Golden Sun Moth Targeted Survey

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Dear Elizabeth,

Golden Sun Moth Targeted Survey

Practical Ecology Pty Ltd was commissioned by Arcadis Australia Pacific Limited (Arcadis) to undertake a Golden Sun Moth *Synemon plana* (GSM) targeted survey for the Craigieburn Road West Upgrade, part of the SRU Project. The survey was prompted by a previous habitat assessment of the Study Area (defined as the SRU project area plus a 20m buffer) that determined a high likelihood for GSM to occur within a section of Mickleham Road, Yuroke (Practical Ecology, 2018).

The GSM is listed as critically endangered under the Australian Government *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). A search of the existing fauna records, for a five kilometre radius around the Study Area, obtained from the Victorian Biodiversity Atlas dataset dated 05/11/2018 (DELWP 2018) indicated more than 300 previous records for GSM between 2005 and 2018. Several of these records are within close vicinity of the Study Area (within 50 metres, but outside the Study Area). Therefore, the GSM targeted survey was deemed necessary to gain a better understanding of the likelihood of the species occurring on site.

Methods

The targeted survey was undertaken by Andrea Canzano and Michelle Savona on Saturday 1st December 2018, between 11:30 am and 1:30 pm. The survey was undertaken according to the methods detailed in the *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth* (DEWHA 2009a).

As per the habitat assessment undertaken by Practical Ecology (2018), five Survey Sites were assigned in the Study Area for the purpose of the project. These were allocated as follows:

- Survey Site 1 – Aitken Boulevard, between Craigieburn Road and Golf View Drive
- Survey Site 2 – Mickleham Road East, north of Craigieburn Road (1520 – 1570 Mickleham Road)
- Survey Site 3 – Mickleham Road West, north of Craigieburn Road (1545 – 1555 Mickleham Road)
- Survey Site 4 – Mickleham Road East, south of Craigieburn Road (1480 Mickleham Road)
- Survey Site 5 – Mickleham Road West, south of Craigieburn Road (1475 – 1505 Mickleham Road)

The weather conditions were clear and sunny, with a temperature range between 23˚C and 26˚C and wind strength of 24km/hr. Relative Humidity was 29% at the start of the survey. Moths were confirmed to be flying via an email post on the *Ecological Consultants Association Victoria Golden Sun Moth flight update* email forum that morning at Broadmeadows Valley Park, which is a known reference site. Three male GSM were observed flying at 9.50am by a Biosis consultant who visited the reference site on 1st December 2018.

The survey was conducted as follows:

- Two ecologists walked parallel transect lines at five metre intervals from the northern to southern boundaries of the Survey Sites (Refer to Map 1).
- All GSM observed were recorded on a GPS and mapped to show their location. This is presented in Map 1. Yellow dots represent single records, whereas pink dots represent multiple records on a single GPS point (where several moths are observed close together).

Results and Recommendations

Survey results

There was a total of 57 GSM recorded within the Study Area. These were recorded in Survey Sites 2-5 (Map 1). The number of moths per Survey Site is presented in Table 1 below. Only males were observed during the surveys and were either perched in open, gravel areas or flying into surrounding habitat (Figure 1and 2 below). Given the extent of GSM recorded during the survey, it was deemed unnecessary to undertake another three surveys, as presence across the whole of Survey Sites 2-5 was confirmed.

Table 1. Golden Sun Moths recorded at Mickleham Road, Yuroke

Survey Site	Address	Number of Golden Sun Moths
1	Aitken Boulevard, between Craigieburn Road and Golf View Drive	0
2	Mickleham Road East, north of Craigieburn Road (1520 – 1570 Mickleham Road)	11
3	Mickleham Road West, north of Craigieburn Road (1545 – 1555 Mickleham Road)	16
4	Mickleham Road East, south of Craigieburn Road (1480 Mickleham Road)	18
5	Mickleham Road West, south of Craigieburn Road (1475 – 1505 Mickleham Road)	12
	TOTAL	**57**

Figure 1. Male Golden Sun Moth observed in habitat on the east side of Mickleham Road, south of Craigieburn Road (Site 4).

Figure 2. Golden Sun Moth observed on a gravel driveway on the west side of Mickleham Road, north of Craigieburn Road (Site 3).

EPBC Act Significant Impact Assessment

According to the *Significant Impact Guidelines for the Critically Endangered Golden Sun Moth* (DEWHA 2009a) an action is likely to have a significant impact if habitat loss, degradation or fragmentation exceeds more than half a hectare of habitat removal. Habitat is defined as being within a similar or connected area within which the Golden Sun Moth is found during surveys or known from records (Figure 3 and Figure 4). The function of the area may include, but is not limited to: feeding, breeding, dispersal (DEWHA 2009a). The proposed upgrade is likely to result in the removal of more than 0.5ha of identified habitat on site, which connects to known habitat adjacent to the site where historical records occur (DELWP 2018). It should be noted that the abovementioned threshold provides guidance only and is not intended to be exhaustive or prescriptive. Our assessment of this criterion is presented in Table 2 below.

Figure 3. Golden Sun Moths observed in roadside reserve on the west side of Mickleham Road, south of Craigieburn Road (Site 5).

Figure 4. Golden Sun Moth habitat, adjacent to the east side of Mickleham Road, south of Craigieburn Road (Site 4).

An assessment was also made using the *Significant Impact Criteria for Matters of National Environmental Significance* (DEWHA 2009b) to determine if the upgrade would have a significant impact on the existing population of GSM in the Study Area. Each of the criteria have been addressed below, based on background review and observations made during the survey.

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will meet the criteria detailed in Table 3 below.

Table 2. Golden Sun Moth – based on significant Impact Criteria, as set out by DEWHA (2009b)

Ecological Element Affected (as per DEWHA 2009b)	Impact Threshold (as per DEWHA 2009b)	Comments (as per DEWHA 2009b)	Site Conditions and Potential Impacts Under Current Reference Design	Likelihood of a Significant Impact
Large or contiguous habitat area (>10 ha)	Habitat loss, degradation or fragmentation >0.5 ha	Habitat is a similar or connected area within which the Golden Sun Moth is found during surveys or known from records. The function of the area may include, but is not limited to: feeding, breeding, dispersal.	The potential habitat identified on site is similar to and connected to areas within which Golden Sun Moth has been previously detected. This potential habitat would be acting as feeding, breeding and dispersal habitat for the species. Targeted surveys concluded that the Project Area is occupied by GSM. The upgrade proposes to remove 2.51 ha of habitat for the GSM. This represents the worst case impact, assuming no other works are undertaken in this area by other organisations. Since the original site assessment was undertaken in December 2018, it is understood that a number of utility companies have already undertaken and propose further works in this area. This is likely to reduce the proposed impacts of MRPV.	Habitat loss from the Upgrade will exceed the habitat impact threshold the GSM set out in DEWHA (21009b) of 0.5ha. While impacts beyond this area threshold are deemed significant for the species and a referral will therefore be prepared, DEWHA (2009b) does state that this threshold ". . . *give[s] guidance to the level of impact that is likely to be significant for the species at a site. [it is] not intended to be exhaustive or prescriptive, but rather to highlight those actions that threaten the persistence and recovery of the golden sun moth*". The habitat identified within the Project Area that is proposed for removal appeared at the time of survey to only be used by male moths for dispersal and thermoregulation. The Upgrade is not likely to therefore threaten the overall persistence of GSM but will reduce the area of available dispersal habitat. While this will be reduced, through the application of mitigation measures impacts on the species overall is unlikely to be significant based on the criteria set out within DoE (2013).
Small or fragmented habitat area(<10 ha)	Any habitat loss, degradation or fragmentation	Small areas of habitat are more likely to suffer significant impacts from loss, degradation and fragmentation than larger areas. The limited dispersal ability of the Golden Sun Moth means habitat areas separated by >200 m are effectively isolated and should be considered as separate habitat areas. Extremely small, isolated and degraded habitat patches (for example <0.25 ha) may support populations of Golden Sun Moth but are unlikely to contribute to the overall ecological health of the species.	N/A: The habitat present on site is connected to other areas of suitable habitat without any barriers to dispersal (i.e. Roads, including the expanded width of the road from the Upgrade) less than 200m in width.	N/A
Habitat connectivity	Fragmentation of a population through the introduction of a barrier to dispersal	Barriers to dispersal could include: breaks in habitat of >200 m; structures that prohibit movement (for example buildings, solid fences).	Habitat for the species has been recorded on either side of Mickleham Road, to both the North and South of Craigieburn. This area is connected to an adjacent property that presents habitat for the species and within which it has been previously recorded. At present it is anticipated that the Upgrade will not affect connectivity for the species – as defined in DELWP (2009) – through isolation of the population as works associated with the Upgrade will still mean that the width of both Craigieburn Road and Mickleham Road are less than 200m in width. Should the species wish to disperse across Mickleham Road, the Upgrade may widen the existing barrier to dispersal presented by the road alignment, but it will not necessarily restrict it based on the 200m barrier threshold defined in DELWP (2009). Mickleham Road is an already established road that has high use and would be resulting in at least some mortality.	Low – The Upgrade will increase the current barrier to dispersal created by Mickleham Road itself, but the widening of this Road is not likely to be prohibitive to dispersal across this road.

