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Milton Meadows FFA Addendum: Biodiversity Assessment of vegetation of road reserve north of Milton Meadows development

Dear David,

A site assessment was undertaken by Cumberland Ecology on 2nd July 2020 of an area on the northern side of Princes Highway opposite to the proposed Milton Meadows development. The assessment undertaken was to assess the biodiversity values of a stretch of vegetation which is to be impacted by a diversion of Warden Road to move the entry of the road off Princes Highway, to join at a future roundabout to be built primarily within/adjacent to 1 DP 737576.

The assessment has been undertaken to provision a request from the Shoalhaven Joint Regional Planning Panel which has requested further detail on the area of vegetation proposed to be removed. As the DA for the Milton Meadows was submitted under former planning provisions and the current assessment is to provide further information, and not for an assessment to accompany a DA modification, impacts are considered under the (now repealed) NSW *Threatened Species Conservation Act 1995* (TSC Act).

The results of the assessment are provided within **Appendix A**.

Yours sincerely,

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APPENDIX A :

Milton Meadows FFA Addendum: Warden Road Diversion

A.1. Introduction

A.1.1. Purpose

Cumberland Ecology Pty Ltd (Cumberland Ecology) has been commissioned by ANNSCA Property Group (APG) to undertake an addendum biodiversity assessment to the existing Flora and Fauna Assessment for the Milton Meadows development to asses an area proposed to be impacted by the diversion of the Princes Highway entry to Warden Road to a proposed future roundabout adjacent/within Lot 1 DP 737576 in Milton, NSW. The purpose of the assessment is to provide information on the biodiversity values of a strip of vegetation (hereafter referred to as the "Subject Site', **Figure 1**) within a road reserve to the north of the Princes Highway to the west of the entrance to Warden Road where the entrance is proposed to be diverted. This additional information was requested by the Shoalhaven Joint Regional Planning Panel (JRPP), who are assessing the Milton Meadows Development Application (DA).

It should be noted that while the biodiversity values of the entire Subject Site were assessed to allow for any required movement of the road diversion during the design process, the diversion is not likely to require the removal of all vegetation in the Subject Site which is wider than the road diversion is expected to be.

A.1.2. Background

Cumberland Ecology has previously been commissioned by APG to prepare a flora and fauna assessment (FFA) (our reference – 16245RP3) and vegetation management plan (VMP) (our reference – 16245RP4) to support a DA for 196 Windward Way, Milton (Lot 1 DP 780801 and Lot 1 DP 737576) ('the Milton Meadows development site'). A previous addendum (16245RP5) to the FFA has also been prepared to detail the impacts to biodiversity of an Asset Protection Zone on the adjoining Lot 3 DP785757. This addendum supports the aforementioned FFA and should be considered alongside that document for all purposes relating to the overall impacts to biodiversity of the Milton Meadows development.

It is noted that the NSW *Biodiversity Conservation Act 2016* (BC Act) has replaced the TSC Act as of 25 August 2017. However, the proposed development fits the required transitional arrangement criteria for the BC Act, as outlined in the *Biodiversity Conservation (Savings and Transitional) Regulation 2017,* to be assessed under the now repealed TSC Act. Therefore, this addendum biodiversity assessment has been prepared as per the requirements of the former TSC Act in accordance with transitional provisions of the BC Act and refers to the TSC Act instead of the BC Act.

A.1.2.1. Zoning

The Subject Site is currently zoned as SP2 - Infrastructure under the *Shoalhaven Local Environment Plan 2014* (the 'Shoalhaven LEP'). The objectives of SP2 Zoning are:

- To provide for infrastructure and related uses; and
- To prevent development that is not compatible with or that may detract from the provision of infrastructure.

A.2. Methodology

Flora surveys were undertaken by a Cumberland Ecology botanist on 2 July 2020 within the Subject Site. Surveys included vegetation mapping and targeted threatened flora searches, in particular targeting *Rhodamnia rubescens* which has been recorded previously by Cumberland Ecology in a property to the south.

All vascular plants recorded or collected were identified using keys and nomenclature provided in Harden (Harden 1990, 1991, 1992, 1993). Where known, taxonomic and nomenclatural changes have been incorporated into the results, as derived from PlantNET.

