic grasses including *Cenchrus clandestinus* (Kikuyu), *Cynodon dactylon* (Couch) and *Dactylis glomerata* (Cocksfoot) although there are large areas of *Poa labillardierei* (Common Tussock Grass) and scattered *Pteridium esculentum* (Austral Bracken) intermixed with various other indigenous grasses, herbs and scramblers.

High threat environmental weeds present in the study area include *Rubus fruticosus* spp. agg. (Blackberry), *Cirsium vulgare* (Spear Thistle) and *Jacobea vulgaris* (Ragwort), with exotic grasses and herbs dominating the site.

3.1.1 Ecological Vegetation Classes

Ecological Vegetation Classes (EVC) are a type of vegetation classification which aims to group plant communities according to common flora species, vegetation structure and common environmental factors such as elevation, soils and average rainfall.

The DELWP's Biodiversity Interactive Map (DELWP, 2017b) displays the study area and its adjacent surrounds as comprising six modelled pre 1750's EVCs:

- EVC 1106: *Damp Heathy Woodland/Lowland Forest Mosaic*;

EVC 23: Herb-rich Foothill Forest;

- EVC 29: *Damp Forest;*
- EVC 53: *Swamp Scrub*;
- EVC 45: *Shrubby Foothill Forest*; and
- EVC 83*: Swampy Riparian Woodland.*

The vast majority of the study area and its surrounds are modelled as being covered by EVC 83: *Swampy Riparian Woodland* following the Tarwin River course with EVC 1106: *Damp Heathy Woodland/Lowland Forest Mosaic* along the higher ground. Extant EVC mapping (DELWP, 2017b) shows the coverage of both of the above mentioned EVCs has been significantly reduced within the wider surrounds of the study area, with a largely intact area of EVC 83*: Swampy Riparian Woodland* remaining within the study area.

Field assessments confirmed the presence of EVC 16: *Lowland Forest*, EVC 18: *Riparian Forest* and EVC 23: *Herb-rich Foothill Forest* through the identification of a wide range of typical life forms and life-form proportions. These three EVCs are found in three sections, with *Herb-rich Foothill Forest* in the south dominated by wattles, *Riparian Forest* in the central area dominated by Strzelecki Gum*,* and *Lowland Forest* dominated by wattles and a variety of Eucalyptus species.

Figure 2 displays the pre-1750's distribution of assigned EVC's within the study area and *Table 1* details the Bioregional Conservation Status of the EVCs present (DELWP, 2017c).

Table 1: Bioregional conservation status of assigned Ecological Vegetation Classes

Ecological Vegetation Class	Bioregional Conservation Significance
EVC 16: Lowland Forest	Vulnerable
EVC 18: Riparian Forest	Vulnerable
EVC 23: Herb-rich Foothill Forest	Vulnerable

The DELWP Benchmark for Lowland Forest describes the EVC as:

> *'Eucalypt forest to 20 m tall on relatively fertile, moderately well-drained soils in areas of relatively high rainfall. Characterised by the diversity of life forms and species in the understorey including a range of shrubs, grasses and herbs.'* (DELWP, 2017c)

The DELWP Benchmark for Riparian Forest describes the EVC as:

> *'A tall forest to 30 m tall along river banks and associated alluvial terraces with occasional occurrences in the heads of gullies leading into creeks and rivers. The soil is fertile alluvium, regularly inundated and permanently moist. Dominated by tall eucalypts but also has an open to sparse secondary tree layer of wattles and scattered dense patches of shrubs, ferns, grasses and herbs.*' (DELWP, 2017c)

The DELWP Benchmark for Herb-rich Foothill Forest describes the EVC as:

> *'Occurs on relatively fertile, moderately well-drained soils on an extremely wide range of geological types and in areas of moderate to high rainfall. Occupies easterly and southerly aspects mainly on lower slopes and in gullies. A medium to tall open forest or woodland to 25 m tall with a small tree layer over a sparse to dense shrub layer. A high cover and diversity of herbs and grasses in the ground layer characterise this EVC.'* (DELWP, 2017c)

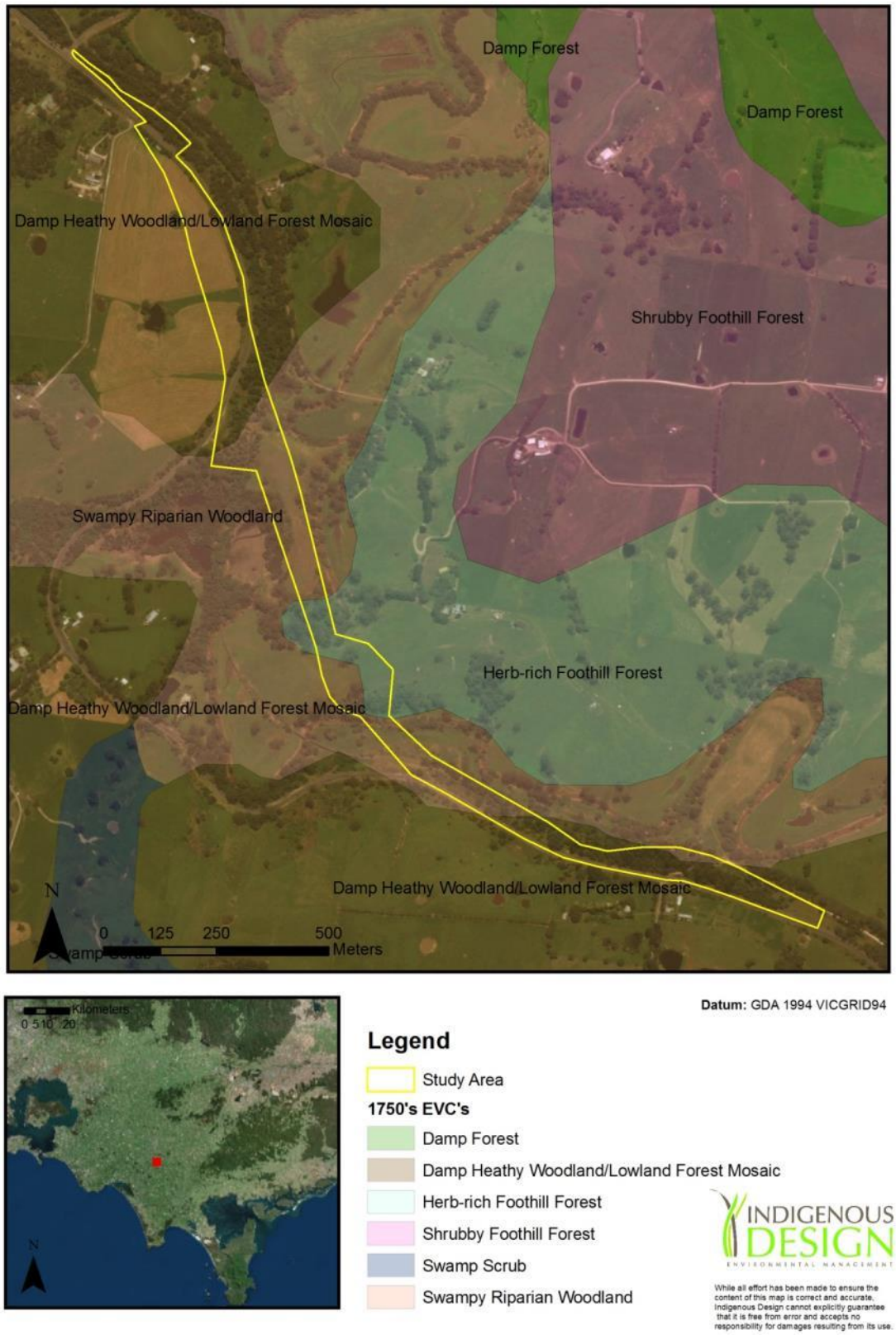

Figure 2: Pre-1750s distribution of assigned ecological vegetation classes within the study area

3.2 Flora Species

3.2.1 Flora Species Recorded

A total of 142 vascular plants were found to occur on site during site assessments. Of these, 85 are considered to be taxa native to Victoria. Appendix 1 displays the results of the flora survey.

3.2.2 Significant Flora Species

The Protected Matters Search Tool (DoE, 2017b) was used to query a five kilometre radius of the study area and identified the possible presence of the following significant flora species:

- *Amphibromus fluitans* (River Swamp Wallaby-grass);
- *Caladenia orientalis* (Eastern Spider Orchid);
- *Eucalyptus strzeleckii* (Strzelecki Gum);
- *Prasophyllum frenchii* (Maroon Leek-orchid);
- *Pterostylis cucullata* (Leafy Greenhood).

One significant flora species was identified on site within the study area; Strzelecki Gum. This species was found consistently spread throughout the study area and due to the large number of individuals identified in the study area; Beveridge Williams was commissioned to survey and precisely record each individual tree. 884 individual Strzelecki Gums are present through the study area and in a 10 metre buffer immediately adjacent to the study area. This species is listed as Vulnerable in Victoria (DELWP , 2005), under the EPBC Act and Threatened under the FFG Act.

The likelihood of occurrence of flora species in regard to the study area has been assessed taking into account the proximity and age of known records and species habitat requirements (Appendix 2). This assessment was initially completed following field assessments for vegetation losses and quality and prior to any additional work in relation to expert opinion or targeted species surveys. A low likelihood of occurrence was determined within the study area for all other EPBC flora listed above, with the exception of Strzelecki Gum, which has a high likelihood of occurrence and River Swamp Wallaby-grass, which was rated as a moderate likelihood of occurrence.

Indigenous Design conducted an investigation into the distribution and abundance of *Eucalyptus strzeleckii* (Strzelecki Gum) in the vicinity of Black Spur, Koonwarra. It involved a desktop review of Strzelecki Gum records and a field survey of publicly accessible land within two kilometres of the proposed realignment site (report included as Appendix 3).

This investigation found:

- the VBA and Atlas of Living Australia (ALA) contain 3,793 Strzelecki Gum records throughout Victoria, with 12 of these records occurring within the survey area.
- The field survey of accessible land within two kilometres of the proposed realignment site yielded an estimate of 2,307 individuals of predominantly reproductively mature Strzelecki Gums from 86 different locations.
  (Bowler T. , 2017a)

A separate targeted study for River Swamp Wallaby-grass was conducted by Indigenous Design to identify and record any potential individuals or suitable habitat through the most likely habitat areas

of the study area. This report has been attached in Appendix 4 and identified several areas of suitable habitat for the River Swamp Wallaby-grass, however no individuals were identified (Bowler T. , 2017). Recommendations from this study include the avoidance of the three areas of suitable habitat through construction constraints and limiting impacts to the identified study area and to avoid other suitable habitat in the wider environs (Bowler T. , 2017).

The likelihood of occurrence for this species has consequently been amended to Low.

Table 2 lists the results of flora based database searches using the VBA within a five kilometre radius of the study area.

Table 2: Significant flora species records identified within five kilometres of the study area from the Victorian Biodiversity Atlas

Scientific Name	Common Name	Victorian Advisory List Status	Count of Sightings
Billardiera scandens s.s.	Velvet Apple-berry	Rare	1
Eucalyptus globulus subsp. globulus	South Blue-gum	Rare	2
Eucalyptus kitsoniana	Bog Gum	Rare	9
Eucalyptus strzeleckii	Strzelecki Gum	Vulnerable	8

(DELWP, 2017g)

Three *Eucalyptus kitsoniana* (Bog Gum) individuals were identified in Habitat Zone 9 and are included within the area of native vegetation proposed to be removed. The specific locations of these trees have been recorded.

3.2.3 Significant Vegetation Communities

One threatened ecological community listed under the EPBC Act was identified in database searches within a five kilometre radius of the study area; the Natural Damp Grassland of the Victorian Coastal Plains. The undulating terrain, vegetation structure and species present indicate that there are no naturally occurring examples of this protected community located within the study area that would necessitate further consideration.

One threatened ecological community listed under the FFG Act was modelled in database searches to potentially occur within the Black Spur Creek study area; the Sedge-rich *Eucalyptus camphora* Swamp community. The vegetation structure and lack of key species identified during field assessments has determined that this threatened community is not present within the study area in any remnant state.

3.2.4 Other Protected Matters

There are no other protected matters of environmental significance which are considered to be applicable to the project and the scope of its native vegetation/ habitat removal.

3.3 Fauna Species

The Protected Matters Search Tool (DoE, 2017b) was used to query a five kilometre radius of the study area and identified the possible presence of the following significant fauna species types:

- Six bird species;
    - *Anthochaera phrygia* (Regent Honeyeater);
    - *Botaurus poiciloptilus* (Australasian Bittern);
    - *Calidris ferruginea* (Curlew Sandpiper);
    - *Lathamus discolor* (Swift Parrot);
    - *Numenius madagascariensis* (Eastern Curlew, Far Eastern Curlew);
    - *Rostratula australis* (Australian Painted Snipe)
- Six mammal species;
    - *Antechinus minimus maritimus* (Swamp Antechinus);
    - *Dasyurus maculatus maculatus* (SE mainland population) (Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll);
    - *Isodon obesulus obesulus* (Southern Brown Bandicoot (Eastern), Southern Brown Bandicoot (South-Eastern);
    - *Mastacomys fuscus mordicus (*Broad-toothed Rat);
    - *Petauroides volans* (Greater Glider);
    - *Pteropus poliocephalus* (Grey-headed Flying-fox)
- Two fish species;
    - *Galaxiella pusilla* (Eastern Dwarf Galaxias, Dwarf Galaxias);
    - *Prototroctes maraena* (Australian Grayling)
- One frog species
    - *Litoria raniformis* (Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog)

Table 3 lists the results of fauna based database searches using the VBA within a five kilometre radius of the study area.

Table 3: Significant fauna species records identified within five kilometres of the study area from the Victorian Biodiversity Atlas

Scientific Name	Common Name	Victorian Advisory List Status	Count of Sightings
Alcedo asurea	Azure Kingfisher	Near Threatened	2
Ardea modesta	Eastern Great Egret	Vulnerable	17
Aythya australis	Hardhead	Vulnerable	3
Gallinago hardwickii	Latham's Snipe	Near threatened	7
Hirundapus caudacutus	White-throated Needletail	Vulnerable	11
Isoodon obesulus obesulus	Southern Brown Bandicoot	Near threatened	2
Lathamus discolor	Swift Parrot	Endangered	2
Litoria raniformis	Growling Grass Frog	Endangered	1
Ninox strenua	Powerful Owl	Vulnerable	1
Nycticorax caledonicus hillii	Nankeen Night Heron	Near threatened	1
Phalacrocorax varius	Pied Cormorant	Near threatened	2
Platalea regia	Royal Spoonbill	Near threatened	3
Prototroctes maraena	Australian Grayling	Vulnerable	3
Varanus varius	Lace Monitor	Endangered	4

(DELWP, 2017g)

Appendix 5 details the assessment of the likelihood of occurrence of rare and threatened fauna species within the study area in regard to the proximity and age of known records and species

habitat requirements. This assessment was initially completed following field assessments for vegetation losses and quality and prior to any additional work in relation to expert advice or targeted species surveys. A low likelihood of presence/usage of habitat by the EPBC listed fauna was determined for all of the species listed above, with the exception of the Swift Parrot and Growling Grass Frog which was assessed as low to moderate and the Australian Grayling which was assessed as moderate to high.

The Tarwin River has several records for the Australian Grayling. The most recent record is approximately 3.5 kilometres north of the study site between Koonwarra and Leongatha and is from 2007. To avoid significantly impacting habitat utilised by the Australian Grayling, any proposed works that will be undertaken within the bed and banks of the Tarwin River must be implemented under a construction environmental plan that addresses concerns over fish movement and sedimentation/erosion. This construction environmental plan must ensure that there are no impacts to the migration of the Australian Grayling or reduced water quality of the Tarwin River.

An assessment of the habitat suitability of the site for Growling Grass Frog was undertaken by an independent aquatic ecologist in September 2017. This assessment considers that there is a low likelihood that Growling Grass Frog occurs in or near the project area and that there would be no significant impact on the species by this proposal (Jenkin, 2017). The report is included in Appendix 6.

Expert opinion for potential impacts on the Swift Parrot was provided by an independent fauna expert in June 2017 (Appendix 7). This assessment identified that:

- no observations of the species have been reported from the study area;
- habitat at the study area was potentially suitable, but it was noted that no autumn flowering eucalypts are present on site and that any disturbance would be temporary;
- any loss of autumn flowering eucalypts could be offset by appropriate revegetation; and
- the proposed works would comply with the national recovery plan for the species by avoiding damage to known or critical habitat.
  (McNabb, 2017).

This advice has resulted in a low likelihood of occurrence and potential impact on both these species and Appendix 5 has therefore been updated accordingly.

3.4 Quantification of Significant Flora and Fauna Species Habitat

Under the Guidelines (DELWP, 2013), the importance of any native vegetation on site in relation to its provision of habitat for significant species is considered through the analysis of DELWP mapping of rare or threatened species habitat. The BIOR provided by DELWP (Appendix 9) specifies any offset requirements which may apply to compensate for the removal of any modelled rare or threatened species habitat.

4 Policy and Legislative Implications

4.1 Commonwealth – Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act establishes a Commonwealth process for assessment of proposed actions that are likely to have a significant impact on Matters of National Environmental Significance (MNES) or on Commonwealth land. An action (i.e. project, development, undertaking, activity, or series of activities), unless otherwise exempt, requires approval from the Commonwealth Environment Minister if they are considered likely to have an impact on any MNES. A referral under the *EPBC Act* is required if a proposed action is likely to have a 'significant impact' on any of the following MNES:

- World Heritage properties;
- National heritage places;
- Ramsar wetlands of international significance;
- Threatened species and ecological communities;
- Migratory and marine species;
- Commonwealth marine area;
- Nuclear actions (including uranium mining);
- Great Barrier Reef Marine Park; and
- A water resource, in relation to coal seam gas development and large coal mining development.

4.1.1 Implications (Significant Impact Criteria)

As outlined in *Section 3.2 & 3.3*, a number of EPBC listed flora and fauna were initially assessed as having a greater than low likelihood of being present within 5 kilometres of the study area. Appendix 8 provides an assessment of the proposed MNES impacts for the 2 remaining species with a greater than low likelihood of occurrence, which has been developed in consultation with VicRoads.

Of those identified, Strzelecki Gum is the most significant in regard to investigation of Matters of National Environmental Significance. Individuals and habitat were identified as being present within the study area and under the final project design the following impacts to Strzelecki Gum have been determined as:

- 69 individual Strzelecki Gum plants are assessed as 'lost';
- 16 individual Strzelecki Gum plants are assessed as 'deemed lost' (>10% impact to TPZ);
- The breakdown of 'lost' Strzelecki Gum trees includes 12 large or very large old trees, 8 medium old trees and 49 small or very small size class trees;
- The breakdown of 'deemed lost' Strzelecki Gum trees includes 7 large or very large old trees, 1 medium old trees and 8 small size class trees;
- Approximately 4.766 hectares of Strzelecki Gum 'habitat' will be impacted within the study area.
- 95 very small recruiting Strzelecki Gums of <1cm DBH are proposed to be translocated.

The full categorisation of Strzelecki Gum within and immediately adjacent to the study site is detailed in Table 4. The precise locations for the Strzelecki Gums assessed as 'lost' and 'deemed lost' in the 5 size classes above are shown in *Maps 2a* and *2b* 'Affected Strzelecki Gum within the Black Spur study area'.

Table 4 – Number and classes of Strzelecki Gum affected including 10m adjacent to the study site

	Very Small	Small	Medium	Large	Very Large	Totals
HZ1	1	4	1	0	0	6
HZ2	0	0	0	0	3	3
HZ3a	0	0	0	0	0	0
HZ3b	0	0	0	0	0	0
HZ4a	6	8	0	0	0	14
HZ4b	4	2	0	0	0	6
HZ5a	0	4	2	4	3	13
HZ5b	0	0	0	0	0	0
HZ6	0	2	3	1	0	6
HZ7	2	16	2	1	0	21
HZ8	0	0	0	0	0	0
HZ9	0	0	0	0	0	0
Translocation	95	0	0	0	0	95
TPZ	3	5	1	3	4	16
Unaffected	405	228	34	32	5	704
Totals	516	269	43	41	15	884

Of the 16 Strzelecki Gums deemed lost based on TPZ encroachment, almost all will remain in situ and some likelihood exists they may continue to remain viable, particularly with the establishment of ‘no go’ zones around the canopy of the trees.

VicRoads will look to translocate all viable recruits within the area of impact, with a current total of 95, however anecdotal evidence of some mortality of these recruits is most likely attributable to frosts over winter.

It is recommended that this proposal be referred to the Federal Department of the Environment and Energy for a determination of whether the impact on Strzelecki Gum will be a Controlled Action.

As previously discussed (Section 3.3) Australian Grayling are known to occur within the Tarwin River catchment and may use it for migration during various stages of their lifecycle. No construction works for this project will occur within or immediately adjacent to the Tarwin River, excepting the potential for a crossing point which will be fish passable to ensure no obstruction to movement of this species. Additionally, as part of the construction management planning, techniques such as sedimentation controls, silt fencing and bunting will be employed to reduce any potential for water quality or sedimentation issues affecting the Tarwin River.

A Working on Waterways Permit will be required from the West Gippsland Catchment Management Authority before commencement of works associated with this proposal and will ensure that any potential impacts such as erosion, barriers to movement and/or changed water flows will be addressed.

4.2 State – Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (FFG Act) is the primary State legislation for the protection of native plants, native animals and ecological communities on public land and waters in Victoria. Species and ecological communities can be listed as threatened under the Act based on assessments by an independent Scientific Advisory Committee. Threatening processes may also be listed.

4.2.1 Implications

A total of seventeen flora species were identified on site that are listed as protected under the FFG Act. Two *Acacia* species found on site; *Acacia dealbata* (Silver Wattle) and *Acacia melanoxylon* (Blackwood) are exempt from the requirement to obtain a permit for their removal under the FFG Act (DELWP, 2017f).

Due to this proposal being located on public land, an application for a 'Permit to Take Protected Flora' must be lodged with the DELWP. Removal of any protected flora taxa may not be undertaken until this permit has been issued. Table 5 provides the detail on flora protected under the FFG Act requiring removal.

Table 5: Details of flora taxa protected under Flora and Fauna Guarantee Act 1988

Scientific Name	Common Name	Estimated Numbers
Acacia mearnsii	Black Wattle	500
Acacia mucronata subsp. longifolia	Narrow-leaf Wattle	20
Acacia suaveolens	Sweet Wattle	25
Acacia verticillata	Prickly Moses	50
Adiantum aethiopicum	Common Maidenhair	200
Blechnum nudum	Fishbone Water-fern	100
Brachyscome multifida	Cut-leaf Daisy	200
Cassinia arcuate	Drooping Cassinia	50
Eucalyptus strzeleckii	Strzelecki Gum	180
Olearia argophylla	Musk Daisybush	5
Olearia lirata	Snowy Daisybush	20
Selaginella uliginosa	Swamp Selaginella	500
Senecio glomeratus	Annual Fireweed	1000
Senecio hispidulus	Rough Fireweed	1000
Senecio linearifolius	Fireweed Groundsel	1000
Senecio minimus	Shrubby Fireweed	1000
Senecio quadridentatus	Cotton Fireweed	1000

4.3 State – Catchment and Land Protection Act 1994

In accordance with Section 20 of the CaLP Act, landholders and managers have a responsibility to take all reasonable steps to:

- Avoid causing or contributing to land degradation which causes or may cause damage to land of another land owner;
- Eradicate regionally prohibited weeds;
- Prevent the growth and spread of regionally controlled weeds on their land; and
- Prevent the spread of, and as far as possible, eradicate established pest animals.

4.3.1 Implications

Five weeds declared noxious under the *Catchment and Land Protection Act 1994* (CaLP Act) were identified on site during assessments (Table 6). All five weeds are categorised within the West Gippsland Catchment Management Authority region as 'Regionally Controlled' (DELWP, 2017d).

Table 6: Declared noxious weeds proclaimed under the Catchment and Land Protection Act 1994

Scientific Name	Common Name	Classification
Cirsium arvense	Perennial Thistle	Regionally Controlled
Cirsium vulgare	Spear Thistle	Regionally controlled
Crataegus monogyna	Hawthorn	Regionally Controlled
Jacobaea vulgaris	Ragwort	Regionally Controlled
Rubus fruticosus spp. agg.	Blackberry	Regionally controlled

4.4 State – Planning and Environment Act 1987

4.4.1 Implications

Native Vegetation

Under *Clause 52.17* of the South Gippsland Shire Planning Scheme, a planning permit is required to clear or disturb native vegetation within the study area. Native vegetation will be impacted and or require removal under the proposal and as such, application of the '*Guidelines*' to obtain a planning permit for the works is necessary. The information provided within this report and detailed specifically within Section 5 is considered to satisfy the information requirements of the Guidelines.

Aboriginal Cultural Heritage

A Cultural Heritage Management Plan will need to be prepared by VicRoads to address any requirements under the *Aboriginal Heritage Regulations* 2007 (DELWP, 2017e).

Heritage

One area listed under the Heritage Register of the South Gippsland Planning Scheme falls within the bounds of the study area:

- HO-51: Three Railway Bridges over Tarwin River South Eastern Railway, Koonwarra

Vegetation removal and construction is planned to occur within the extent of HO-51 which is adjacent to the historic 'Three Railway Bridges'. As part of due diligence appropriate work plans should be implemented to ensure this structure is adequately protected during the construction phase.

5 Victoria's Native Vegetation Permitted Clearing Regulations

5.1 Risk-based Approach

The Guidelines (DELWP, 2013) detail the approach to the assessment and categorisation of biodiversity risk attributed to permitted native vegetation clearing in Victoria. The categories of risk and their subsequent information requirements are as follows:

- **Low Risk** – No site assessment or report required. Permit application made based on desktop and modelled information only.
- **Moderate Risk** – Site assessment and habitat hectares report required.
- **High Risk** – Site assessment and habitat hectares report required.

The risk-based pathway is determined by combining the extent risk and the location risk of the native vegetation proposed to be removed, in accordance with Table 3 and Table 4 of the Guidelines (DELWP, 2013).

Based on the criteria set out in Table 3 of the Guidelines (DELWP, 2013) this project has been assessed as a 'Moderate/High' risk-based pathway project which has been confirmed by the BIOR Report provided in Appendix 9. As such, information and assessment requirements follow those detailed in Tables 5 & 6 of the Guidelines.