Table 3. Self-assessment against the Significant Impact Criteria for Matters of National Environmental Significance (DEWHA 2009b).

Significant Impact Criteria	Risk to MNES Without Mitigation Measures	Likelihood of a Significant Impact (with No Mitigation Measures Implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with Mitigation Measures Applied	Likelihood of a Significant Impact (with Mitigation Measures Implemented)
Lead to a long-term decrease in the size of a population	Soil compaction, weeds, regular mowing/slashing, gravel driveways and vehicles traversing the Study Area have reduced the quality of habitat within the Study Area. It is likely that GSM are using the roadsides to disperse and to thermoregulate on gravel surfaces (particularly males) but less likely that they are being used as a breeding site, as most moths observed during the survey were seen flying into surrounding habitat. Given the characteristics of the surrounding landscape and historical GSM records, it is likely that breeding habitat is located in the adjacent sites. Therefore it is unlikely to lead to a long-term decrease in the size of a population.	Low-Moderate - as the Upgrade is less likely to impact breeding habitat it is unlikely that the effects will lead to a long term decrease in the size of a population.	Works will be restricted to the Project Area with Areas of Sensitive Vegetation established to protect vegetation and habitat that is to be retained. Mitigation measures specifically for GSM will be put in place to reduce any potential impact to the population even through the risk is already low.	Low - Mitigation measures will be implemented to ensure that areas of habitat identified within the Project Area are managed as Areas of Sensitive Vegetation to minimise the dispersal habitat for the species that is impacted. Further to this the breeding habitat for the species, which is deemed likely to be in the adjacent paddocks that form part of the Study Area and not the Project Area and are most likely where the species is breeding will not be impacted by the Upgrade. Other mitigation measures aimed at avoiding and minimising the potential for a significant impact on the species include mitigation measures related to timing of works, fencing, maintenance of management regimes and landscaping works.	Low
Reduce the area of occupancy of the species	The road upgrade is expected to result in the removal of a small proportion of GSM habitat, which may reduce the area of occupancy of the species.	Low-Moderate - The removal of GSM habitat either side of Mickleham Road, will reduce the area of occupancy of the species in that areas it is using to disperse will be removed. The likelihood of this having a significant impact at a species level is deemed low-moderate.	Works will be restricted to the Project Area with Areas of Sensitive Vegetation established to protect vegetation and habitat that is to be retained. Mitigation measures specifically for GSM will be put in place to minimise impacts particularly to dispersing males that are utilising habitat within the Project Area. This includes: - Utilising local fill wherever possible, and ensure only clean fill is imported onto the site. - Revegetating disturbed areas with known food plants for Golden Sun Moth where possible, such as indigenous Wallaby Grasses, or monitor disturbed areas post-construction to ensure that no invasive weeds establish that could threaten the persistence of retained habitat.	Low - the area of occupancy of the species will be reduced through the removal of habitat for dispersal. With the implementation of mitigation measures, including the establishment of Areas of Sensitive Vegetation, the risk to GSM at a species level is low.	Low
Fragment an existing population into two or more populations	Fragmentation of habitat is not likely to occur via the removal of roadside vegetation, as it is not creating a barrier from connecting habitat.	Low - The removal of GSM habitat either side of Mickleham Road is not likely to fragment the existing population into two or more populations. While the Upgrade will widen the barrier to dispersal across Mickleham Road, this barrier will remain below the threshold of 200m defined in DEWHA (2009b).	Mitigation measures specifically for GSM will be put in place to minimise impacts particularly to dispersing males that are utilising habitat within the Project Area. This will continue to allow individuals to continue to utilise roadside areas that are not subject to construction and move across Mickleham Road as they may currently.	Very Low - The road will widen the existing barrier to dispersal presented by Mickleham Road but movement of individuals will be managed during construction through the implementation of appropriate mitigation measures.	Low
Adversely affect habitat critical to the survival of a species	Critical habitat is likely to occur in the large parcels of land adjoining the roadside reserves, given the presence of existing records and the allocation of land as Habitat Conservation Obligation areas. Provided mitigation measures are employed prior to and during construction, it is unlikely that the removal of small pockets of habitat will significantly impact on the survival of the species.	Low-Moderate - The Upgrade proposes to remove slithers of dispersal habitat along the edge paddock areas that are deemed more likely to represent that which is critical for both breeding and dispersal of GSM. It is unlikely that the removal of dispersal habitat from the Project Area will significantly impact on the survival of the species.	Works will be restricted to the Project Area with Areas of Sensitive Vegetation established to protect vegetation and habitat that is to be retained. Mitigation measures specifically for GSM will be put in place to minimise impacts particularly to dispersing males that are utilising habitat within the Project Area.	Low - Mitigation measures will be implemented to ensure that area of habitat identified within the Project Area are managed as Areas of Sensitive Vegetation to minimise the dispersal habitat for the species that is impacted. Further to this, the breeding habitat for the species, which is deemed likely to be in the adjacent paddocks that form part of the Study Area and not the Project Area, will not be conducted during October-January (breeding season).	Low
Disrupt the breeding cycle of a population	Provided upgrade works are conducted outside the breeding season (October-January), it is unlikely that	Moderate - the Upgrade will reduce available dispersal habitat for males; there is therefore	Works will be restricted to the Project Area with Areas of Sensitive Vegetation established to	Low - Provided upgrade works are conducted outside the breeding season (October-January), it is unlikely	Low