A.2.1. Database Search

A search of all threatened flora and species which have been recorded within 10 km of the Subject Site (DPIE 2020a) as undertaken to update the Likelihood of Occurrence assessments from the FFA. Updated assessments are provided in **Appendix C**. Entirely oceanic species have been excluded from this assessment due to lack of habitat.

A.2.2. Vegetation Mapping

Previous broad-scale mapping conducted by the Southeast NSW Native Vegetation Classification and Mapping (SCIVI) as described in Tozer *et. al*. (2010) was utilised to determine potential vegetation communities likely to occur within the Subject Site. Cumberland Ecology previously conducted vegetation surveys in 2016, 2018, and 2020 within properties to the south of the Subject Site as part of the FFA for the Milton Meadows development. The vegetation within the Subject Site was ground-truthed to examine and verify the mapping of the condition and extent of the different vegetation communities. Where vegetation community boundaries were found to differ from the Tozer et al. 2010 mapping, records were made of proposed new boundaries using a hand-held Global Positioning System (GPS) and mark-up of aerial photographs.

The resultant information was synthesised using a Geographic Information System (GIS) to create a spatial database that was used to interpret and interpolate the data to produce a vegetation map of the Subject Site.

A.2.3. Targeted Threatened Flora Surveys

Targeted threatened flora searches via random meanders were undertaken within the Subject Site.

The location of targeted searches for *Rhodamnia rubescens* and other threatened flora species are shown in **Figure 2**.

A.2.4. Habitat Assessment

A fauna habitat assessment was undertaken in conjunction with the vegetation surveys on the 2nd July 2020. The assessment included consideration of important indicators of habitat condition and complexity including the occurrence of microhabitats such as tree hollows, fallen logs, bush rock and wetland areas such as creeks and soaks. Structural features considered included the nature and extent of the understorey and ground stratum and extent of canopy. The survey also included an assessment of the presence of habitat features suitable for use by threatened fauna species known from the locality.

Three threatened fauna species have previously been located within the properties to the south associated with the Milton Meadows development. The Grey-headed Flying-fox and Large Bent-winged Bat were recorded within the Subject Site by BES (2005), and the Eastern Freetail-bat was also recorded by Cumberland Ecology during the 2018 surveys. Habitat assessment within the Subject Site was targeted towards these species.

A.3. Limitations

Vertebrate fauna and vascular flora of the locality are well known based upon a sizeable database of past records and various published reports. The surveys by Cumberland Ecology conducted between 2016 and 2020 added to the existing database and helped to provide a clear indication of the likelihood that various species occur, or are likely to occur, within the Subject Site. The data obtained from database assessment and surveys of the Subject Site furnished an appropriate level of information to support this assessment.

It is considered that the level of flora survey undertaken, with the addition of the detailed literature review and site inspections in 2018, 2019, and 2020 within adjacent properties to the south, is adequate to assess the potential occurrence of threatened flora within the Subject Site.

While no specific fauna surveys were conducted for this addendum biodiversity assessment, numerous fauna surveys have previously been conducted within the Subject Site between 2016 and 2019 for the preparation of the FFA that this document supports and the prior addendum to the FFA. The Vegetation within the Subject Site contains a vegetation community previously recorded within the properties subject to the Milton Meadows development to the south. As such it is considered the prior fauna surveys provide sufficient information to determine the likelihood of occurrence for threatened fauna species within the Subject Site.

An assessment of the likelihood of occurrence of threatened and migratory fauna species recorded in the locality within the database search was undertaken for the Subject Site and included within the FFA. This assessment has been updated for the Subject Site and is included in **Appendix C**.

A.4. Results

The vegetation within the Subject Site was found to comprise ~0.12 ha of Planted Natives/Exotics and Weeds, and ~0.03 ha of Exotic Grassland (**Figure 3**). No threatened flora species were recorded within the Subject Site. A list of all flora species recorded within the Subject Site is provided in **Appendix B**.

A.4.1. Vegetation Communities

Two vegetation communities were mapped as occurring within the Subject Site. These are consistent with communities mapped elsewhere within the FFA for the Milton Meadows development. Neither vegetation community is considered to be naturally occurring.

The vegetation communities within the Subject Site are described below.

A.4.1.1. Planted Natives/Exotics and Weeds

This vegetation community consists of a combination of planted native and exotic species, and native and exotic species which are assumed to have colonised the Subject Site in the time since plantings occurred. It appeared that the plantings were undertaken to provide a visual screen for residential properties from the

adjacent Princes Highway. Aerial photography from 2003 (Google Earth) shows the plantings to be relatively immature at that time and to have been planted in strips in an open grassland area.