5.2 Avoiding and Minimising Impacts on Native Vegetation

5.2.1 Design

A flora and fauna investigation in the early 2000's identified 60 Strzelecki Gums within the project area and the highway alignment directly impacted on 5 Strzelecki Gums. A review of the original design was undertaken in 2016 to reflect current road standards with a redesign including kerb and channel and retaining walls added in the area adjacent to the Black Spur Creek Wetland to minimise impacts to Strzelecki Gum.

A targeted survey for Strzelecki Gums was conducted when the new design was nearing completion and 884 Strzelecki Gums were identified in the proposed study area. This new design was estimated to be impacting 347 of the 884 Strzelecki Gum present. A BIOR report was produced for the proposed impacts of this preliminary design, which identified the following:

- 10.13 hectares of native vegetation to be cleared;
- Offset requirements of
    - 2.599 general BEUs
    - 0.433 specific BEU's for Strzelecki Gum

VicRoads commissioned Beveridge Williams to accurately survey and record the location of every Strzelecki Gum inside and within a 10 metre buffer surrounding the study area. This has allowed

VicRoads scope to amend the design to avoid the greatest concentrations of Strzelecki Gum and/or avoid the significant large and very large trees. Specifically:

- A redesign of the eastern end of the alignment near Minns Road to avoid impacts to the large number of Strzelecki Gum present in that area. The alignment was shifted approximately 10 metres to the south and the longitudinal grade line was elevated approximately 5 metres which reduced the number of trees affected in that area by 31.
- A redesign of the reserve at the western tie-in at the Old Koonwarra-Meeniyan Road. The radius for the horizontal curve was increased and the shoulder/verge area width was reduced to avoid another 144 Strzelecki Gum including the TPZ's of 15 Strzelecki Gums that are 'deemed lost', ie they will be retained on site but more than 10% of their TRZ's are impacted by the proposed works.

In all, 167 Strzelecki Gum will be avoided through design changes with a reduced number of 180 from the original 347 to be impacted. A BIOR report was produced for the proposed impacts of this design (Appendix 9), which identified the following:

- 4.766 hectares of native vegetation to be cleared;
- Offset requirements of
    - 1.267 general BEUs; and
    - No specific BEU's for Strzelecki Gum.

This re-design has resulted in a 53% reduction in the area of native vegetation to be impacted and a 53% reduction in the number of Strzelecki Gum proposed to be removed.

VicRoads has also commissioned Indigenous Design to survey and record Strzelecki Gum within a 2 kilometre radius of the study site (Bowler T. , 2017a). This survey found an additional 86 records of Strzelecki Gum, with an estimated number of 2307 individuals. The population of Strzelecki Gum at Black Spur has been shown to be part of a much larger population than previously known through databases and the Recovery Plan. The removal of 180 Strzelecki Gum from an estimated population of over 3000 is a little over 5% in total.

VicRoads will develop a revegetation management plan in consultation with DELWP, South Gippsland Shire, the West Gippsland Catchment Management Authority, the Nerrena Landcare Group and Great Southern Rail Trail Committee of Management for areas adjacent to the project area and complementary to the Nerrena Landcare Group's Black Spur Creek Wetland Project. This plan and associated works will also be part of offset conditions under VicRoads Flora and Fauna Guarantee Permit and Planning Permit for removal of native vegetation as agreed by DELWP and the South Gippsland Shire.

The nominated areas for revegetation will include the crown land between the Tarwin River Crossing on Buckingham and Fowler's Road south to the new highway realignment and the redundant area of the existing South Gippsland Highway, east of Caithness Road to the third trestle bridge. Areas targeted for improvement will include the road/rail reserve from Old Koonwarra-Meeniyan Road to the nominated revegetation area and the area near the first bridge crossing to Black Spur Creek Wetlands. The plan will utilise locally indigenous plant species, including 4,000 Strzelecki Gum and

330 *Eucalyptus ovata* (Swamp Gum) within a 9.5 hectare site. This landscape plan will form part of the Construction Contract.

The revegetation management plan will look to address the recovery actions and performance criteria as described in the National Recovery Plan for Eucalyptus strzeleckii (Carter, O, 2006) as follows:

Specific objective 1 – Acquire accurate information for conservation status assessment:
Survey accurate locations and record diameter at breast height of Strzelecki Gum and all other eucalypts has been completed within the project area and GPS locations of Strzelecki Gum on public land within a two kilometre radius of the project has also been completed (2,300 trees identified).

This information will be submitted for inclusion into the Victorian Biodiversity Atlas (VBA) to improve location and extent knowledge for this species.

Specific objective 2 – Identify habitat that is critical, common or potential:
An assessment has been completed for the vegetation quality (as part of this report) of the project area and is to be used as a baseline measure for monitoring the success of the revegetated areas.

Specific objective 3 – Ensure that all populations and their habitat are legally protected:
Nominated areas for revegetation are crown land and road reserve (sections of the existing highway will be made redundant by the realignment). VicRoads will seek agreement with DELWP for the long-term protection of these areas.

Specific objective 4 – Manage threats to populations:
VicRoads will develop and implement a targeted weed spraying/removal regime to improve existing areas of Strzelecki Gum and to prepare areas nominated for revegetation (9.5 hectare site). This is likely to occur over a 5 year period and which identifies any pest plant and animal control activities and replacement of any plantings unsuccessful.

VicRoads will seek a suitably qualified organisation to undertake a research project to develop techniques to promote regeneration of Strzelecki Gum.

Specific objective 5 – Identify key biological functions:
VicRoads will engage a local contractor to undertake seed collection and propagation of vegetation including Strzelecki Gum contained within the project area for later revegetation planting outside of the project area and within landscaped areas of the road reserve.

There are currently 95 Strzelecki Gum recruits identified as being impacted by the realignment. VicRoads will look to translocate all viable recruits (anecdotal evidence has attributed some recent losses to frosts over winter) impacted by the project to nominated revegetation areas.

Specific objective 6 – Determines the growth rates and viability of populations:
As part of the research project, monitoring and reporting on the growth rates and health of *Eucalyptus strzeleckii* populations within revegetation areas will be undertaken.

Specific objective 7 – Build community support for conservation:
VicRoads will involve and support members of the Nerrena Landcare Group to actively participate in the revegetation program. In addition, it is intended to make a natural feature of this section of the

Great Southern Rail Trail and to actively promote the works undertaken through DELWP and the South Gippsland Shire.

5.2.2 Construction

It is the responsibility of VicRoads that all workers involved in the construction of the road and bridge sections are made fully aware of the significance of native vegetation surrounding the works area. These considerations should be addressed within a site Construction Environmental Management Plan (CEMP).

A construction boundary has also been developed in consultation with DELWP to determine No-Go Zones for inclusion in the Construction Contract to protect native vegetation outside of the construction footprint. This will include restrictions on ancillary activities such as access track locations.

The construction contract will specify a requirement for a pre-start site inspection between VicRoads staff, the construction contractor and appropriate DELWP personnel.

The contract will also specify management practices in accordance with best practice environmental management, including:

- VicRoads Environmental Protection Policy and Project Management Guidelines – Environmental Protection (VicRoads as amended)
- Victorian Environment Protection Authority Construction Techniques for Sediment Pollution Control (EPA 1991)
- Victorian Environment Protection Authority Environmental Guidelines for Major Construction Sites (EPA 1996)

A financial penalty will also apply should the Contractor remove or damage vegetation outside of the no go zones.

VicRoads will undertake a regular schedule of construction surveillance and audit to ensure contract requirements relating to:

- compliance with the construction activity boundary and maintenance of fencing and protected vegetation marking
- compliance with general environmental management procedures outlined in the project Environmental Management Plan and best practice documents

5.3 Assessing Loss of Native Vegetation

5.3.1 Patches of Native Vegetation

The native vegetation on site was categorised as belonging to three distinct EVC's; EVC 16 – *Lowland Forest*, EVC 18 – *Riparian Forest* and EVC 23 – *Herb-rich Foothill Forest* comprising nine separate patches of native vegetation. Using the methodology described in the *Vegetation Quality Assessment Manual – Guidelines for applying the habitat hectare scoring method – Version 1.3 October 2004* (DSE, 2004) it was determined that there were sufficient quality differences across the

various habitat components in three of the patches to justify breaking the site down into a total of twelve habitat zones.

5.3.1.1 Habitat Zones

Habitat hectare assessments were undertaken across the twelve habitat zones against the appropriate benchmarks for three EVC's in order to assign a quality score. Table 7 displays the results of the habitat hectare assessment and the score attributed to each of the site condition components.

Lowland Forest – Habitat Zone 1

This zone is characterised by the presence of a sparse canopy tree layer above a significantly modified understorey.

The sparse canopy layer hosts three canopy species; Strzelecki Gum, *Eucalyptus viminalis* (Manna Gum) and *Eucalyptus obliqua* (Messmate Stringybark) as well as the non-indigenous *Corymbia citridoria subsp. citridoria* (Lemon-scented Gum).

The middle storey is generally sparse composed of a mixture of immature canopy species including *Eucalpytus globulus subsp. pseudoglobulus* (Gippsland Blue Gum) and indigenous trees such as *Acacia dealbata* (Silver Wattle) and *Acacia melanoxylon* (Blackwood). Several shrub species are present including *Cassinia arcuata* (Drooping Cassinia), *Leptospermum continentale* (Prickly Tea-tree) and the occasional non-indigenous *Pittosporum undulatum* (Sweet Pittosporum) and fruit trees including *Prunus* spp. (Plum) and *Malus* spp. (Apple) that were scattered through the zone.

The ground storey was dominated by exotic grasses including *Anthoxanthum odoratum* (Sweet Vernal-grass), *Cenchrus clandestinus* (Kikuyu) and *Holcus lanatus* (Yorkshire Fog) through pockets of native grasses including *Poa labillardierei* (Common Tussock-grass), *Microlaena stipoides var. stipoides* (Weeping Grass) and *Tetrarrhena juncea* (Forest Wire-grass) were present. A diverse mixture of exotic and native herbs occurs throughout the zone, with sedges and scramblers including *Lepidosperma elatius* (Tall Sword-sedge), *Lomandra filiformis* (Wattle Mat-rush) and *Rubus parvifolius* (Native Bramble) in small pockets.

There are two noxious weeds present in the zone; *Cirsium vulgare* (Spear Thistle) and *Rubus fruticosus* spp. agg. (Blackberry).

Lowland Forest – Habitat Zone 2

This zone has a sparse canopy and middle storey layer above a significantly modified ground storey.

The sparse canopy layer hosts three Eucalypt species of Messmate Stringybark, Strzelecki Gum and *Eucalyptus cypellocarpa* (Mountain Grey Gum).

The middle storey is very open with no immature canopy species present and few trees of Silver Wattle and Blackwood. A small number of shrubs including Prickly Tea-tree and *Melicytus dentatus* (Tree Violet), plus Sweet Pittosporum, Plum and Apple are dotted through the zone.

The ground storey was dominated by exotic grass and herbaceous species including Sweet Vernal-grass, Kikuyu, *Daucus carota* (Wild Carrot), *Helminthotheca echioides* (Ox-tongue) and *Phalaris*

aquatica (Toowoomba Canary-grass). Larger patches of native grasses and herbs than that seen in Habitat 1 occur in the zone, with Common Tussock-grass, Weeping Grass, Forest Wire-grass, *Gahnia radula* (Thatch Saw-sedge) and *Dianella tasmanica* (Tasman Flax-lily) being the common species present.

Spear Thistle and Blackberry were present throughout, as were the threatening scrambling weed species *Galium aparine* (Cleavers) and *Fumaria* spp. (Fumitory).

Lowland Forest – Habitat Zone 3a

This zone has a sparse canopy layer above a dense middle and ground storey with a moderate coverage of weeds (see Photo 1).

The canopy layer is composed solely of Mountain Grey Gum that provides little coverage across the zone.

The middle storey is dense, composed mainly of large trees over 5 metres tall particularly Blackwood, *Acacia mearnsii* (Black Wattle) and Drooping Cassinia. Smaller shrubs of Drooping Cassinia, Tree Violet, *Olearia lirata* (Snowy Daisy-bush) and *Solanum aviculare* (Kangaroo Apple) contribute to the forest coverage. Sweet Pittosporum and Plum individuals are scattered through the zone.

A healthy indigenous ground storey is present, composed of a mixture of herbs, grasses, sedges and bracken. Thatch Saw-sedge and Common Tussock-grass contribute to the majority of coverage however *Pteridium esculentum* (Austral Bracken), *Senecio glomeratus* (Annual Fireweed), *Senecio linearifolius* (Fireweed Groundsel) and *Senecio minimus* (Shrubby Fireweed) are all present in sizeable patches. Exotic grasses including Sweet Vernal-grass, Toowoomba Canary-grass and *Ehrharta erecta var. erecta* (Panic Veldt-grass) can be found throughout the zone.

The noxious weed species of Spear Thistle, Blackberry and *Jacobaea vulgaris* (Ragwort) are all present in the zone, with the high threat weed *Solanum pseudocapsicum* (Madeira Winter Cherry) also present.

Riparian Forest – Habitat Zone 3b

This zone has a sparse canopy layer over a dense middle storey, a moderate ground storey and a high coverage of weeds.

The canopy layer is composed of Strzelecki Gum and Gippsland Blue Gum with very few large trees.

The middle storey is predominantly composed of Wattles including Blackwood, Black Wattle, Silver Wattle and *Acacia verticillata* (Prickly Moses). There is good diversity with a further seven shrub species contributing to the dense middle storey including individuals of *Melaleuca ericifolia* (Swamp Paperbark), *Coprosma quadrifida* (Prickly Currant-bush) and *Kunzea ericoides* spp. agg. (Burgan) all present. Sweet Pittosporum and Plum trees were present through the zone.

Sizeable patches of Common Tussock-grass are present comprising a large portion of the native ground storey coverage. The ground storey diversity is quite high with good a mixture of herbs, grasses, sedges, bracken and scramblers all present in small patches across the zone. *Persicaria*

decipiens (Slender Knotweed), *Persicaria subsessilis* (Hairy Knotweed) and Tall Sword-sedge can be found in damper areas, whilst *Brachyscome multifida* (Cut-leaf Daisy), *Geranium potentilloides* (Soft Crane's-bill) and *Pandorea pandorana* (Wonga Vine) are all present in the drier forested areas. A high coverage of weedy ground storey species including Cleavers, *Cyperus eragrostis* (Drain Flat-sedge), Madeira Winter Cherry, *Hedera helix* (English Ivy) and *Conyza sumatrensis* (Tall Fleabane) are scattered through the entire zone.

There are 7 weedy exotic grasses including Sweet Vernal-grass, Panic Veldt-grass, Kikuyu and *Dactylis glomerata* (Cocksfoot) threatening the patch whilst the noxious weed species of Blackberry, Spear Thistle and Ragwort are present.

Riparian Forest – Habitat Zone 4a

This zone is composed of dense canopy over a moderately open middle storey and significantly modified ground storey.

Strzelecki Gum comprises the majority of the canopy though Mountain Grey Gum and Manna Gum are also present, with the zone containing a high proportion of large trees.

The middle storey is composed of immature canopy trees and indigenous shrubs in a mostly typical open forest structure that thickens up as elevation decreases. The shrub species present include Musk Daisy-bush, Burgan and *Bursaria spinosa* (Sweet Bursaria) whilst the non-indigenous Sweet Pittosporum was present through the zone.

The ground storey was significantly modified however pockets of indigenous species were present, particularly Austral Bracken, Tall Sword-sedge and herbs including Annual Fireweed, Fireweed Groundsel, Shrubby Fireweed and *Senecio quadridentatus* (Cotton Fireweed). Exotic grasses present included Yorkshire Fog and Cocksfoot with the majority of exotic coverage represented by herbaceous species including *Ranunculus repens* (Creeping Buttercup), *Atriplex prostrata* (Orache), *Myosotis sylvatica* (Wood Forget-me-not) and Cleavers.

Noxious species present across the zone were Spear Thistle, Ragwort and Blackberry.

Riparian Forest – Habitat Zone 4b

This zone is characterised by a very sparse canopy cover above a typical middle storey and significantly modified ground storey (see Photo 2).

The canopy is composed of 3 scattered Strzelecki Gum in the north and south of the zone that provide a very sparse coverage.

The middle storey is composed of remnant vegetation and plantings of indigenous species including immature Strzelecki Gum and native shrubs. The plantings are located between the fence-line and the boundary of Habitat Zone 4a. Shrubs comprise the majority of the coverage including Burgan, *Acacia mucronata subsp. longifolia* (Narrow-leaf Wattle), Tree Violet and Sweet Bursaria, along with the immature canopy which are scattered through the entire zone.

The ground storey is significantly modified with pockets of Tall Sword-sedge, *Lomandra longifolia* (Spiny-headed Mat-rush), Austral Bracken and *Urtica incisa* (Scrub Nettle) competing against a

mostly exotic grass coverage of *Agrostis capillaris* (Brown-top Bent), *Cynodon dactylon* (Couch) and Kikuyu.

The noxious weed species of Blackberry, Ragwort and Spear Thistle are present in the zone as are the woody weed species of Madeira Winter Cherry and Sweet Pittosporum.

Riparian Forest – Habitat Zone 5a

This zone is characterised by an established canopy layer over a very open middle storey and significantly modified ground storey (see Photo 3).

The canopy layer is dense and composed entirely of Strzelecki Gum with a number of large trees present.

The middle storey is mostly absent, composed of immature Strzelecki Gum, Silver Wattle, Blackwood, Burgan and *Gynatrix pulchella* (Hemp Bush).

The ground storey is largely exotic grasses including Yorkshire Fog, Cocksfoot and Brown-top Bent however pockets of indigenous species are present, mostly closer to the Tarwin River and include *Carex appressa* (Tall Sedge), Common Tussock-grass and *Juncus australis* (Austral Rush). The exotic herbs present include Creeping Buttercup, *Aster subulatus* (Wild Aster) and Drain Flat-sedge which are typically found in these riparian environments.

Noxious weeds Blackberry, Ragwort and Spear Thistle were present in the zone with woody high threat species including *Salix x reichardtii* (Pussy Willow), Madeira Winter Cherry and English Ivy also present.

Riparian Forest – Habitat Zone 5b

This zone is characterised by a very sparse canopy layer and middle storey above a dense grassy ground storey (see Photo 4)

The canopy is composed of two scattered large trees, a Strzelecki Gum in the south and a Gippsland Blue Gum in the north.

An immature Strzelecki Gum and a diverse range of small sized shrubs including Drooping Cassinia, Blackwood, Silver Wattle and Burgan present mostly on the boundary of the zone represent the middle storey.

Common Tussock-grass comprises the majority of the ground storey with small pockets of Weeping Grass, Soft Crane's Bill, Annual Fireweed and *Senecio hispidulus* (Rough Fireweed) scattered through the zone.

Ragwort and Spear Thistle are present in the zone with a moderate coverage of four exotic grass species including Yorkshire Fog, Kikuyu and Cocksfoot, which are high threats to the large Common Tussock-grass patch.

Riparian Forest – Habitat Zone 6

This zone is characterised by an open canopy layer over a typical middle storey and significantly modified ground storey.

The canopy is composed of large trees of mostly Strzelecki Gum but also includes Manna Gum and Gippsland Blue Gum with the majority of these trees present on the banks of the Tarwin River. The occasional *Pinus radiata* (Radiata Pine) individual was scattered throughout the zone.

The middle storey contains a diverse mixture of trees and shrubs including Prickly Tea-tree, Burgan, *Pomaderris aspera* (Hazel Pomaderris), Black Wattle and Blackwood occurring through the zone in a typical forest structure. Several exotic woody species, are also present particularly the non-indigenous Sweet Pittosporum, *Cratageus monogyna* (Hawthorn), *Solanum mauritianum* (Wild Tobacco Tree) and Plum.

The ground storey is composed mostly of pockets of Tall Sword-sedge, Common Tussock-grass and Austral Bracken with scattered herbs including Fireweed Groundsel, Slender Knotweed and *Lythrum hyssopifolia* (Small Loosestrife) present. Exotic grass species present include Panic Veldt-grass, Sweet Vernal-grass and Yorkshire Fog plus pockets of several riparian herbs such as *Rumex crispus* (Curled Dock) and *Verbena bonariensis* (Purple-top Verbena) comprising the majority of the ground storey.

Blackberry, Hawthorn, Spear Thistle, *Cirsium arvense* (Perennial Thistle) and Ragwort were recorded as the noxious weeds of the zone.

Herb-rich Foothill Forest – Habitat Zone 7

This zone is characterised by a diverse, sparse canopy above a diverse middle storey and modified understorey.

The canopy contains Strzelecki Gum, Mountain Grey Gum, Manna Gum and Gippsland Blue Gum that are sparsely scattered through the zone with a patch of large trees concentrated in the south.

The middle storey contains a diverse mix of immature canopy, wattles and shrubs including Swamp Paperbark, Hop Goodenia, *Sambucus gaudichaudiana* (White Elderberry) and Kangaroo Apple, along with scattered individuals of Sweet Pittosporum, Plum, Pine, Hawthorn and Wild Tobacco Tree.

The ground storey contains patches of Tall Sword-sedge, *Lepidosperma laterale* (Variable Sword-sedge), Common Reed and Thatch Saw-sedge. Small patches of indigenous grasses including Forest Wire-grass, Weeping Grass and *Deyeuxia quadriseta* (Reed Bent-grass) are present through the zone with large patches of herbs including Annual Fireweed, Cotton Fireweed and *Acaena novae-zealandiae* (Bidgee-widgee). A high coverage of exotic grasses including Panic Veldt-grass, Toowoomba Canary-grass and Kikuyu was recorded, though these do not dominate the ground storey.

Noxious weeds present include Blackberry, Hawthorn and Spear Thistle.

Herb-rich Foothill Forest – Habitat Zone 8

This zone is characterised by a dense canopy patch above an absent middle storey and exotic ground storey (see Photo 5).

The canopy is composed of a patch of Gippsland Blue Gum with medium and large sized trees.

The middle storey is absent without a single tree or shrub present.

The ground storey is composed mostly of exotic grasses, particularly Yorkshire Fog and Cocksfoot though a small patch of Weeping Grass was present. Several exotic herbs were recorded including *Solanum nigrum* (Black Nightshade), *Plantago lanceolata* (Ribwort) and *Brassica* spp. (Mustard), outnumbering the handful of Slender Knotweed individuals.

Blackberry was the only noxious weed present though not in any significant coverage.

Lowland Forest – Habitat Zone 9

This zone is characterised by a diverse canopy above a diverse middle storey and modified understorey (see Photo 6).

The canopy contains Strzelecki Gum, Manna Gum, *Eucalyptus radiata* (Narrow-leaf Peppermint) and Messmate Stringybark scattered through the zone.

The middle storey contains a diverse mix of immature canopy, wattles and shrubs including Blackwood, *Acacia suaveolens* (Sweet Wattle), Drooping Cassinia, Swamp Paperbark, Snowy Daisy-bush and *Polyscias sambucifolia* (Elderberry Panax). Scattered individuals of Sweet Pittosporum and *Erica lusitanica* (Spanish Heath) were also present.

The ground storey contains large patches of graminoids, particularly Tall Sword-sedge, Variable Sword-sedge, Thatch Saw-sedge and *Gahnia sieberiana* (Red-fruit Saw-sedge) but also includes Spiny-headed Mat-rush, Wattle Mat-rush, Tasman Flax-lily and *Patersonia occidentalis var. occidentalis* (Long Purple-flag). Small patches of indigenous grasses of Forest Wire-grass, *Austrostipa* spp. (Spear Grass) and *Rytidosperma* spp. (Wallaby Grass) are present through the zone with interspersing patches of herbs including Annual Fireweed, Cotton Fireweed, *Viola hederacea* (Ivy-leaf Violet) and Soft Crane's-bill. A high coverage of exotic grasses including Panic Veldt-grass, Kikuyu and Cocksfoot were present, though these do not dominate the ground storey.

The noxious weeds present are Blackberry and Spear Thistle.

5.3.2 Scattered Trees

1 scattered tree has been identified as requiring removal for this proposal and 21 trees are 'deemed lost' through TPZ impacts. Table 7 identifies the species and their location.

Table 7: Scattered and TPZ impacts

ID	Species	Eastings	Northings	DBH (cm)	Size Class	Impact
1027-LC3	E.strzeleckii	409000	5731797	120.5	VL	TPZ
1022-LC4	E.strzeleckii	409124	5731572	123	VL	TPZ
1030-LC4	E.strzeleckii	409080	5731539	129	VL	TPZ
1111-LC4	E.strzeleckii	409138	5731507	126	VL	TPZ
1002-LC4	E.globulus	408975	5731977	194	VL	Removed
1010-LC4	E.globulus	409062	5731586	150	VL	TPZ
1006-LC4	E.strzeleckii	409100	5731626	81.5	L	TPZ
1021-LC4	E.strzeleckii	409117	5731601	110.5	L	TPZ
1029-LC4	E.strzeleckii	409073	5731525	93	L	TPZ
1040-LC3	E.strzeleckii	409012	5731764	61	M	TPZ
1050-LC9	E.obliqua	409868	5731016	61	M	TPZ
1016-LC10	E.obliqua	409975	5730984	31	S	TPZ
1033-LC3	E.strzeleckii	409009	5731785	26.5	S	TPZ
1077-LC3	E.strzeleckii	409028	5731721	33	S	TPZ
1046-LC4	E.strzeleckii	409015	5731801	22	S	TPZ
1002-LC10	E.strzeleckii	409931	5730998	46	S	TPZ
F1054-MM14	E.strzeleckii	408602	5732733	24	S	TPZ
1003-LC10	E.strzeleckii	409931	5730997	9	VS	TPZ
F1127-MM14	E.strzeleckii	408635	5732702	8	VS	TPZ
F1233-MM15	E.strzeleckii	408667	5732671	10	VS	TPZ
1005-LC1	E.viminalis	408666	5732633	13	VS	TPZ
F1076-MM14	E.radiata	408605	5732729	15	VS	TPZ

The canopy coverage of these trees has been added to the area of native vegetation marked for removal and given the adjacent patch quality score.