Significant Impact Criteria	Risk to MNES Without Mitigation Measures	Likelihood of a Significant Impact (with No Mitigation Measures Implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with Mitigation Measures Applied	Likelihood of a Significant Impact (with Mitigation Measures Implemented)
	construction works will disrupt the breeding cycle of GSM.	some potential that works conducted during the breeding season of GSM could impact the breeding cycle of the population. Any females that may move into the Project Area, while unlikely, could also be directly impacted.	protect habitat that is to be retained. Mitigation measures specifically for GSM will be put in place to minimise impacts particularly to dispersing males that are utilising habitat within the Project Area. Works will not be conducted during October–January (breeding season).	that construction works will disrupt the breeding cycle of GSM	
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The small amount of habitat removal along the roadside reserves may cause a short-term reduction of population numbers, but is not expected to cause a significant decline of the species.	Low – Loss of potential habitat from the Study Area may reduce the area of available habitat for the species but it is unlikely to decline overall.	Mitigation measures specifically for GSM will be put in place to minimise impacts on the species. This includes: -undertaking works outside the breeding season -ensuring appropriate drainage and hydrology so that run-off is diverted away from adjoining habitat -Preventing spread of weeds into adjoining habitat	Low – The removal of habitat is unlikely to be of an extent that the species is likely to decline. There will be a potential reduction in available habitat and the number of individuals recorded within the Study Area, but the species is not likely to decline overall.	Low
Result in invasive species that are harmful to a critically endangered or endangered species becoming stablished in the endangered or critically endangered species' habitat	The upgrade is not likely to result in the introduction or increase in invasive species. The major predators of GSM are native insectivorous birds and insects (Clarke & O'Dwyer 2000).	Low in regard to the introduction of invasive predatory species – the works are unlikely to lead to spread of invasive species that would impact GSM; additional fencing, temporary or permanent, may however result in additional perching site for birds predating on GSM. High in regard to the introduction of harmful weed species– without mitigation measures construction work is known to aid in the spread of weeds. Weed introduction is outlined in the Significant impact guidelines for Golden Sun Moth, to degrade, fragment or result in the loss of habitat for the species.	No specific mitigation measures required to mitigate the risk of invasive predatory species are proposed; measures to minimise bird perching opportunities could include: -The installation and maintenance of humming Mylar strips (bird scarer tape) to temporary stakes and internal wire fencing installed during the GSM flying season (to be removed outside of flying season so birds become less accustomed) -The use of an anti-perching coating on the internal wire fence at the beginning of the GSM flying season (repellent gels are available to prevent birds perching and roosting) - Investigation of alternative designs to fencing that reduce the suitability of hunting perches presented by the existing post and rail fencing. Weed hygiene maintenance forms part of the CEMP and requires all vehicles, machinery and equipment to be cleaned before entering the site to prevent the spread of invasive species. Any weed control proposed in identified GSM habitat should be conducted at times when they will not have a negative impact on the species.	Very Low in regard to the introduction of invasive predatory species– bird predation will be minimised as far as practicable though appropriate mitigation measures. Low in regard to the introduction of harmful weed species– if vehicles, machinery and equipment is properly cleaned before entering the area it is unlikely that the works will lead to the establishment of weed species.	Unlikely
Introduce disease that may cause the species to decline	The upgrade is not expected to introduce disease to GSM populations.	Low– the works are unlikely to lead to spread of disease that would impact GSM	No specific mitigation measures required to mitigate this risk.	None	Unlikely
Interfere with the recovery of the species.	The proposal is not expected to interfere with the recovery of the species, as it does not occur within the vicinity of reserves or conservation areas and does not result in the clearance of surrounding habitat.	Very Low – The Upgrade does not occur within the vicinity of reserves or conservation areas and does not result in the clearance of surrounding habitat	Works will be restricted to the Project Area with Areas of Sensitive Vegetation established to protect vegetation and habitat that is to be retained. Mitigation measures specifically for GSM will be put in place to minimise impacts.	Very Low – The loss of dispersal habitat for the species is unavoidable in the context of the Upgrade. This habitat includes roadside vegetation that is subject to soil compaction, weeds, regular mowing/slashing, gravel driveways and vehicles traversing the site and is not likely to represent that which would be the focus of species recovery.	Very low

Recommendations

Based on the assessment of the significant impact criteria, the proposed upgrade is not likely to impact on the broader areas of habitat, provided the correct mitigation measures are employed during the upgrade works. Key mitigation measures include:

- Reducing the proposed removal of vegetation during the design phase to avoid and minimise habitat loss and reduce the amount of offsets required
- Ensuring that the site's hydrology is not altered so that it impacts on surrounding habitat
- Conducting works outside the breeding season
- Protecting adjacent habitat via the installation of no-go zone fencing and signage
- Ensuring all project infrastructure is located away from native vegetation and GSM habitat

It is therefore recommended that a referral is made to the Commonwealth Department of the Environment and Energy. The referral should provide detailed mitigation measures to address the particular manner in which the upgrade seeks to avoid and minimise significant impacts to GSMs and their habitat, as detailed in Table 3 of this report.

I trust that this fulfils the requirements of your project. I am available to discuss this report further at your convenience.

Best regards,

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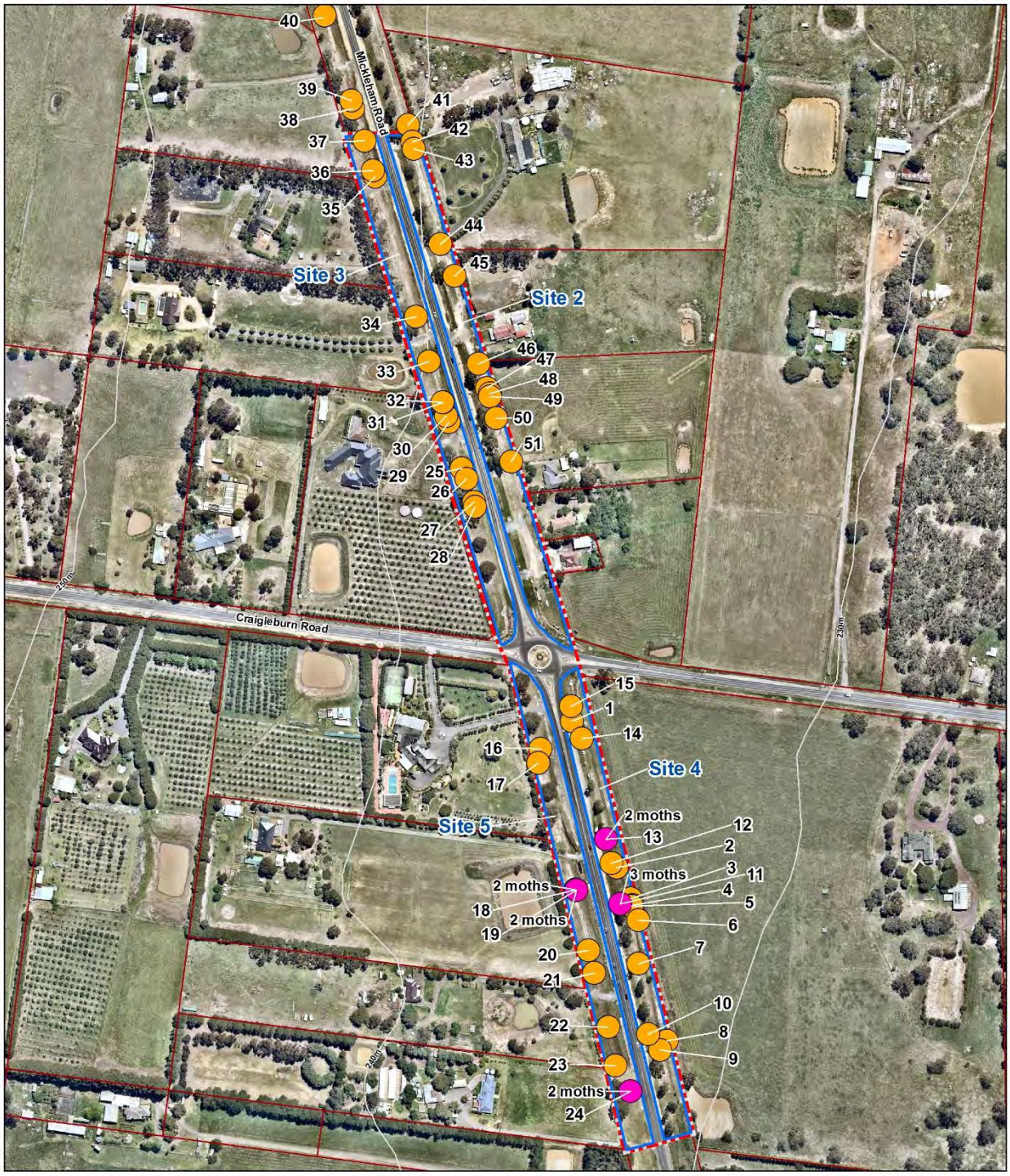

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Disclaimer
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Legend
- Study Area
- Parcels
- Contours (10m)
- Survey Sites

Records
- Multiple Golden Sun Moth records (1/12/2018)
- Single Golden Sun Moth records (1/12/2018)

Details
Date: 15/02/2019
Version: 1

Data Source: Base layers courtesy of VicMap, Copyright © State of Victoria. Aerial photography from Nearmap (Oct 2018).