The dominant plantings are a strip of tall *Casuarina cunninghamiana* subsp. *cunninghamiana* trees, which in the time since planting have recruited further younger individuals both through suckering and seed fall (**Photograph 1**). Interspersed within the strip of *Casuarina cunninghamiana* subsp. *cunninghamiana* are native species with bird-dispersed fruit which appear to have colonised the Subject Site in the time since planting. The most common of these is the P*ittosporum undulatum* (Native Pittosporum), present as individuals ranging in size from shrubs to small trees. Species occurring more sporadically (generally as isolated individuals) include *Alphitonia excelsa* (Red Ash), *Brachychiton acerifolius* (Illawarra Flame Tree), *Breynia oblongifolia* (Coffee Bush), and *Melicytus dentatus* (Native Violet).

In the north-east of the Subject Site along the boundary of the residential property adjacent to the road reserve are further native plantings of *Acacia maidenii* (Maiden's Wattle), *Acacia floribunda* (White Sally), and *Hakea salicifolia* (Willow Hakea), and other plantings of species such as *Grevillea rosmarinifolia* (Rosemary Grevillea) and *Syzygium luehmannii* (Small-leaved Lilly Pilly) occur elsewhere in the Subject Site . Further west along the northern boundary of the Subject Site plantings include the exotic species *Pittosporum tenuifolium* (Kohuhu), *Triadica sebifera* (Chinese Tallow), *Plumeria* sp. (Frangipani), and *Phormium tenax* (New Zealand Flax). Exotic woody species are also present as colonising weeds throughout the Subject Site and include *Ligustrum lucidum* (Broad-leaved Privet), *Rubus fruticosus* (Blackberry), and *Senna pendula* subsp. *glabrata*.

The ground layer is heavily dominated by the exotic grass *Ehrharta erecta* (Panic Veldtgrass), and other exotic grasses including *Paspalum dilatatum* and *Bromus catharticus* (Prairie Grass) also occur. Exotic forbs are common and species present include *Asparagus aethiopicus* (Ground Asparagus), *Acetosa sagittata* (Turkey Rhubarb), and *Stellaria media* (Common Chickweed).

Several common native species are present in the ground layer, generally as scattered individuals. These include the grasses *Microlaena stipoides* subsp. *stipoides* (Weeping Grass) and *Oplismenus aemulus* (Basket Grass), and the forb *Lobelia purpurascens* (White Root), and twiners *Clematis aristata* and *Parsonsia straminea* (Monkey Rope).

Photograph 1 Planted Natives/Exotics and Weeds

A.4.1.2. Exotic Grassland

Open grassland areas occur on the periphery of areas of planted and colonising vegetation and at the current entrance to Warden Road (**Photograph 2**). The exotic grassland is dominated by the exotic grass *Cenchrus clandestinus* (Kikuyu). Several other exotic grasses are also common and species include *Paspalum dilatatum*, *Sporobolus africanus* (Parramatta Grass), *Lolium perenne* (Ryegrass), and *Bromus catharticus*. Exotic forbs are also common and species include *Modiola caroliniana* (Red-flowered Mallow), *Trifolium repens* (White Clover), *Hypochaeris radicata* (Catsear), and *Gamochaeta americana* (Cudweed).

Photograph 2 Exotic Grassland

A.4.2. Threatened Flora Species

No threatened flora species were recorded within the Subject Site.

An assessment of the likelihood of occurrence of threatened flora species which have previously been recorded in the locality was conducted and is included in **Appendix C**. Due to the lack of any remnant native vegetation communities and the apparent, open, degraded grassland which occupied the Subject Site prior to replanting, no threatened flora species are expected to occur.

A.4.3. Fauna Habitat

The vegetation within the Subject Site provides some potential habitat for fauna. There is some foraging habitat potential for woodland birds and arboreal species within planted and colonising native species including *Hakea*, *Casuarina*, and *Pittosporum* trees on site; and dumped garden waste including logs and branches may provide shelter for some common reptiles and other terrestrial species.

Although there are many exotic flora species within the Subject Site, these can also provide potential foraging resources for nectivorous mammals and birds that may use the Subject Site from time to time as part of a larger foraging range.

