ecology & heritage partners

Final Report

Princes Highway Duplication Winchelsea to Colac EPBC Preliminary Documentation

Prepared for

VicRoads (Geelong Ring Road Project)

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Ecology and Heritage Partners Pty Ltd

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GLOSSARY

Acronym	Description
CALP	Catchment and Land Protection Act 1994
CEMP	Construction Environmental Management Plan
CMA	Catchment Management Authority
CMP	Conservation Management Plan
DELWP	Victorian Department of Environment, Land, Water and Planning
DoE	Commonwealth Department of the Environment
DPCD	Victorian Department of Planning and Community Development
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
EVC	Ecological Vegetation Class
FFG Act	Flora and Fauna Guarantee Act 1988
FIS	Flora Information System
NES	National Environmental Significance
PMST	Protected Matters Search Tool (DoE)
VBA	Victorian Biodiversity Atlas (DELWP)

CONTENTS

INTRODUCTION

Background

Ecology and Heritage Partners Pty Ltd were engaged by VicRoads (Geelong Ring Road Project) to prepare further ecological advice as part of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral decision for the Princes Highway duplication – Winchelsea to Colac, Victoria (EPBC Act referral 2012/6568) submitted to the Department of the Environment [(DoE) – formally the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) on 25 November 2012.

The EPBC Act referral was prepared by VicRoads to address the potential impacts on one EPBC Act-listed fauna species (Growling Grass Frog *Litoria raniformis*), as the species was detected within the study area during targeted surveys (Ecology and Heritage Partners Pty Ltd 2012).

Based on the referral decision, the DoE have requested additional information for matters of National Environmental Significance (NES) which are discussed below.

To determine the likely impacts of this project on matters of NES both the *Matters of National Significance Significant Impact Guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2009a) and Growling Grass Frog Significant Impact Guidelines (DEWHA 2009c) have been used as a reference guide in conjunction with database records, previous targeted surveys and discussions with species experts where appropriate.

Scope of Work

The scope of work included the provision of advice and ecological assistance as required to address the following sections outlined in the Decision on Referral – Princes Highway Duplication – Winchelsea to Colac, Victoria (EPBC 2012/6568): Appendix A – Preliminary documentation request:

- General – provide advice and ecological assistance (to be completed by VicRoads)
- Potential impacts to Growling Grass Frog *Litoria raniformis*
- Potential impacts to listed threatened fish species
- Potential impacts to Golden Sun Moth *Synemon plana*
- Potential impacts to listed threatened flora species
- Potential impacts to Striped Legless Lizard *Delma impar* and Corangamite Water Skink *Eulamprus tympanum marnieae*
- Ecological Communities
- Offsets'– provide advice and ecological assistance in consultation with DoE and VicRoads, as required

DISCUSSION

The following section outlines the additional information required relating to the potential impact of the proposed action on listed threatened species and ecological communities as requested on Appendix A.

1 GENERAL – PROVIDE ADVICE AND ECOLOGICAL ASSISTANCE

This component will be provided by VicRoads.

2 POTENTIAL IMPACTS TO GROWLING GRASS FROG *LITORIA RANIFORMIS*

To address this section, the responses for '*Section 2: Appendix A – Preliminary documentation request*' have been merged to discuss the likely impacts to Growling Grass Frog and impacts associated with construction works as part of the proposed action. A description and analysis of the relevant impacts likely to be associated with the Princes Highway Duplication project and appropriate mitigation measures to reduce any such impacts are discussed below.

Growling Grass Frog

The risk of transfer of disease or pathogens

Whilst in many circumstances salvage and translocation of threatened species, including Growling Grass Frog, is considered to be a measure to reduce impact (largely an animal welfare consideration), its appropriateness and applicability should be assessed on a 'case by case' basis. This is especially important for species such as Growling Grass Frog whereby individuals, populations and the species are particularly vulnerable to readily transferrable diseases such as Chytrid Fungus, and whereby there is minimal evidence that salvage and translocation is successful at an individual, population or species level. Investment into other conservation measures, such as landscape scale habitat design and creation, may be more appropriate.

Where possible and practicable, it may be most appropriate to avoid impacts through mitigation measures (i.e. salvage and translocation), or if impacts are not avoidable they should be minimised as much as possible (DEWHA 2009a). Consideration must also be made to the 'environmental context' of the habitat being removed and that sites history, current use and condition of the environment which is likely to be impacted (DEWHA 2009a).

Recent studies have also investigated the practicality of salvage and translocation as a management approach (Heard *et al.* 2010). As per Heard *et al.* (2010), it is stated that 'the aim of translocation is to ensure there is either no net reduction in the abundance of Growling Grass Frog, or no net reduction in the number of populations present'. However, Heard *et al.* (2010) raises several important points regarding the use of translocating individuals and are summarised below:

- Ensuring there is no net reduction in abundance: with the likely end result leading to reduced connectivity between remaining populations, and the potential for a reduction in the likelihood of persistence in the long–term.
- Ensuring there is no net reduction of populations: this is poorly documented and there is currently no evidence that populations of Growling Grass Frog can be successfully relocated. This has been attempted for a closely related species, the Green and Golden Bell Frog *Litoria aurea*, and results have indicated that the success of translocations for this species have not been successful (Smith and Clemann 2008; White and Pyke 2008).
- It is important to flag the potential risks associated with translocating individuals at both the broader population and individual based levels also. The possible spread of disease (i.e. Chytrid fungus) and heightened predation risk are both additional examples of the risks associated with salvage and translocation.

To minimise the risk of spreading disease and pathogens, salvage and translocation of Growling Grass Frog as part of the Princes Highway Duplication project is not proposed. In addition, the number of Growling Grass Frog likely to be detected during construction is not considered to be high based on the results of targeted surveys and the general quality of habitats within or immediately adjoining the Princes Highway which are proposed to be impacted. Overall, the risk of spreading Chytrid fungus through the relocation of individuals is therefore considered to be low.

Construction works will be confined to a specific work area and all top-soil which is stripped is to be re-used in order to reduce the likely spread of Chytrid fungus to surrounding habitats outside the project area. Standard construction procedures such as sedimentation control and use of clean-fill will also eliminate the risk of transferring diseases or pathogens into potential Growling Grass Frog habitats surrounding the construction zone.

Mitigation Measures

- The relocation of Growling Grass Frog will only be undertaken within distances ≤100 metres when detected during pre-clearance surveys or construction activities in accordance with Appendix 3.
- Pre-clearance surveys at waterbodies to be removed or impeded by construction works will only be undertaken where an existing waterbody or suitable habitat(s) (i.e. waterway or drainage line) are available to relocate individuals within ≤100m.
- The relocation of Growling Grass Frog within ≤100m of a removed waterbody will not occur across the Princes Highway or the Geelong–Warrnambool railway as these are considered to be current barriers to dispersal.
- The contact details of a suitably qualified zoologist should be readily available to all staff if a Growling Grass Frog is detected or injured during construction works.

Impacts and mitigation measures associated with the permanent removal of waterbodies

Potential impacts

Previous studies have revealed that the spatial orientation of waterbodies across the landscape is one of the most important habitat determinants influencing the presence of the species at a given site (Robertson *et al*. 2002; Heard *et al*. 2004a, 2004b; Hamer and Organ 2008). For example, waterbodies that are located in close proximity of each other (i.e. cluster of high quality sites) are more likely to support a population of Growling Grass Frog, compared with isolated sites lacking important habitat features (Hamer and Organ 2008).

Given the homogenous nature of the existing habitat surrounding the Princes Highway Duplication (i.e. cleared rural land used for agricultural purposes), and the low quality of existing waterbodies to be removed in proximity to the project, a terrestrial buffer of 30 metres from the centre of each waterbody has been used to calculate the total loss of potential dispersal habitat for Growling Grass Frog. Habitat quality has been determined in accordance with the criteria outlined in '*Detailed Flora and Fauna Survey and Net Gain Assessment Princes Highway Duplication, Winchelsea to Colac, Victoria (pg 18)*' and information on the habitat quality of each waterbody identified during previous assessments is provided below (Appendix 5).

Of the 72 waterbodies identified during the initial flora and fauna assessment, 25 low quality and two moderate quality waterbodies (i.e. farm dams) are proposed to be removed and based on the areas of each waterbody provided in Appendix 4 there a total wetland area of 11,497 m^2 or 1.149 hectares of low quality habitat (no breeding habitat will be impacted) proposed to be removed (Figures 2a-2y). Given that terrestrial dispersal habitat will not be impacted as a result of the proposed development (i.e. ubiquitous throughout the surrounding landscape and not limiting) it has not been included.

Waterbodies proposed to be removed will be offset with the creation of higher quality waterbodies that will be specifically created to provide breeding habitat for Growling Grass Frog, together with a 10 metre terrestrial habitat area surrounding each of the created waterbodies (see below).

It is important to note that the total number of waterbodies proposed to be removed (n=27), and that are subject to the offset calculations, have been determined based on a construction footprint that considered all areas between the proposed right of way boundaries. However, with further concept design work it is highly possible that many of the 27 waterbodies (and the total area of habitat) considered lost as part of the offset calculations when using the Commonwealth Offsets Assessment Guide will be able to be retained or partially retained.

It is highly unlikely that low quality habitat proposed to be removed is currently important for breeding and recruitment by Growling Grass Frog (i.e. essentially only potential loss of foraging and dispersal habitat). The reason for this is because of their isolation (i.e. often over one kilometre) from higher quality waterbodies where the species has previously been detected, or at sites where the species has a higher likelihood of occurrence (i.e. along and in the vicinity of Birregurra Creek).

While the permanent removal of waterbodies may potentially impact Growling Grass Frog in the short-term (i.e. reduction in the species' dispersal ability between low quality waterbodies), given the homogenous nature of the surrounding landscape, the species' ability to disperse across terrestrial habitats (i.e. open paddocks) is unlikely to be restricted during construction. In addition, the large number of existing

waterbodies in the vicinity of high quality habitats which are not proposed to be impacted (in the vicinity of the road) will cater for dispersal within and between nearby waterbodies on private property (Appendix 1).

On a landscape scale, while there is adequate connectivity between existing waterbodies adjacent to the proposed Princes Highway Duplication, most waterbodies are of low quality and are similar to those being removed as part of the project (Appendix 1). The removal of low quality waterbodies is not likely to significantly impact potential 'stepping stone' dispersal habitat for the species.

Avoidance

Important locations for Growling Grass Frog along the Princes Freeway alignment were based on the results of targeted surveys undertaken in 2011/12 (Ecology and Heritage Partners 2012b), combined with important landscape habitat variables such as those outlined in Heard *et al.* (2010). Heard *et al.* (2010) investigated several factors, including i) the percentage (%) of emergent, submergent, floating aquatic vegetation cover ii) annual permanency of water (including during extreme drought) and iii) connectivity to surrounding waterbodies were also used to assist with predicting the probability of Growling Grass Frog occupancy within a known population north of Melbourne.

Other than minor short term disturbance along Birregurra Creek, Sheepwash Creek and ephemeral drainage lines, all sites where Growling Grass Frog has previously been detected (Ecology and Heritage Partners 2012b; DEPI 2012, 2013) will be avoided (i.e. they fall outside of the proposed development footprint). In addition, as part of the development of concept designs, those waterbodies (of which there are very few) that provide key habitat features (e.g. high percentage cover of aquatic vegetation, high water quality) that are important for the species will be avoided.

Habitat creation

To determine the suitability of offsets for the Princes Highway Duplication project the guidelines for offsetting recommended by SEWPaC (2012) were taken into consideration which define environmental offsets as: "*measures that compensate for the residual adverse impacts of an action on the environment*" (Appendix 1). The aim of offsets is to provide environmental benefits to compensate the impacts of an action after avoidance and mitigations measures have been applied (SEWPaC 2012; Appendix 1).

The focus of habitat creation is to ensure constructed waterbodies are located near potential high quality breeding and/or important dispersal habitats (i.e. Birregurra Creek and Sheepwash Creek), and areas identified for habitat creation have the primary aim of ensuring there is an overall improvement or 'net gain' for the species (i.e. provision of high quality breeding habitat), as opposed to creating waterbodies in locations that are unlikely to be used by the species in the future (Appendix 1; Figures 2a-2y).

Based on the results of targeted surveys (Ecology and Heritage Partners 2012b; DEPI 2012, 2013) and the potential impacts to Growling Grass Frog dispersal habitat associated with the project, a total of five 'Habitat Creation Areas' and potential locations for the creation of seven Growling Grass Frog waterbodies were identified (Appendix 1; Figures 2a-2y). Further details on the habitat creation guidelines for constructed wetlands are outlined below (Appendix 4).

Each waterbody will be deep (1.5 to 4 metres) and will be at least 400m^2 in size (10 x 40 metres), which equates a total of **0.28 hectares** (0.04 x 7 = 0.28 ha) of wetland area that will be created as part of the project. In addition, a 10 metre terrestrial habitat area surrounding each of the seven waterbodies (which will provide suitable habitat for the species) will be provided as part of the creation of Growling Grass Frog wetlands. This equates to a total terrestrial habitat area of **0.98 hectares** (i.e. each created wetland will be 1,400 m^2 or 0.14 hectares in size x seven wetlands = 0.98 ha). In summary, the total area of Growling Grass Frog offset proposed as part of the project is **1.26 hectares** (i.e. 0.28 ha of wetland habitat plus 0.98 hectares of terrestrial habitat), and the analysis of the gains is provided in the attached excel spreadsheet. Based on the proposed habitat creation the minimum direct offset for the project will be achieved (i.e. **262.06% of impact offset**).

With respect to the calculation of offsets for the project the Commonwealth Offsets Assessment Guide (excel spreadsheet) was used to calculate the overall gains associated with the creation of waterbodies and to demonstrate what is proposed will compensate for the proposed impacts to low quality Growling Grass Frog foraging and dispersal associated with the project (see attached excel spreadsheet with offset calculations).

The creation of high quality waterbodies within the road reserve will adequately compensate for potential impacts to the species (i.e. loss of low quality habitat) as they will contain key habitat features required by the species, and will be constructed at strategic locations (i.e. in the vicinity of areas where the species is likely to occur) to ensure that dispersal opportunities throughout the local area (within and between sites) is maintained. In addition, created waterbodies will be secured in perpetuity, protected from the surrounding agricultural land uses, and will be managed in accordance with a suitable roadside management regime. This is contrary to the current situation where waterbodies on private property are subject to a range of threatening processes associated with agricultural activities and have unrestricted stock access (i.e. the primary purpose of these waterbodies is for stock).

Several private properties containing waterbodies will be acquired (23 of the 27 waterbodies proposed to be removed). Landowners will be financially compensated by VicRoads for the loss of these dams and in most situations are expected to use that compensation to construct replacement dams in a nearby location on their property (i.e. likely to be in the vicinity of the road). Consequently, it is important to note that the creation of these waterbodies, which is additional to the seven dedicated Growling Grass Frog waterbodies proposed to be constructed by VicRoads within the road reserve, will replace the low quality waterbodies that are proposed to be removed. However, at this stage the location and number of waterbodies that will be replaced by landowners is unknown, and these will not require the same design and habitat specifications as those created by VicRoads specifically for Growling Grass Frog.

In addition, three swale drains will be constructed on both (outer) sides of the road duplication and between both lanes to facilitate surface run-off to the constructed waterbodies, and these will be situated away from the road surface. The drains will run the full distance of the road duplication, totalling 36 kilometres in length and approximately 10 metres wide (i.e. including the table drain and batters). While the drains have the primary purpose of intercepting and directing water run-off from the road surface, they are also likely to provide additional terrestrial dispersal and foraging habitat for Growling Grass Frog (particularly during periods of inundation) as new drains are larger and will be inundated for longer periods. The swale drains will also supply water to the seven constructed wetlands and maintain the inflow from surface runoff on a

more certain basis given the concentrated flow that will be utilised to maintain their capacity. This is likely to be important during periods of low rainfall where wetland water permanency is important for this species.

Previous Monitoring Works

Long–term monitoring has not been undertaken within the local area and it is unknown how frogs move across the existing Princes Highway or whether there is likely to be increased mortalities associated with the Princes Highway Duplication project. As outlined above, the length of occupancy within waterbodies proposed to be removed is also unknown and the frequencies in which such waterbodies are visited by Growling Grass Frog.

Habitat Monitoring Protocol

Maintenance of all constructed Growling Grass Frog wetlands is to be undertaken, in particular the maintenance of aquatic vegetation diversity / structure and terrestrial habitats. This will be essential to ensure these habitat areas become and remain suitable for Growling Grass Frog. Once established, Growling Grass Frog wetlands will primarily be self-sustaining. It is expected that detailed design will result in the creation of Growling Grass Frog wetlands that do not require significant management, including the regulation of water levels. Habitat monitoring at constructed Growling Grass Frog waterbodies will be undertaken following their construction and subsequent inundation. The waterbodies shall be established and contain all of the key habitat features required by Growling Grass Frog (see Appendix 4). There will be a requirement for a 3-year maintenance period after the road works have been completed, and should waterbodies not support key habitat features suitable for Growling Grass Frog, there may be a requirement to extend the maintenance period until such time the waterbodies are suitable. After wetland established the maintenance of the waterbodies will become a responsibility of VicRoads as part of roadside management requirements for the life of the road.

Population monitoring for the species over a 10 year period is not considered necessary as a number of factors may influence the species presence within a wetland (i.e. drought, disease and predation), and therefore may not be directly attributed to the created wetland. Monitoring for the presence of the Growling Grass Frog will be undertaken at created wetlands and surrounding sites and reported as part of the annual monitoring at habitats that are proposed to be created.

Site-specific habitat variables will be recorded during the annual habitat monitoring and will include the following information:

- Terrestrial and aquatic vegetation (analysis of percentage cover of emergent, submerged, floating and fringing vegetation and terrestrial vegetation at constructed wetlands);
- Presence and abundance of predatory fish;
- Water quality (Appendix 4);
- Presence of hard rubbish or other sources of pollution;
- Pest animal prevalence;
- Weed and pest plant prevalence.
- Habitat affected by drought that would have previously provided suitable habitat for the species;

- Type and condition of surrounding habitat within 30 metres of each site (noting this may include modified pasture grasses as part of a secondary buffer area – Appendix 4); and
- The presence of Growling Grass Frog

A photographic reference will be taken at each wetland at a marked location so that comparisons of habitat conditions can be made over time.

Additional mitigation measures during construction

Mitigation measures to protect existing habitat values for Growling Grass Frog during construction will be undertaken at various waterbodies and drainage lines within the development footprint (Appendix 2) (Figures 2a-2y):

To mitigate potential risks to the species during construction, additional mitigation measures will be undertaken at 17 waterbodies that are in the vicinity of the construction footprint to ensure potential impacts to Growling Grass Frog and associated habitats are avoided / minimised. A list of waterbody locations and pre-construction requirements (i.e. pre-clearance surveys and 'No-Go Zone' fencing) associated with construction work is outlined below (Appendix 2).

Mitigation measures during construction include:

- An induction for all Contractors will include information regarding the appearance of Growling Grass Frog and management actions requirements to be undertaken during all stages of the project.
- A 'species fact sheet' will be provided to all work sheds so that the procedures for managing the detection of Growling Grass Frog for all staff are clearly accessible.
- Any waterbody or potential Growling Grass Frog terrestrial habitat located within 10-30 metres of the waterbody which is to be retained will have appropriate 'No-Go Zone' fencing located along the boundary of the construction footprint for protection (Figures 2a-2y).
- All 'No-Go Zone' areas will be clearly marked using highly visible para-webbing type fencing with appropriate signage to be displayed at all times (i.e. 'No-Go Zone – Important Fauna Habitat').
- The relocation of Growling Grass Frog will only be undertaken within distances ≤100 metres when detected during pre-clearance surveys or construction activities in accordance with Appendix 3.
- Pre-clearance surveys at waterbodies to be removed or impeded by construction works will only be undertaken where an existing waterbody or suitable habitat(s) (i.e. waterway or drainage line) are available to relocate individuals within ≤100m.
- The relocation of Growling Grass Frog within ≤100m of a removed waterbody will not occur across the Princes Highway or the Geelong–Warrnambool Railway as these are considered to be current barriers to dispersal.
- Any Growling Grass Frogs that are detected will be relocated appropriately as per the recommendations outlined below (Appendix 3).
- The creation of Growling Grass Frog habitat will follow the guidelines outlined below (Appendix 4). Waterbodies will be designed and located in areas that provide suitable natural hydrology regimes to allow for the filling of waterbodies during rainfall events.