Map 1. Golden Sun Moth Targeted Survey
Mickleham Road

N

0 25 50 75 m

Scale 1:3,050 (Page size A3)

APPENDIX H

EPBC Significant Impact Assessments

Great Egret, Latham's Snipe, White-bellied Sea-Eagle, Eastern Osprey and Common Greenshank – Marine and Migratory Species

Based on Significant Impact Criteria in DoE (2013): *Matters of National Environmental Significance. Significant impact guidelines 1.1.*

Scientific name	Common name	Important Habitat	Significance assessment questions*			Likelihood of significant impact?
			a	b	c	
Marine						
Ardea alba	Great Egret	No	No	No	No	No. The main area of suitable habitat for these species is associated with Aitken Creek and potentially Highlands Lake. While there will be changes made to the Aitken Creek bridge as part of the upgrade, this is not likely to result in a significant impact on these listed species.
Haliaeetus leucogaster	White-bellied Sea-Eagle	No	No	No	No	
Migratory						
Gallinago hardwickii	Latham's Snipe	No	No	No	No	No. The main area of suitable habitat for these species is associated with Aitken Creek and potentially Highlands Lake. While there will be changes made to the Aitken Creek bridge as part of the upgrade, this is not likely to result in a significant impact on these listed species.
Pandion haliaetus	Eastern Osprey	No	No	No	No	
Tringa nebularia	Common Greenshank	No	No	No	No	

* a: substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species

b: result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or

c: seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

Swift Parrot – Based on Significant Impact Criteria for Critically Endangered and Endangered Species

Based on Significant Impact Criteria in DoE (2013): *Matters of National Environmental Significance. Significant impact guidelines 1.1.*

Significant Impact Criteria	Risk to MNES Without Mitigation Measures	Likelihood of a Significant Impact (with No Mitigation Measures Implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with Mitigation Measures Applied	Likelihood of a Significant Impact (with Mitigation Measures Implemented)
Lead to a long-term decrease in the size of a population	Low: Impacts are to foraging not breeding habitat which is in Tasmania. For the foraging habitat in the Study Area: The trees/native vegetation being removed that is more likely to provide foraging habitat are predominantly located at the western end of the Study Area. Some trees do occur to the centre of the Study Area in built up areas, but these are less likely to be used for foraging. The trees to be removed that potentially provide foraging resources for this species includes a 28 Large River Red Gum trees and 48 Small River Red Gum trees. These are not the preferred food source for Swift Parrot, but it could still make use of these during migration.	Low: Trees present would only be utilised intermittently as part of fly-over when species migrates between Tasmania and mainland Australia	Tree loss has been confined to Project Area boundary. Trees close to Project Area should be retained. Establishment of 'tree protection zones along works area are required to prevent construction works/machinery impacting on retained trees where species could be foraging Check trees (zoologist) prior to any tree removal in Swift Parrot flight season (March/April to September) Note: there is scope to further reduce impacts by ensuring detailed design phase incorporates retention of trees within Project Area through further reduction of Project Area boundary.	Low	Low for individual birds
Reduce the area of occupancy of the species	Unlikely. The Study Area is a movement pathway for the species, not a seasonal occupancy site	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Fragment an existing population into two or more populations	Unlikely. The species is highly mobile; therefore, tree removal will not fragment the population	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Adversely affect habitat critical to the survival of a species	Unlikely. The tree species and EVC's present are not the preferred food source (Yellow Gums) or EVCs (Box Ironbark Forest) The area is also not their breeding or over-wintering grounds	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Disrupt the breeding cycle of a population	N/A- their breeding grounds are located in Tasmania	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely. The tree species and EVCs being removed are not the species main preferred foraging trees or EVCs	Low	As outlined above for the first guideline	None	Low
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	Predation of native wildlife by cats is recognised as a threatening process for Swift parrots. It is highly unlikely that the road upgrade will result in an increase of cats, increased urbanisation will increase this risk, which is not associated with the road upgrade project	Moderate- predation by cats	Increased urbanisation along Craigieburn Road will inevitably lead to increased cat numbers, independent of the Upgrade. There is no mitigation measures relevant to the Upgrade, that can be undertaken during the Upgrade to reduce this risk.	Low- probably will be attributable to increased urbanisation	N/A- mitigation measures cannot be applied during the Upgrade
Introduce disease that may cause the species to decline	Disease is not listed as a threat to this species. The Upgrade is unlikely to introduce a disease that may cause this species to decline.	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Interfere with the recovery of the species.	A *National Recovery Plan* has been prepared for the Swift Parrot. Vegetation removal and habitat loss and alteration have been recognised as threatening processes for the species. The habitat available in the Study Area is 'movement pathways' for the species, and the *National Recovery Plan* states that: 'Further information is required to identify potential movement pathways, the importance of such pathways and potential threats that occur in these areas'	Unknown; likely low	Tree removal cannot be avoided due to the constrained nature of the road alignment, therefore mitigation measures to retain as many large trees as possible need to be undertaken, as outlined above for the first criteria	Unknown; likely low	Unknown; likely low

Grey-headed Flying-fox – Based on Significant Impact Criteria for Vulnerable Species

Based on Significant Impact Criteria in DoE (2013): *Matters of National Environmental Significance. Significant impact guidelines 1.1.*

Significant Impact Criteria	Risk to MNES Without Mitigation Measures	Likelihood of a Significant Impact (with No Mitigation Measures Implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with Mitigation Measures Applied	Likelihood of a Significant Impact (With Mitigation Measures Implemented)
Lead to a long-term decrease in the size of an important population	The species has not been previously recorded on the VBA database; it is predicted to occur in the local area by the PMST. Species would only use the Study Area for occasional foraging There is no breeding colony (camp) in the area	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Reduce the area of occupancy of an important population	Species would only use the Study Area for occasional foraging There is no breeding colony in the area	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Fragment an existing population into two or more populations	The highly mobile nature of this species means that the Upgrade would not be a barrier to migration and that no populations would be fragmented.	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Adversely affect habitat critical to the survival of a species	As the Upgrade would be unlikely to create a barrier to migration, it is unlikely that habitat critical to the survival of this species would be adversely affected.	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Disrupt the breeding cycle of an important population	As there is no breeding colony in the area, the Upgrade will not disrupt the species breeding cycle	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	As the species forages in eucalypts (remnant and planted) and fruit trees across Melbourne, the Upgrade will result in minimal overall habitat loss.	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Predation by feral animals is not recognised as a key threatening process for this species, and it is unlikely that the Upgrade project would result in any invasive species becoming established in the Study Area.	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Introduce disease that may cause the species to decline	Disease is not listed as a threat to this species. The Upgrade would be unlikely to introduce a disease that may cause this species to decline.	Low	No specific mitigation measures required to mitigate this risk.	None	Low
Interfere with the recovery of the species.	The Draft Recovery Plan for the species identifies that loss of roosting habitat is critical to the survival of the species. The Plan also recognises that the loss of foraging habitat is also a threatening process, however there is a difference between critical and other foraging habitat. Work is still required to identify critical foraging habitat for the species. It is unlikely that the Study Area contains foraging habitat critical to the species	Unknown; likely low	As a nocturnal species, impact can be minimised by limiting tree removal and/or construction works to daylight hours- as VicRoads normal practice is to undertake work during normal working hours- this will be adhered to Barrier fencing should be installed around Areas of Sensitive Vegetation and the Project Areas to prevent construction works/machinery impacting on retained trees where species could be foraging	Tree removal cannot be avoided due to the constrained nature of the road alignment, therefore mitigation measures to retain as many large trees as possible need to be undertaken, as outlined above for the first criteria	Unknown; likely low