Evidence was present of the exotic mammal, the European Rabbit (*Oryctolagus cuniculus*) in the form of droppings and diggings.

Several non-threatened native bird were also recorded within the Subject Site during the survey. These were the Australian Raven (*Corvus coronoides*), Australian Magpie (*Gymnorhina tibicen*), and the Little Wattlebird (*Anthochaera chrysoptera*).

A.4.4. Threatened Fauna Species

No threatened fauna species were recorded during surveys conducted on 02 July 2020, and only sub-optimal potential foraging habitat for the three species which have been recorded on properties to the south occurs. An assessment of the likelihood of occurrence of threatened fauna species has been conducted and the results are detailed in **Appendix C**.

Regardless, as the Grey-headed Flying-fox, Large Bent-winged Bat and Eastern Freetail-bat have been recorded on the adjacent property, additional Assessments of Significance have been prepared for these species relevant and are presented in **Appendix D**.

A.4.4.1. Grey-headed Flying-fox

The Grey-headed Flying-fox (*Pteropus poliocephalus*) is listed as Vulnerable under the TSC Act and the EPBC Act.

The Grey-headed Flying-fox has been recorded from the Milton Meadows development site by Cumberland Ecology and by previous surveys in 2005 (BES 2005), and potential, albeit degraded, foraging habitat for this species occurs. The species has previously been observed foraging on a large *Ficus obliqua* in the adjacent property to the south, and while there are no *Ficus obliqua* within the Subject Site, the species could potentially forage on native and exotic planted and colonising species. The Subject Site does not constitute a breeding or camp site for the species and would only provide foraging habitat as part of a broader foraging range of the highly mobile species. The Subject Site is not considered to comprise important habitat for the species.

The Large Bent-winged Bat (*Miniopterus orianae oceanensis*) is listed as Vulnerable under the TSC Act.

The Large Bent-winged Bat was recorded within the property to the south of the Subject Site in previous surveys by BES in 2005, and by Cumberland Ecology in the 2018 surveys. Potential foraging habitat for this species occurs within the Subject Site. The species could forage above the canopy of trees found across the Subject Site, however it does not contain caves suitable for roosting for the species.

A.4.4.2. Eastern Freetail-bat

The Eastern Freetail-bat (*Micronomus norfolkensis*) is listed as a vulnerable species under the TSC Act.

The Eastern Freetail-bat was recorded in the property to the south of the Subject Site during February 2018 fauna surveys by Cumberland Ecology. The Subject Site lacks trees with hollows so no roosting habitat is present. The Subject Site does contain potential foraging habitat in areas of planted and colonising native and exotic species, which would only be utilised as part of a broader foraging area for this highly mobile species.

A.5. Impact Assessment

The impacts of the proposed development have been assessed using the OEH Threatened Species Assessment Guidelines (DECC 2007).

A.5.1. Vegetation Removal

The primary impact resulting from the proposed development is the management and modification of vegetation and associated habitat within the Subject Site.

The Subject Site is approximately 0.18 ha in size, of which approximately 0.12 ha is Planted Native/Exotics and Weeds, and 0.03 ha is Exotic Grassland. Areas of both the communities will be cleared for the road deviation, the precise areas subject to the final road design, however it is likely that some vegetation will be retained as the width of the diversion will not extend across the entire Subject Site.

The vegetation within Subject Site is degraded from historical clearing and native vegetation is limited primarily to planted vegetation and individuals of several common, colonising species with bird dispersed fruit.

A.5.2. Impacts to Flora Species

The proposed diversion of the Warden Road entrance has the potential to result in a number of direct and indirect impacts to flora species. In addition to the modification/removal of vegetation within the Subject Site, potential indirect impacts to flora species include:

- Weed invasion;
- Run-off, erosion and sedimentation; and
- Modification of microhabitat features resulting from long and short-term edge effects (e.g. weed invasion).

These impacts are the same as those identified to have potential to occur in the Subject Site, and a number of mitigation measures are proposed to minimise these impacts, including:

- Vegetation protection;
- Revegetation;
- Erosion, sedimentation, and pollution controls; and
- Weed control measures.

These are discussed further in **Section 5** of the FFA. In addition to mitigation measures proposed in the FFA, revegetation is proposed for the existing entrance to Warden Road after it is closed.