5.3.3 Quantification of Losses to Native Vegetation

Maps 1a and 1b provide the location and extent of native vegetation marked for removal. Table 8 provides the calculated area of extent of all twelve Habitat Zones which have been assessed as lost (area of zone to be cleared). These loss calculations follow the methodology described in Section 2.2.2.

The photos section provides photographic examples of the native vegetation to be removed.

Table 8: Quantification and significance of losses in patches of native vegetation

Habitat Zone			**HZ1**	**HZ2**	**HZ3a**	**HZ3b**	**HZ4a**	**HZ4b**
EVC Name (initials)			**LF**	**LF**	**LF**	**RF**	**RF**	**RF**
EVC Number			**16**	**16**	**16**	**18**	**18**	**18**
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Site Condition	Large Old Trees	10	3	7	3	3	10	0
	Canopy Cover	5	0	2	0	0	3	0
	Understorey	25	15	15	10	15	10	10
	Lack of Weeds	15	4	0	6	0	2	0
	Recruitment	10	1	1	1	3	0	0
	Organic Matter	5	3	0	3	3	5	5
	Logs	5	0	4	0	0	5	0
	Total Site Score	75	**26**	**29**	**23**	**24**	**35**	**15**
	Site score out of?	E.g. 55	75	75	75	75	75	75
	Adjusted Site Score		**26**	**29**	**23**	**24**	**35**	**15**
Landscape value	Patch Size	10	5	5	5	5	5	5
	Neighbourhood	10						
	Distance to Core	5						
Habitat points out of 100		**100**	**31**	**34**	**28**	**29**	**40**	**20**
Habitat Score (hab points/100)			**0.31**	**0.32**	**0.28**	**0.29**	**0.4**	**0.20**
Area of zone to be cleared (ha)			0.16	0.11	0.29	0.36	0.14	0.09
Habitat Hectares of loss			**0.05**	**0.04**	**0.08**	**0.10**	**0.06**	**0.02**
Catchment			**West Gippsland**					
Strategic Biodiversity Score			**Refer to BIOR report (Appendix 9)**					
Habitat Importance Score								
General Biodiversity Score								
Specific Biodiversity Equivalence Score								

Habitat Zone			HZ5a	HZ5b	HZ6	HZ7	HZ8	HZ9
EVC Name (initials)			**RF**	**RF**	**RF**	**HRFF**	**HRFF**	**LF**
EVC Number			**18**	**18**	**18**	**23**	**23**	**16**
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Site Condition	Large Old Trees	10	8	0	3	2	1	4
	Canopy Cover	5	5	0	2	2	4	2
	Understorey	25	15	15	15	20	5	20
	Lack of Weeds	15	0	7	6	4	0	7
	Recruitment	10	3	0	6	6	0	6
	Organic Matter	5	3	0	3	4	5	3
	Logs	5	2	0	5	2	5	3
	Total Site Score	75	**36**	**22**	**40**	**40**	**20**	**45**
	Site score out of?	E.g. 55	75	75	75	75	75	75
	Adjusted Site Score		**36**	**22**	**40**	**40**	**20**	**45**
Landscape value	Patch Size	10	5	5	5	5	5	5
	Neighbourhood	10						
	Distance to Core	5						
Habitat points out of 100		**100**	**41**	**27**	**45**	**45**	**25**	**50**
Habitat Score (hab points/100)			**0.43**	**0.27**	**0.45**	**0.45**	**0.25**	**0.50**
Area of zone to be cleared (ha)			0.98	0.01	0.55	1.88	0.12	0.03
Habitat Hectares of loss			**0.42**	**0.003**	**0.25**	**0.85**	**0.008**	**0.02**
Catchment			**West Gippsland**					
Strategic Biodiversity Score			**Refer to BIOR report (Appendix 9)**					
Habitat Importance Score								
General Biodiversity Score								
Specific Biodiversity Equivalence Score								

5.4 Net Gain Targets

5.4.1 Native Patch Losses

The results of vegetation quality assessments and loss area calculations (habitat hectares) were forwarded to DELWP to provide a BIOR report in relation to the proposal. This report converted the habitat hectare figures into Biodiversity Equivalence Units (BEUs) and specified any applicable additional specific (species-based) offset requirements (Appendix 9). Table 9 provides the detail of all native patch losses in BEU's and the subsequent offset requirements.

5.5 Offset Strategy

VicRoads has two offset strategies which require further investigation to determine suitability to meet the like for like criteria.

A registered credit extract can be purchased from the native vegetation credit register that meets offset requirements as set out in Table 9. Alternatively, VicRoads has an offset site on the Princes Highway at Flynn that could be investigated for suitability to meet the like-for-like requirements as it is within the same West Gippsland Catchment Management Authority.

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Table 9: Summary of losses and offset targets for clearing patches of native vegetation

							Offset attributes		
Target #	**Catchment**	**Total losses (BEUs)**	**Offset type**	**Offset risk**	**Risk adjusted offset requirements (BEUs)**	**Habitat for species**	**Minimum habitat score for target**	**Other like-for-like requirements**	**Offset target summary**
1	West Gippsland	0.845	General	1.5	1.267	N/A	0.355	Same catchment **OR** Same municipal district	1.267 BEUs

6 Conclusion and Recommendations

Indigenous Design has been commissioned by VicRoads to undertake an assessment of native vegetation and biodiversity values occurring within a section of the South Gippsland Highway and its surrounds between Koonwarra and Meeniyan. Native vegetation removal is required for a proposal to realign the South Gippsland Highway at Black Spur to improve safety for road users.

The construction footprint was overlaid across all identified native patches and scattered trees to calculate the habitat zones requiring removal or impacted upon under the proposal. A total of 4.766 hectares of native vegetation is proposed to be removed. A *Biodiversity Impact and Offset Requirements Report* (BIOR) in relation to the proposal determined the following:

- The proposal falls within the risk-based pathway of 'high';
- The strategic biodiversity score of all marked (lost) vegetation is 0.444;
- Offset requirements equate to 1.267 'general' Biodiversity Equivalence Units (BEUs) with a minimum strategic biodiversity score of 0.355;
- Offsets must be located within the West Gippsland Catchment Management Authority (WGCMA) boundary or within the South Gippsland Shire Council municipality;
- No 'specific' offset requirements apply.

Of the 20 flora and fauna species listed under the EPBC Act identified in database searches, 5 of these were considered to have a higher than low likelihood of occurrence, being Strzelecki Gum, River Swamp Wallaby Grass, Swift Parrot, Growling Grass Frog and Australian Grayling. Additional investigations into the presence or impact on 3 species, River Swamp Wallaby Grass, Growling Grass Frog and the Swift Parrot have been completed, with recommendations made to avoid and reduce any impacts and their likelihood reduced to Low.

A total of 180 Strzelecki Gum listed as Vulnerable under the EPBC Act are proposed to be impacted by this proposal, with 69 directly requiring removal, 16 outside of the construction footprint 'deemed lost' with Tree Protection Zone (TPZ) impacts greater than 10% and 95 (seedlings) proposed to be translocated. VicRoads has avoided and minimised impacts to significant native vegetation located within the study area through the design and construction process, reducing the proposed impact from approximately 10 hectares in area to 4.766 and from 347 to 180 Strzelecki Gums.

Two offset strategies are currently being explored. VicRoads can purchase a registered credit extract from the native vegetation credit register that meets the like-for-like requirements or alternatively, VicRoads has an offset site on the Princes Highway at Flynn that could be investigated for suitability.

An application for a ‘Permit to Take Protected Flora’ will be required for the proposed removal of seventeen flora species identified in the study area that are listed as protected under the FFG Act. Removal of any protected flora taxa may not be undertaken until this permit has been issued

7 Reference

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Photos

Photo 1 – A typical example of the Lowland Forest EVC comprising Habitat Zone 3a (27/04/2017)

Photo 2 – A typical example of the Riparian Forest EVC comprising Habitat Zone 4b (19/04/2017)

Photo 3 – A typical example of the Riparian Forest EVC comprising Habitat Zone 5a (19/04/2017)

Photo 4 – A typical example of the Riparian Forest EVC comprising Habitat Zone 5b (19/04/2017)

Photo 5 – A typical example of the Herb-rich Foothill Forest EVC comprising Habitat Zone 8 (27/04/2017)

Photo 6 – A typical example of the Lowland Forest EVC comprising Habitat Zone 9 (23/06/2017)

Appendices

Appendices commence on the next page.

Appendix 1: Flora Survey Results

Origin	Botanical Name	Common Name	Conservation Status			HZ1	HZ2	HZ3a	HZ3b	HZ4a	HZ4b	HZ5a	HZ5b	HZ6	HZ7	HZ8	HZ9
			EPBC	Vic Adv.	FFG												
	Acacia dealbata	Silver Wattle				+	+		+			+	+	+	+		
	Acacia mearnsii	Black Wattle						+	+					+	+		
	Acacia melanoxylon	Blackwood				+	+	+	+	+	+	+	+	+	+		+
	Acacia mucronata subsp. longifolia	Narrow-leaf Wattle									+						+
	Acacia suaveolens	Sweet Wattle				+											+
	Acacia verticillata	Prickly Moses				+			+								+
	Acaena novae-zelandiae	Bidgee-widgee				+	+	+		+	+	+	+	+	+		+
*	*Acetosella vulgaris*	Sheep Sorrel				+						+	+				
	Adiantum aethiopicum	Common Maidenhair												+	+		
*	*Agrostis capillaris*	Brown-top Bent									+	+		+			
*	*Alopecurus spp.*	Fox Tail							+								
	Alternanthera denticulata s.l.	Lesser Joyweed										+					
	Amyema pendula	Drooping Mistletoe												+	+		+
*	*Anagallis arvensis*	Pimpernel										+	+				
*	*Anthoxanthum odoratum*	Sweet Vernal-grass				+	+	+	+		+			+			+
*	*Araujia sericifera*	White Bladder-flower						+									
*	*Aster subulatus*	Aster-weed										+					
*	*Atriplex prostrata*	Hastate Orache								+		+					
	Austrostipa spp.	Spear Grass															+
	Billardiera mutabilis	Common Apple-berry															+
	Blechnum nudum	Fishbone Water-fern											+	+			
	Brachyscome multifida	Cut-leaf Daisy							+								
*	*Brassica spp.*	Turnip					+					+				+	
*	*Briza maxima*	Large Quaking-grass							+						+		+
*	*Bromus catharticus*	Prairie Grass					+								+		

Origin	Botanical Name	Common Name	Conservation Status			HZ1	HZ2	HZ3a	HZ3b	HZ4a	HZ4b	HZ5a	HZ5b	HZ6	HZ7	HZ8	HZ9
			EPBC	Vic Adv.	FFG												
	Bursaria spinosa	Sweet Bursaria								+	+						+
*	*Cardamine hirsuta s.l.*	Common Bitter-cress					+										
*	*Carduus spp.*	Slender Thistle										+					
	Carex appressa	Tall Sedge										+					
	Carex spp.	Sedge										+					
	Cassinia arcuata	Drooping Cassinia				+		+	+				+				+
*	*Cenchrus clandestinum*	Kikuyu				+	+		+		+		+		+		+
*	*Chenopodium murale*	Sowbane														+	
*	*Cirsium arvense*	Perennial Thistle					+							+			
*	*Cirsium vulgare*	Spear Thistle				+		+	+	+	+	+	+	+	+		+
	Clematis aristata	Mountain Clematis				+						+					+
*	*Conyza bonariensis*	Flaxleaf Fleabane				+	+		+			+		+	+		
	Coprosma quadrifida	Prickly Currant-bush							+	+				+			+
*	*Corymbia citriodora subsp. citriodora*	Lemon-scented Gum				+											
*	*Crataegus monogyna*	Hawthorn												+	+		
	Cynodon dactylon	Couch									+						
*	*Cyperus eragrostis*	Drain Flat-sedge							+			+			+		
*	*Dactylis glomerata*	Cocksfoot				+	+		+	+	+	+	+	+	+	+	+
*	*Daucus carota*	Carrot					+										
	Daviesia latifolia	Hop Bitter-pea													+		
	Desmodium gunnii	Southern Tick-trefoil													+		
	Deyeuxia quadriseta	Reed Bent-grass													+		
	Dianella brevicaulis	Small-flower Flax-lily															+
	Dianella tasmanica	Tasman Flax-lily					+	+	+								+
*	*Ehrharta erecta var. erecta*	Panic Veldt-grass				+		+	+					+	+		+
	Epacris impressa	Common Heath															+

Origin	Botanical Name	Common Name	Conservation Status			HZ1	HZ2	HZ3a	HZ3b	HZ4a	HZ4b	HZ5a	HZ5b	HZ6	HZ7	HZ8	HZ9
			EPBC	Vic Adv.	FFG												
	Epilobium billardierianum subsp. billardierianum	Smooth Willow-herb															+
	Epilobium hirtigerum	Hairy Willow-herb					+										
*	*Erica lusitanica*	Spanish Heath				+											+
	Eucalyptus cypellocarpa	Mountain Grey-gum					+	+		+							
	Eucalyptus globulus subsp. pseudoglobulus	Gippsland Blue-gum				+			+				+	+	+	+	
	Eucalyptus kitsoniana	Bog Gum		R													+
	Eucalyptus obliqua	Messmate Stringybark				+	+								+		+
	Eucalyptus radiata	Narrow-leaf Peppermint															+
	Eucalyptus strzeleckii	Strzelecki Gum	V	v	L	+	+		+	+	+	+	+	+	+		+
	Eucalyptus viminalis	Manna Gum				+								+	+		+
	Eucalyptus viminalis subsp. viminalis	Manna Gum								+							
*	*Euphorbia peplus*	Petty Spurge					+										
*	*Fumaria spp.*	Fumitory					+										
	Gahnia radula	Thatch Saw-sedge				+	+	+							+		+
	Gahnia sieberiana	Red-fruit Saw-sedge															+
*	*Galium aparine*	Cleavers				+	+		+	+	+	+					+
	Geranium potentilloides	Soft Crane's-bill					+		+	+	+	+	+	+			+
	Gonocarpus tetragynus	Common Raspwort				+											+
	Goodenia ovata	Hop Goodenia				+			+				+		+		+
	Goodia lotifolia	Golden Tip													+		
	Gynatrix pulchella s.l.	Hemp Bush										+					
*	*Hedera helix*	English Ivy							+			+					
*	*Helminthotheca echioides*	Ox-tongue					+										
*	*Holcus lanatus*	Yorkshire Fog				+	+			+	+	+	+	+	+	+	+
*	*Hypochoeris radicata*	Flatweed										+	+	+	+	+	+
*	*Hypochoeris spp.*	Cat's Ear				+			+	+	+						

Origin	Botanical Name	Common Name	Conservation Status			HZ1	HZ2	HZ3a	HZ3b	HZ4a	HZ4b	HZ5a	HZ5b	HZ6	HZ7	HZ8	HZ9
			EPBC	Vic Adv.	FFG												
*	*Jacobaea vulgaris*	Ragwort						+	+	+	+	+	+	+			
	Juncus australis	Austral Rush				+	+			+		+					
	Juncus pallidus	Pale Rush				+											+
	Kunzea ericoides spp. agg.	Burgan							+	+	+	+	+	+			+
	Lepidosperma elatius	Tall Sword-sedge				+	+	+	+	+	+	+		+	+		+
	Lepidosperma laterale	Variable Sword-sedge													+		+
	Leptospermum continentale	Prickly Tea-tree				+	+							+			+
	Lomandra filiformis	Wattle Mat-rush				+											+
	Lomandra longifolia	Spiny-headed Mat-rush									+						+
	Lythrum hyssopifolia	Small Loosestrife				+								+			
*	*Malus spp.*	Apple				+	+										
	Melaleuca ericifolia	Swamp Paperbark							+						+		+
	Melicytus dentatus s.l.	Tree Violet					+	+	+		+		+				+
	Mentha australis	River Mint										+					
	Microlaena stipoides var. stipoides	Weeping Grass				+	+	+		+	+	+	+	+	+	+	
*	*Modiola caroliniana*	Red-flower Mallow					+					+					
*	*Myosotis sylvatica*	Wood Forget-me-not								+		+					
	Olearia argophylla	Musk Daisy-bush								+							+
	Olearia lirata	Snowy Daisy-bush				+		+	+				+				+
	Oxalis spp.	Wood Sorrel												+			
	Pandorea pandorana	Wonga Vine						+	+								
*	*Paspalum dilatatum*	Paspalum											+				+
	Patersonia occidentalis var. occidentalis	Long Purple-flag															+
	Persicaria decipiens	Slender Knotweed							+			+		+		+	
	Persicaria subsessilis	Hairy Knotweed					+		+			+					
*	*Phalaris aquatica*	Toowoomba Canary-grass					+	+	+						+		

Origin	Botanical Name	Common Name	Conservation Status			HZ1	HZ2	HZ3a	HZ3b	HZ4a	HZ4b	HZ5a	HZ5b	HZ6	HZ7	HZ8	HZ9
			EPBC	Vic Adv.	FFG												
*	*Phalaris arundinacea*	Reed Canary-grass											+				
	Phragmites australis	Common Reed													+		
*	*Pinus radiata*	Radiata Pine												+	+		
#	*Pittosporum undulatum*	Sweet Pittosporum				+	+	+	+	+	+			+	+		+
*	*Plantago lanceolata*	Ribwort					+	+	+			+	+	+		+	
	Poa australis spp. agg.	Tussock Grass											+				
	Poa labillardierei	Common Tussock-grass				+	+	+	+	+	+	+	+	+	+		+
	Polyscias sambucifolia	Elderberry Panax															+
	Pomaderris aspera	Hazel Pomaderris									+			+			
*	*Prunella vulgaris*	Self-heal										+					
*	*Prunus spp.*	Prunus				+	+	+	+					+	+		
	Pteridium esculentum	Austral Bracken				+	+	+	+	+	+	+	+	+	+		+
*	*Ranunculus repens*	Creeping Buttercup					+			+	+	+	+	+			+
*	*Rubus fruticosus spp. agg.*	Blackberry				+	+	+	+	+	+	+		+	+	+	+
	Rubus parvifolius	Small-leaf Bramble				+	+	+	+	+	+	+	+	+	+		+
*	*Rumex crispus*	Curled Dock					+					+	+	+		+	
	Rytidosperma spp.	Wallaby Grass															+
*	*Salix X reichardtii*	Pussy Willow										+					
	Sambucus gaudichaudiana	White Elderberry						+				+			+		
	Selaginella uliginosa	Swamp Selaginella															+
	Senecio glomeratus	Annual Fireweed				+		+	+	+	+		+		+		+
	Senecio hispidulus s.l.	Rough Fireweed											+		+		
	Senecio linearifolius	Fireweed Groundsel						+	+	+	+	+		+	+		+
	Senecio minimus	Shrubby Fireweed						+	+	+	+						
	Senecio prenanthoides	Beaked Fireweed															+
	Senecio quadridentatus	Cotton Fireweed								+					+		+

Origin	Botanical Name	Common Name	Conservation Status			HZ1	HZ2	HZ3a	HZ3b	HZ4a	HZ4b	HZ5a	HZ5b	HZ6	HZ7	HZ8	HZ9
			EPBC	Vic Adv.	FFG												
	Solanum aviculare	Kangaroo Apple						+	+	+	+	+			+		
*	*Solanum mauritianum*	Wild Tobacco Tree												+	+		
*	*Solanum nigrum s.s.*	Black Nightshade						+	+	+	+	+			+	+	+
*	*Solanum pseudocapsicum*	Madeira Winter-cherry						+	+	+	+	+	+				
*	*Sonchus oleraceus*	Common Sow-thistle				+			+						+		+
	Stylidium graminifolium s.l.	Grass Trigger-plant															+
*	*Taraxacum sp. 1*	Dandelion							+								
	Tetrarrhena juncea	Forest Wire-grass				+	+	+							+		+
	Urtica incisa	Scrub Nettle							+	+	+	+		+			
*	*Verbena bonariensis s.l.*	Purple-top Verbena												+			
*	*Vicia spp.*	Vetch											+				
	Viola hederacea	Ivy-leaf Violet															+
*	*Watsonia meriana var. bulbilifera*	Wild Watsonia															+

Key to Conservation Status and Origin

Taxon Origin	
#	Native species that may be considered alien in some circumstances
*****	Exotic species

Flora and Fauna Guarantee Act 1988	
L	Listed as a Threatened in Victoria
N	Nominated for listing as Threatened in Victoria
I	Invalid or ineligible to be a Threatened species in Victoria
D	Delisted as Threatened in Victoria

Commonwealth Environment Protection and Biodiversity Conservation Act 1999	
X	Listed as Nationally Extinct
CR	Listed as Nationally Critically Endangered
E	Listed as Nationally Endangered
V	Listed as Nationally Vulnerable
CD	Listed as Conservation Dependent

Advisory List of Rare or Threatened Plants in Victoria (VROTS) (DEPI, 2014)	
x	Listed as Presumed Extinct in Victoria
rx	Listed as Regionally Extinct in a geographic range of Victoria
ew	Listed as Extinct in the Wild in Victoria
cr	Listed as Critically Endangered in Victoria
e	Listed as Endangered in Victoria
v	Listed as Vulnerable in Victoria
nt	Listed as Near Threatened in Victoria
r	Listed as Rare in Victoria
dd	Listed as Data Deficient in Victoria
k	Listed as Poorly Known in Victoria

Bilateral migratory bird agreements	
J	Japan-Australia Migratory Bird Agreement (JAMBA)
C	China-Australia Migratory Bird Agreement (CAMBA)
RO	Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)
B	Converntion on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
RA	Ramsar Convention on Wetlands
A	Agreement on the Conservation of Albatrosses and Petrels (ACAP)

Appendix 2: Rare and Threatened Flora Likelihood of Occurrence

Scientific Name	Common Name	Conservation Status			Count of Sightings	Date of Last Record	Preferred Habitat Notes	Database Source	Likelihood of Occurrence								Comments
		EPBC Listing	Victorian Advisory List	FFG Act Listing					HZ1	HZ2	HZ3	HZ4	HZ5	HZ6	HZ7	HZ8	
Amphibromus fluitans	River Swamp Wallaby-grass	Vulnerable			1	6/02/1996	Natural and man-made water-bodies, including swamps, lagoons, billabongs and dams (DSEWPC 2016).	DSEWPC VBA	Low	Low	Low	Low	Low	Low	Low	Low	Known occurrence near HZ7 towards Meeniyan. Suitable habitat in zones adjacent to the Tarwin River have been surveyed and none found.
Banksia spinulosa var. cunninghamii	Hairpin Banksia			Nominated	1	30/05/1997	Distributed from the coastline into forest areas of the Great Dividing Range. Grows well in soils ranging from light through to moderately heavy with good moisture and drainage.(ANBG 2017)	VBA	Low Moderate	Low Moderate	Low	Low	Low	Low	Low	Low	Potentially suitable habitat in LF. Prefers open woodlands/forests with well-drained soil
Billardiera scandens s.s.	Velvet Apple-berry		Rare		1	3/01/1964	Naturally occurring plants in dry, shaded or cool positions often develop sparse foliage. (ANBG 2016)	VBA	Low	Low	Low	Low	Low	Low	Low	Low	Not suitable habitat. Prefers open woodlands/forests with well-drained soil
Caladenia orientalis	Eastern Spider Orchid	Endangered					Endemic to Victoria where found in coastal heathland and heathy woodlands between the Mornington Peninsula and Yarram, on well-drained soil. (VICFLR 2017)	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	Not suitable habitat. Prefers heathlands with well-drained soil
Eucalyptus globulus subsp. globulus	Southern Blue-gum		Rare		1	1/4/1899	Tall, open forest on a wide range of soils (RBG 2016).	VBA	Low - Moderate	Low - Moderate	Low - Moderate	Low - Moderate	Low - Moderate	Low - Moderate	Low - Moderate	Low - Moderate	Suitable habitat but E. globulus subsp pseudoglobulus found on site
Eucalyptus kitsoniana	Bog Gum		Rare		6	16/09/2009	Endemic to Victoria occurring on coastal lowlands from Yarram west to Cape Otway. It grows in boggy, often heavy soils and is ideal for more difficult growing conditions (RBG 2017).	VBA	Low	Low	Low	Low	Low	Low	Low	Low	Not suitable habitat.
Eucalyptus strzeleckii	Strzelecki Gum	Vulnerable	Vulnerable	Listed	6	2/06/2011	Eucalyptus strzeleckii is a large forest tree component of Herb-rich Foothill Forest and Gippsland Plains Grassy Woodland Ecological Vegetation Classes (John Davies, DPI, pers. comm) of the Strzelecki Ranges. It also occurs on flatter terrain at the edges of the Strzelecki Ranges, where it is largely restricted to the banks of watercourses or on river flats where soils are seasonally waterlogged (DSE 2010a).	DSEWPC VBA	High	High	High	High	High	High	High	Moderate	Found on site in majority of zones. Records around Koonwarra and Meeniyan.
Prasophyllum frenchii	Maroon Leek-orchid	Endangered	Endangered	Listed			Grassland and grassy woodland habitats, on sandy to black clay loams that are generally damp but well drained, although some sites are seasonally waterlogged (DSE 2010b).	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	Not suitable habitat. Found in grasslands with well drained soils.