- Monitoring of created habitat will be conducted annually for three years until waterbodies are established and support the key habitat features for Growling Grass Frog (Appendix 4).
- Each monitoring event will comprise an annual survey (between September and February each year), and will include the following (as a minimum):
    1. Habitat assessment documenting: the type and cover of fringing, emergent, submerged and floating aquatic vegetation, and other refugia; evidence of disturbance such as soil disturbance and erosion.
    2. *In-situ* water quality will also be measured including; Temperature (°C), DO (mg/L), pH, Conductivity (mS/cm), TDS and Turbidity.
    3. Completion of a field assessment sheet and relevant provision of site photos as detailed in Appendix 6.
    4. Monitoring will be reported back to VicRoads, DoE and DELWP and a report outlining the monitoring results will be provided annually.
- Any deterioration in habitat will be provided in the annual report so additional measures can be implemented (i.e. extra plantings, addition of water or extra habitats). This may also require extensions to the three year monitoring program to ensure the offsets have successfully been established prior to DoE's approval.

Likelihood of significant impacts for the permanent removal of waterbodies

While a number of waterbodies will be removed as part of the Princes Highway Duplication project, the provision of seven created waterbodies in strategic locations along the road alignment is considered to adequately offset the their removal of potentially suitable habitat for the species.

This is based on the following factors:

- Low quality waterbodies to be removed are not considered limiting habitat and habitat the species would use on a regular basis, or at all, when not located near important habitats such as Birregurra Creek or confirmed high quality habitats where the species has been detected.
- Seven waterbodies will be created with the aim of providing high quality breeding habitat at 'important' locations, and will be located in areas where Growling Grass Frog is known to, or is likely to occupy habitats (e.g. in the vicinity of Birregurra Creek).
- Growling Grass Frog is unlikely to use the low quality waterbodies that are proposed to be removed on a permanent basis and/or for breeding purposes.
- Appropriate mitigation measures including staff inductions, pre-clearance surveys and contingency measures (i.e. relocation) will be undertaken to prevent direct impacts to the species during construction or the removal of habitats.

Overall, the removal of low quality waterbodies is not considered likely to have a significant impact on the species provided the recommendations and mitigation measures outlined in this addendum are adhered to.

Habitat degradation

The majority of habitats proposed to be impacted are devoid of native terrestrial and aquatic vegetation, while remaining habitats throughout the road reserve are highly modified, with the exception of remnant vegetation patches outlined in Figures 2a-2y. For example, low quality waterbodies proposed to be removed lack extensive terrestrial or aquatic vegetation (i.e. native flora species, logs, rocks or ground debris) with most subject to grazing (unrestricted access) associated with agricultural practices (Plates 1 and 2) (Appendix 5).

While there will be direct vegetation removal during construction throughout areas surrounding existing waterbodies and waterways/drainage lines (which will be re-established with new drainage), this vegetation predominantly comprises exotic pasture grasses that provide marginal refuge and dispersal habitat(s) for the species.

Given that current vegetation quality within the Princes Highway road reserve and adjoining private properties is highly modified, further habitat degradation is unlikely to result from the Princes Highway Duplication project.

Plate 1: Low quality waterbody within the project alignment with little native terrestrial or aquatic vegetation (Source: Ecology and Heritage Partners Pty Ltd).

Plate 2: Low quality waterbody within the project alignment subject to grazing (Source: Ecology and Heritage Partners Pty Ltd).

Likelihood of significant impacts

There is considered to be no significant impacts with respect to further habitat degradation in association with the Princes Highway Duplication project provided appropriate mitigation measures for Growling Grass Frog and standard construction measures are followed at all stages of the project.

Potential impacts associated with hydrological changes

Given the nature of works within waterways there will be temporary disturbance to potential dispersal habitat for Growling Grass Frog and the natural hydrology (i.e. the duration or frequency of flooding events) associated within waterways during construction activities. As part of the Princes Highway Duplication

project, direct impacts to Growling Grass Frog dispersal habitat will occur during the installation of infrastructure associated with works in waterways.

Based on the hydrology assessment undertaken by AECOM (2013), there will be 54 crossings including 2 waterways and 52 culvert crossings. There is expected to be direct short-term impacts associated with all 54 crossings given the high level of infrastructure required to be added to complete the road duplication.

Works in Waterways and Drainage Lines

Birregurra Creek

The works proposed for Birregurra Creek will involve the construction of a single span bridge on the new carriageway (east bound) which will have a short term impacts on the waterway during construction (a bridge current exists at this location).

The section of Birregurra Creek associated with construction works is likely to dry out during summer as has been observed during previous seasons (A, Taylor. pers. obs.), therefore works will be prioritised for summer, where possible, to avoid alterations to hydrology or potential increases to sedimentation downstream as part of the installation of the infrastructure and to maintain the Growling Grass Frog's ability to move through the landscape at this location. This can be achieved through the implemtation of a No-Go Zone to maintain connectivity at this location. Growling Grass Frog is also considered less likely to disperse through the construction site if there is little or no water flowing during works.

However, the timing of works may extend into wetter periods of the year when the species is still active and/or construction activities may encounter high rainfall once works they have commenced. Connectivity under the bridge to allow for Growling Grass Frog dispersal during favourable conditions will remain available through appropriate mitigation measures and site specific fencing.

Sheepwash Creek (Drainage Line (52DL) and Waterbodies 51a/52a)

Sheepwash Creek forms a tributary of Birregurra Creek although the flow has been halted through the creation of a stock crossing running under the Princes Highway which has the stopped natural water flows under normal conditions. A large culvert will be placed on the northern side of the Princes Highway to duplicate the highway (Plate 4). While there are permanent areas of water both north and south of the Princes Highway, there are likely to be minimal impacts to these habitats during construction (Plates 3 and 4). Waterbody 51a will be removed during construction; however, appropriate mitigation measures will be implemented (Plate 5).

Given Sheepwash Creek has now been modified and rarely flows under normal conditions, dispersal by Growling Grass Frog under the Princes Highway is unlikely to occur via this crossing on a regular basis. The hydrology of this crossing will not be further impacted as flows under the Princes Highway have already been modified by the cattle underpass.

Plate 3: 52DL south of the Princes Highway (Ecology and Heritage Partners Pty Ltd).

Plate 4: 52a north of the Princes Highway 2011 (Ecology and Heritage Partners Pty Ltd).

Plate 5: 51a north of the Princes Highway (Ecology and Heritage Partners Pty Ltd).

Culvert Crossings and Minor Drainage Lines

Fifty-two (52) culvert crossings will be installed as part of the Princes Highway Duplication project as outlined in the AECOM (2013) report. All culvert crossings will ensure there is no restriction to the flow of water under the Princes Highway or the movement of fauna following their installation. As outlined above, it is unknown if or how often Growling Grass Frog currently use culverts to move under the Princes Highway.

Culverts will not be installed under the full length of both roads: instead two separate culverts will be installed ensuring that natural light enters both ends of the culvert enabling the ability for fauna (including Growling Grass Frog) to disperse under the highway. While there will be temporary ground disturbances associated with construction works, the vegetation proposed for removal is likely to be highly modified in the majority of instances and dry, in which pre-clearance surveys will not be required unless the culvert is within a designated 30 metre buffer area (Figure 2a-2y).

Mitigation Measures

- All temporary crossings structures used for the construction of watercourses will be completely removed on project completion.
- Other temporary works such as access tracks will be removed in a way that does not leave the waterway or drainage vulnerable to future erosion events.
- Reinstatement works will ensure the hydrology and impacts outside the construction footprint such as erosion and sediment run-off is managed appropriate during all phases of construction.
- The construction site should be left in a condition that promotes the re-growth of aquatic vegetation, without remnant fill and rubble covering the channel.
- At Sheepwash Creek pre-clearance surveys and relocation measures will be undertaken during the removal of waterbody 51a and areas adjoining important habitats 52a and 52DL.
- Any Growling Grass Frog detected during pre-clearance surveys or general construction works must be relocated in accordance with the measures outlined in Appendix 3.
- Frog dispersal corridors must be maintained outside related construction activities through appropriate protective measures (i.e. No-Go Zones).
- Works within waterways must ensure that the flows within the creek are maintained outside construction activities.
- A designated No-Go Zone will be established at Birregurra Creek to restrict the movement of staff and equipment from the works area into the creek and maintain a habitat movement corridor for the Growling Grass Frog (Figures 2q and 2o).

Likelihood of significant impacts

Given the nature of flows within waterways, drainage lines and stand-alone waterbodies which intersect or are located in proximity to the Princes Highway currently, there is likely to be no significant impact to Growling Grass Frog or associated hydrology during the construction works associated with the project.

While the species may be encountered during construction activities, pre-construction surveys and maintaining hydrology and dispersal corridors outside construction works will assist in minimising the short-term impacts to the species within the local area.

Potential impacts associated with road mortality

Major construction activities associated with the Princes Highway Duplication have the cumulative potential to increase the short-term barrier effects to Growling Grass Frog which may cross the highway during favourable conditions (i.e. heavy rains). Road mortalities may also be an impact associated with construction given the increased plant and light vehicle traffic associated with construction activities.

Results of targeted surveys (Ecology and Heritage Partners 2012b), revealed a total of three Growling Grass Frogs within two waterbodies along the project alignment and an additional incidental record outside the project investigation area. Monitoring by DELWP located a further three Growling Grass Frog records in proximity to the Princes Highway and areas identified by Ecology and Heritage Partners (Figures 2a-2y).

The Princes Highway and the Geelong–Warrnambool railway between Colac and Winchelsea may currently act as a barrier for Growling Grass Frog. The project will lead to the maintenance of key existing dispersal corridors traversing the highway, including Birregurra Creek, Sheepwash Creek, drainage lines and existing culvert crossings (Figures 2a–2y).

Culverts will not be installed under the full length of both roads, rather, two separate culverts will be installed ensuring that natural light enters both ends of the culvert enabling the ability for fauna (including Growling Grass Frog) to disperse under the highway.

Based on the historical data and discussions with relevant herpetologist expert Garry Peterson (DELWP), major watercourses including Birregurra Creek and Sheepwash Creek appear to act as a suitable dispersal corridors for Growling Grass Frog and these will be maintained for dispersal at all times.

Given the homogenous nature of the landscape surrounding the Princes Highway Duplication, the ability for Growling Grass Frog to disperse between waterbodies is not likely to be impacted by the proposed construction works. There is a high density of waterbodies (farm dams) located in proximity to the Princes Highway that are not proposed to be impacted, and therefore after mitigation and habitat creation measures are undertaken, the species is likely to continue to disperse within and between waterbodies (e.g. Birregurra Creek) during all stages of the project and when the duplication is completed.

Mitigation Measures

- Birregurra Creek will be bridged to allow for habitat connectivity north and south of the highway.
- During construction dispersal opportunities and north-south connectivity for the Growling Grass Frog will be retained in Birregurra Creek at all times through the implementation of No-Go Zones (Figure 2o).
- The relocation of Growling Grass Frog within ≤100m of a removed waterbody will not occur across the Princes Highway or the Geelong–Warrnambool railway.

Likelihood of significant impacts

With the exception of relevant construction works, the Princes Highway Duplication project is unlikely to further fragment and isolate local Growling Grass Frog populations provided the project is undertaken in according with the mitigation measures outlined in this addendum response. During construction there will be continuous measures to ensure frog dispersal and to reduce direct mortality to frogs (i.e. pre-clearance surveys, staff awareness and relocation measures).

The Princes Highway and adjoining Geelong–Warrnambool railway are considered to already create some form of barrier affect for the dispersal of Growling Grass Frog across the landscape. Therefore, provided appropriate measures are adhered to during construction, there are unlikely to be any additional barriers to dispersal for Growling Grass Frog within and between sites.

Construction Associated Impacts

Standard VicRoads contract clauses (i.e. Section 177 Environmental Management) will be utilised as a minimum to address the management requirements for all elements of the environment.

The contract specification will then be supplemented to address any additional requirements, including where appropriate, any of the mitigation measures proposed in this addendum to avoid/minimise the impacts on the Growling Grass Frog.

The Contractor is required to prepare an Environment Management Plan (EMP) to address the requirements of the specification and to document how all of the objectives of the specification are to be met.

The following section discusses the key mitigation measures from VicRoads Section 177 Environmental Management contract clauses to be implemented during the project as a minimum requirement for Growling Grass Frog. A full copy of the standard environmental requirements (i.e. prior to the development/inclusion of specific requirements for) as found in Section 177 - Environment Management (Major) is provided as Appendix 6.

The impact of erosion and sedimentation

Given the extensive areas of vegetation to be cleared as part of the Princes Highway Duplication project, there is the potential for direct or indirect impacts through erosion and sedimentation run-off into potential Growling Grass Frog habitats adjoining the construction zone if not managed appropriately.

High levels of sedimentation or erosion has the ability to decrease water quality within waterways or waterbodies used by Growling Grass Frog for potential breeding, foraging or refuge habitat (i.e. Waterbodies 26a and 38a where Growling Grass Frog were detected).

Suitable mitigation measures (see below) will be implemented and therefore habitats and the species is not likely to be significantly impacted, if at all, by the proposed road development.

Mitigation Measures

All exposed surfaces shall be free of or treated to minimise erosion. Erosion and sediment controls shall include but are not limited to:

- Ensure the protection of key habitats in proximity to the construction zone are protected from sedimentation (or further sedimentation if water quality is already poor) during all stages of the project (i.e. waterbodies 19a, 28, 26a, 38a, 42, 43, 52a and 66a; Figures 2a-2y).
- Any waterbody or drainage line which is located within 30 metres of the construction footprint will have appropriate erosion and sediment controls installed to ensure no sediment laden water enters the waterbody as a result of construction works associated with the project.
- Prompt temporary and/or permanent progressive revegetation of the site as work proceeds.
- Installation and maintenance of erosion and sedimentation controls, established in accordance with EPA best practice guidelines for the treatment of sediment laden run-off resulting from construction activities.
- Where construction activities are undertaken in, near or over waters, controls shall be established to protect beneficial uses in accordance with any permit, the *State Environmental Planning Policy (Waters of Victoria)* and referenced EPA best practice guidelines.

Stockpiles

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

Likelihood of significant impacts

While there is likely to be some short-term sedimentation associated with the project during times of rainfall, these will be managed appropriately through specific mitigation measures. Long-term impacts are unlikely to result from this project given that areas which have been cleared will be reinstated as soon as practicable to pre-construction levels to ensure future erosion or sedimentation levels are controlled.

Provided appropriate sediment and erosion controls are implemented during rain events in accordance with a suitably prepared EMP, there is considered to be no significant impacts associated with the Princes Highway Duplication project and Growling Grass Frog habitat(s) in proximity to the construction zone.

Noise and Light Pollution

There are no proposed night time works associated with the Princes Highway Duplication project. Given Growling Grass Frog are typically more active during the night impacts to foraging, breeding and hunting activities are not likely to be associated with noise or light pollution during construction.

Ecology and Heritage Partners has undertaken long term monitoring along the Pakenham Bypass located in Victoria between Beaconsfield and Officer, continuing eastwards on the southern side of Pakenham for a distance of approximately 20 kilometres. The bypass has a high level of traffic and associated noise and light pollution in which Growling Grass Frog has been recorded using created habitats within the road reserve over consecutive monitoring seasons for foraging, dispersal and breeding purposes (Ecology and Heritage Partners Pty Ltd 2008; 2009; 2010c; 2011).

Mitigation Measures

- Hours of work shall be between 7am and 6pm weekdays and Saturday.

Likelihood of significant impacts

Growling Grass Frog in proximity to the Princes Highway Duplication project are not likely to be impacted by noise and light pollution during construction works. While there will be increased noise levels associated with construction, this is unlikely to directly impact the species ability to use habitats within the landscape for breeding, foraging or dispersal as has been observed along the Pakenham Bypass (Ecology Partners Pty Ltd 2011). Overall, there are likely to be no significant impacts related to noise and light pollution associated with the project.

Fuels and Chemicals

Fuels and chemicals which are used during construction have the risk of leakage or spillage and the potential to run-off site into creeks or culverts containing aquatic or terrestrial habitat(s) where Growling Grass Frog may occur and/or be residing.

Mitigation Measures

- Nominated points for the refuelling and fluid top up of vehicles and plant and the storage of fuels and chemicals shall be undertaken in a designated area within the construction footprint at least 30 metres from any existing waterbodies, drainage lines or waterway.
- The relevant EMP will include specific procedures (i.e. use of spill kits) to mitigate the effect on the environment from fuels and chemicals, including herbicides and pesticides throughout all phases of construction.

Likelihood of significant impacts

There is unlikely to be any associated impacts to Growling Grass Frog and associated habitats with respect to the storage and management of fuels and chemicals as part of the Princes Highway Duplication project provided appropriate mitigation measures are adhered to during all phases of the project.

Weeds, Pests and Diseases

There is likely to be some initial use of herbicides to manage the encroachment of weeds post-construction before they become a significant problem. However, given the pressures from surrounding agricultural and historical land-use practices, the level of biocides associated with the management of the Princes Highway Duplication project is considered to be low in comparison to the level of chemicals used in the adjoining landscape.

Mitigation Measures

- A frog sensitive herbicide (non-residual herbicide) will be used within 30 metres of waterways, created and existing waterbodies or drainage lines. The use of other herbicides or pesticides within, or in proximity to these areas will be prohibited.

Likelihood of significant impacts

There is unlikely to be any associated impacts to Growling Grass Frog and associated habitats with respect to the management of weeds and pests as part of the Princes Highway Duplication project provided appropriate mitigation measures are adhered to during all phases of the project.

POTENTIAL IMPACTS TO LISTED THREATENED FISH SPECIES

Australian Grayling

Targeted surveys for Australian Grayling have been undertaken within the Barwon River (at Winchelsea) and the species was not detected (Ecology Partners Pty Ltd 2010a; 2010b). However, the species is notoriously difficult to detect during targeted surveys.

With the exception of the Barwon River, there is considered to be a low likelihood of Australian Grayling occurring within the majority of the study area; the ephemeral waterways such as Birregurra Creek and associated tributary drainage lines are considered to be too high within the local catchment, with not enough permanent water and fast flows to provide suitable habitat for the species.

Likelihood of significant impacts

Given no major works adjoining the Barwon River (at Winchelsea) are associated with this project, no significant impacts to Australian Grayling will be associated with the Princes Highway duplication project.

Macquarie Perch

The Macquarie Perch is naturally a riverine fish preferring deeper pools, while this species also prefers breeding habitat to be associated with flowing water where there are rock or gravel substrates.

Historically this species is known from the Murray–Darling Basin. During the late 1800s and early 1900, attempts to translocate the species into coastal river basins were undertaken, with populations now persisting in the Yarra and Glenelg Rivers.

Although there are some historical records of Macquarie Perch in Barwon River, there are no longer considered to be self–sustaining populations occurring there.

As such, the Barwon River basin is excluded from the potential habitat modelling for Macquarie Perch under the *Draft referral guidelines for the endangered Macquarie perch Macquaria australasica* (SEWPaC 2011a).

Likelihood of significant impacts

As per the *Draft referral guidelines for the endangered Macquarie perch Macquaria australasica* (SEWPaC 2011a), the project is outside the known range of suitable habitat for the species. As such, no significant impacts are likely.

Dwarf Galaxias and Yarra Pygmy Perch

Given the presence of suitable habitat for Dwarf Galaxias and Yarra Pygmy Perch within the Princes Highway Duplication alignment, targeted surveys were recently undertaken by Ecology and Heritage Partners (Ecology and Heritage Partners Pty Ltd 2013b).