Given that the habitats in the Subject Site area are very similar to the more degraded areas of the larger Milton Meadows development site to the south, it is recommended that the mitigation measures proposed in the FFA are also implemented in the Subject Site. With the implementation of these mitigation measures, the impacts listed above are considered unlikely to impact significantly on the flora species in the Subject Site.

A.5.3. Impacts to Fauna Species

The proposed diversion of the Warden Road entrance has the potential to result in a number of direct and indirect impacts to fauna species. In addition to the modification/removal of vegetation comprising fauna habitat within the Subject Site, potential indirect impacts to fauna species include:

- Habitat disturbance during the construction phase of the project (e.g. changes in noise);
- Runoff, erosion and sedimentation;
- Increased pollution; and
- Modification of microhabitat features resulting from long and short-term edge effects (e.g. changes in light filtration).

These impacts are the same as those identified to have potential to occur in the Subject Site, and a number of mitigation measures are proposed to minimise these impacts, including:

- Pre-clearing and clearing surveys;
- Erosion, sedimentation and pollution control; and
- Nest box installation.

These are discussed further in **Section 5** of the FFA. Given that the habitats in the Subject Site area are very similar to the more degraded areas of the larger Milton Meadows development site to the south, it is recommended that the mitigation measures proposed in the FFA are also implemented in the Subject Site. With the implementation of these mitigation measures, the impacts listed above are considered unlikely to impact significantly on the flora species in the Subject Site.

A.5.4. Impacts to Threatened Species

No threatened flora species were recorded within the Subject Site. Due to the degraded and highly modified nature of the site, which predominately consists of plantings, none are expected to occur. An assessment of the likelihood of occurrence of threatened flora species is provided in **Appendix C**.

No threatened fauna species were recorded within the Subject Site. In previous surveys, three threatened fauna species have been located within the adjacent Milton Meadows development site to the south; the Grey-headed Flying-fox, the Large Bent-winged Bat and the Eastern Freetail-bat. Some sub-optimal potential foraging habitat for these species occurs, within the Subject Site, and as such a 5 part test for these species has been prepared and is provided in **Appendix D**. This indicates a significant impact is not expected to occur

A.6. Conclusion

Past use of the Subject Site has entailed complete clearing of the pre-existing native vegetation. Vegetation within the site consists of planted native and exotic species only, along with weeds and a small number of colonising, common native species. There is no remnant vegetation within the Subject Site.

The area is currently unmanaged with the exception of mown grassland areas, and up to approximately 0.12 ha of Planted Natives/Exotics and Weeds and approximately 0.03 ha of Exotic Grassland may be required to be removed, though potentially less, pending a finalised road design. No Threatened Ecological Communities will be impacted as a result of the proposed road deviation.

No threatened flora species were recorded during targeted surveys, or are considered likely to occur, and as such a significant impact is not expected to occur to any threatened flora species.

No threatened fauna species were recorded within the Subject Site, however some potential habitat for the three threatened species, previously recorded within the Milton Meadows development site occurs. The Grey-headed Flying-fox, Large Bent-winged Bat and Eastern Freetail-bat have the potential to use the site for occasional foraging purposes, however due to its degraded state these highly mobile species are unlikely to rely on the marginal habitat available within the Subject Site. Therefore, no significant impact to any threatened fauna species is likely to occur as a result of the proposed road deviation.

A range of mitigation measures are recommended to be implemented for the project, which are included within the FFA and VMP previously prepared by Cumberland Ecology. These should be extended to include the Subject Site.

With the implementation of the mitigation measures previously identified for the Milton Meadows development site, no significant impact is predicted to occur to threatened species, populations or communities as a result of the proposed road deviation. Therefore, the preparation of a Species Impact Statement (SIS) is not warranted. A referral to the Commonwealth Department of Energy and the Environment under the EPBC Act is also not required.