Scientific Name	Common Name	Conservation Status			Count of Sightings	Date of Last Record	Preferred Habitat Notes	Database Source	Likelihood of Occurrence								Comments
		EPBC Listing	Victorian Advisory List	FFG Act Listing					HZ1	HZ2	HZ3	HZ4	HZ5	HZ6	HZ7	HZ8	
Pterostylis cucullata	Leafy Greenhood	Vulnerable					Favours open forests and woodlands in well-drained sand and clay loams. It is a post-disturbance coloniser that is usually found in open areas around old quarries and gravel pits, on road verges, disused tracks and animal trails (DSE 2017)	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	Not suitable habitat. Prefers open woodlands/forests with well-drained soil

Bibliography

SPECIES	TAG	Title	Detail
Amphibromus fluitans	DSEWPC 2016	Amphibromus fluitans- River Swamp Wallaby-grass	http://www.environment.gov.au/biodiversity/threatened/species/pubs/19215-conservation-advice.pdf
Banksia spinulosa var. cunninghamii	ANBG 2017	Hairpin Banksia	https://www.anbg.gov.au/gnp/gnp7/banksia-spinulosa.html
Billardiera scandens s.s.	ANBG 2016	Billardiera scandens s.s.	http://www.anbg.gov.au/gnp/interns-2002/billardiera-scandens.html
Caladenia orientalis	VICFLRe	Eastern Spider Orchid	https://vicflora.rbg.vic.gov.au/flora/taxon/81160424-e10f-432a-af82-c9cdd681d30d
Eucalyptus globulus subsp. Globulus	RBG 2016	Eucalyptus globulus subsp. globulus	http://data.rbg.vic.gov.au/vicflora/flora/taxon/31b2d5b0-23f9-47a6-bb36-0a7bab28e659
Eucalyptus kitsoniana	RBG 2017	Bog Gum	https://vicflora.rbg.vic.gov.au/flora/taxon/e9aa87a9-41f4-4287-8404-0befbe488a73 https://www.rbg.vic.gov.au/visit-cranbourne/attractions/plant-collections/eucalypts-for-your-home-garden
Eucalyptus strzeleckii	DSE 2010a	National Recovery Plan for the Strzelecki Gum Eucalyptus strzeleckii	Oberon Carter
Prasophyllum frenchii	DSE 2010b	National Recovery Plan for the Maroon Leek-orchid (Prasophyllum frenchii)	Mike Duncan
Pterostylis cucullata	DSE 2017	Leafy Greenhood	http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=15459

Appendix 3: Targeted survey for Strzelecki Gum within a 2km radius of the Study Site

INDIGENOUS DESIGN
ENVIRONMENTAL MANAGEMENT

Report for VicRoads

Survey of *Eucalyptus strzeleckii* (Strzelecki Gum) surrounding Black Spur, Koonwarra

August 2017

Tim Bowler

Citation

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Indigenous Design Environmental Management
1635 Main Road, Research
www.iddesign.com.au

Disclaimer

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Draft 1.1	07/08/2017	First draft, first review	W. Doherty	T. Bowler
Draft 1.2	10/08/2017	First draft, second review	T. Brooker	T. Bowler
Final	14/08/2017	Final released to client		

Contents

Executive Summary

Indigenous Design Environmental Management has been commissioned by VicRoads to investigate the distribution and abundance of *Eucalyptus strzeleckii* (Strzelecki Gum) in the vicinity of Black Spur, Koonwarra.

This survey supplements a previous detailed survey (Bowler & Doherty, 2017) undertaken within the footprint for the proposed South Gippsland Highway realignment between Koonwarra and Minns Road. This survey involved a desktop review of Strzelecki Gum records and a field survey of publicly accessible land within two kilometres of the proposed realignment site.

Database searches of the Victorian Biodiversity Atlas (VBA) and the Atlas of Living Australia (ALA) identified 3,793 Strzelecki Gum records throughout Victoria (although it is known that many of these are duplicates from the two sources). Twelve of these records occur within the survey area.

The survey, within two kilometres of the proposed realignment site, yielded an estimate of 2,307 predominantly reproductively mature Strzelecki Gums, from 86 different points.

The Black Spur, Koonwarra site is located near the edge of the species range based on database records, with Strzelecki Gums being more abundant to the north and north-east of the site, particularly surrounding Warragul and Morwell. However, the low number of database records within the area may be misrepresenting the range of the species, as it has been shown to be far more prevalent within the area than the databases currently indicate.

1 Introduction

1.1 Project Background

Indigenous Design Environmental Management has been commissioned by VicRoads to investigate the distribution and abundance of *Eucalyptus strzeleckii* (Strzelecki Gum) in the vicinity of Black Spur, Koonwarra.

Strzelecki Gum is a medium to tall forest swamp gum and is listed as Vulnerable by the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). It is also listed as Threatened by the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act). Based on all publicly available sources reviewed, the Black Spur community is near to the most southerly extent of the species. (DELWP, 2017).

This survey supplements a previous detailed survey (Bowler & Doherty, 2017) undertaken within the footprint for the proposed South Gippsland Highway realignment between Koonwarra and Minns Road. Within and immediately adjacent to the construction footprint of this proposed realignment, 883 Strzelecki Gums have previously been recorded (Bowler & Doherty, 2017).

In order to determine the true extent of the proposed impact on the Black Spur Strzelecki Gum community, VicRoads have commissioned a survey to identify other Strzelecki Gum individuals in the vicinity of the Black Spur site.

1.2 Objectives

The objective of this assessment is:

- To investigate database records for Strzelecki Gum;
- To investigate the abundance of the Strzelecki Gum population adjacent to the Black Spur site through targeted survey.

1.3 Site Details

The survey area (*Figure 1*) includes all areas within two kilometres of the Black Spur, Koonwarra site, which is located approximately 120 kilometres south-east of Melbourne, Victoria. It is situated within the South Gippsland Shire and West Gippsland Catchment (WGCMA).

This area is predominantly low-lying, with flood-plains adjacent to the Tarwin River along which the majority of vegetation persists. Isolated fenced-off reserves and bush blocks containing native vegetation also occur across the area. The remaining land use is agricultural, particularly for cattle grazing, with scattered trees across the majority of paddocks constituting the extent of native vegetation.

Figure 1 shows the Black Spur, Koonwarra site and extended study area.

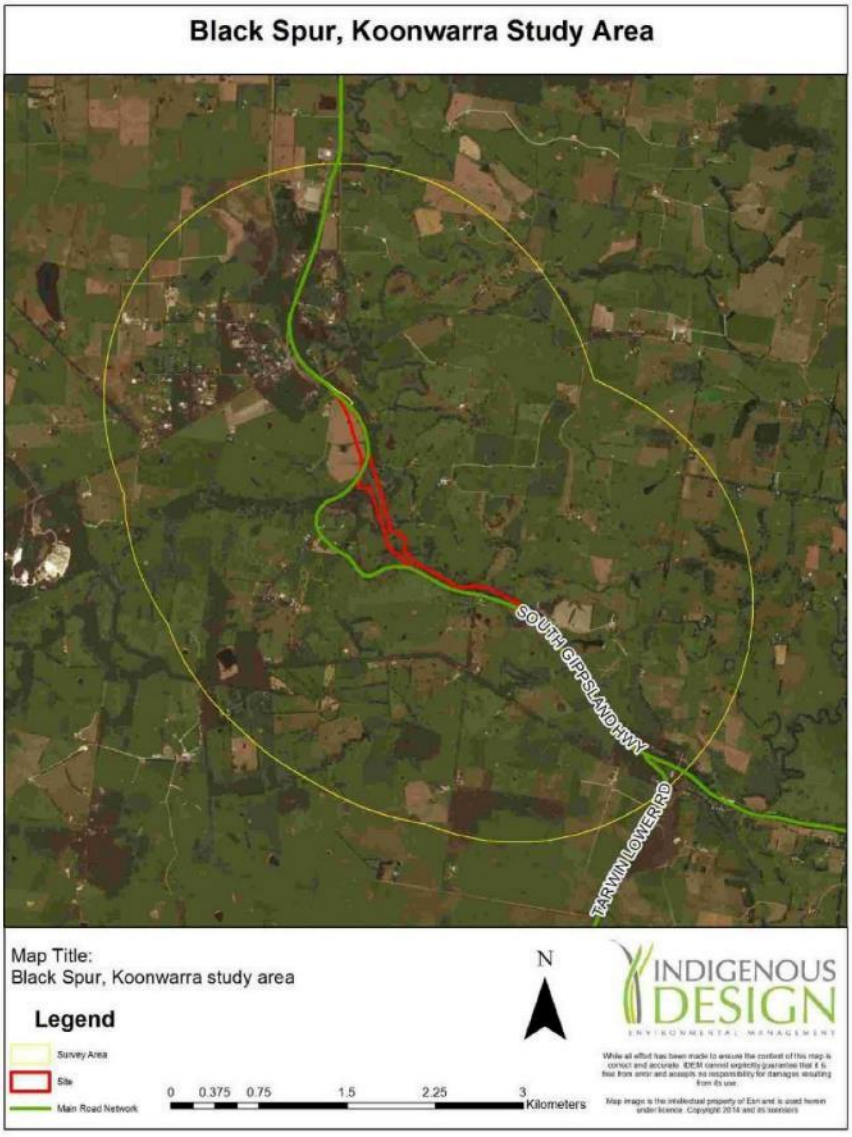

Figure 1: The site and the extent of the two-kilometre radius study area

2 Description of Methods

2.1 Data and Literature Review

Prior to field assessments, two databases were queried and all records of Strzelecki Gums downloaded. These databases were:

- The Victorian Biodiversity Atlas (DELWP, 2017a); and
- The Atlas of Living Australia (ALA) (ALA, 2017).

Downloaded records were compiled and presented in a Geographical Information System (GIS) with special reference to Black Spur, Koonwarra. A two-kilometre buffer was placed around the site to serve as the extent of field surveys.

2.2 Field Survey

Field surveys of the area were undertaken in July, 2017.

All wooded remnant vegetation on public land within two kilometres of the site was inspected for the presence of Strzelecki Gums. When possible, this was done on foot, although the majority of vegetation was situated on roadsides and was surveyed from the vehicle.

All Strzelecki Gums were identified by two consultants trained in the identification of the species and GPS mapped and their abundance estimated.

All mapped individuals and stands were loaded into the spatial analysis software (GIS) and displayed alongside known locations of Strzelecki Gums from database searches within the broader context of ten kilometres from the site.

2.3 Discussion

The results of the two field surveys were discussed at three levels; the site (<2 kilometres from the Black Spur, Koonwarra site), the local area (<10 kilometres from the Black Spur, Koonwarra site) and the region (the entire Gippsland population of Strzelecki Gum).

While no special reference has been made to the EPBC Act, the survey results will have relevance to the Significant Impact Criteria.

2.4 Limitations

The assessment was undertaken in July of 2017 and so it is possible that some of the identifying features of Strzelecki Gum may not have been present, particularly the glaucous new growth.

Survey of *Eucalyptus strzeleckii* (Strzelecki Gum) surrounding Black Spur, Koonwarra | August, 2017

Due to the majority of the land within the survey area being privately owned, the survey was restricted to public land and roadsides. If Strzelecki Gums on private land were able to be confidently identified, these were also mapped and numbers estimated.

3 Results and Discussion

3.1 Database Searches

Database searches resulted in 3,793 Strzelecki Gum records throughout Victoria being identified. This total included 1,928 from the Atlas of Living Australia (ALA) and 1,865 from the Victorian Biodiversity Atlas (VBA) records. These records are largely located within West Gippsland, specifically the Baw Baw Shire Council municipality. Some of these records may be duplicates, with ALA and VBA records being present in the same area, however both sources were used so that records unique to each database could be identified.

Although many of the ALA records seem to be considerably beyond the range of the species, all records were included for transparency purposes. Records from the VBA should be deemed more reputable due to them being reviewed by experts prior to their inclusion in the dataset (Schinagl, 2016).

3.1.1 The survey area (<2km from the site)

Six VBA records and six ALA records occur within the survey area. The location of all Strzelecki Gum records within the Gippsland Region, compiled from database searches, can be seen in Map 1.

3.1.2 The local area (<10km from the site)

Within 10 kilometres of the site, 18 VBA and 21 ALA records are present, predominantly along the Tarwin River and adjoining tributaries, with the Black Spur site being in the middle of these records. The highest density of Strzelecki Gum database records are found immediately adjacent to the site, and along the northern boundary of the Leongatha town ship.

The disjunct distribution of these records may be due to previous clearing regimes across the area, with the species originally likely to have existed throughout the entire area, particularly along the Tarwin River.

3.1.3 The region (Gippsland)

The distribution of Strzelecki Gums is highest in the Strzelecki Bioregion, with a few records also found in the Gippsland Plain and Highlands – Southern Fall bioregions which abut the Strzelecki bioregion (Schinagl, 2016).

Based on the Strzelecki Gum database records in the region, the species is not common south of Mount Worth State Park, with a scattered distribution throughout South Gippsland Shire (where the site is located), Latrobe City and a small amount of records for the Wellington and Bass Coast Shires. These areas have been extensively cleared for farmland, indicating that the species may have been much more abundant pre-colonisation.

The concentration of records north of Mount Worth State Park within the Baw Baw Shire Council may be attributed to more intact vegetation along rivers and their floodplains, as well as this area providing more preferable habitat for the species.

3.2 Strzelecki Gum Targeted Survey

The two-kilometre search area surrounding the Black Spur site encompasses 2,306.68 hectares of predominantly privately owned land, and as such the actual survey area was much smaller, being limited to public land including roadsides, rail trails and waterway corridors.

Assuming that Strzelecki Gums are able to be identified from 50 metres away, and approximately 220 kilometres being traversed by either vehicle or foot, the area surveyed is estimated to be approximately 330 hectares (Map 4).

The survey of this publicly accessible land resulted in an estimated 2,307 predominantly reproductively mature Strzelecki Gums being identified from 86 points. The majority of these points were roadsides.

3.3 Distribution

The location of the surveyed Strzelecki Gums, as well as that of the desktop records, show that the site is at the southern edge of the species natural range, with the dominant Eucalyptus species surrounding the site being *Eucalyptus obliqua* (Messmate) and *Eucalyptus viminalis* (Manna Gum), particularly south towards the coast.

4 Conclusions and Recommendations

Within two kilometres of the site, an estimated 2,307 Strzelecki Gums were recorded as part of this targeted survey, as well as 12 database records from VBA and ALA. These records are largely confined to roadsides and river banks, while ten kilometres from the site, a total of 39 database records are recorded.

The Black Spur, Koonwarra site is located near the southern limit of the species, with Strzelecki Gums being more abundant north and north-east of the site, particularly surrounding Morwell and Warragul. Despite this, the species may have been more abundant in the survey area pre-colonisation, with a high level of clearing having been undertaken, although the low number of records surrounding the site may also be an indication of the species natural range.

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Photos

Photo 1 – Typical example of Strzelecki Gums being confined to the immediate river bank, or as scattered trees (27/7/2017)

Photo 2 – Dense Strzelecki Gums on Old Koonwarra Road at the Tarwin River crossing (27/7/2017)

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Photo 3 – Dense Strzelecki Gums on the Great Southern Rail Trail, between Koonwarra and Meeniyan (27/7/2017)

Photo 4 – The majority of the land in the area has been cleared, used for grazing, with sparse scattered trees, many of which are Strzelecki Gums (27/7/2017)

Survey of *Eucalyptus strzeleckii* (Strzelecki Gum) surrounding Black Spur, Koonwarra | August, 2017

Photo 5 – A view of the site, taken from Buckingham and Fowlers Road, facing south-west (26/7/2017)

Appendix 1: Strzelecki Gum patches identified within two kilometres of the Black Spur site

Latitude	Longitude	Northing	Easting	Estimated number of Strzelecki Gums
-38.5474	145.9478	5732924.417	408312.5597	10
-38.5489	145.9494	5732757.643	408450.6242	20
-38.5481	145.9479	5732843.466	408316.5854	18
-38.5464	145.9469	5733032.544	408232.6303	13
-38.5441	145.9368	5733273.887	407345.8743	1
-38.5441	145.9394	5733278.928	407576.695	1
-38.5463	145.9439	5733040.593	407967.7513	1
-38.5477	145.9447	5732888.141	408036.3446	2
-38.5488	145.9454	5732765.445	408102.5973	5
-38.5529	145.9355	5732299.731	407241.059	15
-38.5354	145.9518	5734255.903	408645.2912	40
-38.5387	145.9518	5733895.4	408648.5733	50
-38.5391	145.9519	5733850.614	408657.3044	10
-38.5456	145.9473	5733123.899	408261.7692	100
-38.5481	145.9501	5732846.613	408507.3168	25
-38.5462	145.9542	5733056.909	408862.1915	150
-38.5449	145.9580	5733207.11	409192.6707	19
-38.5421	145.9608	5733526.594	409432.3715	1
-38.5431	145.9646	5733419.752	409769.9491	30
-38.5433	145.9668	5733395.265	409956.0299	100
-38.5438	145.9721	5733348.25	410418.3277	20
-38.5444	145.9726	5733281.436	410465.1284	25
-38.5401	145.9575	5733741.964	409148.5367	100
-38.5488	145.9511	5732772.382	408598.9169	5
-38.5492	145.9528	5732730.462	408749.5252	5
-38.5503	145.9539	5732601.016	408844.6748	12
-38.5519	145.9542	5732427.464	408871.2573	1
-38.5537	145.9558	5732231.641	409016.7421	20
-38.5540	145.9559	5732199.968	409022.946	52
-38.5567	145.9578	5731904.504	409191.8087	50
-38.5505	145.9550	5732580.017	408941.9608	1
-38.5492	145.9551	5732734.657	408944.2281	100
-38.5506	145.9574	5732579.721	409150.6526	200
-38.5580	145.9533	5731746.68	408801.1378	28
-38.5612	145.9489	5731387.636	408425.2486	13
-38.5598	145.9475	5731546.068	408296.924	20
-38.5634	145.9466	5731142.567	408224.5721	50
-38.5617	145.9522	5731338.137	408709.1207	25

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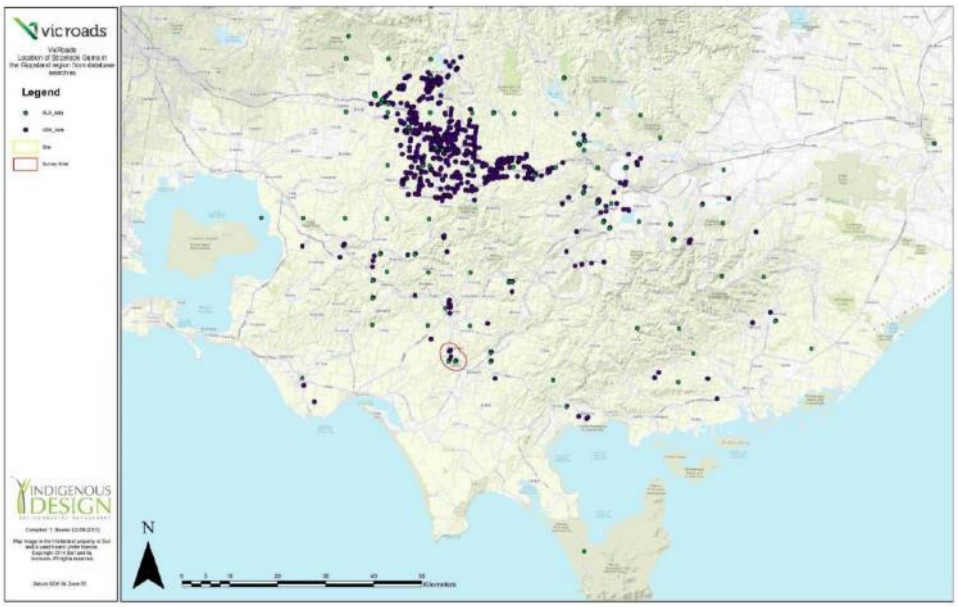
Latitude	Longitude	Northing	Easting	Estimated number of Strzelecki Gums
-38.5693	145.9650	5730513.085	409832.7381	40
-38.5727	145.9645	5730135.979	409792.407	7
-38.5731	145.9658	5730093.093	409907.7937	5
-38.5741	145.9643	5729975.266	409776.3817	30
-38.5760	145.9640	5729759.907	409753.5071	1
-38.5697	145.9596	5730457.171	409365.8493	100
-38.5691	145.9742	5730541.93	410639.3433	50
-38.5748	145.9787	5729916.801	411032.4836	50
-38.5768	145.9859	5729691.816	411664.0777	7
-38.5739	145.9829	5730019.573	411400.6774	25
-38.5711	145.9815	5730330.844	411271.7731	3
-38.5724	145.9818	5730179.591	411300.9148	10
-38.5722	145.9807	5730204.616	411207.1195	20
-38.5686	145.9824	5730604.071	411353.9749	50
-38.5580	145.9852	5731786.419	411577.3478	32
-38.5766	145.9832	5729716	411426.4877	15
-38.5764	145.9824	5729740.329	411361.7901	75
-38.5760	145.9813	5729782.607	411261.1984	14
-38.5754	145.9800	5729843.991	411150.4399	20
-38.5746	145.9791	5729932.816	411067.9532	10
-38.5740	145.9786	5729997.772	411022.109	3
-38.5721	145.9771	5730206.372	410895.1999	10
-38.5709	145.9761	5730345.175	410805.5021	50
-38.5696	145.9750	5730486.866	410710.3819	23
-38.5688	145.9742	5730575.043	410633.1423	17
-38.5684	145.9737	5730620.165	410596.506	5
-38.5680	145.9733	5730663.1	410560.515	12
-38.5671	145.9723	5730757.243	410473.2445	27
-38.5664	145.9713	5730838.115	410379.4385	8
-38.5658	145.9702	5730901.817	410281.6353	5
-38.5643	145.9656	5731060.086	409885.4008	5
-38.5642	145.9645	5731079.791	409789.4959	20
-38.5633	145.9619	5731174.509	409555.2863	10
-38.5621	145.9608	5731308.363	409460.413	50
-38.5628	145.9566	5731218.306	409094.8474	9
-38.5624	145.9556	5731263.314	409009.8771	4
-38.5628	145.9542	5731218.49	408890.7168	30
-38.5600	145.9542	5731527.935	408880.8134	20
-38.5596	145.9541	5731577.199	408873.4385	5
-38.5576	145.9546	5731791.632	408914.6166	3
-38.5574	145.9540	5731817.341	408864.0523	4

Survey of *Eucalyptus strzeleckii* (Strzelecki Gum) surrounding Black Spur, Koonwarra | August, 2017

Latitude	Longitude	Northing	Easting	Estimated number of Strzelecki Gums
-38.5547	145.9557	5732118.715	409007.2059	5
-38.5544	145.9553	5732147.919	408971.7921	6
-38.5541	145.9553	5732190.664	408968.5071	13
-38.5507	145.9534	5732562.707	408799.3955	25
-38.5651	145.9689	5730983.131	410167.6692	25
-38.5655	145.9696	5730936.209	410235.5204	1
-38.5766	145.9794	5729713.524	411101.4698	10

Survey of *Eucalyptus strzeleckii* (Strzelecki Gum) surrounding Black Spur, Koonwarra | August, 2017

Map 1 –Location of Strzelecki Gums in the Gippsland region, from database searches



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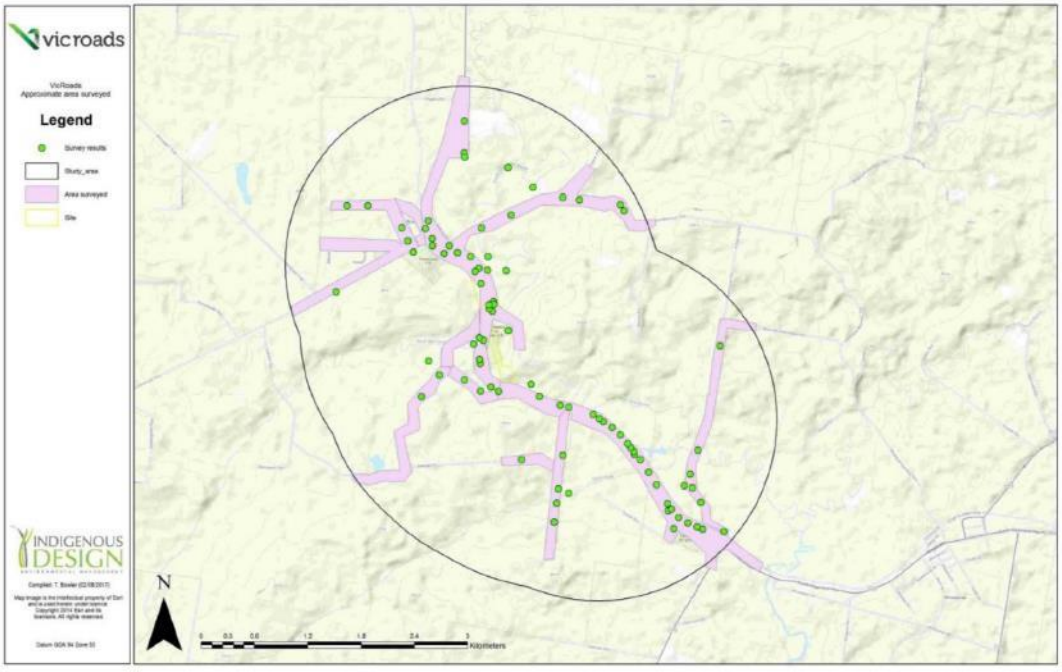
Survey of *Eucalyptus strzeleckii* (Strzelecki Gum) surrounding Black Spur, Koonwarra | August, 2017

Map 2: Detailed survey area – Topography Map



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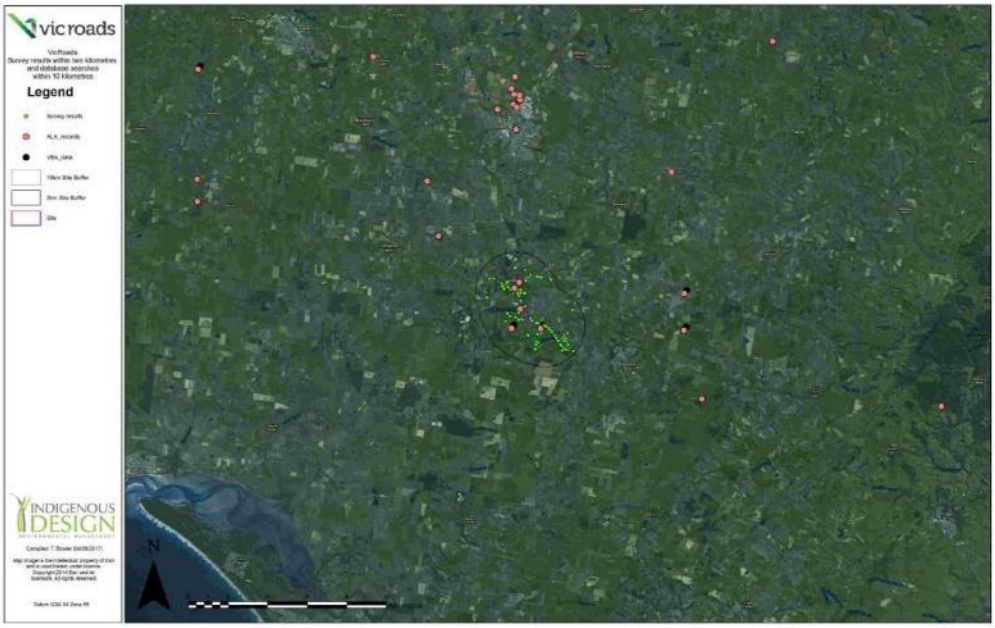
Map 3 –Survey results from two kilometres of site and database searches from ten kilometres of site – Base Map