While some suitable habitat for both Dwarf Galaxias and Yarra Pygmy Perch were found in the study area, the likely use of these habitats by these species is subject to their persistence in refuge pools within the local catchment; no such refuge pools were detected during the current survey (Ecology and Heritage Partners Pty Ltd 2013b). Yarra Pygmy Perch in particular are known to favour systems that have local permanent water, and thus are unlikely to occupy the habitats within the study area even after significant flooding events.

While Dwarf Galaxias exploit infrequently inundated habitats such as those found throughout the study area, and are known travel significant distances upstream under high–flow conditions for spawning, the lack of records for Dwarf Galaxias in the immediately connected Barwon River, and the lack of suitably vegetated refuge pools within the local catchment makes their presence highly unlikely (Ecology and Heritage Partners Pty Ltd 2013b).

Likelihood of significant impacts

While there was some suitable ephemeral habitat present for Yarra Pygmy Perch and Dwarf Galaxias located within or in proximity to the study area, further investigation identified there were no suitable refuge pools from which a source–population could be sustained during dry periods. Therefore, the habitats implicated in

the development are highly unlikely to be utilised by these species, regardless of the presence of potentially suitable habitat features, and no significant impacts are likely.

POTENTIAL IMPACTS TO GOLDEN SUN MOTH *SYNEMON PLANA*

Golden Sun Moth has not been recorded within 10 kilometres of the study area (DSE 2011a), although DoE's PMST predicted suitable habitat for the species to occur within 10 kilometres of the study area (SEWPaC 2013). Extant DSE mapping shows isolated occurrences of Plains Grassy Woodland and Grassy Woodland, with occurrences of Floodplain Riparian Woodland (EVC 56) following DSE's Ecological Vegetation Class (EVC) benchmarks, Stony Rises Woodland (EVC 203), Plains Sedgy Wetland (EVC 647) and Swamp Scrub (53) (DSE 2011a). EVCs recorded within the study area during the assessment are outlined in Table 1 below.

Table 1. EVCs mapped within the study area.

Otway Plain bioregion		
Grassy Woodland	175	Endangered
Plains Grassy Wetland	125	Endangered
Swamp Scrub	53	Vulnerable
VVP bioregion		
Plains Grassy Woodland	55	Endangered
Plains Sedgy Wetland	647	Endangered
Floodplain Riparian Woodland	56	Endangered

While small remnant patches of vegetation were recorded, canopy tree species were largely absent from all vegetation types within the study area, therefore EVC classification was largely based on the presence/abundance of native understorey species such as Kangaroo Grass *Themeda triandra*, Bristly Wallaby–grass *Rytidosperma setaceum*, Spear–grasses *Austrostipa* spp. and Grey Tussock–grass *Poa sieberiana*.

The majority of land surrounding the Princes Highway alignment is highly modified as a result of previous agricultural practices (i.e. cropping and grazing), dominated by introduced pastures grasses and planted vegetation. As outlined in the *Significant impact guidelines for the critically endangered Golden Sun Moth (Synemon plana)* (DEWHA 2009b), the species is vulnerable to disturbance regimes including ploughing, heavy grazing and the removal or degradation of grass plants which is consistently observed in land adjoining the Princes Highway. Overall, there is limited connectivity to large areas of remnant vegetation within the local area. Furthermore, many of the remnant patches do not contain remnant trees perhaps indicating that vegetation had been once cleared.

This may also explain the presence of extensive sections of planted vegetation and colonising ground species such as Golden Wattle *Acacia pycnantha*, Bristly Wallaby–grass and Spear–grasses located within the road reserves. There is considered to be a low likelihood that Golden Sun Moth (or a resident population) is present within the Princes Highway Duplication project alignment given the modified nature of remnant habitat(s) which are small in size, degraded and have poor connectivity to more suitable habitat within the local area.

Likelihood of significant impacts

Overall, none of the significant impact criteria outlined in DoE's 'Significant impact guidelines 1.1 (pg. 10)' (DEWHA 2009), will be directly associated with this species and the Princes Highway Duplication project. Some of these impacts which will not be associated with this project are listed below (DEWHA 2009a):

- A lead to long-term decrease in the size of a population;
- Reduced area of occupancy by the species;
- Adversely impacting habitat critical to the survival of a species;
- Modifying, destroying, removing, isolating or decreasing the availability of quality of habitat to the extent that the species is likely to decline; and
- Introducing disease or invasive species that may cause decline or decease available habitat.

For example, there is only one patch of the remnant Plains Grassy Woodland (PGW3) located within the proposed alignment which reaches 0.5 hectares in area. Within this patch, the native grass cover accounts for less than 50% of the vegetative cover, the weed cover is greater than 25% and the understorey vegetation displays low flora diversity (<10 indigenous species).

Given that many of the remnant patches identified during detailed assessments are small and are rarely connected within 200 metres of one another, it is unlikely there will be any significant impacts to Golden Sun Moth associated with this project based on the significant impact thresholds identified within DoE's guidelines (DEWHA 2009a; 2009b).

POTENTIAL IMPACTS TO LISTED THREATENED FLORA SPECIES

The detailed flora surveys were undertaken during spring, which is considered to be an optimal time for identification of flora species within the study area (Ecology and Heritage Partners 2012c; 2012d).

While there are records of Clover Glycine, Spiny Rice–flower, Spiny Peppercress and Basalt Peppercress within close proximity to the study area (i.e. within 5km) (see Figure 3 of Ecology and Heritage Partners, 2012c; 2012d), no individuals were recorded during the detailed assessment.

Further targeted surveys were not recommended based on the timing of the original assessment being optimum (and sub optimal in the case of Spiny Rice–flower) for locating these threatened species and the modified nature of the understorey vegetation present within the study area.

Clover Glycine

No Clover Glycine plants were recorded within the study area during the detailed assessment. There has been one record of this species within the local area (dated 2001) recorded approximately 4 kilometres north of the proposed alignment.

Likelihood of significant impacts

Given the modified nature of the study area and the low diversity present within the understorey vegetation, it is considered unlikely for this species to occur within the proposed alignment. Based on this, it is not expected that any Clover Glycine plants would be impacted by the Princes Highway Duplication Project.

Spiny Rice–flower

No Spiny Rice–flower plants were recorded within the study area during the detailed assessment. There have been seven records of this species within the local area (most recent dated 2007), the closest recorded approximately 3 kilometres north of the proposed alignment.

Likelihood of significant impacts

Given the modified nature of the study area and the low diversity present within the understorey vegetation, it is considered unlikely for this species to occur within the proposed alignment. Based on this, it is not expected that any Spiny Rice–flower plants would be impacted by the Princes Highway Duplication Project.

Spiny Peppercress

No Spiny Peppercress plants were recorded within the study area during the detailed assessment. There have been six records of this species within the local area (most recently dated 2009), directly downstream along the banks of the Barwon River north of the Princes Highway bridge in Winchelsea.

Likelihood of significant impacts

Given the highly modified nature and low diversity of suitable habitat for this species (riparian vegetation) within the study area, it is considered unlikely for this species to occur within the proposed alignment. Based on this, it is not expected that any Spiny Peppercress plants would be impacted by the Princes Highway Duplication Project.

Basalt Peppercress

No Basalt Peppercress plants were recorded within the study area during the detailed assessment. There have been two records of this species within the local area (most recently dated 2000), the closest recorded approximately 2 kilometres north of the proposed alignment around Lake Colac.

Likelihood of significant impacts

Given the highly modified nature and low diversity of suitable habitat for this species (around the margins of freshwater and saline marshes and shallow lakes) within the study area, it is considered unlikely for this species to occur within the proposed alignment. Based on this, it is not expected that any Spiny Peppercress plants would be impacted by the Princes Highway Duplication Project.

POTENTIAL IMPACTS TO STRIPED LEGLESS LIZARD *DELMA IMPAR* AND CORANGAMITE WATER SKINK *EULAMPRUS TYMPANUM MARNIEAE*

Striped Legless Lizard

In the state of Victoria, DELWP has developed a document to cover both policy and procedures for the relocation of threatened fauna titled the '*Policy and procedure statement for the translocation of threatened vertebrate fauna in Victroria*' (DSE 2011b). The document only applies to threatened native vertebrate fauna under the Victorian *Flora & Fauna Guarantee Act 1988* (FFG Listed species) or EPBC Act-Listed species.

The document and procedures aim to assist any proposal that requires the potential salvage and translocation of a threatened vertebrate fauna species and this must be approved by DELWP's 'Translocation Evaluation Panel' (TEP). Given the low likelihood of detecting Striped Legless Lizard *Delma impar*, Ecology and Heritage Partners wrote a letter to the TEP seeking further direction for the treatment of this species as part of the Princes Highway Duplication project.

The summary letter has been attached as Appendix 8 (Ecology and Heritage Partners Pty Ltd 2013a), which outlines the current habitat attributes present within the existing and current Princes Highway alignment, in addition to the proposed treatment for Striped Legless Lizard during construction activities associated with the project (if detected unexpectedly).

The likelihood of Striped Legless Lizard being present within or in proximity to the proposed Princes Highway Duplication area was considered low during previous assessments(Ecology and Heritage Partners Pty Ltd 2012c; 2013a).

In addition, there is only one patch of Plains Grassy Woodland EVC that reaches the minimum size threshold of 0.5 hectares; however, the quality is considered to be poor overall (see below for a description in Section 7). All remaining patches are small and isolated and under pressure from exotic weeds associated with common agricultural practices and the existing Princes Highway.

Based on the current size and quality of habitat located in proximity to the Princes Highway, there is considered to be no direct impacts to Striped Legless Lizard or preferred habitats associated with the Princes Highway Duplication project.

Likelihood of significant impacts

Overall, there is considered to be no significant impacts on Striped Legless Lizard associated with the Princes Highway Duplication project as none of the significant impact criteria outlined in DoE's 'Significant impact guidelines 1.1 (pg. 10)' (DEWHA 2009) will be directly associated with the species. This is based on a low likelihood of the species occurring within the project area and the lack of potentially suitable habitat(s).

Corangamite Water Skink

Corangamite Water Skink habitat typically consist of large rocky basalt outcrops located near remnant vegetation and adjacent permanent or ephemeral wetlands including deep freshwater marshes, permanent open freshwater lakes, semi-permanent saline marshes and permanent saline lakes (Peterson and Robertson 2011). Remnant vegetation comprises native plants such as Scrub Nettle *Urtica incisa*, Variable Groundsel *Senecio pinnatifolius*, Tall Sedge *Carex appressa* and Tree Violet *Melicytus dentata* (Peterson and Robertson 2011). These habitat characteristics are not present within the proposed Princes Highway Duplication alignment. This is likely to be the reason for this species being detected by the PMST; however, there is considered to be no suitable habitat within the study area for this species and no further consideration is required.

Likelihood of significant impacts

As no suitable habitat is present for this species and no extant populations are known to-occur and/or are likely to-occur within the Princes Highway Duplication alignment, there is considered to be no significant impacts on Corangamite Water Skink associated with the project as none of the significant impact criteria

outlined in DoE's 'Significant impact guidelines 1.1 (pg. 10)' (DEWHA 2009) will be directly associated with the species.

ECOLOGICAL COMMUNITIES

Two nationally listed ecological communities, Grassy Eucalypt Woodland of the Victorian Volcanic Plain and Natural Temperate Grassland of the Victorian Volcanic Plain, both listed as critically endangered under the EPBC Act, were predicted by the PMST to occur within 10 kilometres of the study area (Ecology and Heritage Partners 2012c; 2012d).

An additional two ecological communities, Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains and White Box–Yellow Box–Blakely's Red Gum Grassy Woodland and Derived Native Grassland have also been suggested by DoE as requiring consideration as part of the EPBC referral decision for this project (EPBC 2012/6568). A discussion of each nationally listed ecological community can be found below.

Grassy Eucalypt Woodland of the Victorian Volcanic Plain

Remnant native vegetation from the Plains Grassy Woodland EVC within the study area may be considered to be part of the EPBC Act listed Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP) community if it meets the specified size and condition thresholds (SEWPaC 2011b). The key diagnostic criteria and condition thresholds present within the study area, as outlined in EPBC Act Policy Statement (SEWPaC 2011b) for GEWVVP include:

- A minimum patch size of 0.5 hectares;
- One or more of the following grass genera accounts for at least 50% of the perennial ground layer cover: Themeda (Kangaroo–grass), Rytidosperma (Wallaby–grass), Austrostipa (Spear–grass) Microlaena (Weeping–grass) and/or Poa (Tussock–grass).

OR

- If native grasses account for less than 50% of the perennial ground cover layer, then the patch is either:
    - A valuable wildflower site where at least 50% of the ground layer vegetative cover is represented by native dryland forbs during spring–summer; OR
    - Not heavily invaded by perennial weeds such that perennial weeds comprise less than 70% of the ground layer vegetative cover; OR
    - If perennial weeds comprise more than 70% of the ground layer vegetative cover, then the patch must have more than ten native perennial species per 100m2 AND a density of at least three big trees per hectare.

Likelihood of significant impacts

Only one patch of the habitat zone PGW3 within the proposed alignment meets the minimum size requirement of 0.5 hectares. Within this patch, the native grass cover accounts for less than 50% of the vegetative cover, the weed cover is greater than 25%, the understorey vegetation displays low flora diversity

(<10 indigenous species) and there are no canopy trees present. Based on this, it was determined that it did not meet the condition thresholds for this EPBC Act listed community and is therefore not considered to be part of this nationally significant community.

Natural Temperate Grasslands of the Victorian Volcanic Plain

Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) is listed as critically endangered under the EPBC Act.

This ecological community is typically associated with the Plains Grassland EVC, which was not recorded within the study area and therefore, this community was not considered any further as potentially occurring (SEWPaC 2011b).

Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains

The Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains ecological community was officially listed under the EPBC Act in March 2012. The detailed flora assessment was undertaken prior to this listing in October 2011, and therefore, was not considered in Ecology and Heritage Partners 2012.

As per the listing advice (SEWPaC 2012a), two wetland EVCs which are considered to most likely correspond to the Seasonal Herbaceous Wetland ecological community, were recorded within the study area (Plains Sedgy Wetland and Plains Grassy Wetland). Only one patch of Plains Grassy Wetland (PGWe1) within the proposed alignment meets the minimum size requirement of 0.5 hectares.

Likelihood of significant impacts

This patch contains greater than 50% cover of Common Tussock–grass Poa labillardierei, which is listed as a typical species of this ecological community; however, there were no other graminoid or forb species present. Therefore, this wetland is not consistent with the key diagnostic characteristics of the Seasonal Herbaceous Wetlands and does not form part of this ecological community.

White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

White Box, Yellow Box and Blakely's Red Gum were not recorded within the study area and therefore vegetation within the study area was not considered to be part of this nationally significant community.

OFFSETS

No additional offsets are required for the removal of vegetation under the EPBC Act Offset Policy as there are no matters of National Environmental Significance present within the study area (SEWPaC 2012b).

FIGURES

Legend

Construction Footprint (with 2m buffer)

Vegetation

Plains Grassy Woodland

Planted trees and shrubs

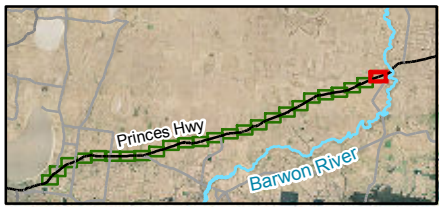
Fauna Habitat

Low Quality Waterbody

Impact

Waterbody removed (no pre-clearance survey required)

Waterbody not impacted (no pre-clearance surveys required)



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2a

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

Legend

- Construction Footprint (with 2m buffer)

Vegetation

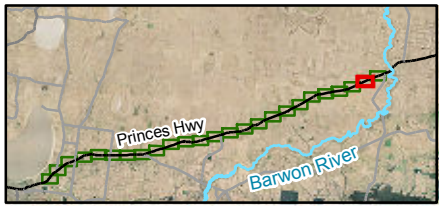
- Plains Grassy Woodland
- Planted trees and shrubs

Fauna Habitat

- Low Quality Waterbody
- Embedded Rock/Rock Piles

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- No Go Zone Fencing



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2b

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

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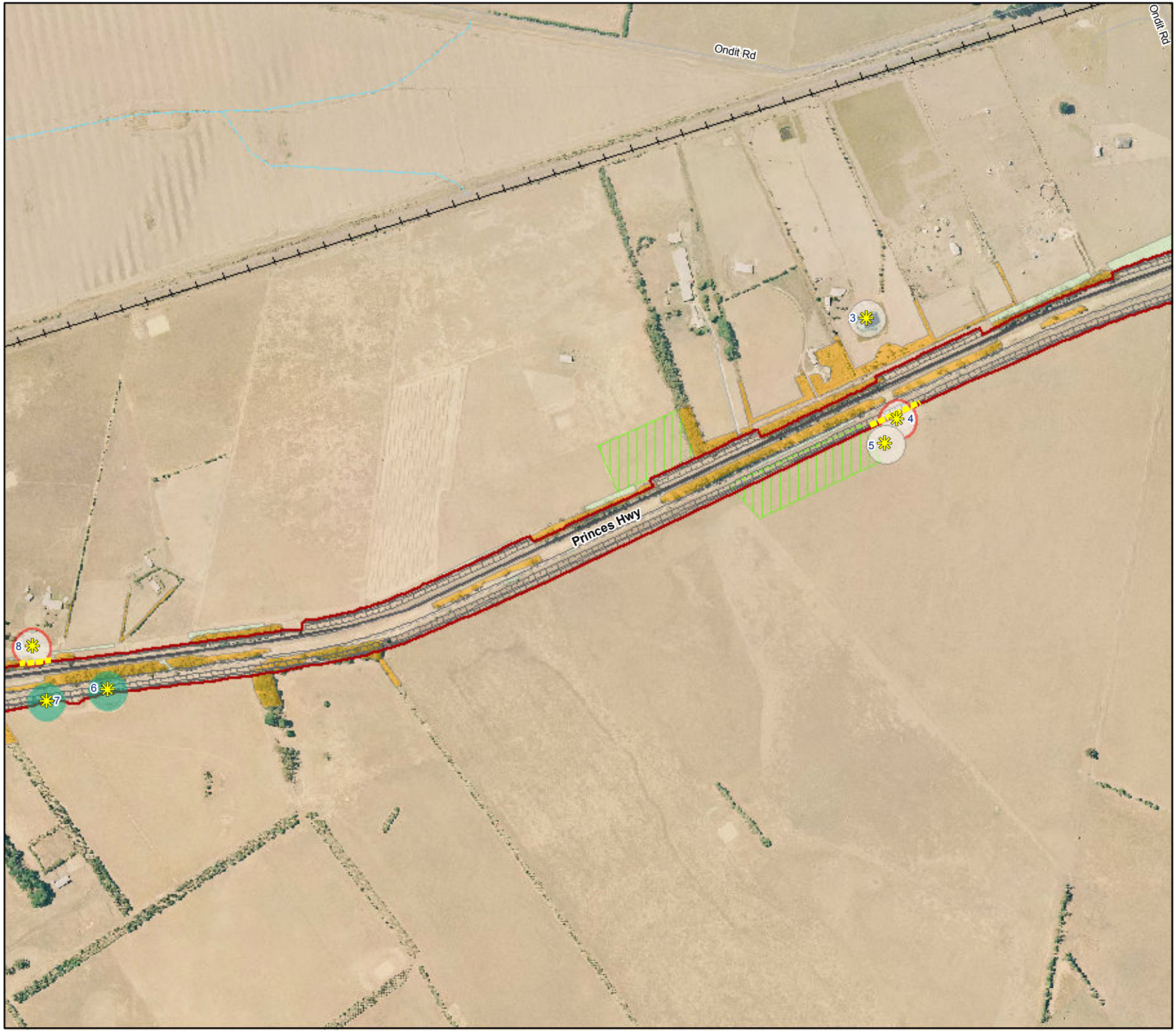


Legend

- Construction Footprint (with 2m buffer)

Vegetation

- Plains Grassy Woodland
- Planted trees and shrubs

Fauna Habitat

- Low Quality Waterbody
- Embedded Rock/Rock Piles

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- No Go Zone Fencing

NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2c

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG

Legend

- Construction Footprint (with 2m buffer)