A.7. References

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APPENDIX B :
Flora Species Recorded

Table 1 Flora Species recorded within Subject Site

BAM Growth Form Group	Family	Scientific Name	Common Name	Native	Exotic	High Threat Weed	Q1 C	Q1 A	RMS1 P	RMS 2 P
Tree (TG)	Casuarinaceae	*Allocasuarina torulosa*	Forest Oak	YES					1	
Tree (TG)	Casuarinaceae	*Casuarina cunninghamiana* subsp. *cunninghamiana*	River Oak	YES			30.0	50		
Tree (TG)	Fabaceae (Mimosoideae)	*Acacia maidenii*	Maiden's Wattle	YES					1	
Tree (TG)	Malvaceae	*Brachychiton acerifolius*	Illawarra Flame Tree	YES			2.0	1		
Tree (TG)	Myrtaceae	*Syzygium luehmannii*	Small-leaved Lilly Pilly	YES					1	
Tree (TG)	Rhamnaceae	*Alphitonia excelsa*	Red Ash	YES			0.3	1		
Shrub (SG)	Fabaceae (Mimosoideae)	*Acacia floribunda*	White Sally	YES					1	
Shrub (SG)	Myrtaceae	*Leptospermum petersonii*	Lemon-scented Teatree	YES					1	
Shrub (SG)	Phyllanthaceae	*Breynia oblongifolia*	Coffee Bush	YES					1	
Shrub (SG)	Pittosporaceae	*Pittosporum undulatum*	Sweet Pittosporum	YES			15.0	10		
Shrub (SG)	Proteaceae	*Grevillea rosmarinifolia*	Rosemary Grevillea	YES					1	
Shrub (SG)	Proteaceae	*Hakea salicifolia*	Willow-leaved Hakea	YES			20.0	10		
Shrub (SG)	Violaceae	*Melicytus dentatus*	Tree Violet	YES					1	
Other (OG)	Apocynaceae	*Parsonsia straminea*	Common Silkpod	YES					1	
Other (OG)	Bignoniaceae	*Pandorea pandorana*	Wonga Wonga Vine	YES			0.5	3		

BAM Growth Form Group	Family	Scientific Name	Common Name	Native	Exotic	High Threat Weed	Q1 C	Q1 A	RMS1 P	RMS 2 P
Other (OG)	Luzuriagaceae	*Geitonoplesium cymosum*	Scrambling Lily	YES			0.1	1		
Other (OG)	Menispermaceae	*Stephania japonica*	Snake vine	YES					1	
Other (OG)	Ranunculaceae	*Clematis aristata*	Old Man's Beard	YES					1	
Grass & grasslike (GG)	Lomandraceae	*Lomandra hystrix*		YES					1	
Grass & grasslike (GG)	Poaceae	*Microlaena stipoides* var. *stipoides*	Weeping Grass	YES			1.0	100		
Grass & grasslike (GG)	Poaceae	*Oplismenus aemulus*		YES			0.2	50		
Forb (FG)	Asteraceae	*Cotula australis*	Common Cotula	YES			0.1	30		1
Forb (FG)	Geraniaceae	*Pelargonium sp.*		YES					1	
Forb (FG)	Lobeliaceae	*Lobelia purpurascens*	Whiteroot	YES			0.1	20		
Forb (FG)	Polygonaceae	*Rumex brownii*	Swamp Dock	YES						1
Fern (EG)	Dennstaedtiaceae	*Pteridium esculentum*	Bracken	YES					1	
Exotic	Alliaceae	*Agapanthus praecox* subsp. *orientalis*			YES				1	
Exotic	Apocynaceae	*Araujia sericifera*	Moth Vine		YES		0.1	10		
Exotic	Apocynaceae	*Plumeria* sp.	Frangipani		YES		0.3	3		
Exotic	Araliaceae	*Hedera helix*	English Ivy		YES	YES			1	

BAM Growth Form Group	Family	Scientific Name	Common Name	Native	Exotic	High Threat Weed	Q1 C	Q1 A	RMS1 P	RMS 2 P
Exotic	Araliaceae	*Schefflera arboricola*			YES				1	
Exotic	Asparagaceae	*Asparagus aethiopicus*	Asparagus Fern		YES	YES	0.5	20		
Exotic	Asteraceae	*Bidens pilosa*	Cobbler's Pegs		YES	YES			1	
Exotic	Asteraceae	*Conyza sumatrensis*	Tall fleabane		YES		0.1	20		
Exotic	Asteraceae	*Gamochaeta americana*	Purple Cudweed		YES					1
Exotic	Asteraceae	*Gamochaeta pensylvanica*	Cudweed		YES					1
Exotic	Asteraceae	*Hypochaeris radicata*	Catsear		YES		0.1	5		1
Exotic	Asteraceae	*Sonchus oleraceus*	Common Sowthistle		YES				1	1
Exotic	Asteraceae	*Taraxacum officinale*	Dandelion		YES		0.1	5		1
Exotic	Basellaceae	*Anredera cordifolia*	Madeira Vine		YES	YES			1	
Exotic	Brassicaceae	*Cardamine hirsuta*	Common Bittercress		YES		0.1	5		1
Exotic	Brassicaceae	*Lepidium didymum*	Lesser Swinecress		YES					1
Exotic	Caryophyllaceae	*Cerastium glomeratum*	Mouse-ear Chickweed		YES		0.1	10		
Exotic	Caryophyllaceae	*Stellaria media*	Common Chickweed		YES		0.1	100		1
Exotic	Euphorbiaceae	*Euphorbia peplus*	Petty Spurge		YES		0.1	5		
Exotic	Euphorbiaceae	*Triadica sebifera*	Chinese Tallowood		YES	YES	0.3	3		
Exotic	Fabaceae (Caesalpinioideae)	*Senna pendula* var. *glabrata*			YES				1	