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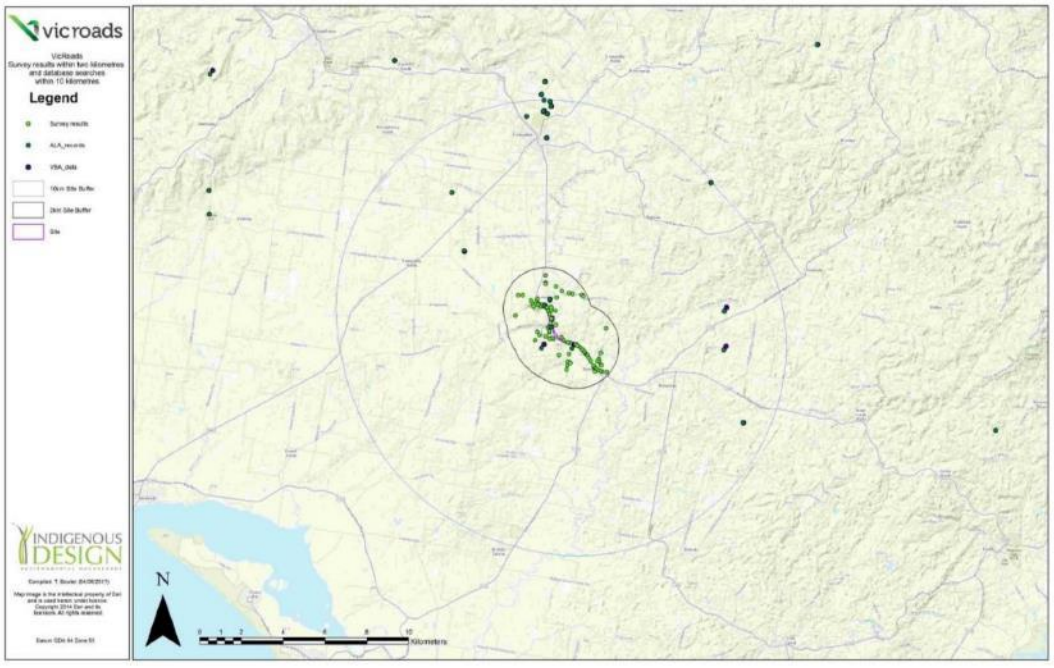
Map 4–Survey results from two kilometres of site and database searches from ten kilometres of site – Topography Map



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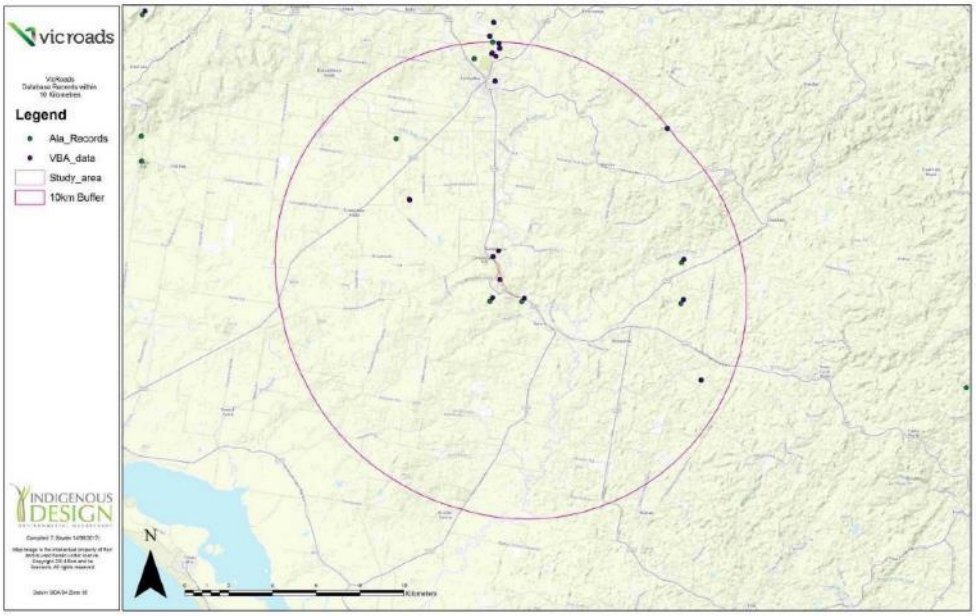
Map 5–Database search results within 10 kilometres of the site – Topography Map



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1635 Main Rd, Research, VIC, 3095 P (03) 9437 0555
Melbourne | Morwell | Wonthaggi E nicole@iddesign.com.au

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Appendix 4: Targeted survey for River Swamp Wallaby Grass

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Report for VicRoads

Habitat assessment and targeted survey for River Swamp Wallaby Grass (*Amphibromus fluitans*) at Black Spur, Koonwarra

July 2017

Tim Bowler

Citation

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1635 Main Road, Research
www.iddesign.com.au

Disclaimer

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Version Control

Status	Date	Revision type	Reviewed by	Amended by
Draft 1.1	21/07/2017	First draft, first review	W. Doherty	T. Bowler
Draft 1.2	27/07/2017	First draft, second review	T. Brooker	T. Bowler
Final	03/08/2017	Final released to client		

Contents

Executive Summary

Indigenous Design Environmental Management has been commissioned by VicRoads to undertake an assessment of habitat potential and conduct a targeted survey for *Amphibromus fluitans* (River Swamp Wallaby Grass) adjacent to the proposed South Gippsland Highway realignment at Black Spur, Koonwarra, particularly areas of possible construction impacts.

The presence of River Swamp Wallaby Grass recorded nearby on the Victorian Biodiversity Atlas (VBA) dictated the need to undertake a targeted survey to determine if this proposal would impact on the species.

River Swamp Wallaby Grass is listed as vulnerable under the Environment Protection & Biodiversity Conservation (EPBC) Act 1999 (DEE, 2017).

The scope of this assessment and survey are to:

- Assess the study site's habitat for potential to host River Swamp Wallaby Grass; and
- Determine the location of River Swamp Wallaby Grass through targeted surveys.

The outcomes of this survey are to be used by VicRoads to plan construction constraints to minimise impacts on any identified habitat and known locations of River Swamp Wallaby Grass.

River Swamp Wallaby Grass individuals were not identified in the targeted survey within or surrounding the study area. The majority of the study area has been modified from its original vegetation cover however three depressions, particularly one in the north, may still provide suitable habitat for River Swamp Wallaby Grass. These three depressions contain important habitat characteristics including standing water and areas of bare ground, although the high weed cover and high level of grazing and trampling by cattle suggests that the persistence of this species is unlikely.

In order to avoid further consideration of this species in regard to the EPBC Significant Impact Criteria, the following are recommended:

- Works should avoid, as much as is practicable, disturbing areas of suitable habitat for River Swamp Wallaby Grass, particularly in Area 1; and
- Works should be undertaken solely within the study area and the planned realignment footprint to avoid suitable habitat for the species located on the Tarwin River floodplain.

1 Introduction

1.1 Project Background

Indigenous Design Environmental Management has been commissioned by VicRoads to undertake an assessment of habitat potential and conduct a targeted survey for *Amphibromus fluitans* (River Swamp Wallaby Grass) within the construction footprint and adjacent to the proposed South Gippsland Highway realignment at Black Spur, Koonwarra. The targeted survey was undertaken in areas of potential suitable habitat within the realignment corridor (ie the Tarwin River floodplain) and areas identified by VicRoads as being required for construction activities such as parking, stockpiling, etc. The entire realignment corridor has previously been surveyed for all flora species and traversed numerous times, with no other areas identified as potential suitable habitat or the species identified.

A record of River Swamp Wallaby Grass on the Victorian Biodiversity Atlas (VBA) in close proximity dictated the need to undertake a targeted survey to determine if this proposal would impact on the species.

River Swamp Wallaby Grass is listed as vulnerable under the EPBC Act 1999 (DEE, 2017).

The scope of this assessment and survey are to:

- Assess the study site's habitat for potential to host River Swamp Wallaby Grass; and
- Determine the location of River Swamp Wallaby Grass through targeted surveys.

The outcomes of this survey are to be used by VicRoads to plan the construction constraints to minimise impacts on any identified habitat and known locations of River Swamp Wallaby Grass.

1.2 Species Information

River Swamp Wallaby Grass is an aquatic perennial with long, horizontally-growing stems with upturned tips, particularly when growing in water, and often only the inflorescence being emergent. The species is stoloniferous (root like stems that grow horizontally) and rhizomatous (Walsh, 1994), with the plant growing to 120 cm high overall (DEE, 2017).

The closest record of River Swamp Wallaby Grass to the Koonwarra study site dates from 1996 and relates to a record 1200 metres east-southeast of the area (DELWP, 2016), with two records at this location which are shown in Map 1.

1.3 Study Area

The study area is located 1.8 kilometres south-east of the township of Koonwarra and approximately 120 kilometres south-east of Melbourne. The study area abuts the Tarwin River, and is adjacent to the proposed South Gippsland Highway realignment, with the land being used for cattle grazing.

Targeted *Amphibromus fluitans* survey, Black Spur, Koonwarra | July, 2017

Very little native vegetation remains within the study area, with the past and current grazing regime resulting in the area being dominated by exotic species, particularly pasture grasses and wetland weeds.

2 Methodology

2.1 Data and Literature Review

Relevant literature, on-line resources and numerous databases were reviewed to provide an assessment of the habitat suitability and location of previous River Swamp Wallaby Grass records. The following were reviewed:

- The Department of Environment, Land, Water and Planning (DELWP) NatureKit (DELWP, 2017a) for:
    - Modelled data for River Swamp Wallaby Grass;
    - Graminoid Threatened Flora Lifeforms locations.
- The Victorian Biodiversity Atlas (DELWP, 2016) for previously documented flora records within the study area and surrounding areas;
- The Australian Department of the Environment and Energy Species Profile and Threat Database (SPRAT);
- Relevant environmental legislation.

2.2 Habitat Assessment

An asssessment of the site's potential to provide habitat for River Swamp Wallaby Grass was undertaken using the resources defined above with a site visit to the study area conducted on the 18th July 2017.

Habitat requirements for the species have been defined as:

River Swamp Wallaby-grass grows mostly in permanent swamps (NSW OEH 2013h) and also lagoons, billabongs, dams and roadside ditches (Carr 2000 pers. comm.; NSW NPWS 2000 pers. comm.; Flora & Fauna Guarantee SAC 1997d; Walsh 1994). The species requires moderately fertile soils with some bare ground; conditions that are caused by seasonally-fluctuating water levels (NSW OEH 2013h). The species has some resistance to salinisation of habitat in experimental tests (James et al. 2009). (DEE, 2017)

2.3 Field Survey

A targeted field survey for the River Swamp Wallaby Grass was undertaken within the study area. The area was traversed by foot, with particular focus on depressions and standing water, which are more likely to provide habitat for this species.

2.4 Limitations

The site survey was undertaken in July, outside of the species' flowering period which is between November and March. It is therefore unlikely that reproductive characteristics, particularly its seed

head (which is often the only part of the plant that is visible above water) was present. However, the perennial nature of the species means that mature individuals would still be visible and easily detected if present.

3 Results & Discussions

3.1 Habitat Description

Native vegetation exists primarily as scattered remnant trees along either side of the river bank, and ephemeral vegetation surrounds a number of depressions. The majority of the study area is comprised of open, cleared grazing land abutting the Tarwin River that is predominantly exotic pasture grasses and sedges.

Large remnant trees, *Eucalyptus strzeleckii* (Strzelecki Gum), are scattered along the river bank in low densities, along with *Acacia melanoxylon* (Blackwood), although the majority are found on the opposite side of the river.

The understorey is highly degraded and again limited to the river bank, composed of scattered *Melaleuca ericifolia* (Swamp Paperbark) and *Kunzea* spp. agg. (Burgan).

The groundstorey is composed mostly of exotic graminoids and herbs including *Phalaris arundinacea* (Reed Canary Grass), *Cynodon dactylon* (Couch), *Dactylis glomerata* (Cocksfoot), *Paspalum dilatatum* (Paspalum), *Holcus lanatus* (Yorkshire Fog), *Cyperus eragrostis* (Drain Flat-sedge) and *Rumex crispus* (Curled Dock) plus *Sphagnum* sp. (Sphagnum moss) present throughout the area. Sparsely scattered natives including *Juncus australis* (Austral Rush) and *Juncus pallidus* (Pale Rush) are present in the depressions.

Beyond the study area, isolated patches of remnant vegetation of various quality remain incorporating a number of Ecological Vegetation Classes composed mostly of Strzelecki Gum, Blackwood, *Acacia dealbata* (Silver Wattle), and *Phalaris australis* (Common Reed). Common Reed is particularly dominant immediately to the north of the study area in a submerged wetland area that could possibly still harbour River Swamp Wallaby Grass (Photo 4).

3.2 Habitat Assessment

The majority of the study area has been modified from its original vegetation cover however three depressions, particularly one in the north of the area (Area 1), may provide suitable habitat for River Swamp Wallaby Grass (see Photos 1-3).

These three depressions contain important habitat characteristics including standing water and areas of bare ground, although the high weed cover and high level of grazing and trampling by cattle suggests that the persistence of this species is unlikely. These locations are shown in Map 2.

3.3 Targeted Survey

River Swamp Wallaby Grass individuals were not identified in the targeted survey within the study area, with the survey concentrating on the depressions (previously discussed) shown in Map 2, along with the Tarwin River edge.

Targeted *Amphibromus fluitans* survey, Black Spur, Koonwarra | July, 2017

The VBA record of River Swamp Wallaby Grass located in close proximity to the study area was also searched for (adjacent to the Great Southern Rail Trail) however it was unable to be located either through inaccuracy of the records location or seasonal limitations as previously discussed.

4 Conclusion and Recommendations

Assessments have concluded that within the study area, three depressions subject to inundation may provide suitable habitat for River Swamp Wallaby Grass, particularly in Area 1. However the dominance of exotic species and high level of grazing and disturbance suggests the species is unlikely to be present.

No River Swamp Wallaby Grass individuals were identified through targeted survey within or surrounding the study area, although the time of year was not ideal to survey this species, with the flowering season occurring from November to March.

In order to avoid further consideration of this species in regard to the EPBC Significant Impact Criteria, the following is recommended:

- Works should avoid, as much as is practicable, disturbing areas of suitable habitat for River Swamp Wallaby Grass, particularly in Area 1; and
- Works should be undertaken solely within the study area and the planned realignment footprint to avoid suitable habitat for the species located on the Tarwin River floodplain.

References

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Photos

Photo 1 – The main depression and suitable habitat within the study area (Area 1) - (18/07/2017)

Photo 2 – The main depression and suitable habitat within the study area, with a drain leading to the Tarwin River (Area 1) - (18/07/2017)

Targeted *Amphibromus fluitans* survey, Black Spur, Koonwarra | July, 2017

Photo 3 – Minor damp depression with no standing water and ephemeral exotic species (Area 3) - (18/07/2017)

Photo 4 – Inundated wetland north of the study area (18/07/2017)

Map 1 – River Swamp Wallaby Grass (*Amphibromus fluitans*) survey area and nearby records

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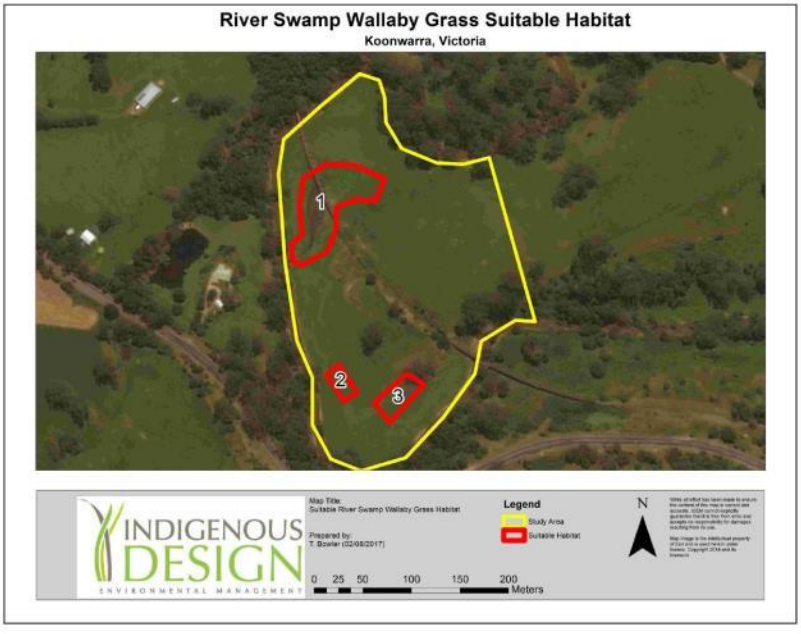
Map 2 – Suitable habitat for River Swamp Wallaby Grass (*Amphibromus fluitans*)



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Appendix 5: Rare and Threatened Fauna Likelihood of Occurrence

Scientific Name	Common Name	Conservation Status			Treaty	Count of Sightings	Date of Last Record	Preferred Habitat Notes	Database Source	Likelihood of Occurrence								Comments
		EPBC Listing	Victorian Advisory List	FFG Act Listing						HZ1	HZ2	HZ3	HZ4	HZ5	HZ6	HZ7	HZ8	
Birds																		
Alcedo azurea	Azure Kingfisher		Near Threatened			2	1/09/1979	Never far from water, preferring freshwater rivers and creeks as well as billabongs, lakes, swamps and dams, usually in shady overhanging vegetation. It is sometimes seen in parks on rivers, as well as duck ponds (BiB 2016a).	VBA	Low	Low	Low	Moderate	Moderate	Moderate	Low	Low	Potential suitable habitat
Anthochaera phrygia	Regent Honeyeater	Critically Endangered	Critically Endangered	Listed				Occur mainly in dry box ironbark open-forest and woodland areas. feeding on the nectar from eucalypts such as the Mugga Ironbark, White Box and Yellow Box, and Blakeley's Red Gum on which they are reliant (DSEWPC 2016a).	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Ardea modesta	Eastern Great Egret		Vulnerable	Listed	CAMBA JAMBA	17	1/09/1981	Prefer shallow water, particularly when flowing, but may be seen on any watered area, including damp grasslands (DSE 2010a).	VBA	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Aythya australis	Hardhead		Vulnerable			3	1/09/1979	Found in freshwater swamps and wetlands and occasionally in sheltered estuaries. They prefer deep, fresh open water and densely vegetated wetlands for breeding (BiB 2016b).	VBA	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Botaurus poiciloptilus	Australasian Bittern	Endangered	Endangered	Listed				Frequents reedbeds, and other vegetation in water such as cumbungi, lignum and sedges. The nest is a shallow structure of dry or green reeds, within a clump of reeds in water or a swamp (SA-MDB 2016).	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Calidris ferruginea	Curlew Sandpiper	Critically Endangered	Endangered					Intertidal mudflats of estuaries, lagoons, mangroves, as well as beaches, rocky shores and around lakes, dams and floodwaters (BL 2016a)	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Gallinago hardwickii	Latham's Snipe		Near Threatened		CAMBA JAMBA ROKAMBA BONN	7	1/12/1980	Found in small groups or singly in freshwater wetlands on or near the coast, generally among dense cover. They are found in any vegetation around wetlands, in sedges, grasses, lignum, reeds and rushes and also in saltmarsh and creek edges on migration. They also use crops and pasture (BiB 2016c).	VBA	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Hirundapus caudacutus	White-throated Needletail		Vulnerable		CAMBA JAMBA ROKAMBA	11	1/02/2000	In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground (Coventry 1989; Tarburton 1993; Watson 1955). Because they are aerial, it has been stated that conventional habitat descriptions are inapplicable (Cramp 1985), but there are, nevertheless, certain preferences exhibited by the species. Although they occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland (Higgins 1999). (DSEWPCa).	VBA	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat

Scientific Name	Common Name	Conservation Status			Treaty	Count of Sightings	Date of Last Record	Preferred Habitat Notes	Database Source	Likelihood of Occurrence								Comments
		EPBC Listing	Victorian Advisory List	FFG Act Listing						HZ1	HZ2	HZ3	HZ4	HZ5	HZ6	HZ7	HZ8	
Lathamus discolor	Swift Parrot	Critically Endangered	Endangered	Listed		2	15/04/2007	Found in dry sclerophyll forests and woodlands, suburban parks and gardens and flowering fruit trees (BiB 2016d).	DSEWPC, VBA	Low	Low	Low	Low	Low	Low	Low	Low	Recent sightings approx 4km west of study site. Blue Gums present in site, but no swamp Gums. Expert advice received in regard to likelihood of site being utilised.
Ninox strenua	Powerful Owl		Vulnerable	Listed		1	19/08/2006	Home range of 400-1450 ha. Found in open forests and woodlands, as well as along sheltered gullies in wet forests with dense understoreys, especially along watercourses. Will sometimes be found in open areas near forests such as farmland, parks and suburban areas, as well as in remnant bushland patches. Needs old growth trees to nest (Day and Simpson 2010).	VBA	Low	Low	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Recent sighting approx 3.5km southwest. Potential suitable habitat
Nycticorax caledonicus	Nankeen Night Heron		Near Threatened			1	31/08/1977	Frequents well-vegetated wetlands, and is found along shallow river margins, mangroves, floodplains, swamps, and parks and gardens (BiB 2016e).	VBA	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Numenius madagascariensis	Eastern Curlew	Critically Endangered	Vulnerable		CAMBA JAMBA ROKAMBA BONN			Found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons (BiB 2016f).	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Phalacrocorax varius	Pied Cormorant		Near Threatened			2	13/03/1977	Found in marine habitats, including estuaries, harbours and bays. It is also found in mangroves and on large inland wetlands in eastern Australia. Breeds in colonies on coastal islands, flooded tree plains, mangroves and sometimes on artificial structures such as beacons (BiB 2016g).	VBA	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Platalea regia	Royal Spoonbill		Near Threatened			3	1/12/1979	Found in shallow freshwater and saltwater wetlands, intertidal mud flats and wet grasslands. Will also use artificial wetlands such as sewage lagoons, saltfields, dams and reservoirs (BiB 2016h).	VBA	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Rostratula australis	Australian Painted Snipe	Endangered	Critically Endangered	Listed	CAMBA			Inhabits inland and coastal shallow freshwater wetlands, occuring in both ephemeral and permanent wetlands, particularly where there is grass. Individuals have been spotted in artificial dams, sewage ponds and waterlogged grasslands (DSEWPC 2016b).	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Amphibians and Reptiles																		

Scientific Name	Common Name	Conservation Status			Treaty	Count of Sightings	Date of Last Record	Preferred Habitat Notes	Database Source	Likelihood of Occurrence								Comments
		EPBC Listing	Victorian Advisory List	FFG Act Listing						HZ1	HZ2	HZ3	HZ4	HZ5	HZ6	HZ7	HZ8	
Litoria raniformis	Growling Grass Frog	Vulnerable	Endangered	Listed		1	14/1/1970	Need still or slow moving water with emergent vegetation around the edges and mats of floating and submerged plants (DSE 2007).	DSEWPC, VBA	Low	Low	Low	Low	Low	Low	Low	Low	Potential suitable habitat. Population recorded around Stony Creek 40 years ago. Expert opinion received with low likelihood of occurrence determined.
Varanus varius	*Lace Monitor*		*Endangered*			*4*	*21/02/1993*	*The calculated mean home range for the Lace Goanna is 64 +/- 34 ha and it utilises large hollow bearing trees for such activities as night time shelter and resting (Weavers 1993). Routes of low dispersal probability relate to the upperalpine slopes and plateux and flat grassy plains of western Victoria (*VEAC)	*VBA*	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*	*Low*	No suitable habitat
Mammals																		
Antechinus minimus maritimus	Swamp Antechinus	Vulnerable						This species occurs in damp habitats with dense understorey vegetation. It has been found in forest, woodland, heathland, tussock grassland, and sedgeland. It prefers lower elevation areas, with a southerly aspect and moderate slope (IUNC 2016)	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	Outside of known range
Dasyurus maculatus maculatus	Spot-tailed Quoll	Endangered	Endangered	Listed				Home range 100 to 200 ha. Trees with hollows, hollow logs on the ground, rocky outcrops, caves or rock crevices (Menkhorst, Knight 2010).	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	Small/fragmented habitat
Isoodon obesulus obesulus	Southern Brown Bandicoot	Endangered	Near Threatened	Listed		2	23/03/1962	Home range 1 to 6 ha. Eucalypt woodlands and forests that have a dense shrubby understorey. Bandicoots often inhabit blackberry thickets (Menkhorst, Knight 2010).	DSEWPC, VBA	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Mastacomys fuscus mordicus	Broad-toothed Rat	Vulnerable	Endangered	Listed				Occur in a wide range of environments from alpine herbfields to coastal tussock grassland (Menkhorst, Knight 2010)	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	Outside of known range
Petauroides volans	Greater Glider	Vulnerable	Vulnerable					The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers (Kehl & Borsboom 1984; Kavanagh & Lambert 1990; van der Ree et al., 2004). It is typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows (Andrews et al., 1994; Smith et al., 1994, 1995; Kavanagh 2000; Eyre 2004; van der Ree et al., 2004; Vanderduys et al., 2012). The distribution may be patchy even in suitable habitat (Kavanagh 2000). The greater glider favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	Outside of known range

Scientific Name	Common Name	Conservation Status			Treaty	Count of Sightings	Date of Last Record	Preferred Habitat Notes	Database Source	Likelihood of Occurrence								Comments
		EPBC Listing	Victorian Advisory List	FFG Act Listing						HZ1	HZ2	HZ3	HZ4	HZ5	HZ6	HZ7	HZ8	
								species (Kavanagh 1984) (Menkhorst, Knight 2010).										
Pteropus poliocephalus	Grey-headed Flying-fox	Vulnerable	Vulnerable	Listed				Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy (Menkhorst, Knight 2010).	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	No suitable habitat
Fish																		
Galaxiella pusilla	Dwarf Galaxias	Vulnerable	Endangered	Listed				Dwarf Galaxias has broad habitat requirements and occurs in slow flowing and still, shallow, permanent and temporary freshwater habitats such as swamps, drains and the backwaters of streams and creeks, often (but not always) containing dense aquatic macrophytes and emergent plants (Cadwallader & Backhouse 1983; McDowall 1996; Hammer 2002a). In larger pools, the species is usually found amongst marginal vegetation. Some wetlands where it occurs may partially or completely dry up during summer (Humphries 1986) and such wetlands rely on seasonal flooding plus linkages to other sites where the species occurs, for recolonisation (Backhouse & Vanner 1978). Wetlands connected to a more permanent waterbody (such as river or creek) may also be vital to their long-term survival (particularly during extended dry conditions) and must therefore be considered as part of the habitat requirement critical to survival (DSEWPC 2016c)	DSEWPC	Low	Low	Low	Low	Low	Low	Low	Low	Some aspects of habitat may be present in the general vicinity however outside of the species known range. Fish surveys conducted over the past 30 years have failed to record the species.
Prototroctes maraena	Australian Grayling	Vulnerable	Vulnerable	Listed		3	3/04/2007	Inhabit cool, clear, freshwater streams and rivers with gravel substrate and areas alternating between pools and riffle zones. The species has been found over 100 km upstream from the sea (DSEWPC 2016d)	DSEWPC, VBA	Low	Low	Low	Low	Moderate - High	Moderate - High	Low	Low	Recent sightings north of Koonwarra. Older sightings south of Tarwin. Suitable river habitat present.