Vegetation

- Plains Grassy Woodland
- Planted trees and shrubs

Fauna Habitat

- Low Quality Waterbody

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- Indicative area of proposed habitat creation
- No Go Zone Fencing

NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2d

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

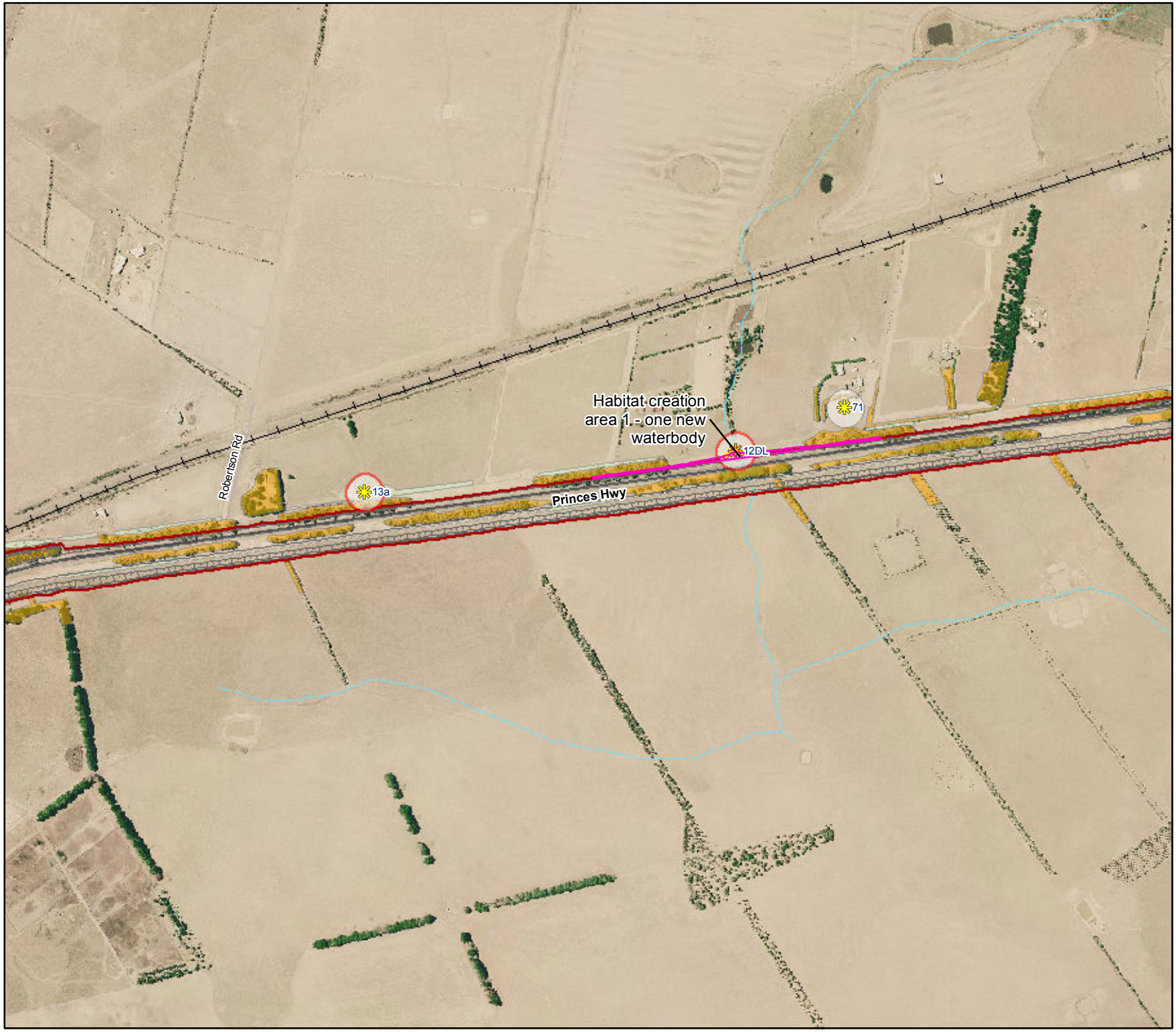
N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG



Legend

- Construction Footprint (with 2m buffer)

Vegetation

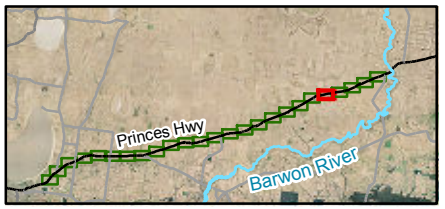
- Plains Grassy Woodland
- Planted trees and shrubs

Fauna Habitat

- Moderate Quality Waterbody
- Low Quality Waterbody

Impact

- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- Indicative area of proposed habitat creation
- No Go Zone Fencing



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2e

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG

Legend

- Construction Footprint (with 2m buffer)

Vegetation

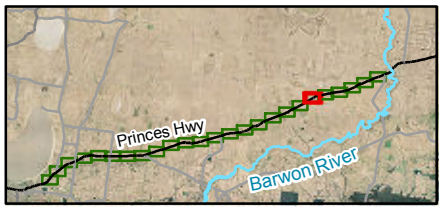
- Plains Grassy Woodland
- Planted trees and shrubs

Fauna Habitat

- Low Quality Waterbody
- Embedded Rock/Rock Piles

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- No Go Zone Fencing



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2f

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG

Legend

- Construction Footprint (with 2m buffer)

Vegetation

- Plains Grassy Woodland
- Planted trees and shrubs

Fauna Habitat

- Moderate Quality Waterbody
- Low Quality Waterbody
- Embedded Rock/Rock Piles

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- No Go Zone Fencing

NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2g

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

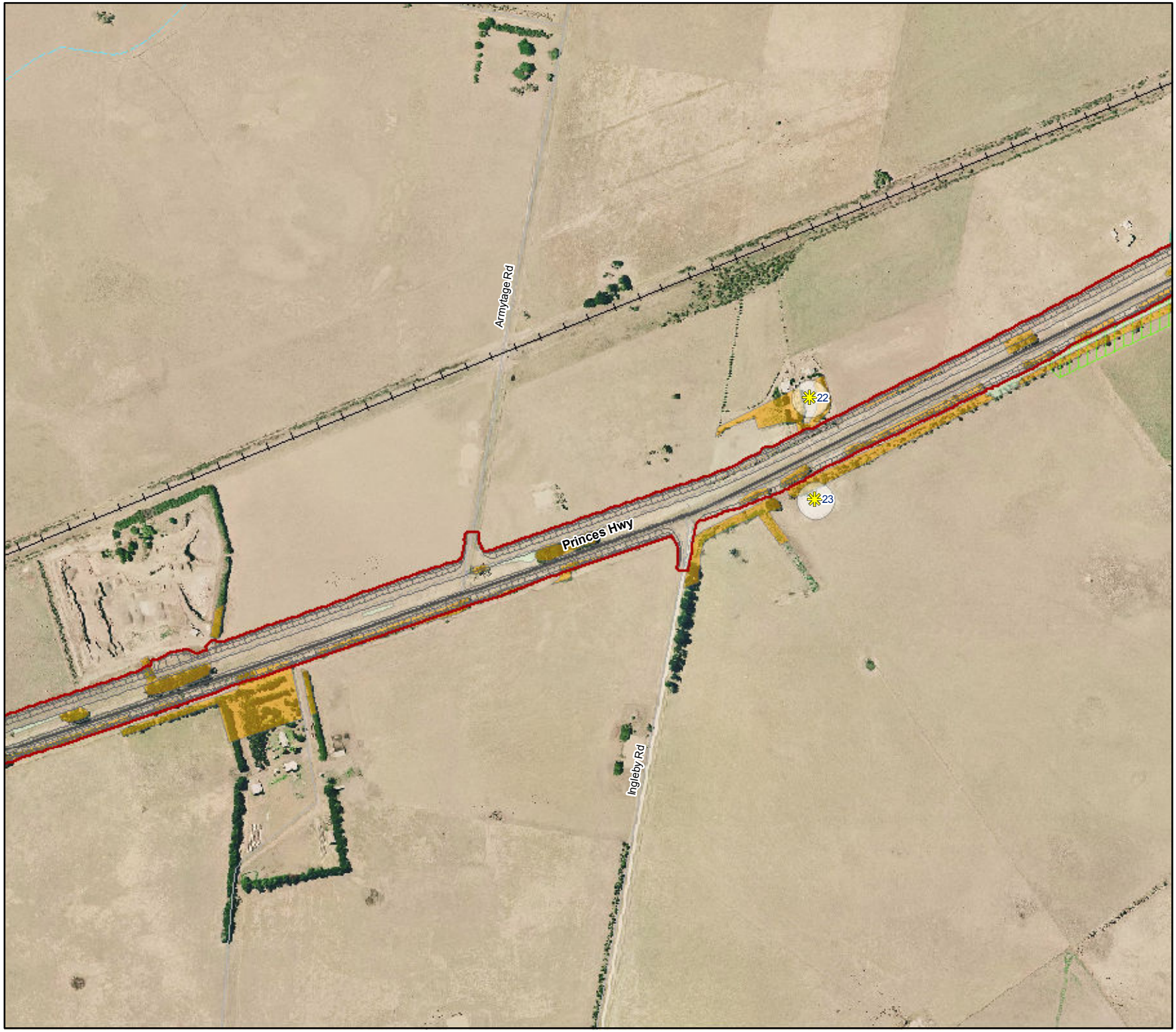
N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG



Legend

- Construction Footprint (with 2m buffer)

Vegetation

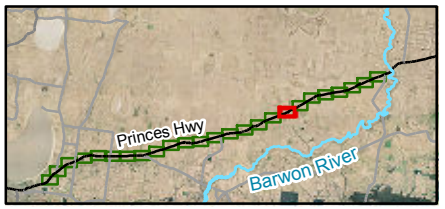
- Plains Grassy Woodland
- Planted trees and shrubs

Fauna Habitat

- Low Quality Waterbody
- Embedded Rock/Rock Piles

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2h

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

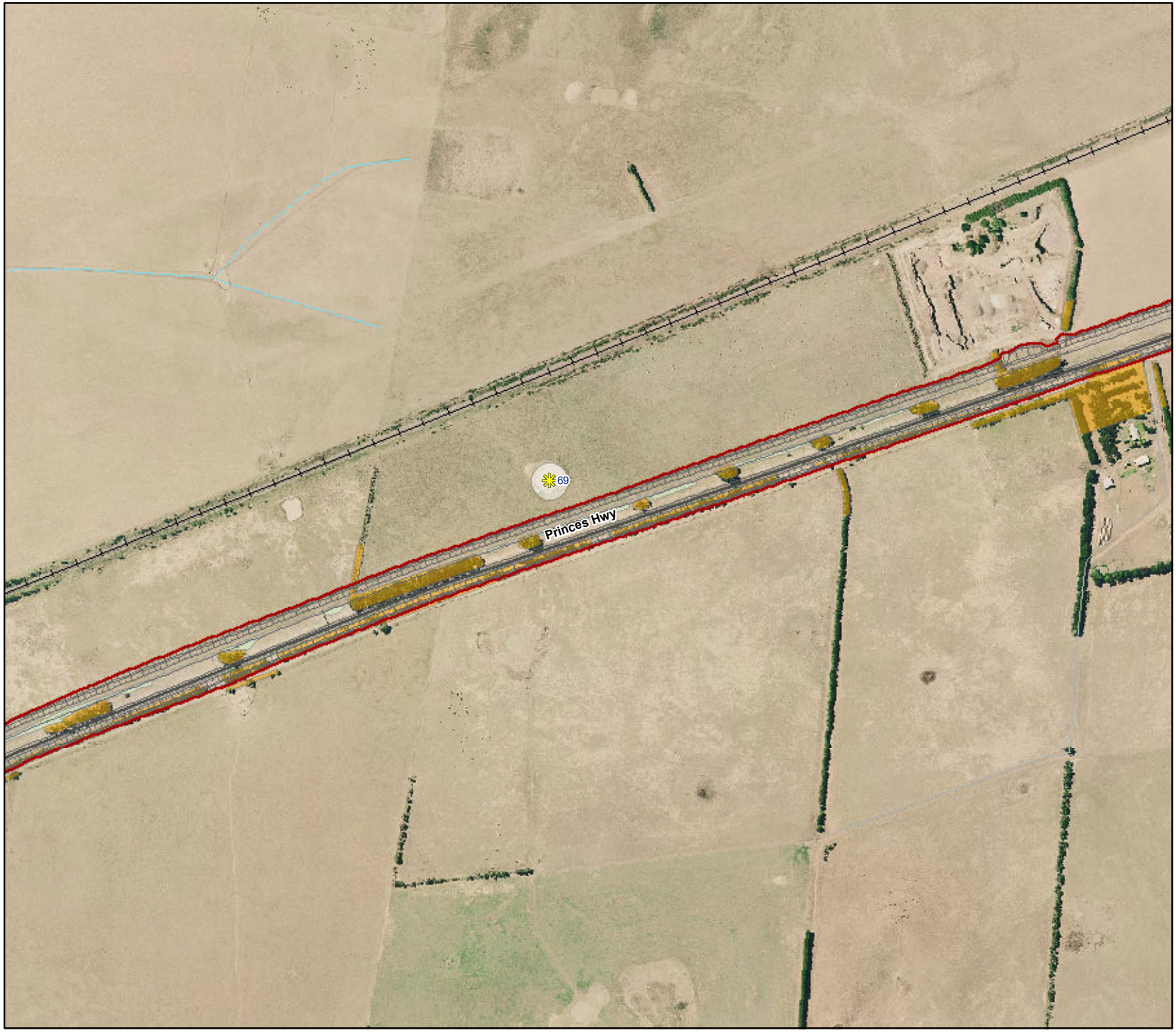
N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG



Legend

Construction Footprint (with 2m buffer)

Vegetation

Plains Grassy Woodland

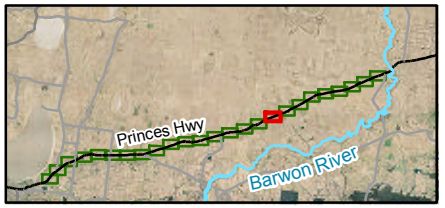
Planted trees and shrubs

Fauna Habitat

Low Quality Waterbody

Impact

Waterbody not impacted (no pre-clearance surveys required)



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2i

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

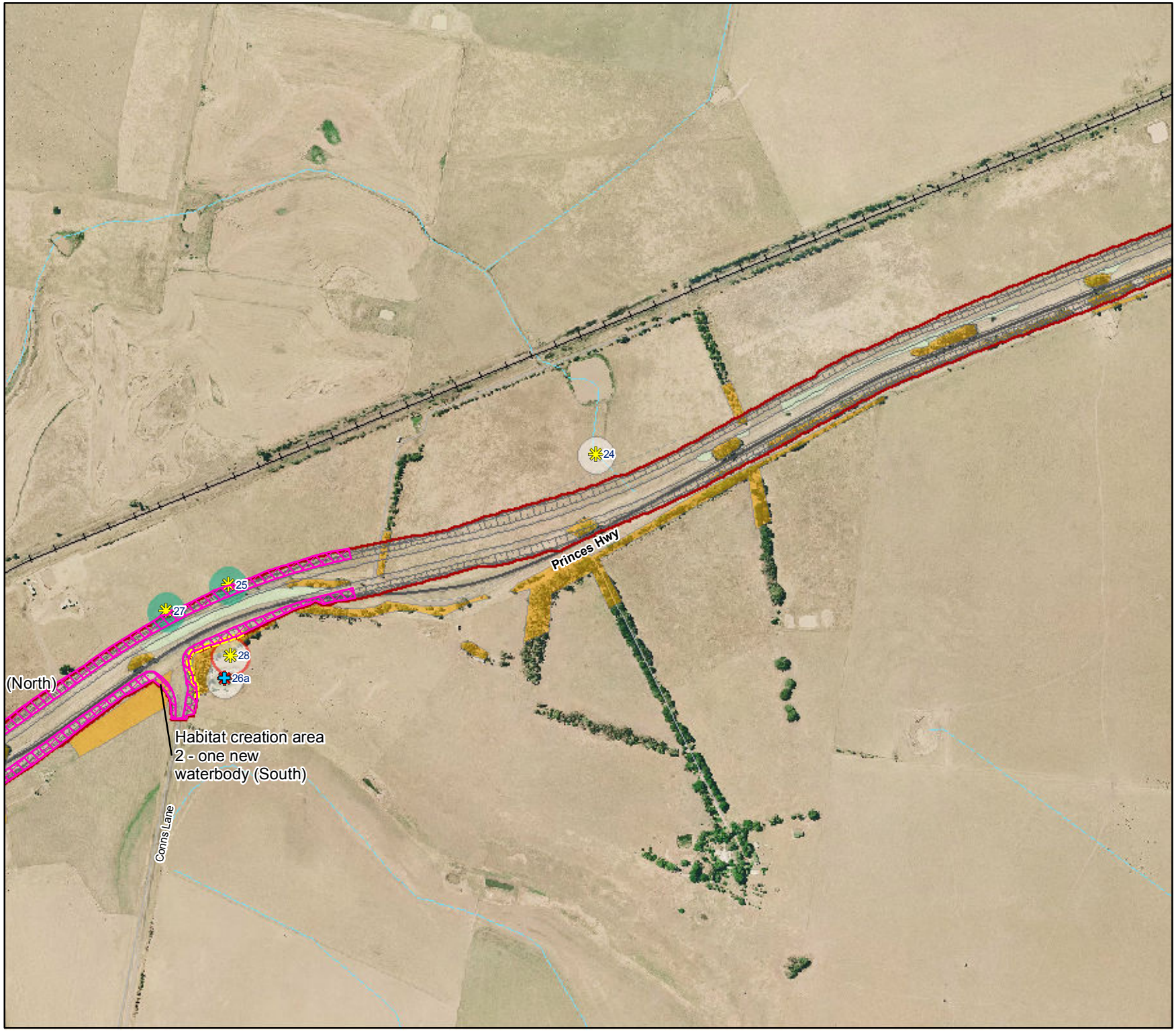
N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG



Legend

- Construction Footprint (with 2m buffer)

Vegetation

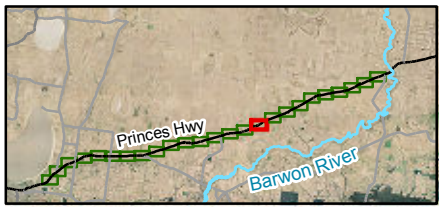
- Plains Grassy Woodland
- Planted trees and shrubs

Fauna Habitat

- High Quality Waterbody
- Low Quality Waterbody
- Previous Growling Grass Frog records

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- Indicative area of proposed habitat creation
- No Go Zone Fencing