BAM Growth Form Group	Family	Scientific Name	Common Name	Native	Exotic	High Threat Weed	Q1 C	Q1 A	RMS1 P	RMS 2 P
Exotic	Fabaceae (Faboideae)	*Trifolium repens*	White Clover		YES					1
Exotic	Iridaceae	*Dietes grandiflora*			YES		0.2	1		
Exotic	Lamiaceae	*Stachys arvensis*	Stagger Weed		YES		0.1	10		
Exotic	Liliaceae	*Lilium formosanum*	Formosan Lily		YES				1	
Exotic	Malaceae	*Eriobotrya japonica*	Loquat		YES				1	
Exotic	Malvaceae	*Modiola caroliniana*	Red-flowered Mallow		YES					1
Exotic	Malvaceae	*Sida rhombifolia*	Paddy's Lucerne		YES		0.1	20		
Exotic	Ochnaceae	*Ochna serrulata*	Mickey Mouse Plant		YES	YES	0.2	1		
Exotic	Oleaceae	*Ligustrum lucidum*	Large-leaved Privet		YES	YES			1	
Exotic	Oleaceae	*Ligustrum sinense*	Small-leaved Privet		YES	YES			1	
Exotic	Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis		YES		0.2	50		
Exotic	Passifloraceae	*Passiflora edulis*	Common Passionfruit		YES		0.3	1		
Exotic	Phormiaceae	*Phormium tenax*	New Zealand Flax		YES		0.3	1		
Exotic	Pinaceae	*Pinus* sp.			YES					1
Exotic	Pittosporaceae	*Pittosporum tenuifolium*	Tawhiwhi		YES		5.0	3		
Exotic	Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues		YES				1	
Exotic	Poaceae	*Bromus catharticus*	Praire Grass		YES				1	1
Exotic	Poaceae	*Cenchrus clandestinus*	Kikuyu Grass		YES	YES			1	1

BAM Growth Form Group	Family	Scientific Name	Common Name	Native	Exotic	High Threat Weed	Q1 C	Q1 A	RMS1 P	RMS 2 P
Exotic	Poaceae	*Ehrharta erecta*	Panic Veldtgrass		YES	YES	65.0	6,500		
Exotic	Poaceae	*Eragrostis tenuifolia*	Elastic Grass		YES					1
Exotic	Poaceae	*Lolium perenne*	Perennial Ryegrass		YES					1
Exotic	Poaceae	*Paspalum dilatatum*	Paspalum		YES	YES			1	1
Exotic	Poaceae	*Poa annua*	Winter Grass		YES		1.0	200		
Exotic	Poaceae	*Sporobolus africanus*	Parramatta Grass		YES					1
Exotic	Polygonaceae	*Acetosa sagittata*	Rambling Dock		YES	YES			1	1
Exotic	Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel		YES		0.1	50		1
Exotic	Rosaceae	*Rubus fruticosus*	Blackberry complex		YES				1	
Exotic	Rubiaceae	*Richardia brasiliensis*	Mexican Clover		YES		0.1	2		
Exotic	Solanaceae	*Solanum nigrum*	Black-berry Nightshade		YES		0.2	2		
Exotic	Verbenaceae	*Verbena bonariensis*	Purpletop		YES				1	

Table Key: C = Coverage, A = Abundance, RMS = Random Meander Survey, P = Presence (1=Present)