Bibliography

SPECIES	TAG	Title	Detail
Birds			
Alcedo azurea	BiB 2016a	Azure Kingfisher	http://www.birdsinbackyards.net/species/Ceyx-azureus
Anthochaera phrygia	DSEWPC 2016a	Regent Honeyeater	https://www.environment.gov.au/biodiversity/threatened/publications/factsheet-regent-honeyeater-xanthomyza-phrygia
Ardea modesta	DSE 2010a	Action Statement No 120	http://www.depi.vic.gov.au/__data/assets/pdf_file/0004/251185/Great_Egret_Ardea-alba.pdf

SPECIES	TAG	Title	Detail
Aythya australis	BiB 2016b	Hardhead	http://www.birdsinbackyards.net/species/Aythya-australis
Botaurus poiciloptilus	SA-MDB 2016	Australasian Bittern	http://root.ala.org.au/bdrs-core/mdnrm/fieldguide/taxon.htm?id=29026
Calidris ferrunginea	Birdlife 2016a	Curlew Sandpiper	http://birdlife.org.au/bird-profile/curlew-sandpiper
Gallinago hardwickii	BiB 2016c	Latham's Snipe	http://www.birdsinbackyards.net/species/Gallinago-hardwickii
Hirundapus caudacutus	DSEWPC 2016a	White-throated Needletail	http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=682
Lathamus discolor	BiB 2016d	Swift Parrot	http://www.birdsinbackyards.net/species/Lathamus-discolor
Ninox strenua	Day and Simpson 2010	Field Guide to the Birds of Australia	
Nycticorax caledonicus	BiB 2016e	Nankeen Night-Heron	http://www.birdsinbackyards.net/species/Nycticorax-caledonicus
Numenius madagascariensis	BiB 2016f	Eastern Curlew	http://www.birdsinbackyards.net/species/Numenius-madagascariensis
Phalacrocorax varius	BiB 2016g	Pied Cormorant	http://www.birdsinbackyards.net/species/Phalacrocorax-varius
Platalea regia	BiB 2016h	Royal Spoonbill	http://www.birdsinbackyards.net/species/Platalea-regia
Rostratula australis	DSEWPC 2016b	Australian Painted Snipe	http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=77037
Amphibians & Reptiles			
Litoria raniformis	DSE 2007	Growling Grass Frog	http://www.dse.vic.gov.au/__data/assets/pdf_file/0016/103408/GGF_fact_sheet.pdf
Varanus varius	VEAC	Statewide Modelling of Native Vegetation (unpublished web document)	
Mammals			
Antechinus minimus maritimus	IUNC 2016	Swamp Antechinus	http://www.iucnredlist.org/details/40525/0
Dasyurus maculatus maculatus	Menkhorst, Knight 2010	A Field Guide to the Mammals of Australia, Third Edition, 2010. Oxford University Press.	
Isoodon obesulus obesulus	Menkhorst, Knight 2010	A Field Guide to the Mammals of Australia, Third Edition, 2010. Oxford University Press.	
Mastacomys fuscus mordicus	Menkhorst, Knight 2010	A field Guide to the Mammals of Australia, Third Edition, 2010. Oxford University Press.	
Petauroides volans	Menkhorst, Knight 2010	A Field Guide to the Mammals of Australia, Third Edition, 2010. Oxford University Press.	
Pteropus poliocephalus	Menkhorst, Knight 2010	A Field Guide to the Mammals of Australia, Third Edition, 2010. Oxford University Press.	
Fish			
Galaxiella pusilla	DSEWPC 2016c	Dwarf Galaxias	http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=56790
Prototroctes mareana	DSEWPC 2016d	Australian Grayling	http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=26179

Appendix 6: Swift Parrot Assessment Report

South Gippsland Highway Realignment
Black Spur - Koonwarra

Swift Parrot *Lathamus discolor*

Report to Vic Roads

June 2017

E. McNabb & S. Dewar-McNabb

Ninox Pursuits Environmental Services
PO Box 135
Gembrook Victoria 3783

South Gippsland Highway Realignment
Black Spur – Koonwarra

E. McNabb and S. Dewar-McNabb

Report to VicRoads

June 2017

Ninox Pursuits Environmental Services
PO Box 135
Gembrook Victoria 3783
www.ninoxpursuits.com.au

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Cover photo: Swift Parrot, Photo © 2017 Garry Cheers

Acknowledgements

The maps were compiled using Department of Environment, Land, Water and Planning (DELWP) Biodiversity Interactive Mapping (DELWP 2017).

Thanks to Deborah McLees (VicRoads). Barry Hill and Andrew Chapman for information. Richard Loyn commented on a draft and Garry Cheers provided the Swift Parrot photo.

Summary

No Swift Parrot observations have been reported at the proposed South Gippsland Highway realignment project site near Koonwarra.

Swift Parrots have regularly been observed in autumn since 2007, feeding in Swamp Gums on private property, approximately 3.5 km west of the proposed highway re-alignment site.

The species is considered transient, feeding on flowering Eucalypts as it disperses across the mainland. The parrots may recur in the district as they return toward Tasmania, when other trees (e.g. Strzelecki Gum) may be flowering.

Habitat at the proposed re-alignment was assessed as potentially suitable for Swift Parrots, predominantly when eucalypts are flowering.

Disturbance to habitat will be temporary and the minimal loss of potential habitat can be offset by appropriate revegetation near the old highway (which will become redundant).

Dept of Land, Water, Environment and Planning habitat modelling predicts that the project area does not include *Critical Habitat* for Swift Parrot.

VicRoads proposed works will comply with the Swift Parrot National Recovery Plan Objectives by avoiding damage to known or critical habitat and contribute to meeting those objectives by restoring a proportion of the original (pre 1750) habitat.

Introduction

The Swift Parrot *Lathamus discolor* is an endemic Australian parrot that breeds in tree hollows in Tasmania (Higgins 1999). It has never been recorded breeding in the wild on mainland Australia. It migrates from Tasmania each autumn to disperse across the south-eastern mainland, seeking nectar from flowering eucalypts. Other foods include sugary lerps of leaf-feeding psyllids, gleaned from the eucalyptus canopy. In Victoria, records are generally concentrated in low-rainfall areas containing box-ironbark forest, especially where they contain flowering Red Ironbarks *Eucalyptus sideroxylon* (Emison *et al*. 1987; VBA). Such areas are found mainly in north-east and north-central Victoria, near Melbourne and in the lowlands of Gippsland near Bairnsdale, with a sparser scatter of records in south Gippsland.

The Swift Parrot is listed as *Critically Endangered* under the Environment Protection and Biodiversity Conservation Act (EPBC) (1999). It is *Endangered* under the Advisory List of Threatened Fauna in Victoria (DELWP) and listed under the Victorian Flora and Fauna Guarantee (FFG) Act. Four objectives set under the Swift Parrot National Recovery Plan (Saunders and Tzaros 2011) are considered in this report. These objectives are:

Objective 1: To identify and prioritise habitats and sites used by the species across its range, on all land tenures.

Objective 2: To implement management strategies to protect and improve habitats and sites on all land tenures

Objective 3: To monitor and manage the incidence of collisions, competition and Beak and Feather Disease (BFD).

Objective 4: To monitor population trends and distribution throughout the range.

VicRoads is currently planning a realignment of the South Gippsland Highway south of Koonwarra, at a site known locally as 'Black Spur' to improve traffic safety and travelling efficiency. As part of a Biological Assessment undertaken by Indigenous Design, the Swift Parrot has been identified as having been recorded within 4kms of the site. Consequently, VicRoads is required to meet compliance with legislation protecting native fauna at the site (e.g. Saunders and Tzaros 2011; Webster *et al* 2002). To help assess the potential impact of the project, VicRoads commissioned Ninox Pursuits to assess the possible habitat value of the project site and provide expert opinion on the suitability of the site as habitat for the Swift Parrot and provide advice on the likelihood of any negative impacts, and how they might be mitigated (if necessary).

Methods

Review of existing information

The Department of Environment Land, Water and Planning (DELWP) Victorian Biodiversity Atlas (VBA) and Atlas of Living Australia (ALA) databases were interrogated to provide information on existing Swift Parrot records on and near the proposed highway realignment (the project) area. The VBA also provided mapping of *Fauna Habitat Models for Native Vegetation Regulation* to determine if habitat in the project area was defined as critical for Swift Parrot.

Further examination of the VBA also provided detailed historic (1750) and current (2005) mapping of Ecological Vegetation Classes (EVC).

Each separate image was examined to identify Swift Parrot habitat features (e.g. Swamp Gums *Eucalyptus ovata*) which may be at risk.

Information on Swift Parrot observations was provided by a local native plant nurseryman, Mr Barry Hill and Mr Andrew Chapman of Inverloch, both experienced bird observers.

Field work

Daytime inspection of all accessible sections of the project area was conducted on foot with a VicRoads engineer to familiarise with habitat. Nine detailed satellite images of the project area, provided by VicRoads, allowed a further degree of familiarisation and assessment of sections which were not accessible on foot.

A one minute latitude/longitude (grid) block, approximately 3.6 km away, where Swift Parrots had been recorded, was inspected to assess it for suitable habitat and interview the resident who had observed the parrots.

No targeted bird survey was conducted. Such surveys are of limited value for this species, as Swift Parrots move widely through the woodlands of south-eastern Australia (MacNally and Horrocks 2000), and may be present at a particular sites just for short periods (a few weeks) and not every year.

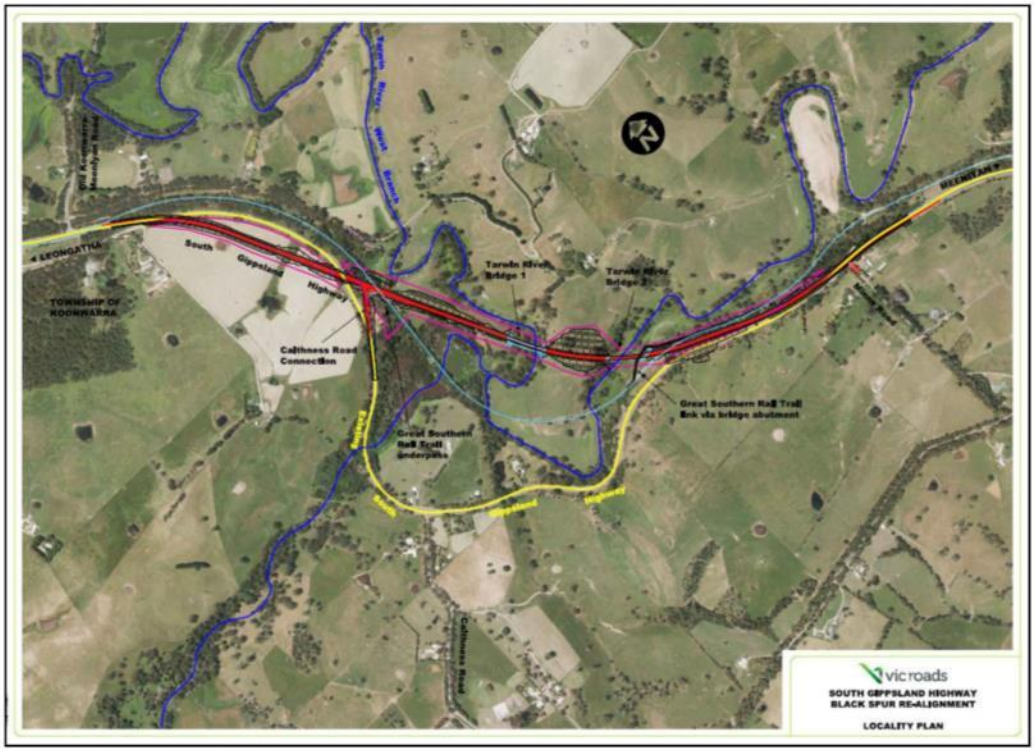

Figure 1. Locality plan of South Gippsland Highway Black Spur proposed Re-alignment (Courtesy VicRoads).

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Results

Existing information

The VBA revealed no record of Swift Parrot specifically within the project area. The closest records were two reports in 2007, of Swift Parrot within a one minute grid block approximately 3.6 km west of the project area (Figure 2). This was the only area within five km of the project where Swift Parrot has been reported.

The next closest records were in the ALA which reported two birds in Leongatha, 9.5 km to the north in April 2014 and an older observation of 20 birds near the head of Black Spur Creek (Fig 2) approximately 6.5 km south-west, also in April, in 2004.
The VBA *Fauna Habitat Model for Native Vegetation Regulation* mapping (Appendix 1) predicts that critical habitat for the Swift Parrot falls mainly in central and north-east Victoria, not anywhere in South Gippsland.

Field work

The EVC mapping (Figure 2) shows a significant patch of Damp Heathy Woodland/Lowland Forest Mosaic (DHW/LFM) on private land along Roughead Road, on the northern edge of the above one minute grid block. This EVC includes Swamp Gum, the only eucalypt species in the area that flowers in autumn, when Swift Parrots are arriving on the mainland. Subsequently, a visit was made to one private property at 535 Roughead Road where the Swamp Gums appeared to be most abundant, to interview the property owner, Mr Barry Hill, a native plant nurseryman.

An experienced bird observer, Mr Hill who is very familiar with the species, reported that Swift Parrots usually arrive on his property in autumn to feed on Swamp Gum flowers and have been doing so for many years. Further, Hill has been involved with Landcare work near the project site over several years and was certain that Swift Parrots had not been observed in the project vicinity.
An acquaintance of Hill, Mr Andrew Chapman provided further information and reported seeing a large flock, numbering "possibly 50 or more" Swift Parrots when he was visiting Hill's property.

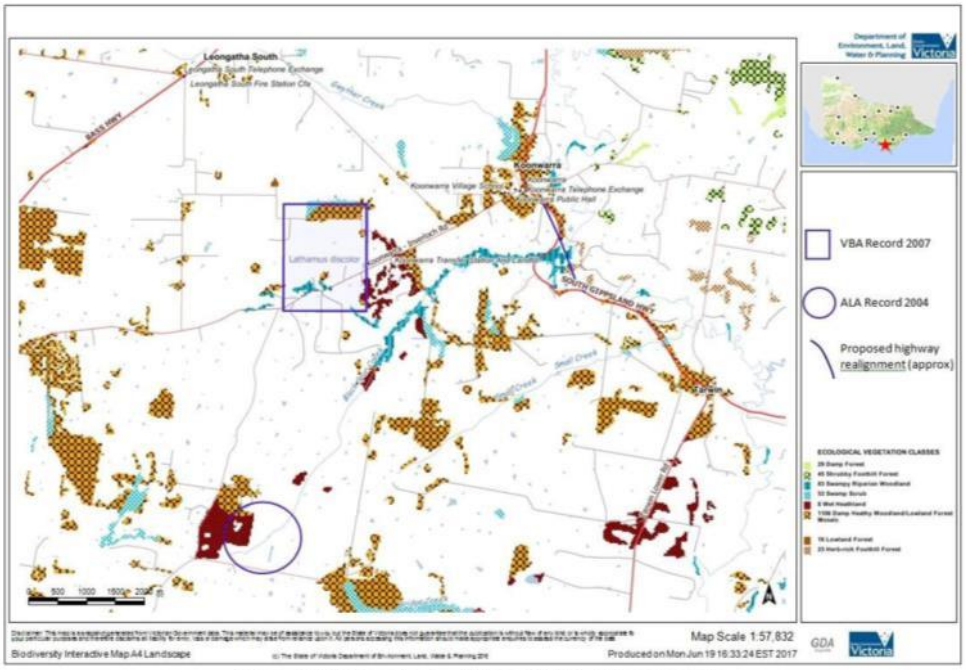

Figure 2. EVC map showing VBA and ALA Swift Parrot records.

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Discussion

The only record within four kilometres was in DHW/LFM on the private property at Roughead Road in 2007. The species has been a somewhat regular annual visitor at the property in autumn since 2007 to feed on Swamp Gum flowers (B. Hill and A. Chapman pers. comm.). Habitat on that property is protected under a Trust for Nature Covenant, thus providing a permanent foraging site for Swift Parrots.

The only locally indigenous eucalypt in the project area which flowers in autumn is the Swamp Gum. Therefore, it appears that flowering Swamp Gums provide a vital food source to the parrots when they arrive in south Gippsland after their long flight across Bass Strait.

The two EVCs at the project area which include Swamp Gum are DHW/LFM and Swampy Riparian Woodland (SRW). Disturbance to the DHW/LFM EVC is expected to be minimal as the alignment just clips the southern edge of an extensive area of this EVC as it passes the old highway (Figure 2).

The proposed highway realignment traverses several deep valleys in which SRW occurs but may not generally encroach into this EVC because the highway will be elevated above much of the lower riparian landscape. However, some temporary habitat disturbance is expected due to construction of pylons etc. Disruption of Swift Parrot habitat because of the project as currently planned is expected to be minimal.

Historic (1750) EVC mapping (Figure 3) may provide guidance to help revegetation where it originally consisted of DHW/LFM and SWW habitat. Therefore, revegetation near the old (redundant) highway may serve to offset any loss of autumn flowering eucalypts. Such offsets do not have immediate effect, as it takes many years for new trees to grow to sufficient size to provide a useful food source. However, they can help enhance habitat in future decades.

VicRoads will comply with the Swift Parrot National Recovery Plan Objectives as follows:

Objective 1. To identify and prioritise habitats and sites used by the species across its range, on all land tenures.

- There are no reports of Swift Parrots at or near the project site.
- Swamp Gums provide a vital food source for Swift Parrots in autumn as they recover from their flight across Bass Strait to winter on mainland Australia.
- Flowering Swamp Gums approximately 3.6 km west of the VicRoads project site annually provide a food source for Swift Parrots as they move through the district in autumn.

- Other areas of Damp Heathy Woodland/Lowland Forest Mosaic or Swampy Riparian Woodland may also be utilised by Swift Parrots although no such reports have come to notice through this investigation.
- There are no reports to date of Swift Parrots feeding in Swampy Riparian Woodland within the project area.
- Swift Parrots appear not to be dependent on habitat in the proposed highway realignment project area during their autumn–spring movements on the mainland.

Objective 2: To implement management strategies to protect and improve habitats and sites on all land tenures.

- Planning the highway realignment to minimise loss of Swift Parrot (and native fauna) habitat.
- Revegetating appropriate areas where native habitat has been reduced since European colonisation.
- The one property regularly utilised by Swift Parrots is protected under a Trust for Nature Covenant.

Therefore, habitat will be protected and improved.

Objective 3: To monitor and manage the incidence of collisions, competition and Beak and Feather Disease (BFD).

This objective may not be relevant in the context of this study as the risk of Swift Parrot collision with a vehicle is low. The proposed highway realignment will be approximately one km shorter than the current route, thereby reducing any likelihood of collision with motor vehicles. Swift Parrots have been recorded colliding with windows in Tasmania (Pfennigwerth 2008), but rarely with vehicles as they usually feed high in the eucalypt canopy.

Objective 4: To monitor population trends and distribution throughout the range.

- We recommend that VicRoads encourage and support ongoing monitoring and reporting of Swift Parrot occurrences and movements in the Koonwarra area.

The lack of Swift Parrot records in the project area does not prove that the area is not utilised at some time by these birds. For example, little has come to light about their movements in spring as they return for their flight southward across Bass Strait. Other eucalypts in the area which are known to flower in spring such as Strzelecki Gum *E. Strzelecki* and Narrow-leaved Peppermint *E. radiate*, may provide food and help build up energy for the parrots as they approach their long flight south.

No reports of Swift Parrot at the project area have been reported at this time. However, the birds' movements appear to have been transitory and some may have passed un-noticed as they disperse into the mainland. Similarly, we must consider the possibility that they may have passed unnoticed in the Koonwarra area in spring when other eucalypts may be flowering (e.g. *E. strzeleckii*) as they prepare to return southward. Therefore, loss of spring flowering eucalypts should be minimised and where practicable, revegetation may offset any losses.

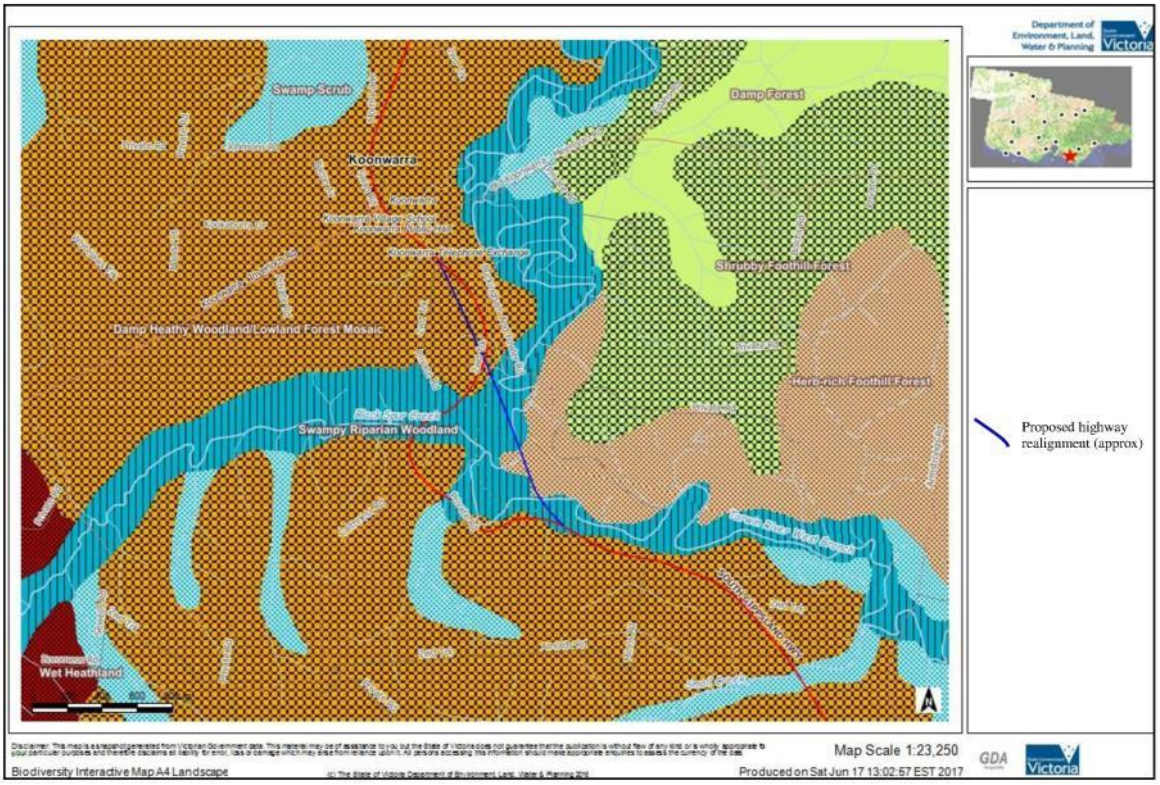

Figure 3. Map showing 1750 EVCs.

Conclusions

- No records of this species have been reported at the works site with the nearest confirmed sighting being 4km away on private property. At that site, the species has been a somewhat regular annual visitor at the property in autumn since 2007 to feed on Swamp Gum flowers.
- Negative impacts to Swift Parrot habitat are expected to be minimal as few of the favoured tree species (E.g. Swamp Gum) will be felled, and many more occur in nearby remnant woodland..
- Critical habitat within Victoria for this species is located in central and north-east Victoria, not anywhere in South Gippsland (Appendix 1).
- The specific pathways taken by the parrots as they travel through the Koonwarra district, to and from their breeding grounds in Tasmania, are not well known or documented.
- Swamp Gums are present in two EVCs local to the project site: DHW/LFM and Swampy Riparian Woodland (SRW). Disturbance to the DHW/LFM EVC is expected to be minimal.
- The proposed highway realignment traverses several deep valleys in which SRW occurs but may not generally encroach into this EVC because the highway will be elevated above much of the lower riparian landscape.
- Vic Roads proposed works will comply with and contribute to meeting the Swift Parrot National Recovery Plan Objectives.

Recommendations

- Loss of habitat caused by the project to be offset by revegetation with the most impacted EVCs, Damp Heathy Woodland/Lowland Forest Mosaic and Swampy Riparian Woodland. This can be accomplished along margins of the old highway.
- 1750 EVC mapping to provide a guide for restoration of the original EVCs in other areas where practicable.
- Encourage and support community groups to monitor and report future Swift Parrot observations.
- VicRoads to adhere to the proposed realignment as described.