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2j

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

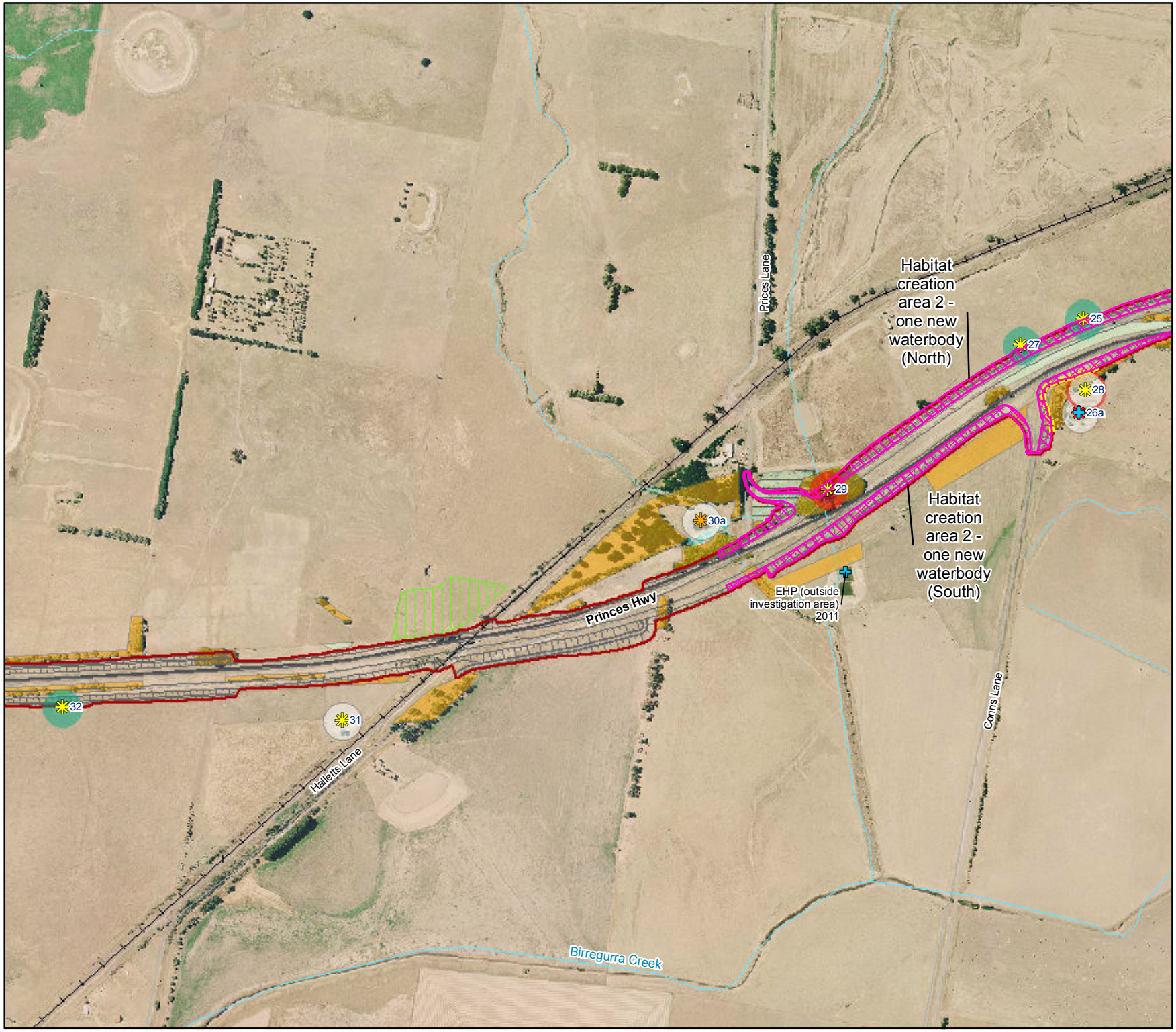
N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG



Legend

- Construction Footprint (with 2m buffer)

Vegetation

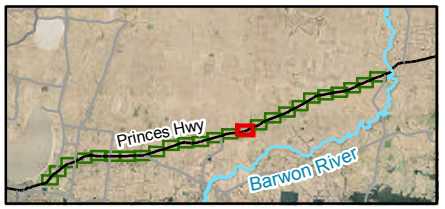
- Grassy Woodland
- Swamp Scrub
- Plains Grassy Woodland
- Planted trees and shrubs

Fauna Habitat

- High Quality Waterbody
- Moderate Quality Waterbody
- Low Quality Waterbody
- Embedded Rock/Rock Piles
- Previous Growling Grass Frog records

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody removed (pre-clearance survey required)
- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- Indicative area of proposed habitat creation
- No Go Zone Fencing



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2k

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

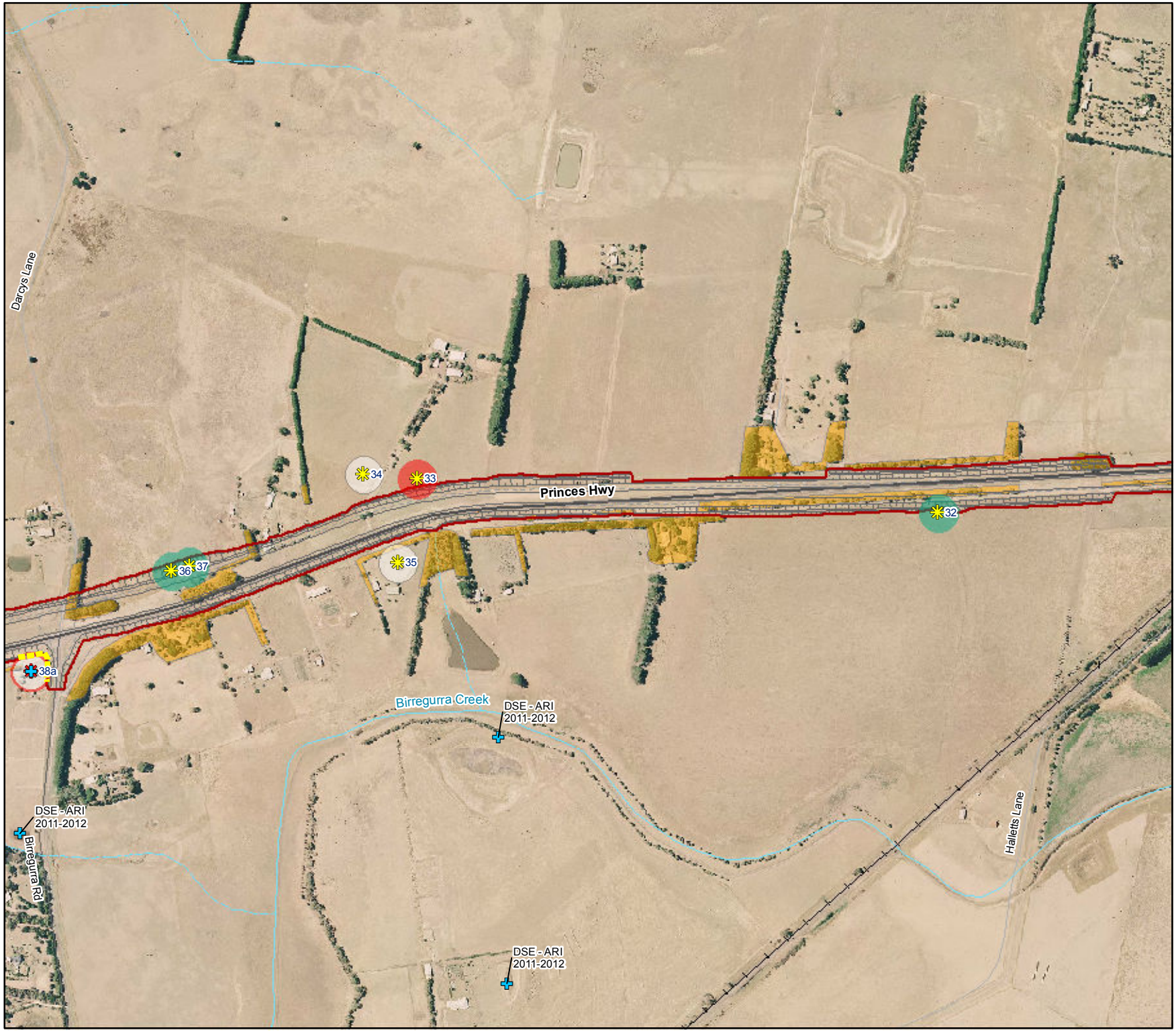
N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG



Legend

- Construction Footprint (with 2m buffer)

Vegetation

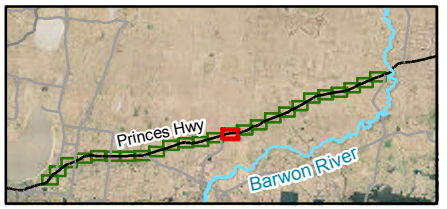
- Planted trees and shrubs

Fauna Habitat

- High Quality Waterbody
- Low Quality Waterbody
- Previous Growling Grass Frog records

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody removed (pre-clearance survey required)
- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- No Go Zone Fencing



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2l

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG

Legend

- Construction Footprint (with 2m buffer)

Vegetation

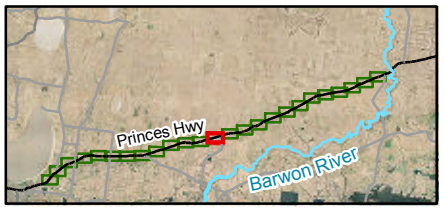
- Grassy Woodland
- Planted trees and shrubs

Fauna Habitat

- High Quality Waterbody
- Low Quality Waterbody
- Previous Growling Grass Frog records

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody removed (pre-clearance survey required)
- Waterbody not impacted (pre-clearance survey required)
- No Go Zone Fencing



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2m

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

Legend

Construction Footprint (with 2m buffer)

Vegetation

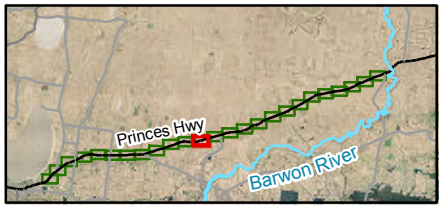
Planted trees and shrubs

Fauna Habitat

Low Quality Waterbody

Impact

Waterbody removed (pre-clearance survey required)



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2n

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG

Legend

- Construction Footprint (with 2m buffer)

Vegetation

- Swamp Scrub
- Plains Grassy Wetland
- Planted trees and shrubs

Fauna Habitat

- High Quality Waterbody
- Low Quality Waterbody
- Previous Growling Grass Frog records

Impact

- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- Pre-clearance survey required
- Indicative area of proposed habitat creation
- No Go Zone Fencing

NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2o

Fauna habitat impacted within the study area

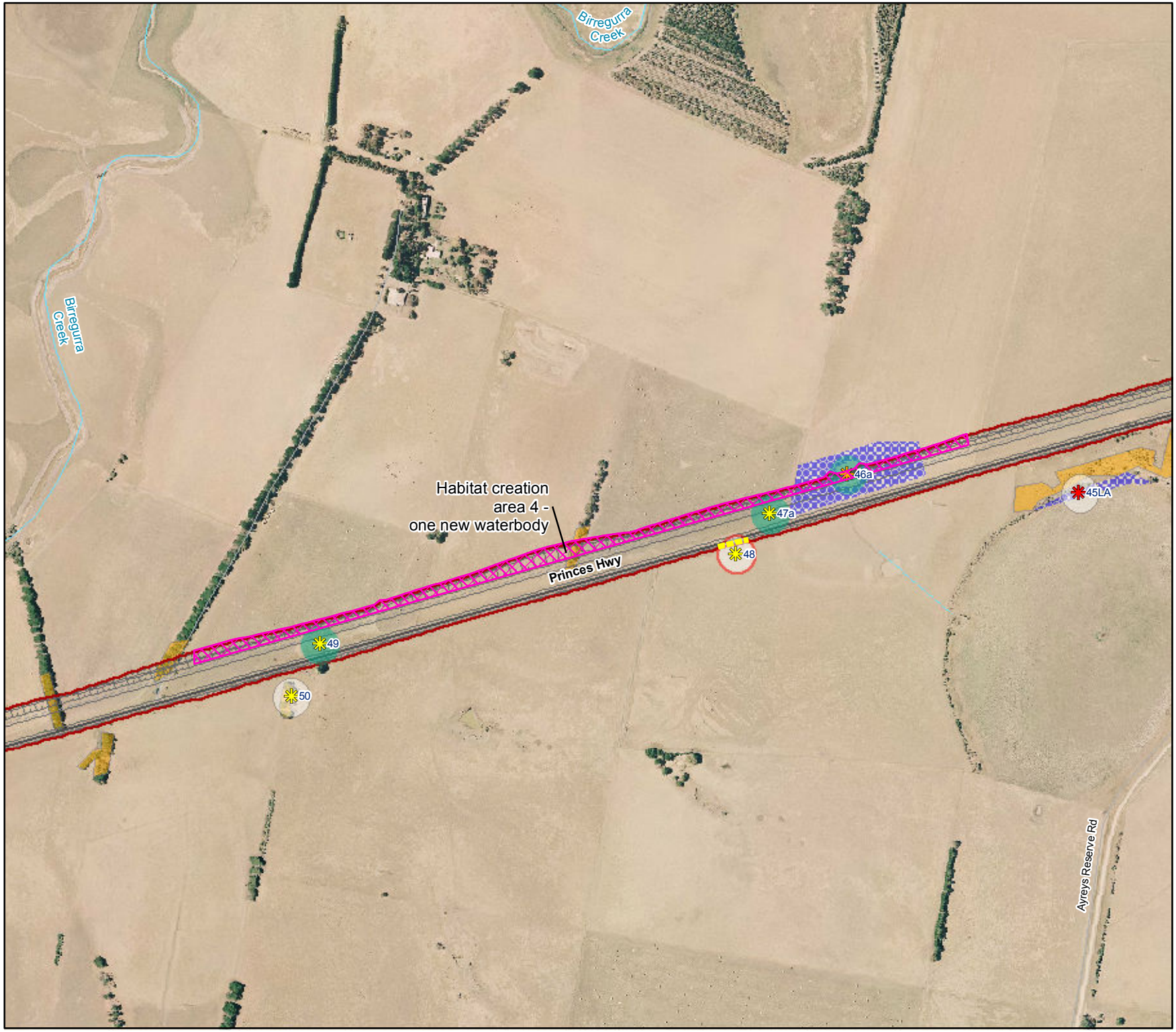
Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners



Legend

- Construction Footprint (with 2m buffer)

Vegetation

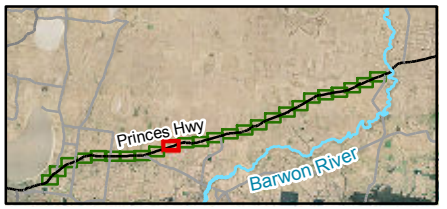
- Plains Grassy Wetland
- Planted trees and shrubs

Fauna Habitat

- High Quality Waterbody
- Moderate Quality Waterbody
- Low Quality Waterbody

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- Indicative area of proposed habitat creation
- No Go Zone Fencing



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2p

Fauna habitat impacted within the study area

Princes Highway Duplication Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG

Legend

- Construction Footprint (with 2m buffer)

Vegetation

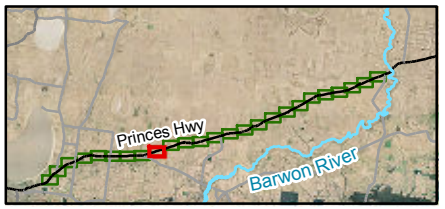
- Plains Sedgy Wetland
- Planted trees and shrubs

Fauna Habitat

- High Quality Waterbody
- Moderate Quality Waterbody
- Low Quality Waterbody

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody removed (pre-clearance survey required)
- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- Indicative area of proposed habitat creation
- No Go Zone Fencing



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2q

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

Legend

Construction Footprint (with 2m buffer)

Vegetation

Planted trees and shrubs

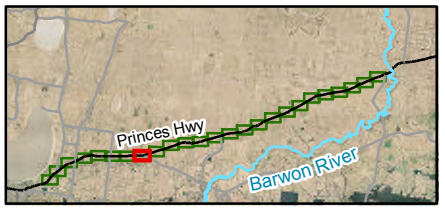
Fauna Habitat

Low Quality Waterbody

Impact

Waterbody removed (no pre-clearance survey required)

Waterbody not impacted (no pre-clearance surveys required)



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2r

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG

Legend

- Construction Footprint (with 2m buffer)

Vegetation

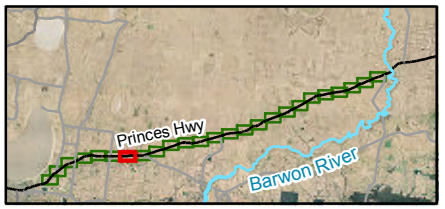
- Grassy Woodland
- Planted trees and shrubs

Fauna Habitat

- Moderate Quality Waterbody
- Low Quality Waterbody

Impact

- Waterbody not impacted (no pre-clearance surveys required)



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2s

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

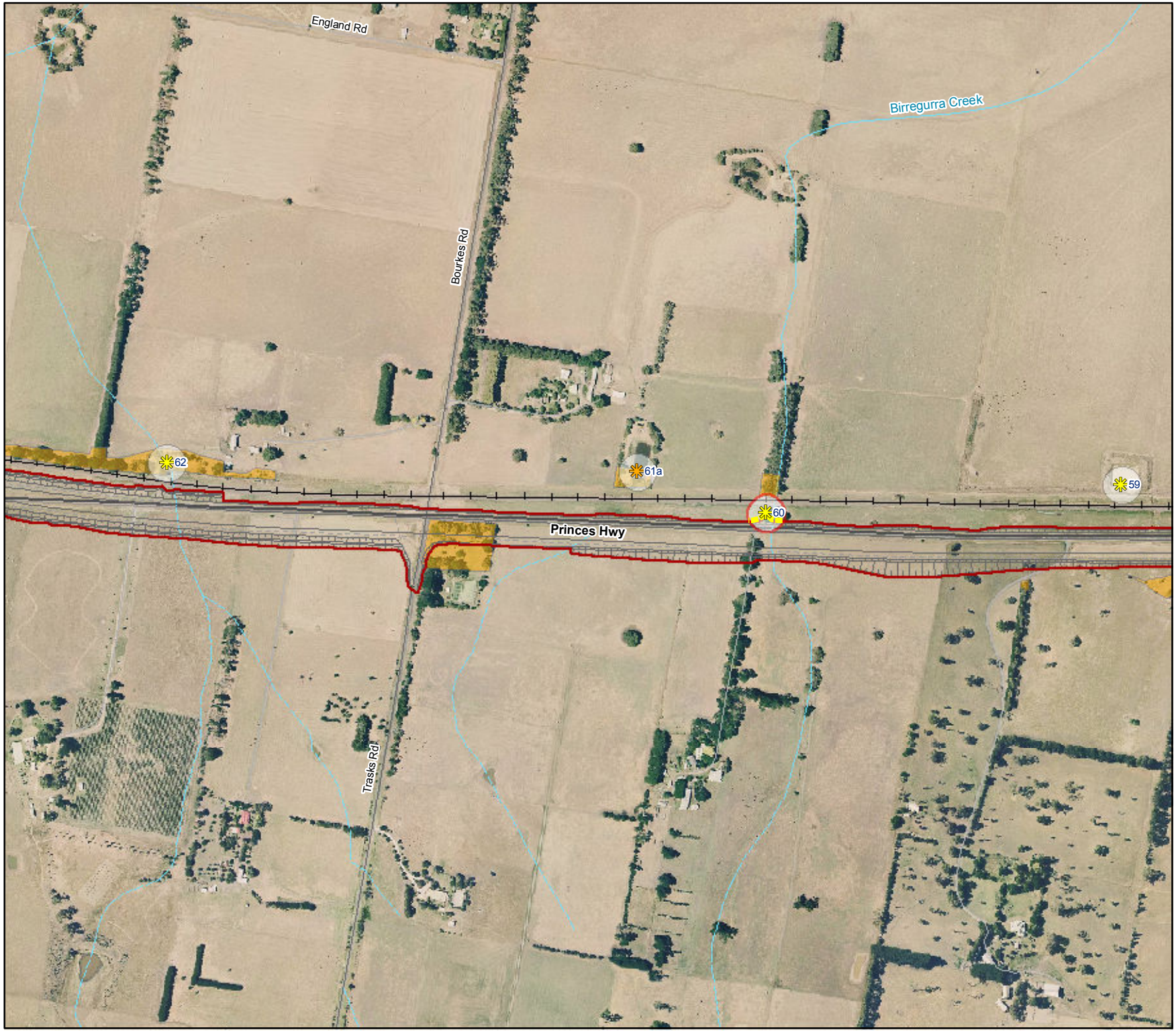
N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG



Legend

- Construction Footprint (with 2m buffer)

Vegetation

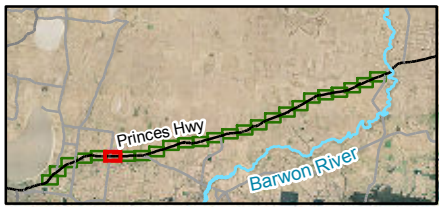
- Grassy Woodland
- Planted trees and shrubs