Golden Sun Moth – Based on Significant Impact Criteria for Critically Endangered and Endangered Species as per DoE (2013)

Significant Impact Criteria	Risk to MNES Without Mitigation Measures	Likelihood of a Significant Impact (with No Mitigation Measures Implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with Mitigation Measures Applied	Likelihood of a Significant Impact (with Mitigation Measures Implemented)
Lead to a long-term decrease in the size of a population	Through targeted surveys, GSM was observed on either side of Mickleham Road to both the north and south of Craigieburn Road. The Upgrade will result in the removal of habitat for the species these areas. While this is the case, Canzano (2019) states that only males were observed, and the species is most likely using these areas to disperse and to thermoregulate on gravel surfaces. Given the characteristics of the surrounding landscape and historical GSM records, it is likely that breeding habitat is located in the adjacent paddocks and less likely that breeding is occurring in the roadside vegetation that will be removed by the Upgrade. Many male moths were observed flying into surrounding paddocks during the survey. Therefore, it is unlikely that removal of habitat for the species from the Upgrade will lead to a long-term decrease in the size of a population.	Low-Moderate - as the Upgrade is unlikely to impact breeding habitat it is unlikely that the effects will lead to a long-term decrease in the size of a population.	Works will be restricted to the Project Area with Areas of Sensitive Vegetation established to protect vegetation and habitat that is to be retained. Mitigation measures specifically for GSM will be put in place to reduce any potential impact to the population even through the risk is already low. See Table 5-1 for full summary of specific mitigation measures for GSM.	Low – Mitigation measures will be implemented to ensure that areas of habitat identified within the Project Area are managed as Areas of Sensitive Vegetation to minimise the dispersal habitat for the species that is impacted. Further to this the breeding habitat for the species, which is deemed likely to be in the adjacent paddocks that form part of the Study Area and not the Project Area and are most likely where the species is breeding will not be impacted by the Upgrade. Other mitigation measures aimed at avoiding and minimising the potential for a significant impact on the species are presented in Section 5.3.3.1. This includes mitigation measures related to timing of works, fencing, maintenance of management regimes and landscaping works.	Low
Reduce the area of occupancy of the species	The species was confirmed to be occupying the area on either side of Mickleham Road, to both the north and south of Craigieburn Road. Habitat mapped for the species within these areas is presented in Figure 3-7b.The Upgrade proposes to remove a portion of this GSM habitat. Note that the habitat has been identified as likely dispersal habitat, rather than breeding habitat, however removal of this habitat will reduce the overall area of occupancy of the species.	Low-Moderate - The removal of GSM habitat either side of Mickleham Road, will reduce the area of occupancy of the species in that areas it is using to disperse will be removed. The likelihood of this having a significant impact at a species level is deemed low-moderate.	Works will be restricted to the Project Area with Areas of Sensitive Vegetation established to protect vegetation and habitat that is to be retained. Mitigation measures specifically for GSM will be put in place to minimise impacts particularly to dispersing males that are utilising habitat within the Project Area. See Table 5-1 for full summary of specific mitigation measures for GSM.	Low – the area of occupancy of the species will be reduced through the removal of habitat for dispersal. Within the implementation of mitigation measures, including the establishment of Areas of Sensitive Vegetation, the risk to GSM at a species level is low.	Low
Fragment an existing population into two or more populations	Fragmentation of habitat is not likely to occur via the removal of roadside vegetation as part of the Upgrade, as it is not creating a barrier from connecting habitat (Canzano 2019). The Upgrade will mean that the area of available dispersal habitat for species moving to and from the Project Area into adjacent paddocks will be reduced. This loss of habitat will not however result in the establishment of road pavement greater that the 200m threshold, as described in in DEWHA (2009b), that may result in a barrier for dispersal of the species across the road.	Low – The removal of GSM habitat either side of Mickleham Road is not likely to fragment the existing population into two or more populations. While the Upgrade will widen the barrier to dispersal across Mickleham Road, this barrier will remain below the threshold of 200m defined in DEWHA (2009b).	Mitigation measures specifically for GSM will be put in place to minimise impacts particularly to dispersing males that are utilising habitat within the Project Area. This will continue to allow individuals to continue to utilise roadside areas that are not subject to construction and move across Mickleham Road as they may currently. See Table 5-1 for full summary of specific mitigation measures for GSM.	Very Low - The road will widen the existing barrier to dispersal presented by Mickleham Road but movement of individuals will be managed during construction through the implementation of appropriate mitigation measures.	Low
Adversely affect habitat critical to the survival of a species	Documents including DEWHA (2009b) and DEWHA (2009c) do not define habitat critical to the survival of GSM. DEWHA (2009c) does state however that "*Because of their highly fragmented distribution and limited dispersal ability, all populations of this critically endangered moth are considered to be important for the long-term survival and recovery of the species*." As the habitat to be removed as part of the Upgrade is likely to represent that used for dispersal by male	Low-Moderate - The Upgrade proposes to remove slithers of dispersal habitat along the edge paddock areas that are deemed more likely to represent that which is critical for both breeding and dispersal of GSM. It is unlikely that the removal of dispersal habitat from the Project Area will significantly impact on the survival of the species.	Works will be restricted to the Project Area with Areas of Sensitive Vegetation established to protect vegetation and habitat that is to be retained. Mitigation measures specifically for GSM will be put in place to minimise impacts particularly to dispersing males that are utilising habitat within the Project Area. See	Low – Mitigation measures will be implemented to ensure that area of habitat identified within the Project Area are managed as Areas of Sensitive Vegetation to minimise the dispersal habitat for the species that is impacted. Further to this, the breeding habitat for the species, which is deemed likely to be in the adjacent paddocks that form part of the Study Area and not the Project Area, will not be	Low