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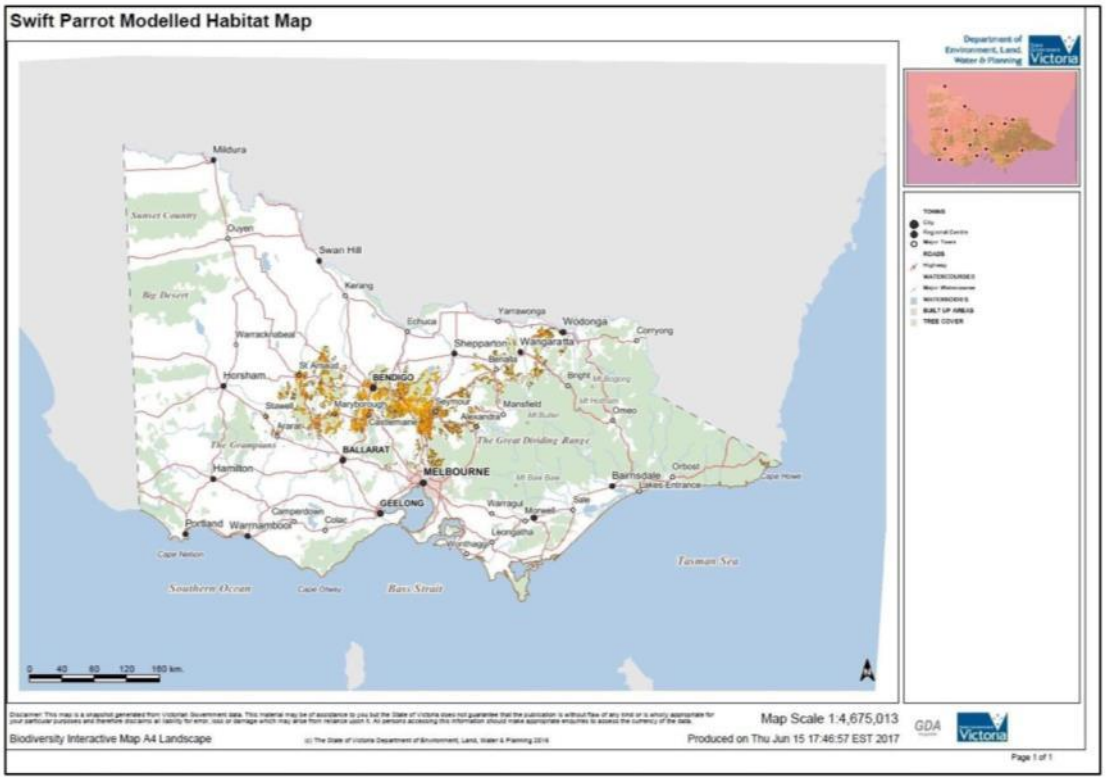
Appendix 1
Fauna Habitat Model for Native Vegetation Regulation – Swift Parrot.



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Appendix 7: Growling Gras Frog Assessment Report

AQUATICA ENVIRONMENTAL

220 Old Eltham Road
Lower Plenty, Victoria
Australia 3095

t 0413 935 497
e info@AquaticaEnvironmental.com.au
www.AquaticaEnvironmental.com.au

Our Ref: 000200

15 September 2017

Debbie McLees
Senior Project Engineer
VicRoads - South Eastern Projects
PO Box 158
Traralgon VIC 3844

Via email: Deborah.Mclees@roads.vic.gov.au

Dear Debbie

Report: South Gippsland Highway, Koonwarra - Growling Grass Frog Assessment

Aquatica Environmental (Aquatica and the trading name of Aquatica Australia Pty Ltd) was engaged by VicRoads to undertake a Growling Grass Frog (*Litoria raniformis*) assessment at the location of a proposed highway realignment near Koonwarra, Victoria.

VicRoads is currently in the planning phase for a proposed realignment of an approximately 3.7 kilometre section of the South Gippsland Highway, south of Koonwarra (the project area). The project will include realigning the highway predominantly to the west of the existing highway and in vicinity of the Black Spur Creek Wetlands (the wetlands) and the construction of two bridge crossings over the Tarwin River (see Attachment A).

Previous ecological assessments have identified that suitable habitat for Growling Grass Frog potentially occurred in the wetlands, that the species had not been recorded in the project area or its immediate vicinity and that there was a low-moderate likelihood the species may occur (Ecology Australia 2000 and T. Brooker 2007, pers. comm. 14 September). The nearest published records of Growling Grass Frog were from 1970 approximately 10 kilometres east south east, near Stony Creek (DELWP 2017).

VicRoads requested this assessment in order to gain more certainty regarding the actual likelihood of occurrence of Growling Grass Fog in the project area and its vicinity, and to assess the significance of impact if assessed as potentially present.

1. Growling Grass Frog Habitat Requirements and Distribution

Habitat Requirements

Growling Grass Frog mostly occur in still or slow-flowing water bodies such as wetlands, lagoons, swamps, lakes, ponds and farm dams. These water bodies are typically dominated by aquatic and emergent vegetation including specie such as Triglochin, Typha, Phragmites and Eleocharis. However, they have been recorded in a wide range of habitat types including agriculture and higher rainfall pastoral lands, irrigation channels, farm dams and open grassland. Generally, larger and more permanent

water bodies, with a higher portion of dense emergent and/or fringing vegetation, are more likely to support Growling Grass Frog (DE 2017).

Growling Grass Frog have three primary habitat requirements to support a population including:

- **Basking habitat**: Frogs are active during both day and night during the warmer months and require aquatic/emergent vegetation, grassy banks, rocks or logs where they have been observed to bask on both sunny and overcast days (DE 2017)
- **Breeding habitat**: Breeding is dependent upon permanent freshwater waterbodies with submerged aquatic vegetation for breeding. Their preference is for the shallower/ perimeter part of waterbodies (up to 1.5 metres in depth) where there is generally a complex aquatic and emergent vegetation structure (Threatened Species Unit 2001, Ehmann & White 1997 and Courtice and Grigg 1975 cited in DE 2017).
- **Refuge habitat**: Used for overwintering/hibernation, the species is known to use a range of refuge habitats including cracks in soil, fallen timber, rocks, debris and dense vegetation on low, frequently inundated floodplains (Cogger 2000 and S. Wassens undated, pers. comm. cited in NSW DEC 2005a cited in DE 2017).

Distribution

A search of the Victorian Biodiversity Atlas (DELWP 2017), returned a single record of the species from approximately 10 kilometres east south east of the project area (near Stony Creek, see Figure 1). The VBA record provides little detail on the number, specific location, collection method or collector and only indicates that it was a museum specimen (as opposed to a formal survey).

The VBA search returned no other relevant records of Growling Grass Frog in the Tarwin River catchment (i.e. recent, verified, survey-based or indicative of a resident population). The next nearest recent records were from the Latrobe River catchment in 1997 and 2010 (36 kilometres north east, see Figure 1) and Bunyip River catchments in 2008 (50 kilometres north west).

Figure 1 VBA records of Growling Grass Frog (●) relative to the project area (●)

2. Previous Assessments

Ecology Australia undertook a targeted survey for Growling Grass Frog in Black Spur and Gwyther Creeks in the vicinity of the project area in 2000. The assessment concluded that there was potential suitable habitat in Gwyther Creek (on the eastern side of the highway (assumedly in the wetlands), there was unlikely suitable habitat in Black Spur Creek and that it was unlikely that Growling Grass Frog occurred in the study area.

A recent study undertaken by Indigenous Design concluded there was suitable habitat for the species in the project area and there was a low-moderate likelihood of occurrence for Growling Grass Frog (T. Brooker 2007, pers. comm. 14 September).

The VBA also showed records of a number of surveys conducted between 1977 and 2005, all within 20 kilometres of the project area, that recorded many frog species, but not Growling Grass Frog (DELWP 2017).

A brief internet resources search also failed to return any other reference to, or mentioning of, Growling Grass Frog and the wider project area, including from the locally active Nerrena Landcare Group and the Black Spur Creek Project (NLG 2016).

3. Site Inspection

The Black Spur Creek Wetlands and associated wetland areas were inspected on 13 September 2017. The wetlands were visually inspected on foot and mostly from Buckingham and Flowers Road and the rail trail. The key wetlands inspected are highlighted in Figure 2 below (wetlands 1-4).

On the day of the inspection water levels in Black Spur Creek and Tarwin River West Branch were high. All the inspected wetlands appeared to be at capacity, fully connected to the streams/river flats and with observable flows. However, aerial imagery and historical photographs (NLG 2016) appear to indicate that these wetlands can dry completely during lower rainfall periods

Table 1 provides an outline the individual wetlands inspected, their habitat descriptions (relevant to Growling Grass Frog) and the suitability of the habitat for Growing Grass Frog. Wetland photographs are provided in Attachment 1.

Table 1 Wetland Descriptions

Wetland	Habitat Description	Growling Grass Frog Suitability
1	Heavily inundated on the day of the survey with multiple points of connectivity to Tarwin River West Branch and visible flows. Open, with little/no aquatic/emergent vegetation. Grassy/weedy edges with scattered Acacia and Willow trees. Understood to be mostly dominated by *Persicaria* sp. and weeds when water level is lower (T. Bowler 2017, pers. comm. 11 September).	Moderate suitability as inspected, but negligible if fully dries through the warmer months.
2	As with all wetlands inspected, area was heavily inundated, so difficult to ascertain the base wetland habitat. The base wetland has some sedges and reeds (T. Bowler 2017, pers. comm. 11 September)	Low-Moderate suitability, but negligible if fully dries through the warmer months.
3	A small depression in the floodplain. Heavily grazed. Unlikely to support any significant aquatic/emergent vegetation.	Low-no suitability.
4	A shallow anabranch wetland in the stream channel. Vegetation was mostly submerged terrestrial grasses and herbs. Many frogs heard calling.	Low suitability as shallow and likely dries in warmer months.

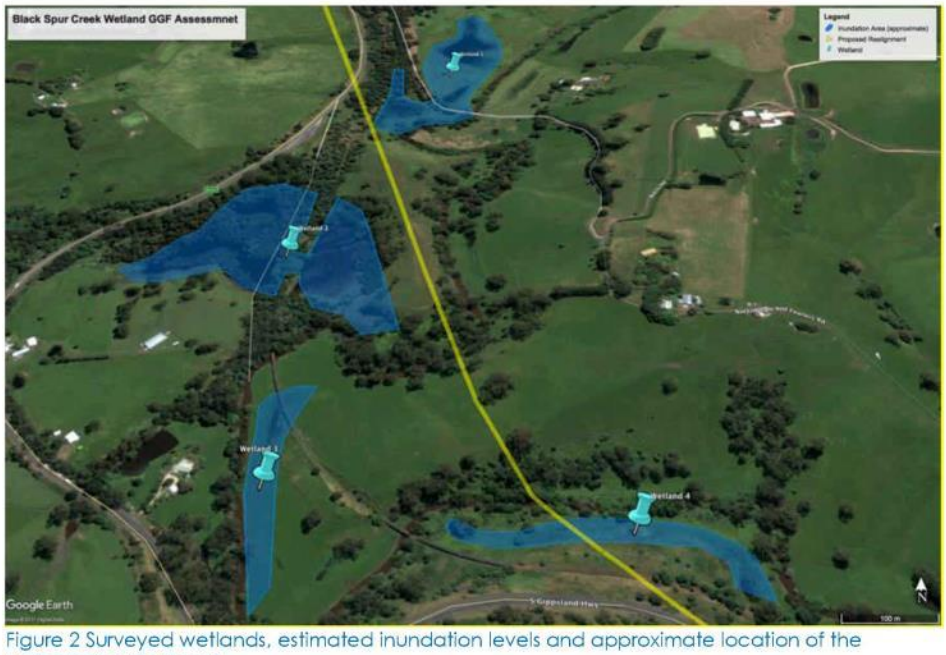

Figure 2 Surveyed wetlands, estimated inundation levels and approximate location of the proposed realignment

Although not directly related to assessing the likelihood of occurrence of Growling Grass Frog in the project area, it is worth noting that numerous other common

amphibian species were recorded calling during the site inspection. This indicates that the wetlands in the project area are at least suitable for some amphibian species.

The species recorded included:

- Brown Tree Frog *Litoria ewingi*;
- Common Froglet *Crinia Signifera*; and
- Striped Marsh Frog *Limnodynastes peroni*.

4. Likelihood of Occurrence Assessment

Based on the findings of this assessment it is considered there is a low likelihood that Growling Grass Frog occur in or near the project area. Although there are some of the habitat niches required to support Growling Grass Frog present in the wetlands in the project area, appear to dry in the warmer months. There are also no existing actual (or anecdotal) records of the species in the project area or the broader Tarwin River catchment. This is despite active local environmental groups and previous surveys in the broader catchment failing to record the species.

5. Significance Impact Assessment

As there is a low likelihood the species occurs in the project area, it is therefore highly unlikely there will be species-related implications for the project under local, state or federal legislation, including under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

However, for the purposes of completeness of this assessment, Table 2 outlines the significant impact criterion for a Vulnerable species under the (EPBC Act) Significant Impact Guidelines 1.1 (Department of Environmental 2013).

Table 2 Significant impact criteria for a Vulnerable species

Criteria	Significant impact?
The guidelines stipulate that "where an action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
• reduce the area of occupancy of an important population	**No**: Highly unlikely that an important population occurs in or near the project area.
• lead to a long-term decrease in the size of an important population of a species	**No**: Highly unlikely that an important population occurs in or near the project area.
• fragment an existing important population into two or more populations	**No**: Highly unlikely that an important population occurs in or near the project area.
• adversely affect habitat critical to the survival of a species	**No**. Aspects of suitable are habitat present in the project area, but as it is unlikely the species occurs, the proposed works are unlikely to impact the survival of the species.
• disrupt the breeding cycle of an important population	**No**: Highly unlikely that an important population occurs in or near the project area.
• modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**No**. Aspects of suitable habitat are present in the project area, but as it is unlikely the species occurs, the proposed works are unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat.

Criteria	Significant impact?
• result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**No.** Lack of nearby records suggests species is highly unlikely to become established in the project area by any natural means.
• introduce disease that may cause the species to decline, or	**No.** Unlikely the species occurs to be at risk by an introduced disease.
• interfere substantially with the recovery of the species."	**No.** Unlikely species occurs in the project area.

6. Summary

This assessment concludes that there is a low likelihood of Growling Grass Frog occurring in or near the project area. Although there was some possible suitable habitat for the species in the Black Spur Creek, and other nearby wetlands, there were no existing records or reports of the species in the project area or in the broader Tarwin River catchment.

If you have any questions or would like to discuss this report or any other matter further, please do not hesitate to call me on 0413 935 497. Thank you for the opportunity of working with VicRoads on this project.

Kind Regards,

Aaron Jenkin
Director and Principal Ecologist

AQUATICA ENVIRONMENTAL

Mobile: 0413 935 497
Email: aaron@equaticaenvironmental.com.au
Website: www.aquaticaenvironmental.com.au

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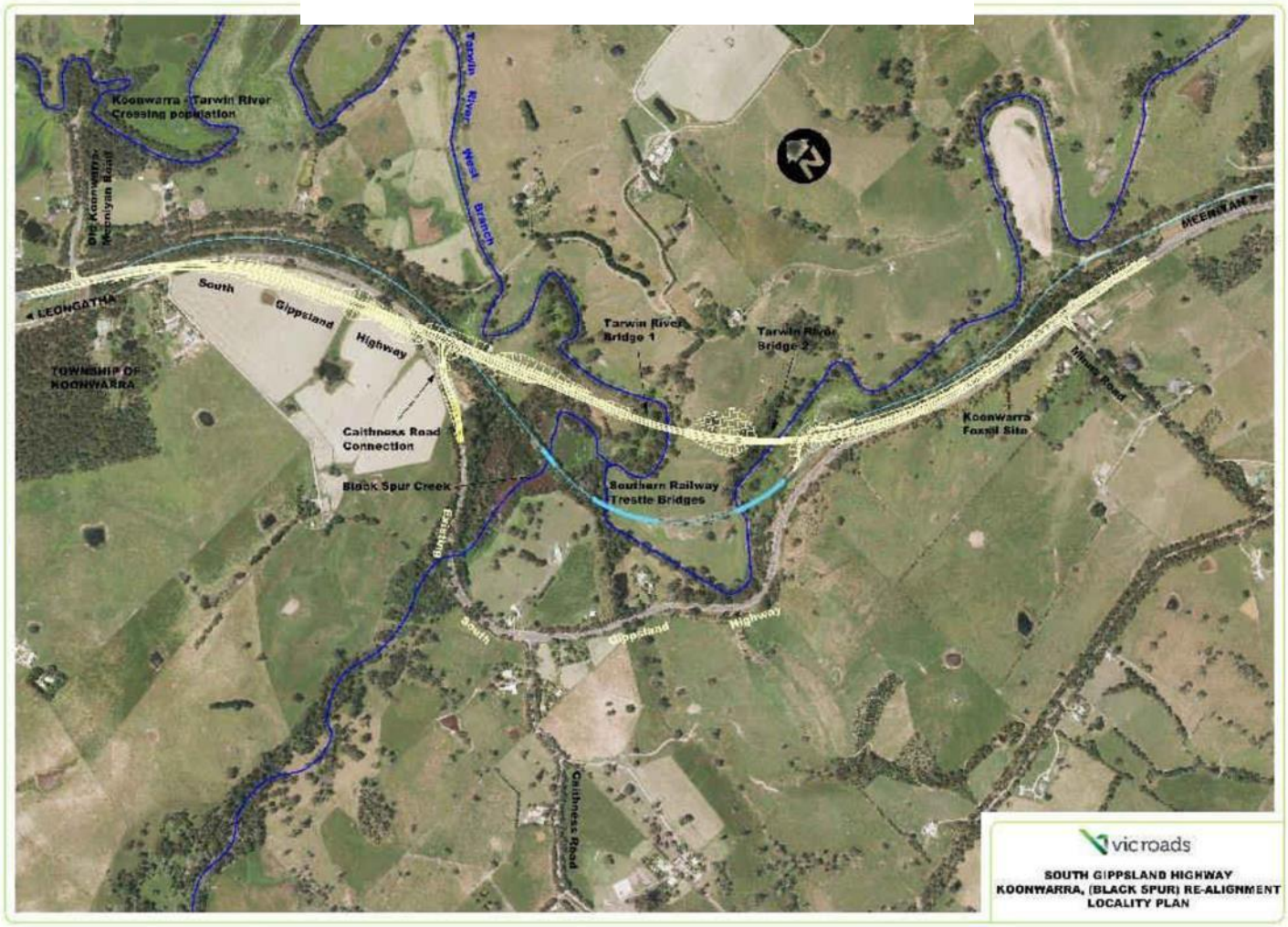
Department of Environment, Land, Water and Planning (2017). Victorian Biodiversity Atlas. Available online at: https://www.environment.vic.gov.au/biodiversity/victorian-biodiversity-atlas. Last accessed 11 September 2017.

Ecology Australia (2000). South Gippsland Highways, Koonwarra: Additional Terrestrial Fauna and Fish Survey – Gwyther and Blackspur Creek. Report prepared for VicRoads dated 7 December 2000.

Nerrena Landcare Group (2016). Black Spur Creek Wetland Project. Dated September 2016.

Attachment A: Proposed highway realignment (Source: VicRoads)



Attachment B: Wetland Photographs

Wetland 1 (north and south of road)

Wetland 2 (upstream and downstream of rail trail bridge)

Wetland 3 (looking downstream)

Wetland 4 (looking downstream)

Appendix 8: MNES Tables

Eucalyptus strzeleckii – Strzelecki Gum (Vulnerable)

MNES	Significant Impact Criteria	Risk to MNES without mitigation measures	Likelihood of a Significant impact (with no mitigation measures implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with mitigation measures applied	Likelihood of a Significant impact (with mitigation measures implemented)
Eucalyptus strzeleckii	*Lead to a long term decrease in the size of an important population*	An important population of Strzelecki Gum at the Koonwarra – Tarwin River Crossing has been identified in the National Recovery Plan, however this is outside of the study area. It is unclear whether the Strzelecki Gum found surrounding this site would be considered an extension of this population. The removal of all 884 individuals within the project area will affect the size of the population at this location.	**HIGH**	The size of the population within and adjacent to the Black Spur project has been shown to be far more extensive than previously known through a recently completed VicRoads targeted survey. An additional 86 records and 2,307 individual Strzelecki Gums have been found within 2km of the site, previously unrecorded on databases. Re-design measures of the road construction footprint have significantly reduced the impact on both Strzelecki Gum numbers and habitat. A reduction within the project area from 10.13 hectares to 4.766 hectares of habitat has been achieved (53%) and a reduction in individual numbers from 884 to 180 (80%). The removal of 180 Strzelecki Gum from an estimated population of over 3000 is a little over 5% in total. VicRoads will implement a landscape revegetation plan within the project area which includes: • Planting of 4,000 Strzelecki Gums within an area of 9.5 hectares of plantings and enhancement works, • Targeted weed spraying/removal program, • Protection of revegetated areas from grazing, • Translocation of all viable recruits impacted by the works. 95 recruits are planned to be translocated however frosts over winter have caused some losses (pers. com. D. McLees).	The removal of 180 individuals will decrease the size of the naturally occurring population present.	**MODERATE**

MNES	Significant Impact Criteria	Risk to MNES without mitigation measures	Likelihood of a Significant impact (with no mitigation measures implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with mitigation measures applied	Likelihood of a Significant impact (with mitigation measures implemented)
Eucalyptus strzeleckii	*Reduce the area of occupancy of an important population*	An important population of Strzelecki Gum at the Koonwarra – Tarwin River Crossing has been identified in the National Recovery Plan, however this is outside of the study area. It is unclear whether the Strzelecki Gum found surrounding this site would be considered an extension of this Important population. The necessary realignment of the road will physically reduce the available area of suitable habitat for this population of up to 10.13ha.	**HIGH**	Re-design measures of the road construction footprint have significantly reduced the impact on both Strzelecki Gum numbers and habitat. A reduction from 10.13 hectares to 4.766 hectares of habitat has been achieved and a reduction in individual numbers from 338 to 180. The removal of 4.766hectres of Strzelecki Gum habitat will be offset through the implementation of the landscape revegetation plan, which includes 9.5 hectares of plantings and enhancement works. This proposed revegetation of habitat in close proximity to the study area will assist in the increase of area for the population into the future ..	The removal of 4.766 hectares will reduce the area of the naturally occurring population present.	**MODERATE**
Eucalyptus strzeleckii	*Fragment an existing important population into two or more populations*	The proposed works could lead to the fragmentation of the existing naturally occurring population into additional sub populations, however historic land clearing has resulted in fragmentation of the remnant native vegetation on site.	**LOW**	Implementation of a landscape revegetation plan will connect the existing population within the road/rail reserve to a small population of very large trees near the Tarwin River through revegetation of crown land. 4,000 Strzelecki Gums will be planted throughout the study site as part of these works along with redundant sections of the former highway.	The population in the immediate vicinity is unlikely to be further fragmented, given past land clearing and revegetation proposed.	**LOW**

MNES	Significant Impact Criteria	Risk to MNES without mitigation measures	Likelihood of a Significant impact (with no mitigation measures implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with mitigation measures applied	Likelihood of a Significant impact (with mitigation measures implemented)
Eucalyptus strzeleckii	*Adversely affect habitat critical to the survival of a species*	The National Recovery Plan states that Strzelecki Gum is restricted to small stands on farm paddocks and roadside verges. This proposal has the potential to remove up to 10.13ha of suitable habitat permanently reducing the current habitat available for Strzelecki Gum.	**MODERATE**	Re-design measures of the road construction footprint have significantly reduced the impact on both Strzelecki Gum numbers and habitat. The implementation of the Landscape revegetation plan will assist in replacing lost habitat for Strzelecki Gum in this area with 9.5 hectares proposed to extend and link current habitat, including the re-establishment of the vegetation community and other understorey species Strzelecki Gum is associated with. This will develop and contribute to the regional population. And associated vegetation community. A survey will be undertaken to acquire baseline population data and document known habitat, collecting floristic and environmental information relevant to the community ecology and condition.	The proposal is unlikely to adversely affect habitat critical to the survival of the species.	**LOW**
Eucalyptus strzeleckii	*Disrupt the breeding cycle of an important population*	The population within the site shows all life stages of the species with small/medium/large size class individuals. Current seedling recruitment levels are high, but anecdotally appear to be affected by adjacent grazing and frost damage. The presence of a wide range of size classes of reproductively mature trees across the site indicates past levels of recruitment have been adequate.	**LOW**	The removal of 5% of the known number of Strzelecki Gum within 2kms of the site is not likely to disrupt the breeding cycle of the site's population. Research opportunities being explored as part of this proposal aim to negate this impact, which will include the development and implementation of management techniques to promote regeneration and natural recruitment and to report on learnings and outcomes to assist future Eucalyptus strzeleckii revegetation projects.	LOW	**LOW**

MNES	Significant Impact Criteria	Risk to MNES without mitigation measures	Likelihood of a Significant impact (with no mitigation measures implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with mitigation measures applied	Likelihood of a Significant impact (with mitigation measures implemented)
Eucalyptus strzeleckii	*Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*	The maximum potential extent of removal of suitable habitat of 10.13 ha may lead to the decline of the community in a localised context.	**MODERATE**	Re-design measures of the road construction footprint have significantly reduced the impact on Strzelecki Gum habitat by 53%. Habitat available for Strzelecki Gum will be extended and linked as part of the landscape revegetation plan proposed to be undertaken in the immediate vicinity, with 4,000 seedlings to be planted over a 9.5 hectare area.	The loss of suitable habitat is not considered likely to lead to the decline of the community in a localised context, given the extent of the local population and revegetation proposed.	**LOW**
Eucalyptus strzeleckii	*Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*	The disturbances associated with the proposal are unlikely to result in the further establishment of invasive species either weeds or pest animals.	**LOW**	N/A	N/A	**LOW**

MNES	Significant Impact Criteria	Risk to MNES without mitigation measures	Likelihood of a Significant impact (with no mitigation measures implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with mitigation measures applied	Likelihood of a Significant impact (with mitigation measures implemented)
Eucalyptus strzeleckii	*Introduce disease that may cause the species to decline*	There is no evidence to suggest that planned works would represent an increased risk of introduction of disease that may cause the community to decline.	**LOW**	As part of the construction management planning, all vehicles and machinery used for construction works will be required to be clean and free from soil and other materials.	Low	**LOW**
Eucalyptus strzeleckii	*Interfere substantially with the recovery of the species*	The 2006 Recovery Plan estimates up to 15,000 plants could be surviving while other estimates speculate up to 150,000 pants could exist (Campbell, 2007). In this context the removal of these individual plants cannot be considered to substantially interfere with the recovery of the species	**LOW**	It is not considered that the impact on 180 Strzelecki Gums would substantially interfere with the recovery of the species, given the number and extent of Strzelecki Gum found within the wider region. The landscape revegetation and research opportunities proposed for this project will result in an improvement in habitat quality and extent and knowledge in regard to recruitment and regeneration.	Low	**LOW**