Fauna Habitat

- Moderate Quality Waterbody
- Low Quality Waterbody

Impact

- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- No Go Zone Fencing



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2t

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

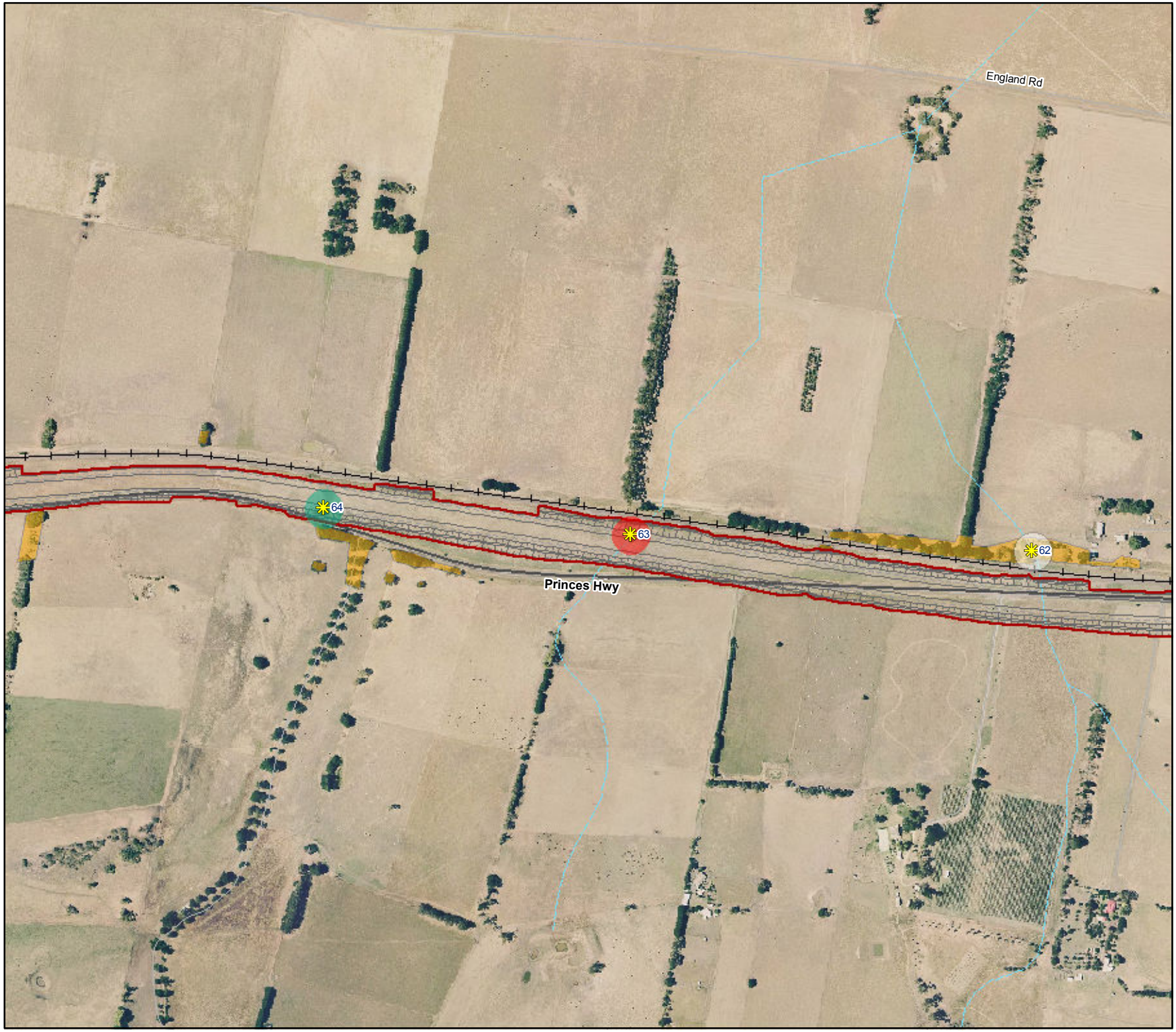
N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG



Legend

- Construction Footprint (with 2m buffer)

Vegetation

- Planted trees and shrubs

Fauna Habitat

- Low Quality Waterbody

Impact

- Waterbody removed (no pre-clearance survey required)
- Waterbody removed (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)

NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2u

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG

Legend

Construction Footprint (with 2m buffer)

Vegetation

Planted trees and shrubs

Fauna Habitat

Low Quality Waterbody

Impact

Waterbody not impacted (no pre-clearance surveys required)

NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2v

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG

Legend

- Construction Footprint (with 2m buffer)

Vegetation

- Planted trees and shrubs

Fauna Habitat

- Moderate Quality Waterbody
- Low Quality Waterbody

Impact

- Waterbody not impacted (pre-clearance survey required)
- Waterbody not impacted (no pre-clearance surveys required)
- No Go Zone Fencing

NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2w

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

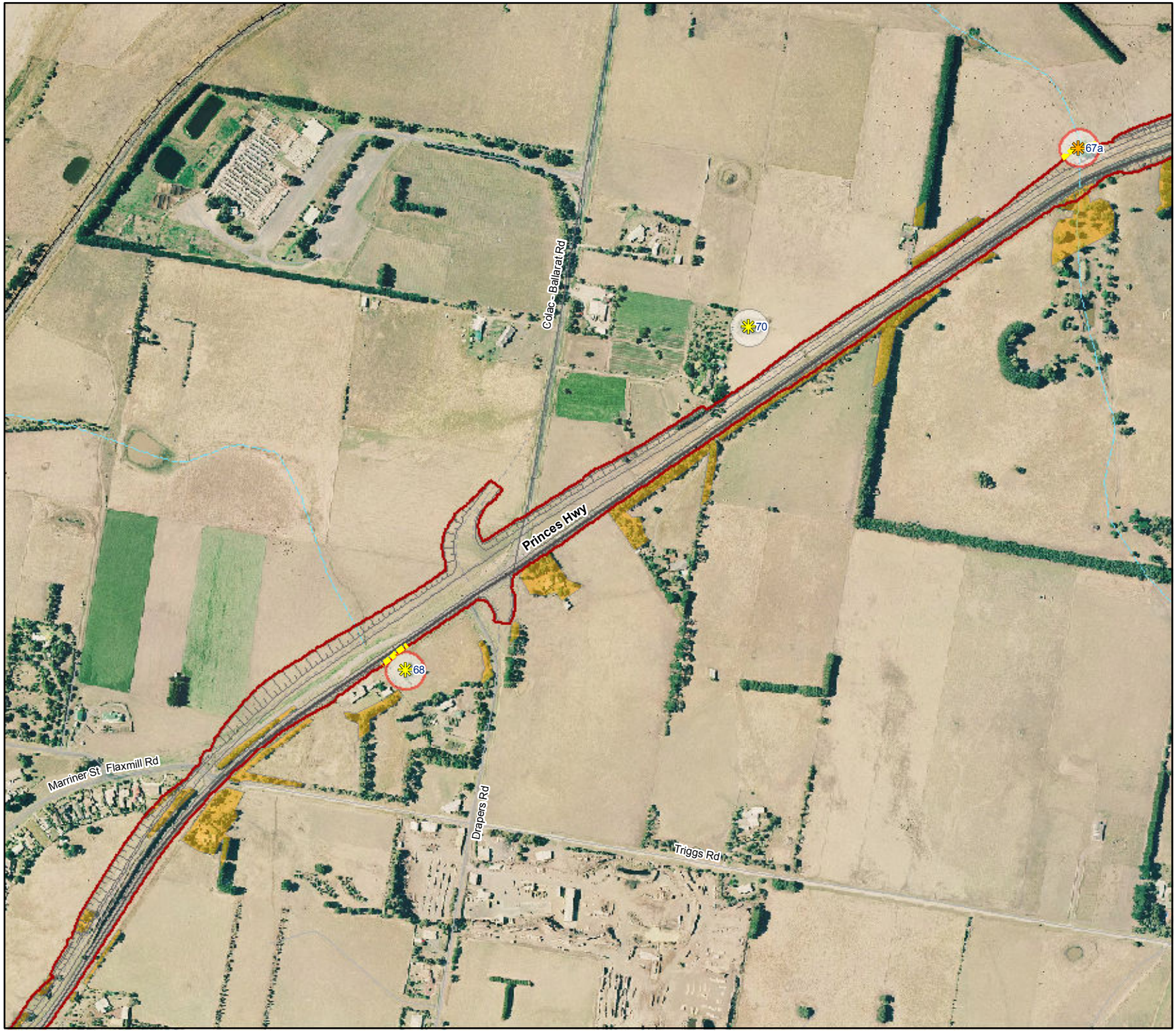
N

0 125 250

Metres

ecology & heritage partners

4865_Fig02_EcoFeatures.mxd (#4676) 21/10/2015 RG



Legend

Construction Footprint (with 2m buffer)

Vegetation

Planted trees and shrubs

Fauna Habitat

Moderate Quality Waterbody

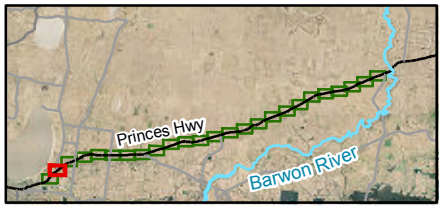
Low Quality Waterbody

Impact

Waterbody not impacted (pre-clearance survey required)

Waterbody not impacted (no pre-clearance surveys required)

No Go Zone Fencing



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2x

Fauna habitat impacted within the study area

Princes Highway Duplication
Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

Legend

Construction Footprint (with 2m buffer)

Vegetation

Planted trees and shrubs

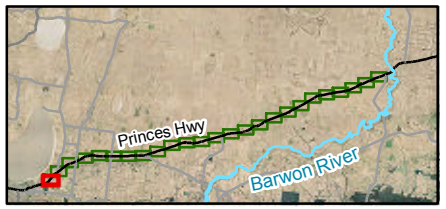
Fauna Habitat

Low Quality Waterbody

Impact

Waterbody not impacted (pre-clearance survey required)

No Go Zone Fencing



NOTE: Vegetation mapping is based on a site ssessment undertaken in October 2011. The boundary of mapped vegetation patches identified may vary over time due to seasonal variation in growth, decline, structural changes and/or natural regeneration due to changes in land management practice. Aerial photography is from 2007.

Figure 2y

Fauna habitat impacted within the study area

Princes Highway Duplication Winchelsea to Colac

N

0 125 250

Metres

ecology & heritage partners

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APPENDICES

Appendix 1 – Areas Proposed for Habitat Creation (Offset)

To determine the suitability of offsets for the Princes Highway Duplication project the guidelines for offsetting recommended by SEWPaC (2012) have been taken into consideration which define environmental offsets as: "*measures that compensate for the residual adverse impacts of an action on the environment*". The aim of offsets is to provide environmental benefits to compensate for potential impacts of an action after avoidance and mitigations measures have been applied (SEWPaC 2012).

Habitat Creation Area	Waterbody number(s)	Total distance / proximity of cluster (distance between outer waterbodies)	Map Reference	Location to Princes Highway	Approximate number of waterbodies within 1000m without dispersal barriers and excluding waterbodies 'to be' removed	Proposed number of waterbodies to offset habitat removal	Explanation for habitat creation
1	12DL [Drainage Line}	>1000 metres	2e	North and South	7	1	This drainage line is likely to facilitate north – south dispersal for Growling Grass Frog between larger more permanent waterbodies to the north and throughout the local area during suitable conditions (i.e. high rainfall). It is proposed that a new waterbody is built at this location to provide habitat for Growling Grass Frog. The waterbody will be located near the 12DL drainage line and will be situated on the north side of the Princes Highway.
2	25, 27 and 29	670 metres	3j and 3k	North	4	2	Two waterbodies are proposed to replace low quality waterbodies 25, 27 and 29. On the northern side of the Princes Highway, a waterbody should be constructed adjacent to the drainage line near waterbody 29. On the southern side of the Princes Highway a waterbody should be created either adjacent to the north-south drainage line dissected by the road, or between waterbody 26a and the waterbody where the species was previously detected (Figure 2k). The creation of high quality waterbodies will augment or supplement the existing habitats present at this location and where an existing population of the species occurs. Dispersal opportunities (during favourable conditions) for adult and juvenile frogs between suitable sites north, south, east and west of the proposed road duplication will be retained.

Habitat Creation Area	Waterbody number(s)	Total distance / proximity of cluster (distance between outer waterbodies)	Map Reference	Location to Princes Highway	Approximate number of waterbodies within 1000m without dispersal barriers and excluding waterbodies 'to be' removed	Proposed number of waterbodies to offset habitat removal	Explanation for habitat creation
3	42, 43, 44, 45, Lake Ayrey Wildlife Reserve and Birregurra Creek (41BC)	~1000 metres	2o	South	10-12	2	Two waterbodies are proposed at this Habitat Creation Area. One waterbody is proposed on the south side of the road, between Birregurra Creek and waterbody 42, while another waterbody is proposed on the north side between Birregurra Creek and an area of planted vegetation to the west. Ideally both waterbodies will be constructed as close to Birregurra Creek as possible to attract frogs at this location and to facilitate or encourage movement under the road (i.e. to maintain habitat permeability / connectivity along Birregurra Creek, north and south of the proposed road duplication). The provision of additional breeding habitat in this area is likely to benefit Growling Grass Frog at this location, compared with sites that are isolated (irrespective of the presence of suitable site specific habitat features at sites) and unlikely to be used by the species in the long term.
4	46a, 47a and 49	Birregurra Creek (<200 metres)	2q	North	4	1	One waterbody is proposed at this location to compensate for the removal of one moderate and one low quality waterbody. The creation of a waterbody at this location will provide for potential habitat connection between Birregurra Creek situated approximately 500 metres north of the road, and the proposed waterbody and 41BC located approximately 750 metres to the east (i.e. at Habitat Creation Area 3 where the road dissects Birregurra Creek).

Habitat Creation Area	Waterbody number(s)	Total distance / proximity of cluster (distance between outer waterbodies)	Map Reference	Location to Princes Highway	Approximate number of waterbodies within 1000m without dispersal barriers and excluding waterbodies 'to be' removed	Proposed number of waterbodies to offset habitat removal	Explanation for habitat creation
5	51a, 52a and 52 Drainage Line	100	2q	North	3	1	While the species has not been detected at this location, there is potential habitat along Birregurra Creek (i.e. the species is known to persist and use habitat resources along other similar sections of Birregurra Creek) and Sheepwash Creek north and south of the road. One waterbody is proposed at this location to compensate for the removal of a moderate quality wetland (site 51a) and to facilitate dispersal between Site 52a, Sheepwash Creek and Birregurra Creek to the north. Should a population be present at this location, the availability of high quality breeding habitat along the northern road reserve will likely to be used by Growing Grass Frog during dispersal from Birregurra Creek into more permanent larger waterbodies during the warmer months.

Appendix 2 – Construction Impacts / Management Summary

Habitat ID	Map ID	Habitat Quality	Latitude	Longitude	No-Go Fencing	Pre-clearance Survey Required
1	Figure 2b	Low	-38.2504	143.9670	×	×
2	Figure 2b	Low	-38.2515	143.9650	×	×
3	Figure 2c	Low	-38.2535	143.9530	×	×
4	Figure 2c	Low	-38.2549	143.9530	✓	✓
5	Figure 2c	Low	-38.2552	143.9530	×	×
6	Figure 2d	Low	-38.2591	143.9390	×	×
7	Figure 2d	Low	-38.2593	143.9380	×	×
8	Figure 2d	Low	-38.2585	143.9380	✓	✓
9	Figure 2d	Low	-38.2599	143.9350	×	×
10	Figure 2d	Low	-38.2587	143.9340	×	×
11a	Figure 2d	Low	-38.2591	143.9320	×	×
12DL	Figure 2e	Medium	-38.2609	143.9220	✓	✓
13a	Figure 2e	Low	-38.2616	143.9150	×	✓
14	Figure 2f	Low	-38.2635	143.9080	×	×
15	Figure 2f	Low	-38.2632	143.9070	×	×
16	Figure 2f	Low	-38.2669	143.8990	×	×
17	Figure 2f	Low	-38.2675	143.9000	✓	✓
18	Figure 2g	Low	-38.2687	143.8960	×	×
19a	Figure 2g	Medium	-38.2714	143.8930	×	×
20	Figure 2g	Low	-38.2698	143.8970	×	×
21	Figure 2g	Low	-38.2720	143.8880	×	×
22	Figure 2h	Low	-38.2744	143.8810	×	×
23	Figure 2h	Low	-38.2759	143.8810	×	×
24	Figure 2j	Low	-38.2858	143.8470	×	×
25	Figure 2j	Low	-38.2878	143.8400	×	×
26a	Figure 2j	High	-38.2892	143.8400	✓	×
27	Figure 2j	Low	-38.2882	143.8390	×	×
28	Figure 2j	Low	-38.2889	143.8400	✓	✓
29	Figure 2k	Low	-38.2904	143.8350	×	✓
30a	Figure 2k	Medium	-38.2909	143.8330	×	×
31	Figure 2k	Low	-38.2939	143.8270	×	×
32	Figure 2k	Low	-38.2938	143.8220	×	×
33	Figure 2l	Low	-38.2936	143.8120	×	✓
34	Figure 2l	Low	-38.2935	143.8110	×	×

Habitat ID	Map ID	Habitat Quality	Latitude	Longitude	No-Go Fencing	Pre-clearance Survey Required
35	Figure 2l	Low	-38.2948	143.8120	×	×
36	Figure 2l	Low	-38.2950	143.8080	×	×
37	Figure 2l	Low	-38.2949	143.8080	×	×
38a	Figure 2m	High	-38.2965	143.8050	✓	✓
39	Figure 2m	Low	-38.2978	143.7990	×	✓
40	Figure 2m	Low	-38.2989	143.7920	×	✓
42	Figure 2o	Low	-38.3017	143.7690	✓	✓
43	Figure 2o	Low	-38.3015	143.7670	✓	✓
44	Figure 2o	Low	-38.3018	143.7640	×	×
45LA	Figure 2o	High	-38.3030	143.7600	×	×
46a	Figure 2p	Medium	-38.3029	143.7560	×	×
47a	Figure 2p	Low	-38.3035	143.7550	×	×
48	Figure 2p	Low	-38.3040	143.7540	✓	✓
49	Figure 2p	Low	-38.3055	143.7470	×	×
50	Figure 2p	Low	-38.3063	143.7460	×	×
51a	Figure 2q	Medium	-38.3086	143.7340	×	✓
52a	Figure 2q	High	-38.3083	143.7340	✓	✓
52DL	Figure 2q	High	-38.3092	143.7340	✓	✓
53	Figure 2q	Low	-38.3108	143.7270	×	×
54	Figure 2r	Low	-38.3121	143.7230	×	×
55	Figure 2r	Low	-38.3139	143.7220	×	×
56	Figure 2r	Low	-38.3125	143.7200	×	×
57	Figure 2r	Low	-38.3129	143.7260	×	×
58a	Figure 2s	Medium	-38.3112	143.7080	×	×
59	Figure 2s	Low	-38.3113	143.6980	×	×
60	Figure 2t	Low	-38.3118	143.6920	✓	✓
61a	Figure 2t	Medium	-38.3113	143.6900	×	×
62	Figure 2u	Low	-38.3114	143.6810	×	×
63	Figure 2u	Low	-38.3113	143.6740	×	✓
64	Figure 2u	Low	-38.3110	143.6680	×	×
65	Figure 2v	Low	-38.3122	143.6580	×	×
66a	Figure 2w	Medium	-38.3185	143.6400	✓	✓
67a	Figure 2w	Medium	-38.3187	143.6370	✓	✓
68	Figure 2x	Low	-38.3264	143.6260	✓	✓
69	Figure 2i	Low	-38.2805	143.8610	×	×
70	Figure 2x	Low	-38.3214	143.6320	×	×

Habitat ID	Map ID	Habitat Quality	Latitude	Longitude	No-Go Fencing	Pre-clearance Survey Required
71	Figure 2e	Low	-38.2602	143.9240	×	×
72	Figure 2d	Low	-38.2599	143.9330	×	×

Appendix 3 – Growling Grass Frog Relocation Procedure

A precautionary set of procedures will be implemented in the case a Growling Grass Frog is unearthed / discovered during construction or pre–clearance surveys.