Significant Impact Criteria	Risk to MNES Without Mitigation Measures	Likelihood of a Significant Impact (with No Mitigation Measures Implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with Mitigation Measures Applied	Likelihood of a Significant Impact (with Mitigation Measures Implemented)
	GSM (no females, which rarely fly observed), this habitat is not likely critical to the survival of the species. Habitat that is likely to be critical for the species is considered more aligned with that present in the large parcels of land adjoining the Project Area (particularity in the MSA area) where both dispersal and breeding are more likely to occur.		Table 5-1 for full summary of specific mitigation measures for GSM.	impacted by the Upgrade. Other mitigation measures aimed at avoiding and minimising the potential for a significant impact on the species are presented in Section 5.3.3.1. This includes mitigation measures related to timing of works, fencing, maintenance of management regimes and landscaping works.	
Disrupt the breeding cycle of a population	No females were observed during targeted surveys undertaken along Mickleham Road. Females are reluctant to fly, and most likely walk between tussocks during display and egg laying. In contrast, adult males are capable of active and prolonged flights, although it is estimated that they will not travel more than 100m away from suitable habitat patches (DEWHA 2009c). Only males were observed during targeted surveys, while is unlikely that the area impacted by the upgrade is breeding habitat, impacts to the breeding cycle of GSM needs to be considered to mitigate any potential impacts through a reduction in male dispersal habitat in particular. Note that if it is the case that works are conducted during the breeding season, and females happen to lay eggs within the Project Area (none observed in this area during surveys however), there is a high risk of mortality of adult females and their young.	Moderate – the Upgrade will reduce available dispersal habitat for males; there is therefore some potential that works conducted during the breeding season of GSM could impact the breeding cycle of the population. Any females that may move into the Project Area, while unlikely, could also be directly impacted.	Works will be restricted to the Project Area with Areas of Sensitive Vegetation established to protect habitat that is to be retained. Mitigation measures specifically for GSM will be put in place to minimise impacts particularly to dispersing males that are utilising habitat within the Project Area. Works will not be conducted during October-January (breeding season). See Table 5-1 for full summary of specific mitigation measures for GSM.	Low - Provided upgrade works are conducted outside the breeding season (October-January), it is unlikely that construction works will disrupt the breeding cycle of GSM.	Low
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The small amount of habitat removal from the Upgrade may cause a short-term reduction of population numbers within the Project Area along Mickleham Road, but is not expected to cause a significant decline of the species.	Low - Loss of potential habitat from the Study Area may reduce the area of available habitat for the species but it is unlikely to decline overall.	Mitigation measures specifically for GSM will be put in place to minimise impacts on the species. See Table 5-1 for full summary of specific mitigation measures for GSM.	Low - The removal of habitat is unlikely to be of an extent that the species is likely to decline. There will be a potential reduction in available habitat and the number of individuals recorded within the Study Area, but the species is not likely to decline overall.	Low
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	The works are unlikely to lead to the introduction or spread of a harmful predatory invasive species. The major predators of GSM are native insectivorous birds and insects Any works has a high risk of weed spread through contaminated equipment and vehicles. If the works resulted in the spread of invasive weeds it is likely that GSM habitat will be negatively impacted.	Low in regard to the introduction of invasive predatory species – the works are unlikely to lead to spread of invasive species that would impact GSM; additional fencing, temporary or permanent, may however result in additional perching site for birds predating on GSM. High in regard to the introduction of harmful weed species- without mitigation measures construction work is known to aid in the spread of weeds. Weed introduction is outlined in the *Significant impact guidelines for Golden Sun Moth*, to degrade, fragment or result in the loss of habitat for the species.	No specific mitigation measures required to mitigate the risk of invasive predatory species are proposed; measure to minimise bird perching opportunities for part of the mitigation measures outlined in Section 5.3.3.1. Weed hygiene maintenance forms part of the CEMP and requires all vehicles, machinery and equipment to be cleaned before entering the site to prevent the spread of invasive species. Any weed control proposed in identified GSM habitat should be conducted at times when they will not have a negative impact on the species. See Table 5-1 for full summary of specific mitigation measures for GSM.	Very Low in regard to the introduction of invasive predatory species– bird predation will be minimised as far as practicable though appropriate mitigation measures. Low in regard to the introduction of harmful weed species- if vehicles, machinery and equipment is properly cleaned before entering the area it is unlikely that the works will lead to the establishment of weed species.	Unlikely
Introduce disease that may cause the species to decline	The works are unlikely to lead to the introduction or spread of a harmful disease species.	Low- the works are unlikely to lead to spread of disease that would impact GSM	No specific mitigation measures required to mitigate this risk.	None	Unlikely

Significant Impact Criteria	Risk to MNES Without Mitigation Measures	Likelihood of a Significant Impact (with No Mitigation Measures Implemented)	Specific Mitigation Measure(s)	Residual Risk to MNES with Mitigation Measures Applied	Likelihood of a Significant Impact (with Mitigation Measures Implemented)
Interfere with the recovery of the species.	The proposal is not expected to interfere with the recovery of the species, as it does not occur within the vicinity of reserves or conservation areas and does not result in the clearance of surrounding habitat that is more likely to be used for breeding. The habitat to be removed is most likely used for dispersal rather than breeding.	Very Low - The Upgrade does not occur within the vicinity of reserves or conservation areas and does not result in the clearance of surrounding habitat (Canzano 2019)	Works will be restricted to the Project Area with Areas of Sensitive Vegetation established to protect vegetation and habitat that is to be retained. Mitigation measures specifically for GSM will be put in place to minimise impacts.	Very Low - The loss of dispersal habitat for the species is unavoidable in the context of the Upgrade. This habitat includes roadside vegetation that is subject to soil compaction, weeds, regular mowing/slashing, gravel driveways and vehicles traversing the site and is not likely to represent that which would be the focus of species recovery.	Very Low

Golden Sun Moth - Based on Significant Impact Criteria in DEWHA (2009b)

Ecological Element Affected (as per DEWHA 2009b)	Impact Threshold (as per DEWHA 2009b)	Comments (as per DEWHA 2009b)	Site Conditions and Potential Impacts Under Current Reference Design	Likelihood of a Significant Impact
Large or contiguous habitat area (>10 ha)	Habitat loss, degradation or fragmentation >0.5 ha	Habitat is a similar or connected area within which the Golden Sun Moth is found during surveys or known from records. The function of the area may include, but is not limited to: feeding, breeding, dispersal.	The potential habitat identified on site is similar to and connected to areas within which Golden Sun Moth has been previously detected. This potential habitat would be acting as feeding, breeding and dispersal habitat for the species. Targeted surveys concluded that the Project Area is occupied by GSM. The upgrade proposes to remove 2.51 ha of habitat for the GSM.	Habitat loss from the Upgrade will exceed the habitat impact threshold the GSM set out in DEWHA (21009b) of 0.5ha. While impacts beyond this area threshold are deemed significant for the species and a referral will therefore be prepared, DEWHA (2009b) does state that this threshold ". . . *give[s] guidance to the level of impact that is likely to be significant for the species at a site. [it is] not intended to be exhaustive or prescriptive, but rather to highlight those actions that threaten the persistence and recovery of the golden sun moth*". The habitat identified within the Project Area that is proposed for removal appeared at the time of survey to only be used by male moths for dispersal and thermoregulation. The Upgrade is not likely to therefore threaten the overall persistence of GSM but will reduce the area of available dispersal habitat. While this will be reduced, through the application of mitigation measures impacts on the species overall is unlikely to be significant based on the criteria set out within DoE (2013).
Small or fragmented habitat area (<10 ha)	Any habitat loss, degradation or fragmentation	Small areas of habitat are more likely to suffer significant impacts from loss, degradation and fragmentation than larger areas. The limited dispersal ability of the Golden Sun Moth means habitat areas separated by >200 m are effectively isolated and should be considered as separate habitat areas. Extremely small, isolated and degraded habitat patches (for example <0.25 ha) may support populations of Golden Sun Moth but are unlikely to contribute to the overall ecological health of the species.	N/A: The habitat present on site is connected to other areas of suitable habitat without any barriers to dispersal (i.e. Roads, including the expanded width of the road from the Upgrade) less than 200m in width	N/A
Habitat connectivity	Fragmentation of a population through the introduction of a barrier to dispersal	Barriers to dispersal could include: breaks in habitat of >200 m; structures that prohibit movement (for example buildings, solid fences).	Habitat for the species has been recorded on either side of Mickleham Road, to both the North and South of Craigieburn. This area is connected to an adjacent property that presents habitat for the species and within which it has been previously recorded. At present it is anticipated that the Upgrade will not affect connectivity for the species - as defined in DELWP (2009) - through isolation of the population as works associated with the Upgrade will still mean that the width of both Craigieburn Road and Mickleham Road are less than 200m in width. Should the species wish to disperse across Mickleham Road, the Upgrade may widen the existing barrier to dispersal presented by the road alignment, but it will not necessarily restrict it based on the 200m barrier threshold defined in DELWP (2009). Mickleham Road is an already established road that has high use and would be resulting in at least some mortality.	Low - The Upgrade will increase the current barrier to dispersal created by Mickleham Road itself, but the widening of this Road is not likely to be prohibitive to dispersal across this road.

APPENDIX I

EnSym Report

Scenario test – native vegetation removal

This report provides offset requirements for internal testing of different proposals to remove native vegetation. **This report DOES NOT support an application to remove, destroy or lop native vegetation under Clause 52.16 or 52.17 of planning schemes in Victoria.** A report must be obtained from the Department of Environment, Land, Water and Planning (DELWP).