Prototroctes maraena – Australian Grayling (Vulnerable)

MNES	Significant Impact Criteria	Risk to MNES without mitigation measures	Likelihood of a Significant impact (with no mitigation measures implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with mitigation measures applied	Likelihood of a Significant impact (with mitigation measures implemented)
Prototroctes maraena	*Lead to a long term decrease in the size of an important population*	The Tarwin River has been identified as an important river location for the long term survival and recovery of this species. Suitable habitat exists within the Tarwin River and a confirmed VBA record less than 5km away to the north has been identified.	**MODERATE**	No construction works for this project will occur within or immediately adjacent to the Tarwin River, excepting the potential for a crossing point. Any crossing structure will be fish passable to ensure no obstruction to migration As part of the construction management planning, techniques such as sedimentation controls, silt fencing and bunting will be employed to reduce any potential for water quality or sedimentation issues affecting the Tarwin River. A Working on Waterways Permit is required from the West Gippsland Catchment Authority before construction of the two Tarwin River bridge crossings and any access points that impact the river can begin. This permit will ensure that any potential impacts to the waterway that could affect the Australian Grayling such as erosion, barriers to movement and/or changed water flows will be addressed.	Low	**LOW**
Prototroctes maraena	*Reduce the area of occupancy of an important population*	The construction of two Tarwin River crossings will not physically reduce the area of occupancy for the Australian Grayling..	**LOW**	N/A	N/A	**LOW**

MNES	Significant Impact Criteria	Risk to MNES without mitigation measures	Likelihood of a Significant impact (with no mitigation measures implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with mitigation measures applied	Likelihood of a Significant impact (with mitigation measures implemented)
Prototroctes maraena	*Fragment an existing important population into two or more populations*	The population is highly mobile with several confirmed VBA records along the Tarwin River.	**LOW**	The Working on Waterways Permit and the construction management planning will ensure that any potential impacts to the waterway that could affect the Australian Grayling habitat will be addressed and reduced to a negligible impact.	Low	**LOW**
Prototroctes maraena	*Adversely affect habitat critical to the survival of a species*	Given the wide distribution and range of habitats used by the species throughout its life, it is unlikely that this proposal will impact habitat critical for the species survival.	**LOW**	The Working on Waterways Permit and the construction management planning will ensure that any potential impacts to the waterway that could affect the Australian Grayling habitat will be addressed and reduced to a negligible impact.	Low	**LOW**

MNES	Significant Impact Criteria	Risk to MNES without mitigation measures	Likelihood of a Significant impact (with no mitigation measures implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with mitigation measures applied	Likelihood of a Significant impact (with mitigation measures implemented)
Prototroctes maraena	*Disrupt the breeding cycle of an important population*	As the Australian Grayling needs to move between rivers and coastal seas to complete its life cycle, barriers blocking upstream migration can interfere with downstream migration, and cause local extinction in the section of river upstream from the barrier. If barriers block access to breeding habitat, then reproductive output can be reduced, limit the ability to colonise or recolonise suitable habitat, and can reduce gene flow by fragmenting populations.	**MODERATE**	Any barriers or other obstructions placed in the river for this project to be undertaken will be fish passable and as per conditions imposed by the WGCMA. The Working on Waterways Permit and the construction management planning will ensure that any potential impacts to the waterway in regard to water quality or other impacts that could affect the Australian Grayling habitat will be addressed and reduced to a negligible impact.	Low	**LOW**
Prototroctes maraena	*Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*	The most significant threats to the species relate to waterway management. The planned works are primarily based and while impacts to surrounding waterways are a possibility they could not be considered to pose a threat such that the species is likely to decline.	**LOW**	N/A	N/A	**LOW**

MNES	Significant Impact Criteria	Risk to MNES without mitigation measures	Likelihood of a Significant impact (with no mitigation measures implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with mitigation measures applied	Likelihood of a Significant impact (with mitigation measures implemented)
Prototroctes maraena	*Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*	The disturbances associated with the proposal are unlikely to result in the further establishment of invasive pest animals.	**LOW**	N/A	N/A	**LOW**
Prototroctes maraena	*Introduce disease that may cause the species to decline*	There is no evidence to suggest that planned works would represent an increased risk of introduction of disease that may cause the community to decline.	**LOW**	N/A	N/A	**LOW**

MNES	Significant Impact Criteria	Risk to MNES without mitigation measures	Likelihood of a Significant impact (with no mitigation measures implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with mitigation measures applied	Likelihood of a Significant impact (with mitigation measures implemented)
Prototroctes maraena	*Interfere substantially with the recovery of the species*	The most significant threats to the species relate to waterway management. The planned works are terrestrially based and while impacts to surrounding waterways are a possibility they could not be considered to pose a threat such that they would interfere substantially with the recovery of the species.	**LOW**	N/A	N/A	**LOW**

Appendix 9: BIOR Report – Final Design

Biodiversity impact and offset requirements report

This report **does not represent an assessment by DELWP** of the proposed native vegetation removal. It provides additional biodiversity information to support moderate and high risk-based pathway applications for permits to remove native vegetation under clause 52.16 or 52.17 of planning schemes in Victoria.

Date of issue: **14/09/2017**
Time of issue: **2:11 pm**

DELWP ref: IND_0072

Project ID	027VR_Clearing

Summary of marked native vegetation

Risk-based pathway	**High**
Total extent	4.766 ha
Remnant patches	4.696 ha
Scattered trees	1 tree
Location risk	C

Strategic biodiversity score of all marked native vegetation	0.444

Offset requirements if a permit is granted

If a permit is granted to remove the marked native vegetation, a requirement to obtain a native vegetation offset will be included in the permit conditions. The offset must meet the following requirements:

Offset type	**General offset**
General offset amount (general biodiversity equivalence units)	1.267 general units
General offset attributes	
Vicinity	West Gippsland Catchment Management Authority (CMA) **or** South Gippsland Shire Council
Minimum strategic biodiversity score	0.355[1]

See Appendices 1 and 2 for details in how offset requirements were determined.

NB: values presented in tables throughout this document may not add to totals due to rounding

[1] Minimum strategic biodiversity score is 80 per cent of the weighted average score across habitat zones where a general offset is required

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Biodiversity impact and offset requirements report

Next steps

Any proposal to remove native vegetation must meet the application requirements of the high risk-based pathway and it will be assessed under the high risk-based pathway.

If you wish to remove the marked native vegetation you are required to apply for a permit from your local council. Council will then refer your application to DELWP for assessment, as required. **This report is not a referral assessment by DELWP.**

The biodiversity assessment report from NVIM and this biodiversity impact and offset report should be submitted with your application for a permit to remove native vegetation you plan to remove, lop or destroy.

The Biodiversity assessment report generated by the tool within NVIM provides the following information:

- The location of the site where native vegetation is to be removed.
- The area of the patch of native vegetation and/or the number of any scattered trees to be removed.
- Maps or plans containing information set out in the *Permitted clearing of native vegetation – Biodiversity assessment guidelines*
- The risk-based pathway of the application for a permit to remove native vegetation

This report provides the following information to meet application requirements for a permit to remove native vegetation:

- Confirmation of the risk-based pathway of the application for a permit to remove native vegetation
- The strategic biodiversity score of the native vegetation to be removed
- Information to inform the assessment of whether the proposed removal of native vegetation will have a significant impact on Victoria's biodiversity, with specific regard to the proportional impact on habitat for any rare or threatened species.
- The offset requirements should a permit be granted to remove native vegetation.

Additional application requirements must be provided with an application for a permit to remove native vegetation in the moderate or high risk-based pathways. These include:

- A habitat hectare assessment report of the native vegetation that is to be removed
- A statement outlining what steps have been taken to ensure that impacts on biodiversity from the removal of native vegetation have been minimised
- An offset strategy that details how a compliant offset will be secured to offset the biodiversity impacts of the removal of native vegetation.

Refer to the *Permitted clearing of native vegetation – Biodiversity assessment guidelines* and for a full list and details of application requirements.

Authorised by the Victorian Government, 8 Nicholson Street, East Melbourne.

For more information contact the DELWP Customer Service Centre 136 186

www.delwp.vic.gov.au

Biodiversity impact and offset requirements report

Appendix 1 – Biodiversity impact of removal of native vegetation

Habitat hectares

Habitat hectares are calculated for each habitat zone within your proposal using the extent and condition scores in the GIS data you provided.

Habitat zone	Site assessed condition score	Extent (ha)	Habitat hectares
1-7-A	0.450	1.875	0.844
2-6-A	0.450	0.549	0.247
3-8-A	0.250	0.120	0.030
4-5-A	0.430	0.979	0.421
5-5-B	0.270	0.006	0.002
6-4-B	0.200	0.092	0.018
7-4-A	0.400	0.124	0.050
8-10-A	0.200	0.070	0.014
9-3-F	0.290	0.001	0.000
10-3-E	0.290	0.098	0.028
11-3-D	0.290	0.029	0.008
12-3-C	0.290	0.233	0.068
13-3-A	0.280	0.233	0.065
14-3-B	0.280	0.052	0.015
15-2-B	0.320	0.068	0.022
16-2-A	0.320	0.044	0.014
17-1-A	0.310	0.159	0.049
18-9-A	0.500	0.033	0.017
TOTAL			**1.912**

Impacts on rare or threatened species habitat above specific offset threshold

The specific-general offset test was applied to your proposal. The test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the specific offset threshold. The threshold is set at 0.005 per cent of the total habitat for a species. When the proportional impact is above the specific offset threshold a specific offset for that species' habitat is required.

The specific-general offset test found your proposal does not have a proportional impact on any rare or threatened species' habitats above the specific offset threshold. No specific offsets are required. A general offset is required as set out below.

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Biodiversity impact and offset requirements report

Clearing site biodiversity equivalence score(s)

The general biodiversity equivalence score for the habitat zone(s) is calculated by multiplying the habitat hectares by the strategic biodiversity score.

Habitat zone	Habitat hectares	Proportion of habitat zone with general offset	Strategic biodiversity score	General biodiversity equivalence score (GBES)
1-7-A	0.844	100.000 %	0.408	0.344
2-6-A	0.247	100.000 %	0.565	0.140
3-8-A	0.030	100.000 %	0.393	0.012
4-5-A	0.421	100.000 %	0.419	0.176
5-5-B	0.002	100.000 %	0.451	0.001
6-4-B	0.018	100.000 %	0.464	0.009
7-4-A	0.050	100.000 %	0.491	0.024
8-10-A	0.014	100.000 %	0.494	0.007
9-3-F	0.000	100.000 %	0.509	0.000
10-3-E	0.028	100.000 %	0.495	0.014
11-3-D	0.008	100.000 %	0.486	0.004
12-3-C	0.068	100.000 %	0.486	0.033
13-3-A	0.065	100.000 %	0.477	0.031
14-3-B	0.015	100.000 %	0.451	0.007
15-2-B	0.022	100.000 %	0.476	0.010
16-2-A	0.014	100.000 %	0.488	0.007
17-1-A	0.049	100.000 %	0.394	0.019
18-9-A	0.017	100.000 %	0.406	0.007

Biodiversity impact and offset requirements report

Mapped rare or threatened species' habitats on site

This table sets out the list of rare or threatened species' habitats mapped at the site beyond those species for which the impact is above the specific offset threshold. These species habitats do not require a specific offset according to the specific-general offset test.

Species number	Species common name	Species scientific name
10045	Lewin's Rail	Lewinia pectoralis pectoralis
10186	Intermediate Egret	Ardea intermedia
10187	Eastern Great Egret	Ardea modesta
10215	Hardhead	Aythya australis
10220	Grey Goshawk	Accipiter novaehollandiae novaehollandiae
10226	White-bellied Sea-Eagle	Haliaeetus leucogaster
10230	Square-tailed Kite	Lophoictinia isura
10248	Powerful Owl	Ninox strenua
10498	Chestnut-rumped Heathwren	Calamanthus pyrrhopygius
11280	Grey-headed Flying-fox	Pteropus poliocephalus
12283	Lace Monitor	Varanus varius
12407	Swamp Skink	Lissolepis coventryi
13117	Brown Toadlet	Pseudophryne bibronii
13125	Southern Toadlet	Pseudophryne semimarmorata
4686	Australian Grayling	Prototroctes maraena
500044	Sticky Wattle	Acacia howittii
500575	Winged Water-starwort	Callitriche umbonata
501290	Bog Gum	Eucalyptus kitsoniana
502709	Maroon Leek-orchid	Prasophyllum frenchii
504491	Southern Blue-gum	Eucalyptus globulus subsp. globulus
504558	Strzelecki Gum	Eucalyptus strzeleckii
505337	Austral Crane's-bill	Geranium solanderi var. solanderi s.s.

Biodiversity impact and offset requirements report

Appendix 2 – Offset requirements detail

If a permit is granted to remove the marked native vegetation the permit condition will include the requirement to obtain a native vegetation offset.

To calculate the required offset amount required the biodiversity equivalence scores are aggregated to the proposal level and multiplied by the relevant risk multiplier.

Offsets also have required attributes:

- General offsets must be located in the same Catchment Management Authority (CMA) boundary or Local Municipal District (local council) as the clearing and must have a minimum strategic biodiversity score of 80 per cent of the clearing.[2]

The offset requirements for your proposal are as follows:

Offset type	Clearing site biodiversity equivalence score	Risk multiplier	Offset requirements	
			Offset amount (biodiversity equivalence units)	Offset attributes
General	0.845 GBES	1.5	1.267 general units	Offset must be within West Gippsland CMA or South Gippsland Shire Council Offset must have a minimum strategic biodiversity score of 0.355

[2] Strategic biodiversity score is a weighted average across habitat zones where a general offset is required

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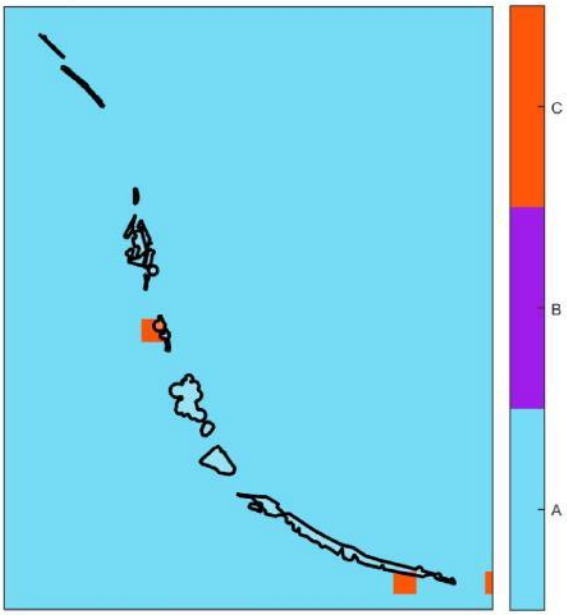
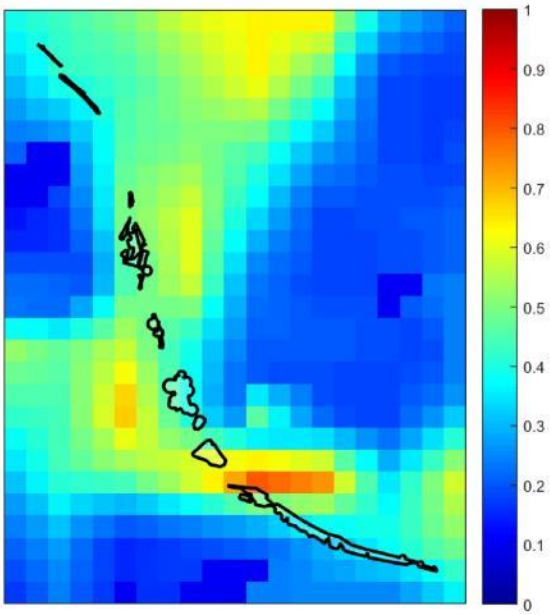
Biodiversity impact and offset requirements report

Appendix 3 – Images of marked native vegetation

1. Native vegetation location risk map



2. Strategic biodiversity score map



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Biodiversity impact and offset requirements report

3. Aerial photograph showing marked native vegetation

Biodiversity impact and offset requirements report

Highly localised habitat

A highly localised habitat is habitat for a rare or threatened species that is spread across a very restricted area (less than 2,000 hectares). This can also be applied to a similarly limited sub-habitat that is disproportionately important for a wide-ranging rare or threatened species. Highly localised habitats have the highest habitat importance score (1) for all locations where they are present.

Minimum strategic biodiversity score

The minimum strategic biodiversity score is an attribute for a general offset.

The strategic biodiversity score of the offset site must be at least 80 per cent of the strategic biodiversity score of the native vegetation to be removed. This is to ensure offsets are located in areas with a strategic value that is comparable to, or better than, the native vegetation to be removed. Where a specific and general offset is required, the minimum strategic biodiversity score relates only to the habitat zones that require the general offset.

Offset risk factor

There is a risk that the gain from undertaking the offset will not adequately compensate for the loss from the removal of native vegetation. If this were to occur, despite obtaining an offset, the overall impact from removing native vegetation would result in a loss in the contribution that native vegetation makes to Victoria's biodiversity.

To address the risk of offsets failing, an offset risk factor is applied to the calculated loss to biodiversity value from removing native vegetation.

$$\textit{Risk factor for general offsets} = 1.5$$

$$\textit{Risk factor for specific offset} = 2$$

Offset type

The specific-general offset test determines the offset type required.

When the specific-general offset test determines that the native vegetation removal will have an impact on one or more rare or threatened species habitat above the set threshold of 0.005 per cent, a specific offset is required. This test is done at the permit application level.

A general offset is required when a proposal to remove native vegetation is not deemed, by application of the specific-general offset test, to have an impact on any habitat for any rare or threatened species above the set threshold of 0.005 per cent. All habitat zones that do not require a specific offset will require a general offset.

Proportional impact on species

This is the outcome of the specific-general offset test. The specific-general offset test is calculated across the entire proposal for each species on the native vegetation permitted clearing species list. If the proportional impact on a species is above the set threshold of 0.005 per cent then a specific offset is required for that species.

Specific offset amount

The specific offset amount is calculated by multiplying the specific biodiversity equivalence score of the native vegetation to be removed by the risk factor for specific offsets. This number is expressed in specific biodiversity equivalence units and is the amount of offset that is required to be provided should the application be approved. This offset requirement will be a condition to the permit for the removal of native vegetation.

$$\textit{Risk adjusted specific biodiversity equivalence score} = \textit{specific biodiversity equivalence score clearing} \times 2$$

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Biodiversity impact and offset requirements report

Specific offset attributes	Specific offsets must be located in the modelled habitat for the species that has triggered the specific offset requirement.
Specific biodiversity equivalence score	The specific biodiversity equivalence score quantifies the relative overall contribution that the native vegetation to be removed makes to the habitat of the relevant rare or threatened species. It is calculated for each habitat zone where one or more species habitats require a specific offset as a result of the specific-general offset test as follows: $$\textit{Specific biodiversity equivalence score} = \textit{habitat hectares} \times \textit{habitat importance score}$$
Strategic biodiversity score	This is the weighted average strategic biodiversity score of the marked native vegetation. The strategic biodiversity score has been calculated from the *Strategic biodiversity map* for each habitat zone. The strategic biodiversity score of native vegetation is a measure of the native vegetation's importance for Victoria's biodiversity, relative to other locations across the landscape. The *Strategic biodiversity map* is a modelled layer that prioritises locations on the basis of rarity and level of depletion of the types of vegetation, species habitats, and condition and connectivity of native vegetation.
Total extent (hectares) for calculating habitat hectares	This is the total area of the marked native vegetation in hectares. The total extent of native vegetation is an input to calculating the habitat hectares of a site and in calculating the general biodiversity equivalence score. Where the marked native vegetation includes scattered trees, each tree is converted to hectares using a standard area calculation of 0.071 hectares per tree. This information has been provided by or on behalf of the applicant in the GIS file.
Vicinity	The vicinity is an attribute for a general offset. The offset site must be located within the same Catchment Management Authority boundary or Local Municipal District as the native vegetation to be removed.

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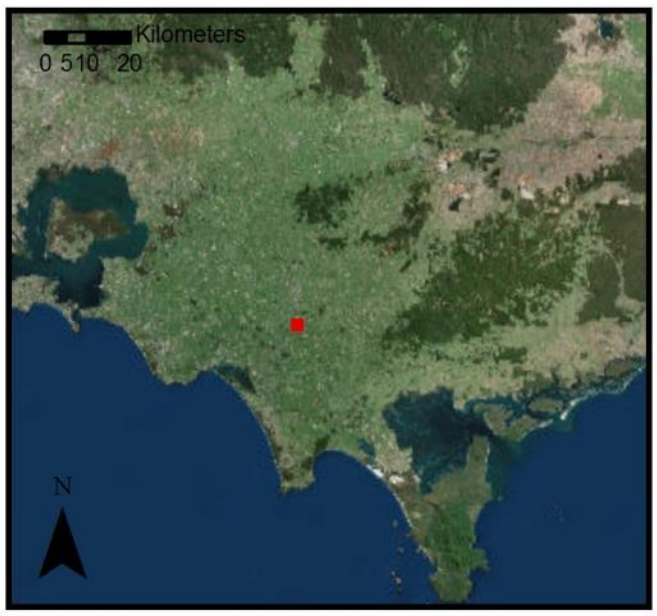
Maps

Maps commence on the next page.

Map 1a – Native Vegetation patches marked for removal in the north of the study area



Legend

- Study Area
- Construction Areas
- Native Vegetation Losses

Assessed Native Patches

- HZ1
- HZ2
- HZ3a
- HZ3b
- HZ4a
- HZ4b
- HZ5a
- HZ5b
- HZ6
- HZ7
- HZ8
- HZ9

Title: Native vegetation patches marked for removal
Reference: 027VR
Drafted By: B. Doherty (18/09/2017)
Reviewed By: T. Brooker (18/09/2017)
Version: For Publication
Datum: GDA 1994 VicGrid 94

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Map 1b – Native Vegetation patches marked for removal in the south of the study area

Legend

- Study Area
- Construction Areas
- Native Vegetation Losses

Assessed Native Patches

- HZ1
- HZ2
- HZ3a
- HZ3b
- HZ4a
- HZ4b
- HZ5a
- HZ5b
- HZ6
- HZ7
- HZ8
- HZ9

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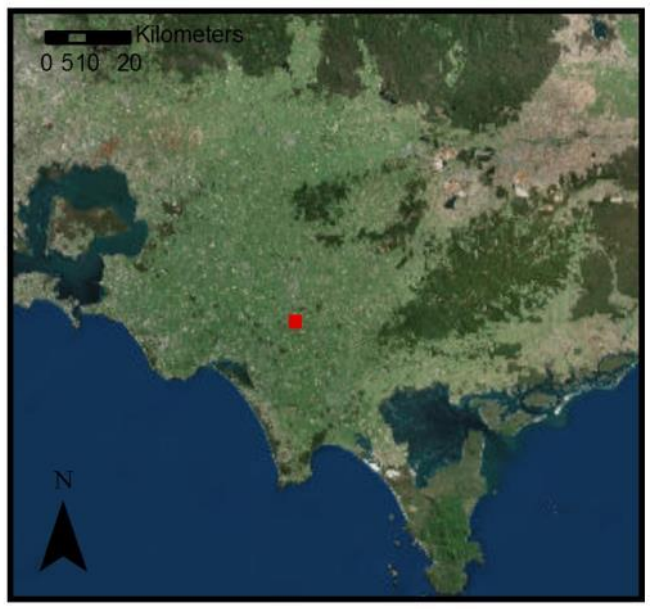
Map 2a – Affected Strzelecki Gum in the north of the Black Spur study area



Legend

Strzelecki Gum

- Remove
- Retain
- TPZ
- Translocate
- Study Area
- Native Vegetation Losses

While all effort has been made to ensure the content of this map is correct and accurate, Indigenous Design cannot explicitly guarantee that it is free from error and accepts no responsibility for damages resulting from its use.

Title: Affected Strzelecki Gum through the Black Spur study area
Reference: 027VR
Drafted By: B. Doherty (18/09/2017)
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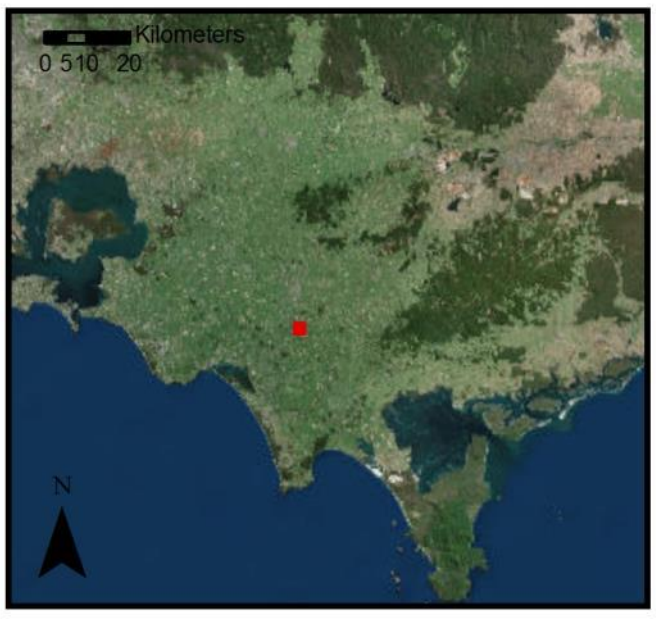
Map 2b – Affected Strzelecki Gum in the south of the Black Spur study area



Legend

Strzelecki Gum

- Remove
- Retain
- TPZ
- Translocate
- Study Area
- Native Vegetation Losses

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INDIGENOUS DESIGN
ENVIRONMENTAL MANAGEMENT

INDIGENOUS DESIGN
1635 Main Rd, Research, VIC, 3095
Melbourne | Morwell | Wonthaggi

ABN: 64 081 044 144

P (03) 9437 0555
E nicole@iddesign.com.au

www.iddesign.com.au