- Prior to any construction works an appropriate on–site meeting will be held to outline the following information:
    1. A description of the appearance for Growling Grass Frog and areas in which the species may be discovered;
    2. Where possible, works should minimise direct impact to areas of retained vegetation (including exotic vegetation used by Growling Grass Frog for refuge);
    3. Single–use lightweight plastic bags will be provided by the ecological consultant and must be kept on site at all times in case of an emergency in which injured or salvaged individuals are located during construction. This will allow a relevant site supervisor or designated staff member from the construction team to keep the animal safe until the relevant ecological consultant is contacted and/or arrives on site (if required); and,
    4. Provision of a 'Species Fact Sheet' outlining information on the species and habitat attributes will be kept on site at all times (i.e. in the site shed).
- If an individual Growling Grass Frog is discovered during construction the animal must be carefully captured using latex gloves (one pair per individual frog captured) and placed into the plastic bag provided.
- Once contained the site supervisor must inform an ecological consultant or selected environmental staff from VicRoads in order to check for any signs of injury or ill health (i.e. Chytrid fungus). Any injured individuals will be taken to the nearest veterinary clinic (Colac or Geelong) for appropriate treatment or euthanasia, if required.
- Any Growling Grass Frog collected during salvage operations which are not visibly injured will be relocated to suitable habitat within ≤100 metres of the construction zone into suitable habitats in proximity to the detection site.
- Appropriate handling hygiene protocols will be undertaken in accordance with Murray *et al*. 2011 for the relocation of Growling Grass Frog.
- The necessary Management Authorisation handling permits under the *Wildlife Act 1975* from DELWP will be obtained by the relevant Contractor or ecological consultant prior to the commencement of construction works.

Appendix 4 – Growling Grass Frog Habitat Creation Guidelines

The following information provides a guide associated with the creation of Growling Grass Frog habitat within the road reserves as part of the project. Where possible, a 10 metre primary terrestrial vegetation buffer from the edge of the Growling Grass Frog wetland will be created, and approximately 0.03 hectares of terrestrial planting around each created waterbody will be provided.

The primary buffer area will be densely vegetated with a diversity of indigenous grasses, herbaceous species and low shrubs (excluding trees), along with other terrestrial habitat such as rocks and logs). A 'secondary' buffer area that extends from the densely vegetated area will comprise mown grass, and will provide suitable foraging habitat for the species. These areas will be connected to proposed swale drains.

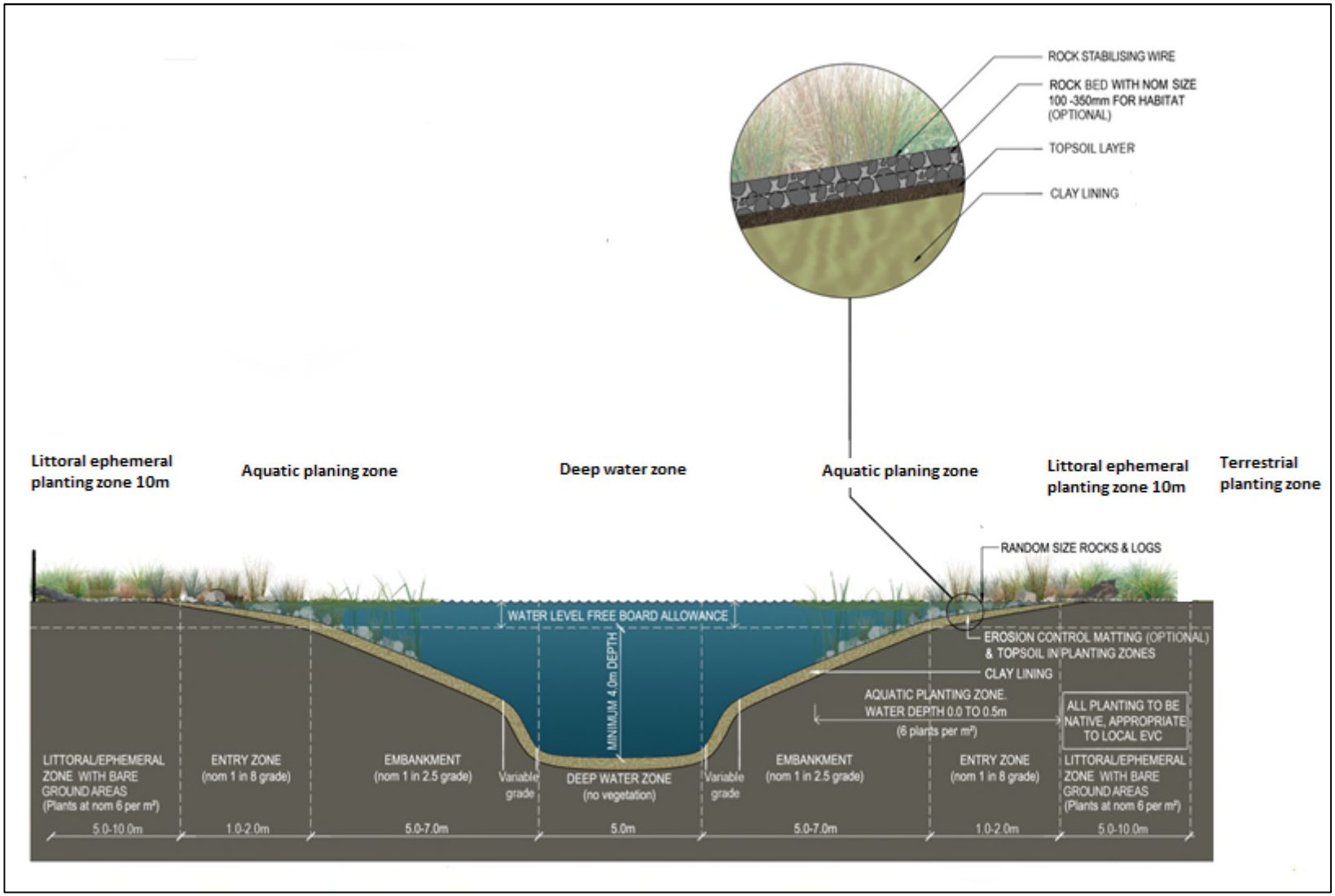
The following will be considered as part of the design, creation and management of created waterbodies:

- The total size of each waterbody will be at least 400m^2 (i.e. 20m x 20m) exclusive of the 10 metre primary terrestrial planting zone. A more linear shape (i.e. 10m x 40m) may be required if located within the road reserves as opposed to being located on private land;
- The depth of the waterbody will be at least 1.5 m and up to 4 m in most instances (i.e. it is critically important that waterbodies are permanent, or dry out very infrequently – i.e. every 3-5 years);
- Waterbodies will be lined with material amenable to holding water, and will not be clay-lined which causes higher levels of turbidity. Low levels of turbidity and pollutants (nitrates and phosphates) is important to increase the likelihood of breeding and recruitment by the species;
- Waterbodies will have the following zones (Plate 6);
    - Terrestrial planting zone, for terrestrial vegetation consistent with the local and or previous Ecological Vegetation Class (EVC);
    - Littoral ephemeral planting zone, for fringing vegetation and marsh, rocks and other refuge, and some areas of bare ground;
    - An aquatic planting zone: i.e. emergent and submergent vegetation
    - A rock stabilising zone for erosion control; and
    - A deep water zone where floating aquatic vegetation can persist.
- It is critically important that waterbodies comprise at least 30% cover of emergent , 60% cover of submergent, and at least 20% floating vegetation will aim to be achieved;
- Suitable aquatic and semi-aquatic species to plant within the littoral ephemeral zone, aquatic zone and deep water zone will be used. A list of species likely to be suitable will be provided by a suitably qualified consultant and may require refinement depending on the location of waterbodies;
- Installation of protective netting around/over the planted aquatic and semi-aquatic vegetation for as long as is required for successful establishment. Once vegetation is established netting will be progressively removed; and,

- Permanent signage will be installed at the new wetlands detailing information about Growling Grass Frogs, the wetland and the conservation goals of such created habitat.

If there are ongoing issues with water permanency of the waterbodies, additional adaptive management actions will be undertaken. Any changes will have to be approved by the relevant authorities (i.e. DoE, DELWP and VicRoads).

Plate 6. An indicative design for Growling Grass Frog. *Note: measurements may vary and are indicative in this example.*



Appendix 5 –Waterbody Habitat Quality Summary Tables for Princes Highway Duplication

Those waterbodies highlighted **bold (below)** are proposed to be removed as part of the Princes Highway Duplication project. The locations of all waterbodies provided here are shown in Figures 2a-2y.

A large number of waterbodies were identified during the initial investigation area and not all were assessed in detail, and/or targeted for Growling Grass Frog surveys. Further information on the assessment and survey methods undertaken as part of the project is provided in the following documents:

1. Ecology and Heritage Partners Pty Ltd 2012b (March). Targeted Growling Grass Frog *Litoria raniformis* Surveys, Princes Highway Duplication, Winchelsea to Colac, Victoria
2. Ecology and Heritage Partners Pty Ltd 2012c (July). Detailed Flora and Fauna Surveys and Net Gain Assessment – Princes Highway Duplication Winchelsea to Colac, Victoria. Unpublished report prepared for VicRoads.
3. Ecology and Heritage Partners Pty Ltd 2012d (October). Additional Flora and Fauna Assessment and Net Gain Analysis for the Princes Highway Duplication Project – Winchelsea to Colac, Victoria. Unpublished letter report prepared for VicRoads.

Habitat Assessment Location	41 (Birregurra Creek)	45 (Lake Ayrey Wildlife Reserve)	52a	52DL	26a	38a
Approx. size of targeted x survey area (metres) (L x W)	40 x 15	400 x 350	80 x 40	200 x 15	40 x 40	25 x 15
Emergent vegetation (%)	25	95	40	60	<1	5-10
Submerged vegetation (%)	5	30	5	5	50	60
Open water (%)	75	5	60	40	100	90
Floating vegetation (%)	<5	10	5–10	15	5	80
Fringing Vegetation (%)	80	100	100	100	90	85
Surrounding habitat (within 30 metres)	Paddocks with pasture grasses / roads / private property	Revegetation areas / roads / private property	Paddocks with pasture grasses / roads / private property	Paddocks with pasture grasses used for cattle grazing / roads	Paddocks with pasture grasses used for cattle grazing and roads	Paddocks with pasture grasses used for horse grazing and roads
Water quality and depth	Good (<0.5 metres)	N/A (Too shallow at the time of survey)	Good (> 0.5 metres)	Good (> 0.5 metres)	Good (0.2 – 1.5 metres)	Good (0.2 – 0.5 metre)
Fish present	None observed	None observed	None observed	None observed	None observed	None observed
Frog eggs present	Yes	No	No	No	No	Yes
Dominant flora species	Common Reed *Phragmites australis* and pasture grasses	Water Couch *Paspalum distichum*, native herbs, sedges and pasture grasses	Dock *Rumex* sp., Rushes *Juncus* spp. and pasture grasses	Pondweed *Potamogeton* spp., Common Spike-rush *Eleocharis acuta* and pasture grasses	Pondweed *Potamogeton* spp. and *Juncus* spp.	Pondweed *Potamogeton* spp. and Common Spike-rush *Eleocharis acuta*
Overall Habitat Quality	High High grasses along bank, good cover of emergent vegetation / and good water quality	High High cover of emergent vegetation. Large in size and lots of refuge available within vegetation after rainfall	High High cover of fringing and emergent vegetation. Refuge available within vegetation and along banks	High Large area, clean water with good refuge throughout emergent and fringing vegetation	High Ungrazed buffer surrounding bank, good cover of submerged vegetation / little fringing vegetation	High High cover of floating and submerged vegetation, good water quality. Grazed by horses, refuge available within vegetation and along banks

Habitat Assessment Location	11a	12 D/L	13a	19a	30a	46a
Approx. size of targeted survey area (metres) (L x W)	25 x 25	20 x 5	30 x 15	100 x 50	40 x 30	**30 x 30 (900m2)**
Emergent vegetation (%)	0	80	<1	<1	20	**<10**
Submerged vegetation (%)	0	<1	0	0	<5	**0**
Open water (%)	100	20	100	100	80	**95**
Floating vegetation (%)	0	<1	0	0	<1	**0**
Fringing Vegetation (%)	100	100	90	100	90	**100**
Surrounding habitat (within 30 metres)	Paddocks with pasture grasses used for cattle grazing / roads	Slashed road reserve, private property / roads	Paddocks with pasture grasses used for cattle grazing / roads	Paddocks with pasture grasses used for cattle grazing / crops/ roads	Paddocks with pasture grasses used for cattle grazing and roads	**Pasture grasses / roads**
Water quality and depth	Poor (>0.5 metres)	N/A (Dry at time of survey)	Poor (>0.5 metre)	Moderate (> 2 metres)	Poor-Moderate (>0.5 metre)	**Poor-Moderate (>0.5 metres)**
Fish present	None observed	N/A	None observed	None observed	None observed	**None observed**
Frog eggs present	No	No	No	Yes	No	**No**
Dominant flora species	Pasture grasses	Common Reed *Phragmites australis* and pasture grasses	Pasture grasses	Pasture grasses	Common Reed *Phragmites australis* and Common Spike-rush	**Pasture grasses**
Overall Habitat Quality	Low Ungrazed buffer surrounding bank, high cover of fringing vegetation / no suitable habitat	Moderate Provides good cover emergent vegetation / little fringing vegetation	Low Ungrazed buffer surrounding bank, high cover of fringing vegetation / no suitable habitat	Moderate Ungrazed buffer surrounding bank, good cover of fringing vegetation / large permanent water source	Moderate Grazed margins surrounding bank, good cover of emergent vegetation / little fringing vegetation	**Moderate** **Ungrazed buffer surrounding bank, high cover of fringing vegetation / no suitable habitat**

Habitat Assessment Location	47a	51a	58a	61a	66a	67a
Approx. size of targeted survey area (metres) (L x W)	25 x 15 (375m2)	25 x 10 (250m2)	20 x 10	70 x 40	20 x 15	15 x 10
Emergent vegetation (%)	5	15	25	0	5	15
Submerged vegetation (%)	0	<1	<1	0	<1	<1
Open water (%)	95	85	75	98 (some shading)	95	85
Floating vegetation (%)	0	10	0	0	<1	1
Fringing Vegetation (%)	20	100	100	70	100	100
Surrounding habitat (within 30 metres)	Paddocks with pasture grasses used for sheep grazing	Paddocks with pasture grasses used for cattle grazing / roads	Paddocks with pasture grasses / roads / railway	Paddocks with pasture grasses / roads / private property / railway	Paddocks with pasture grasses / roads / private property	Pasture grasses used for cattle grazing / roads
Water quality and depth	Poor - Moderate (>0.5 metre)	Moderate (>0.5 metre)	Moderate (>0.5 metre)	Poor - Moderate (>1.5 metre)	Moderate - Good (>1 metre)	Moderate (> 1 metre)
Fish present	None observed	None observed	None observed	None observed	None observed	None observed
Frog eggs present	No	No	Yes	No	Yes	Yes
Dominant flora species	Pasture grasses	Pasture grasses	Common Spike-rush and pasture grasses	Pasture grasses	Common Spike-rush and pasture grasses	Water Couch *Paspalum distichum*, and pasture grasses
Overall Habitat Quality	**Low** **Grazed banks, low cover of vegetation within and surrounding waterbody / no suitable habitat**	**Moderate** **Ungrazed buffer surrounding bank, high cover of fringing vegetation / little suitable habitat**	Moderate Good buffer surrounding bank, high cover of fringing and emergent vegetation	Moderate Low cover of fringing / floating and emergent vegetation. Some refuge available within vegetation and along banks (i.e. loose rocks)	Moderate Good cover of fringing vegetation. Some refuge available within vegetation and along banks (i.e. fallen logs)	Moderate Good cover of fringing vegetation. Some refuge available within vegetation / heavily grazed

Habitat Assessment Location	1	2	3	4	5	6
Approx. size of waterbody (metres) (L x W)	**10 x 8 (80m2)**	9 x 15	36 x 25	85 x 18	22 x 11	**28 x 15 (420m2)**
Emergent vegetation (%)	<u>No detailed habitat data was collected during previous assessments for these waterbodies.</u>					
Submerged vegetation (%)						
Open water (%)						
Floating vegetation (%)						
Fringing Vegetation (%)						
Surrounding habitat (within 30 metres)	**Paddocks used for cropping / roads**	Paddocks used for cropping	Paddocks used for cropping / private property	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	**Paddocks with pasture grasses used for cattle grazing / roads / planted trees**
Water quality	**Poor**	Poor	Poor	Poor	Poor	**Poor**
Dominant flora species	**Paddocks with cropping used for agricultural purposes**	Paddocks with cropping used for agricultural purposes	Paddocks with cropping used for agricultural purposes	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	**Paddocks with pasture grasses used for cattle grazing**
Overall Habitat Quality	**Low** **High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	Low High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	Low High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**

Habitat Assessment Location	7	8	9	10	14	15
Approx. size of waterbody (metres) (L x W)	36 x 24 (864m2)	35 x 18	40 x 27 (1080m2)	15 x 15	80 x 25 (2000m2)	20 x 14 (280m2)
Emergent vegetation (%)	No detailed habitat data was collected during previous assessments for these waterbodies.					
Submerged vegetation (%)						
Open water (%)						
Floating vegetation (%)						
Fringing Vegetation (%)						
Surrounding habitat (within 30 metres)	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees / dwelling	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees / railway
Water quality	Poor	Poor	Poor	Poor	Poor	Poor
Dominant flora species	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cropping	Paddocks with pasture grasses used for cattle grazing
Overall Habitat Quality	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No native fringing, emergent or floating vegetation.**	Low Heavily grazed. High cover or pasture grasses surrounding bank. No native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No native fringing, emergent or floating vegetation.**	Low Heavily grazed. High cover or pasture grasses surrounding bank. No native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No native fringing, emergent or floating vegetation.**	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No native fringing, emergent or floating vegetation.**

Habitat Assessment Location	16	17	18	20	21	22
Approx. size of waterbody (metres) (L x W)	11 x 18 (198m2)	7 x 9	10 x 10 (100m2)	16 x 12	8 x 8 (36m2)	20 x 60
Emergent vegetation (%)	No detailed habitat data was collected during previous assessments for these waterbodies.					
Submerged vegetation (%)						
Open water (%)						
Floating vegetation (%)						
Fringing Vegetation (%)						
Surrounding habitat (within 30 metres)	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees / dwelling
Water quality	Poor	Poor	Poor	Poor	Poor	Poor
Dominant flora species	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing
Overall Habitat Quality	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.