Date of issue: **29/05/2019**
Time of issue: **5:11 pm**

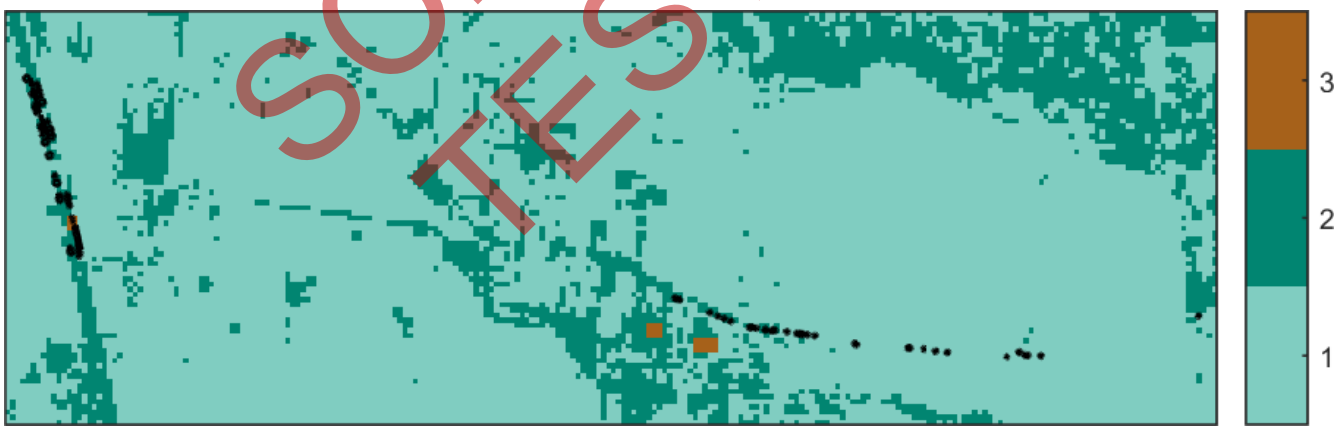
Report ID: Scenario Testing

Project ID	P17_4_EnSym_VicGrid94_updated_29

Assessment pathway

Assessment pathway	**Detailed Assessment Pathway**
Extent including past and proposed	2.584 ha
Extent of past removal	0.000 ha
Extent of proposed removal	2.584 ha
No. Large trees proposed to be removed	12
Location category of proposed removal	Location 3 The native vegetation is in an area where the removal of less than 0.5 hectares could have a significant impact on habitat for one or more rare or threatened species.The native vegetation is also in an area mapped as an endangered Ecological Vegetation Class (as per the statewide EVC map).

1. Location map



Scenario test – native vegetation removal

Offset requirements if a permit is granted

Any approval granted will include a condition to obtain an offset that meets the following requirements:

General offset amount[1]	0.606 general habitat units
Vicinity	Port Phillip and Westernport Catchment Management Authority (CMA) or Hume City Council
Minimum strategic biodiversity value score[2]	0.340
Large trees	12 large trees

NB: values within tables in this document may not add to the totals shown above due to rounding

Appendix 1 includes information about the native vegetation to be removed

Appendix 2 includes information about the rare or threatened species mapped at the site.

Appendix 3 includes maps showing native vegetation to be removed and extracts of relevant species habitat importance maps

1 The general offset amount required is the sum of all general habitat units in Appendix 1.

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

Scenario test – native vegetation removal

Next steps

Any proposal to remove native vegetation must meet the application requirements of the Detailed Assessment Pathway and it will be assessed under the Detailed Assessment Pathway.

This report DOES NOT support an application to remove, destroy or lop native vegetation under Clause 52.16 or 52.17 of planning schemes in Victoria.

If you wish to remove the mapped native vegetation you must submit the related shapefiles to the Department of Environment, Land, Water and Planning (DELWP) for processing, by email to ensymnvrtool.support@delwp.vic.gov.au. DELWP will provide a *Native vegetation removal report* that is required to meet the permit application requirements in accordance with *Guidelines for the removal, destruction or lopping of native vegetation* (Guidelines).

Appendix 1: Description of native vegetation to be removed

The species-general offset test was applied to your proposal. This test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the species offset threshold. The threshold is set at 0.005 per cent of the mapped habitat value for a species. When the proportional impact is above the species offset threshold a species offset is required. This test is done for all species mapped at the site. Multiple species offsets will be required if the species offset threshold is exceeded for multiple species.

Where a zone requires species offset(s), the species habitat units for each species in that zone is calculated by the following equation in accordance with the Guidelines:

Species habitat units = extent x condition x species landscape factor x 2, where the species landscape factor = 0.5 + (habitat importance score/2)

The species offset amount(s) required is the sum of all species habitat units per zone

Where a zone does not require a species offset, the general habitat units in that zone is calculated by the following equation in accordance with the Guidelines:

General habitat units = extent x condition x general landscape factor x 1.5, where the general landscape factor = 0.5 + (strategic biodiversity value score/2)

The general offset amount required is the sum of all general habitat units per zone.

Native vegetation to be removed

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
1-8b	Patch	vvp_0055_61	Endangered	0	no	0.200	0.036	0.036	0.265		0.007	General
1-8a	Patch	vvp_0055_61	Endangered	0	no	0.200	0.037	0.037	0.449		0.008	General
1-17	Patch	vvp_0055_61	Endangered	1	no	0.300	0.033	0.033	0.620		0.012	General
1-16	Patch	vvp_0055_61	Endangered	1	no	0.410	0.199	0.199	0.620		0.099	General
1-19	Patch	vvp_0055_61	Endangered	0	no	0.150	0.020	0.020	0.100		0.003	General
1-156	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.100		0.005	General
1-155	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.028	0.100		0.005	General
1-154	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.028	0.100		0.005	General
1-138	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.102		0.005	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
1-137	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.100		0.005	General
1-153	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.100		0.005	General
1-131	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.100		0.005	General
1-125	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.023	0.100		0.004	General
1-122	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.023	0.100		0.004	General
1-116	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.025	0.100		0.004	General
1-115	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.025	0.100		0.004	General
1-107	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.196		0.006	General
1-105	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.340		0.006	General
1-102	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.014	0.340		0.003	General
1-103	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.024	0.340		0.005	General
1-101	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.012	0.340		0.002	General
1-100	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.016	0.340		0.003	General
1-99	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.023	0.340		0.005	General
1-98	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.340		0.006	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
1-95	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.022	0.340		0.004	General
1-94	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.020	0.340		0.004	General
1-97	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.026	0.340		0.005	General
1-96	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.016	0.340		0.003	General
1-93	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.020	0.340		0.004	General
1-92	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.340		0.006	General
1-89	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.023	0.340		0.005	General
1-91	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.022	0.340		0.004	General
1-90	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.015	0.340		0.003	General
1-84	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.340		0.006	General
1-82	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.357		0.006	General
1-81	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.480		0.007	General
1-80	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.480		0.007	General
1-75	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.027	0.350		0.005	General
1-76	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.022	0.414		0.005	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
1-71	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.026	0.480		0.006	General
1-238	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.027	0.620		0.007	General
1-239	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.021	0.620		0.005	General
1-240	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.025	0.619		0.006	General
1-222	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.620		0.017	General
1-221	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.021	0.620		0.005	General
1-244	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.640		0.008	General
1-245	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.029	0.640		0.007	General
1-220	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.640		0.017	General
1-246	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.018	0.640		0.005	General
1-247	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.019	0.640		0.005	General
1-219	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.024	0.640		0.006	General
1-248	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.029	0.640		0.007	General
1-218	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.640		0.017	General
1-217	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.640		0.008	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
1-182	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.540		0.016	General
1-183	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.540		0.016	General
1-216	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.063	0.540		0.015	General
1-184	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.540		0.007	General
1-215	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.053	0.540		0.012	General
1-185	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.540		0.007	General
1-214	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.060	0.540		0.014	General
1-186	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.540		0.007	General
1-213	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.380		0.006	General
1-187	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.323		0.006	General
1-188	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.030	0.219		0.006	General
1-189	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.030	0.168		0.005	General
1-212	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.380		0.015	General
1-211	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.380		0.006	General
1-190	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.140		0.005	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
1-262	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.500		0.007	General
1-9	Patch	vvp_0055_61	Endangered	0	no	0.180	0.003	0.003	0.140		0.000	General
1-9	Patch	vvp_0055_61	Endangered	0	no	0.180	0.003	0.003	0.140		0.000	General
1-208	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.325		0.006	General
1-191	Scattered Tree	vvp_0055_61	Endangered	1	no	0.200	0.070	0.070	0.393		0.015	General
1-209	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.380		0.006	General
1-210	Scattered Tree	vvp_0055_61	Endangered	0	no	0.200	0.031	0.031	0.380		0.006	General
1-9	Patch	vvp_0055_61	Endangered	0	no	0.180	0.019	0.019	0.140		0.003	General

Appendix 2: Information about impacts to rare or threatened species' habitats on site

This table lists all rare or threatened species' habitats mapped at the site.