Habitat Assessment Location	23	24	25	27	28	29
Approx. size of waterbody (metres) (L x W)	50 x 30	20 x 20	**35 x 25 (875m2)**	**13 x 18 (234m2)**	10 x 8	**34 x 23 (782m2)**
Emergent vegetation (%)	No detailed habitat data was collected during previous assessments for these waterbodies.					
Submerged vegetation (%)						
Open water (%)						
Floating vegetation (%)						
Fringing Vegetation (%)						
Surrounding habitat (within 30 metres)	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing	**Paddocks with pasture grasses used for cattle grazing and roads**	**Paddocks with pasture grasses used for cattle grazing and roads**	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	**Roads and planted trees**
Water quality	Poor	Poor	**Poor**	**Poor**	Poor	**Poor**
Dominant flora species	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	**Paddocks with pasture grasses used for cattle grazing**	**Paddocks with pasture grasses used for cattle grazing**	Paddocks with pasture grasses used for cattle grazing	**Paddocks with pasture grasses used for cattle grazing / exotic planted vegetation**
Overall Habitat Quality	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**

Habitat Assessment Location	31	32	33	34	35	36
Approx. size of waterbody (metres) (L x W)	20 x 20	31 x 20 (620m2)	18 x 18 (324m2)	16 x 16	17 x 15	10 x 10 (100m2)
Emergent vegetation (%)	No detailed habitat data was collected during previous assessments for these waterbodies.					
Submerged vegetation (%)						
Open water (%)						
Floating vegetation (%)						
Fringing Vegetation (%)						
Surrounding habitat (within 30 metres)	Paddocks with pasture grasses used for cattle and roads	Paddocks with pasture grasses used for cattle / roads / planted trees	Paddocks with cropping used for agricultural purposes	Paddocks with cropping used for agricultural purposes	Paddocks with pasture grasses used for cattle / roads / planted trees	Paddocks with pasture grasses used for cattle / roads / planted trees
Water quality	Poor	Poor	Poor	Poor	Poor	Poor
Dominant flora species	Paddocks with pasture grasses used for cattle	Paddocks with pasture grasses used for cattle	Pasture grasses around banks of dam	Pasture grasses around banks of dam	Paddocks with pasture grasses used for cattle	Paddocks with pasture grasses used for cattle / exotic planted vegetation
Overall Habitat Quality	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**

Habitat Assessment Location	37	39	40	42	43	44
Approx. size of waterbody (metres) (L x W)	10 x 10 (100m2)	42 x 27	5 x 5 (25m2)	34 x 13	30 x 20	6 x 8
Emergent vegetation (%)	No detailed habitat data was collected during previous assessments for these waterbodies.					
Submerged vegetation (%)						
Open water (%)						
Floating vegetation (%)						
Fringing Vegetation (%)						
Surrounding habitat (within 30 metres)	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with cropping used for agricultural purposes and roads	Paddocks with pasture grasses used for cattle grazing and roads	Paddocks with pasture grasses used for cattle grazing and roads	Paddocks with pasture grasses used for cattle grazing and roads
Water quality	Poor	Poor	Poor	Poor	Poor	Poor
Dominant flora species	Paddocks with pasture grasses used for cattle grazing / exotic planted vegetation	Paddocks with pasture grasses used for cattle grazing	Pasture grasses around banks of dam	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing
Overall Habitat Quality	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.

Habitat Assessment Location	48	49	50	53	54	55
Approx. size of waterbody (metres) (L x W)	6 x 6	20 x 11 (220m2)	5 x 5	17 x 10 (170m2)	5 x 15 (75m2)	22 x 29
Emergent vegetation (%)	No detailed habitat data was collected during previous assessments for these waterbodies.					
Submerged vegetation (%)						
Open water (%)						
Floating vegetation (%)						
Fringing Vegetation (%)						
Surrounding habitat (within 30 metres)	Paddocks with pasture grasses used for cattle grazing / roads	Paddocks with pasture grasses used for cattle grazing / roads	Paddocks with pasture grasses used for cattle grazing / roads	Paddocks with pasture grasses used for cattle grazing and roads	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing, roads and dwelling
Water quality	Poor	Poor	Poor	Poor	Poor	Poor
Dominant flora species	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing
Overall Habitat Quality	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**	Low Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.

Habitat Assessment Location	56	57	59	60	62	63
Approx. size of waterbody (metres) (L x W)	**30 x 14 (420m2)**	20 x 15	40 x 40	9 x 5	13 x 10	**7 x 13 (19m2)**
Emergent vegetation (%)	<u>No detailed habitat data was collected during previous assessments for these waterbodies.</u>					
Submerged vegetation (%)						
Open water (%)						
Floating vegetation (%)						
Fringing Vegetation (%)						
Surrounding habitat (within 30 metres)	**Paddocks with pasture grasses used for cattle grazing / roads / planted trees**	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with cropping used for agricultural purposes and roads / planted trees	Paddocks with pasture grasses used for cattle grazing, planted trees and roads	Paddocks with pasture grasses used for cattle grazing, roads, railway and dwelling	**Paddocks with pasture grasses used for cattle grazing / roads / planted trees**
Water quality	**Poor**	Poor	Poor	Poor	Poor	**Poor**
Dominant flora species	**Paddocks with pasture grasses used for cattle grazing**	Paddocks with pasture grasses used for cattle grazing	Pasture grasses around banks of dam	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	**Paddocks with pasture grasses used for cattle grazing**
Overall Habitat Quality	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank.** No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** Heavily shaded, pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** Heavily grazed. High cover or pasture grasses surrounding bank. No or minimal (<5% over) native fringing, emergent or floating vegetation.	**Low** **High cover or pasture grasses surrounding bank.** **No or minimal (<5% over) native fringing, emergent or floating vegetation.**

Habitat Assessment Location	64	65	68	69	70	71	72
Approx. size of waterbody (metres) (L x W)	**13 x 10 (130m2)**	20 x 20	28 x 22	40 x 30	40 x 22	19 x 10	**34 x 22 (748m2)**
Emergent vegetation (%)	<u>No detailed habitat data was collected during previous assessments for these waterbodies.</u>						
Submerged vegetation (%)							
Open water (%)							
Floating vegetation (%)							
Fringing Vegetation (%)							
Surrounding habitat (within 30 metres)	**Paddocks with cropping used for agricultural purposes / roads / planted trees**	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / dwelling / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / dwelling / planted trees	Paddocks with pasture grasses used for cattle grazing / roads / planted trees / dwelling	**Paddocks with pasture grasses used for cattle grazing / roads / planted trees**
Water quality	**Poor**	Poor	Poor	Poor	Poor	Poor	**Poor**
Dominant flora species	**Pasture grasses around banks of dam**	Paddocks with pasture grasses used for cattle grazing	Pasture grasses around banks of dam	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	Paddocks with pasture grasses used for cattle grazing	**Paddocks with pasture grasses used for cattle grazing**
Overall Habitat Quality	**Low** **High cover or pasture grasses surrounding bank.** No or minimal (<5% over) native fringing, emergent or floating vegetation.	Low Heavily grazed. High cover or pasture grasses surrounding bank. No native fringing, emergent or floating vegetation.	Low High cover or pasture grasses surrounding bank. No native fringing, emergent or floating vegetation.	Low Heavily grazed, pasture grasses surrounding bank. No native fringing, emergent or floating vegetation	Low Heavily grazed. High cover or pasture grasses surrounding bank. No native fringing, emergent or floating vegetation.	**Low** High cover or pasture grasses surrounding bank. No native fringing, emergent or floating vegetation.	**Low** **Heavily grazed. High cover or pasture grasses surrounding bank. No native fringing, emergent or floating vegetation.**

Appendix 6 – Habitat Assessment Sheet

Growling Grass Frog Survey Data Sheet					
Date:	Waterbody #	Assessor	Visit # (1/2)	Time start	Time finish
Photographs					
Photos:					
Habitat Assessment / Water Quality					
Temperature:	DO (mg/L):	pH:	Conductivity (mS/cm):	TDS:	Turbidity:
% Fringing	*% Emergent*	*% Floating*	*% Submerged*	*Fish Present? Y / N / Unkwn*	*Water depth / % filled:*
Aquatic veg spp.					
Comments					
Frogs at Waterbodies					
Growling Grass Frog detected during active searching					
Adult male	*Adult female*	*Adult (sex unknown)*	*Subadult*	*Metamorph*	*Gambusia?*
Other frog species observed					
Comments					

Appendix 7 – Section 177 - Environment Management (Major)

(Attached Separately)

Appendix 8 – Striped Legless Lizard summary letter to the TEP

(Attached Separately)

ecology & heritage partners

Peter Menkhorst
Arthur Rylah Institute for Environmental Research
Department of Sustainability and Environment
123 Brown Street, Heidelberg
Victoria 3084

22 April 2013

Our ref: 4676 (related projects 4865)

Dear Peter,

Re: Striped Legless Lizard and the Princes Highway Duplication project: Colac - Winchelsea

As part of the overall improvement of rural highways within south-western Victoria, VicRoads will be duplicating the existing Princes Highway between Winchelsea and Colac, Victoria. Ecology and Heritage Partners Pty Ltd has been engaged by VicRoads to undertake the necessary ecological investigations and provide legislative and policy advice throughout this process.

Upon submission of an *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) Referral to the Department of Sustainability, Environment, Water, Population and Communities (SEWPaC), the proposed Princes Highway Duplication was deemed a Controlled Action, requiring further assessment and approval under the EPBC Act. As part of this process, SEWPaC requested further information about a number of Matters of National Environmental Significance (NES), including Striped Legless Lizard *Delma impar*.

During ecological investigations, the likelihood of Striped Legless Lizard being present within or in proximity to the proposed Princes Highway Duplication area was considered low. However, having regard for the precautionary principle[1] (albeit considered lower than a 50% chance of detection), a number of mitigation measures to accommodate for the species are recommended. Given the likelihood of the species actually being uncovered is considered low, VicRoads are seeking confirmation that a detailed Translocation Plan as per the Department of Sustainability and Environment (DSE) (2011a) is not required.

Further information about the proposed Princes Highway Duplication, including the assessment of potential for Striped Legless Lizard to be present is provided below for your consideration.

[1] *Precautionary principle:* It is not necessary for an impact to have a greater than 50% chance of happening to be considered 'likely' to occur; it is sufficient if an impact on the environment has a real or not remote chance or possibility. If there is scientific uncertainty about the impacts of an action and potential impacts are serious or irreversible, a lack of scientific certainty about the potential impacts of an action will not itself justify a decision that the action is not likely to have a significant impact on the environment (DEWHA 2009).

Background

The following reports and associated investigations for the Princes Highway Duplication between Winchelsea and Colac have been completed.

- Ecology Partners Pty Ltd 2010a (June). Aquatic fauna and flora investigation for works associated with the rehabilitation of the Masonry Arch Bridge, Princes Highway, Winchelsea. Unpublished report completed for VicRoads.
- Ecology Partners Pty Ltd 2010b (July). Targeted aquatic fauna assessment for the rehabilitation of the Masonry Arch Bridge, Princes Highway, Winchelsea.
- Ecology and Heritage Partners Pty Ltd 2011 (December). Weed Assessment – Princes Highway Duplication Winchelsea to Colac, Victoria. Unpublished report prepared for VicRoads.
- Ecology and Heritage Partners Pty Ltd 2012a (January). (Addendum Report): Targeted Aquatic Fauna Assessment for the Rehabilitation of the Masonry Arch Bridge, Princes Highway, Winchelsea
- Ecology and Heritage Partners Pty Ltd 2012b (March). Targeted Growling Grass Frog *Litoria raniformis* Surveys, Princes Highway Duplication, Winchelsea to Colac, Victoria
- Ecology and Heritage Partners Pty Ltd 2012c (July). Detailed Flora and Fauna Surveys and Net Gain Assessment – Princes Highway Duplication Winchelsea to Colac, Victoria. Public report prepared for VicRoads.

Study Area

The Princes Highway Duplication is proposed to align 36 kilometres of the existing Princes Highway from Deans Marsh Road Winchelsea to east of Geelong-Warrnambool railway line, Colac. The study area defined for the ecological investigations included 75 meters either side of the existing highway (Ecology and Heritage Partners Pty Ltd 2012c) (Figure 1). However, a detailed plan outlining the proposed Princes Highway Duplication alignment is provided below to indicate the areas of vegetation likely to be impacted or removed (Figures 3a-3y).

Topography within the study area varies from relatively flat plains in the east to gently undulating in the west. According to DSE (2011b), it traverses two Bioregions, the Victorian Volcanic plan (VVP) and the Otway Plain (Figure 2). Two main waterways, Birregurra Creek and Sheepwash Creek (albeit highly modified and not continuous) intersect the study area.

Roadside verges supporting areas of native and non-native vegetation, and privately owned agricultural land supporting primarily non-native vegetation, dominate the study area (Figures 3a-3y).

The study area also falls within the jurisdiction of the Corangamite Catchment Management Authority and the Colac Otway Shire municipality. The majority of study area is zoned as Road Zone – Category 1 (RDZ1) within the road reserves (DPCD 2013).

Previous records of Striped Legless Lizard in the local area

Striped Legless Lizard has not been recorded previously within or adjacent to the study area (DSE 2011b, Viridans 2012).

The species has been recorded within 10 kilometres on three occasions (Table 1; Figure 4a-4b): twice (in 2006 and 2007) at Birregurra, approximately 4.2 kilometres north of the study area; and once (in 1932) at Winchelsea, approximately 1.5 kilometres east of the study area.

Table 1. *Details of previous Striped Legless Lizard records within 10 kilometres of the study area.*

Year	Count	Record type	Survey Type	Location description	Proximity to the study area
2006	2	Trapped and released	Tile (roof) census	Paddock off McDonnells Rd, Birregurra	Approximately 4.2 km north
2007	1	Trapped and released	Tile (roof) census	Paddock off McDonnells Rd, Birregurra	Approximately 4.2 km north
1932	n/a	Museum	General observations	Winchelsea	Approximately 1.5 km east

Data source: Victorian Biodiversity Atlas (DSE 2011b); Victorian Fauna Database (Viridans 2012)

Quality of Striped Legless Lizard habitat in the study area

Roadside verges supporting areas of native and non-native vegetation (e.g. Plate 1), and privately owned agricultural land supporting primarily non-native vegetation (e.g. Plate 2), dominate the study area (Figures 3a-3y).

Plate 1. Example of roadside verges in the study area

The majority of the study area, and the landscape surrounding it, has been (and continues to be) subject to a range of disturbance regimes including native vegetation clearance, livestock grazing, soil cultivation and cropping. As a result, vegetation throughout is generally dominated by introduced flora species, lacks structural complexity, and has been subject to some form of soil disturbance. Remnant vegetation is generally limited to: small areas of Floodplain Riparian Woodland, Swamp Scrub, Plains Grassy Wetland, Plains Sedgy Wetland; and narrow linear areas of Grassy Woodland and Plains Grassy Woodland (Figures 3a-3y).

Overstory trees are generally absent from the Grassy Woodland and Plains Grassy Woodland areas. Small and/or narrow linear areas of Minor Treeless Vegetation and Modified Treeless Vegetation with components of native vegetation are also present (Figures 3a-3y).

Plate 2. Example of agricultural landscape in the study area. Roadside reserve in foreground.

Areas of embedded rock and rock piles can also be found within the study area; however, most of these areas are lacking suitable refuge habitat (i.e. cracks in soil and native tussock grasses), are grazed by livestock or dominated by introduced vegetation (Plate 3; Figures 3a-3y).

Plate 3. Example of area of embedded rock (in the background) present within the study area.

Potential habitat for Striped Legless Lizard within the study area is limited to the narrow linear areas of Grassy Woodland and Plains Grassy Woodland, and the areas of embedded rock and rock piles (Figures 3a-3y). Some of the areas of Minor and / or Modified Treeless Vegetation that have not been subject to disturbance, and resemble grassland habitat (in composition or structure), may also constitute habitat characteristics for the species (Figures 3a-3y). However, the size, connectivity and overall availability of potential habitat within the study area is low, and that which is present is surrounded by a vast landscape of largely inhospitable habitat.

Likelihood of Striped Legless Lizard

Based upon the number and location of recent Striped Legless Lizard records in the local area; the type, extent and connectivity of suitable habitat within the study area; and the ecological information currently available about the species, the likelihood of Striped Legless Lizard being present within the study area is considered low.

Mr Garry Peterson (Senior Project Officer Terrestrial Biodiversity, Warrnambool, Victoria) also feels that this is a reasonable conclusion (pers. comm. 13/03/13). Mr Peterson expressed that due to the highly modified nature of the landscape and the relatively small and isolated areas of potential habitat present, the likelihood of Striped Legless Lizard occurrence within the study area is low (pers. comm. 13/03/13).

As such, it is also considered to be a low likelihood that the species will be impacted upon by the Princes Highway Duplication. Nonetheless, having regard for the precautionary principle, a number of measures to accommodate for the species, if it is present, should be implemented (Appendix 1).

Avoid and protect potential habitat

Whilst there is minimal scope to modify the proposed alignment of the Princes Highway Duplication, there remains opportunity to avoid potential Striped Legless Lizard habitat by micro-siting subsidiary construction activities such as site offices, machinery set down areas, access tracks etc. Where possible such activities will be micro-sited so as to avoid identified potential habitat.

Detecting Striped Legless Lizard during Construction

It is understood that VicRoads will ensure that the awarded contractor for the project will follow all relevant VicRoads standard environmental management guidelines. This will assist to mitigate/ameliorate potential impacts on the ecological values within the study area, specifically threatened fauna species including Striped Legless Lizard. The successful contractor will be required to adhere to all relevant VicRoads policies in the instance a threatened fauna species is detected during construction works, including:

- All major and minor works associated with the Princes Highway Duplication will be in accordance with VicRoads standard '*Section 177 Environmental Management (major)*' agreement, and will require numerous environmental procedures including;

- Flora and Fauna
- Environmental Management (i.e. the preparation of an Environmental Management Plan and Project Environment Protection Strategies PEPS);
- Cultural Heritage;
- Air and Water Quality Monitoring;
- Erosion and Sediment Controls;
- Noise; and,
- Reporting and Auditing;

Recommended Contingency Measures during Construction

A section outlining the recommended contingency measures for the salvage and translocation of Striped Legless Lizard are provided in Appendix 1 below.

Conclusion

Based upon the number and location of recent Striped Legless Lizard records in the local area; the type, extent and connectivity of suitable habitat within the study area; and the ecological information currently available about the species, the likelihood of Striped Legless Lizard being present within the study area and subsequently being impacted upon by the Princes Highway Duplication is considered low.

Nonetheless, having regard for the precautionary principle, appropriate mitigation measures to accommodate for the species should be implemented during construction. VicRoads are seeking confirmation that a detailed Translocation Plan as per DSE (2011a) is not required.

We trust that information provided is adequate in extent and content to inform you decision. If you require anything further, please do not hesitate to contact me.

Sincerely,

Andrew Taylor
Consultant Zoologist
Ecology and Heritage Partners Pty Ltd

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Appendix 1 – Contingency actions if a Striped Legless Lizard is detected during construction

The following summarises the salvage and translocation activities that will be implemented if an individual Striped Legless Lizard is detected during construction works. The methodology has regard for standard salvage procedures specified by DSE for the Melbourne Growth Areas (DSE 2011c), but has been tailored to suit the Princes Highway Duplication project.

Site induction for staff and contractors

A suitably qualified person will conduct inductions for all those who are engaged to work on site throughout the construction phase of the project. The induction will include the following:

- Information about the environmental values within and surrounding the development footprint, including the potential (albeit low) of Striped Legless Lizard being present.
- Diagnostic, ecological, behavioural and legislative information relating to the Striped Legless Lizard.
- An outline of the responsibilities and duty of care that all persons on site in adhering to the relevant 'no go zones' and a clear definition of activities that are not permitted within these zones.
- A summary of salvage procedures.
- Distribution of a pamphlet outlining all of the above.

Determination of a suitable recipient site

Where available, individuals will be translocated within 100 – 150 meters of where they were found, in suitable habitat with suitable landscape context, which is not scheduled for disturbance. An alternative recipient site will be also be determined in consultation with DSE, particularly Mr Garry Peterson (Senior Project Officer Terrestrial Biodiversity, Warrnambool, Victoria), if this can not be achieved.

If Striped Legless Lizard are found

In the event that Striped Legless Lizard is found during the salvage operations, the following will also apply:

- Request the machine operator to stop;
- Capture the individual(s) and transfer to a cloth bag until a zoologist is contacted or present on site (only one individual per bag);
- If the recipient site is nearby, the zoologist will relocate the individual immediately for release;
- If the recipient site is not nearby, the cloth bag containing the Lizard will be placed in a secure, cool, and shaded location where there is no risk of it being accidentally

crushed or exposed to extreme weather conditions, until relocation to the recipient site (this will also be immediately unless a number of individuals are being found , in which case individuals may be held for no longer than 2 hours before release into recipient site);

- Document the exact location where each Lizard was found (using a GPS) and where possible, the sex, age class, and morphological data;
- Document the habitat characteristics of where each Lizard was found including soil, vegetation; and,
- Notify the relevant authorities (DSE, SEWPaC) the same day and forward on all of the relevant data (above) within 10 days.