Species common name	Species scientific name	Species number	Conservation status	Group	Habitat impacted	% habitat value affected
Golden Sun Moth	*Synemon plana*	15021	Critically endangered	Dispersed	Top ranking map ; special site	0.0008
Large-headed Fireweed	*Senecio macrocarpus*	503116	Endangered	Dispersed	Habitat importance map	0.0002
Yellow Watercrown Grass	*Paspalidium flavidum*	507820	Endangered	Dispersed	Habitat importance map	0.0002
Large-flower Crane's-bill	*Geranium sp. 1*	505342	Endangered	Dispersed	Habitat importance map	0.0001
Plump Swamp Wallaby-grass	*Amphibromus pithogastrus*	503624	Endangered	Dispersed	Habitat importance map	0.0001
Brackish Plains Buttercup	*Ranunculus diminutus*	504314	Rare	Dispersed	Habitat importance map	0.0001
Plains Yam-daisy	*Microseris scapigera s.s.*	504657	Vulnerable	Dispersed	Habitat importance map	0.0001
Tough Scurf-pea	*Cullen tenax*	502776	Endangered	Dispersed	Habitat importance map	0.0001
Matted Flax-lily	*Dianella amoena*	505084	Endangered	Dispersed	Habitat importance map	0.0001
Pale-flower Crane's-bill	*Geranium sp. 3*	505344	Rare	Dispersed	Habitat importance map	0.0001
Rye Beetle-grass	*Tripogon loliiformis*	503455	Rare	Dispersed	Habitat importance map	0.0001
Western Golden-tip	*Goodia medicaginea*	501518	Rare	Dispersed	Habitat importance map	0.0001
Curly Sedge	*Carex tasmanica*	500650	Vulnerable	Dispersed	Habitat importance map	0.0001
Purple Blown-grass	*Lachnagrostis punicea subsp. punicea*	504206	Rare	Dispersed	Habitat importance map	0.0001
Swamp Fireweed	*Senecio psilocarpus*	504659	Vulnerable	Dispersed	Habitat importance map	0.0001
Arching Flax-lily	*Dianella sp. aff. longifolia (Benambra)*	505560	Vulnerable	Dispersed	Habitat importance map	0.0001
Pale Swamp Everlasting	*Coronidium gunnianum*	504655	Vulnerable	Dispersed	Habitat importance map	0.0001
Golden Sun Moth	*Synemon plana*	15021	Critically endangered	Dispersed	Habitat importance map ; special site	0.0000

Rosemary Grevillea	*Grevillea rosmarinifolia subsp. rosmarinifolia*	504066	Rare	Dispersed	Habitat importance map	0.0000
Austral Crane's-bill	*Geranium solanderi var. solanderi s.s.*	505337	Vulnerable	Dispersed	Habitat importance map	0.0000
Growling Grass Frog	*Litoria raniformis*	13207	Endangered	Dispersed	Habitat importance map	0.0000
Small Milkwort	*Comesperma polygaloides*	500798	Vulnerable	Dispersed	Habitat importance map	0.0000
Bearded Dragon	*Pogona barbata*	12177	Vulnerable	Dispersed	Habitat importance map	0.0000
Clover Glycine	*Glycine latrobeana*	501456	Vulnerable	Dispersed	Habitat importance map	0.0000
Grassland Earless Dragon	*Tympanocryptis pinguicolla*	12922	Critically endangered	Dispersed	Habitat importance map	0.0000
Speckled Warbler	*Chthonicola sagittatus*	10504	Vulnerable	Dispersed	Habitat importance map	0.0000
Small Scurf-pea	*Cullen parvum*	502773	Endangered	Dispersed	Habitat importance map	0.0000
Barking Owl	*Ninox connivens connivens*	10246	Endangered	Dispersed	Habitat importance map	0.0000
Black Falcon	*Falco subniger*	10238	Vulnerable	Dispersed	Habitat importance map	0.0000
Swift Parrot	*Lathamus discolor*	10309	Endangered	Dispersed	Habitat importance map	0.0000
Brown Toadlet	*Pseudophryne bibronii*	13117	Endangered	Dispersed	Habitat importance map	0.0000
White-throated Needletail	*Hirundapus caudacutus*	10334	Vulnerable	Dispersed	Habitat importance map	0.0000
Swamp Everlasting	*Xerochrysum palustre*	503763	Vulnerable	Dispersed	Habitat importance map	0.0000

Habitat group

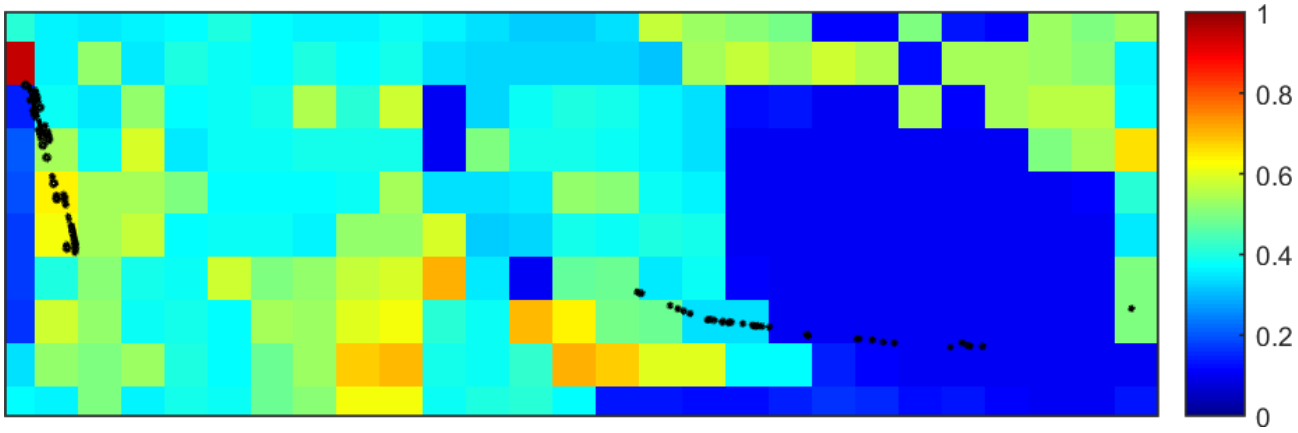
- Highly localised habitat means there is 2000 hectares or less mapped habitat for the species
- Dispersed habitat means there is more than 2000 hectares of mapped habitat for the species

Habitat impacted

- Habitat importance maps are the maps defined in the Guidelines that include all the mapped habitat for a rare or threatened species
- Top ranking maps are the maps defined in the Guidelines that depict the important areas of a dispersed species habitat, developed from the highest habitat importance scores in dispersed species habitat maps and selected VBA records
- Selected VBA record is an area in Victoria that represents a large population, roosting or breeding site etc.

Appendix 3 – Images of mapped native vegetation

2. Strategic biodiversity values map



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