APPENDIX C :
Likelihood of Occurrence Tables

Table 2 Likelihood of Occurrence - Threatened Flora Species

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	10km radius Count	Habitat Requirements	Likelihood of Occurrence
Myrtaceae	*Rhodamnia rubescens*	Scrub Turpentine	CE		8	Formerly common species that has been heavily impacted by Myrtle Rust to which it is extremely susceptible. Occurs in littoral, warm temperate, and subtropical rainforest, and wet sclerophyll forest, usually on volcanic and sedimentary soils.	Species unlikely to occur due to lack of remnant native vegetation. Species is a conspicuous shrub and Subject Site was thoroughly surveyed.
Myrtaceae	*Syzygium paniculatum*	Magenta Lilly Pilly	E	V	1	On south coast of NSW occurs on grey soils over sandstone, restricted mainly to remnant stands of littoral (coastal) rainforest.	Species unlikely to occur due to lack of remnant native vegetation and highly modified nature of Subject Site.
Orchidaceae	*Caladenia tessellata*	Thick-lipped Spider-orchid, Daddy Long-legs	E	V	1	Found in low, dry sclerophyll woodlands on clay loams or sandy soils, with a healthy or grassy understorey.	Species unlikely to occur due to lack of remnant native vegetation and highly modified nature of Subject Site.
Orchidaceae	*Cryptostylis hunteriana*	Leafless Tongue-orchid	V	V	1	Does not appear to have well defined habitat preferences and is known from a range of communities, including swamp heath and woodland.	Species unlikely to occur due to lack of remnant native vegetation and highly modified nature of Subject Site.

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	10km radius Count	Habitat Requirements	Likelihood of Occurrence
Santalaceae	*Thesium australe*	Austral Toadflax	V	V	1	Found in very small populations scattered across eastern NSW. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (Themeda australis).	Species unlikely to occur due to lack of remnant native vegetation and highly modified nature of Subject Site.

Table 3 Likelihood of Occurrence - Threatened Fauna Species

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Records in locality	Habitat Requirements	Likelihood of Occurrence
Amphibia							
Myobatrachidae	*Mixophyes balbus*	Stuttering Frog	E	V	1	Occurs in large forest tracts of temperate, sub-tropical rainforest and wet sclerophyll forest and is generally associated with permanent streams.	Unlikely to occur. No suitable habitat and few records in the locality.
Myobatrachidae	*Heleioporus australiacus*	Giant Burrowing Frog	V	V	4	Distribution is dependent on areas with native vegetation. Found in various vegetation communities including heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Associated with hanging swamps and perennial creeks in the northern portion of its range, and forest communities in the southern portion. Uses wet habitats for breeding.	Unlikely to occur. No suitable habitat and few records in the locality.
Hylidae	*Litoria aurea*	Green and Golden Bell Frog	E	V	2	Inhabits a wide range of water bodies, particularly ephemeral ponds for breeding, with the exception of fast-flowing streams. Terrestrial habitat includes grassy low vegetation and diurnal shelter sites. In NSW, this species is commonly found in disturbed areas although vegetation diversity is positively associated with presence.	Unlikely to occur. No suitable habitat and few records in the locality.

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Records in locality	Habitat Requirements	Likelihood of Occurrence
Aves							
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	V	Ma	22	Found in coastal and terrestrial habitats along the coast of Australia characterised by large areas of open water such as large rivers, swamps and lakes used for foraging. Also known to occur near the sea or sea-shore around bays, lakes, billabongs, beaches etc. Recorded in terrestrial habitats including coastal dunes, grassland, heath land, woodland, forest and even urban areas.	Unlikely to occur. Limited suitable habitat present; however, it is not located in proximity to open water.
Accipitridae	*Lophoictinia isura*	Square-tailed Kite	V	-	4	Commonly found around timbered watercourses in dry woodlands and open forests. Forages over large distances feeding on passerines. Often encountered in habitats with open acacia scrub, low open eucalypt woodland and grassy groundcover.	Unlikely to occur. No suitable remnant native vegetation present.
Accipitridae	*Pandion haliaetus*	Eastern Osprey	V	Ma, Mi	6	Occurs in littoral and coastal habitats, terrestrial wetlands and offshore islands. Require extensive areas of open water for foraging. Occasionally travel inland along major rivers.	Unlikely to occur. Limited suitable habitat present; however, it is not located in proximity to open water.

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Records in locality	Habitat Requirements	Likelihood of Occurrence
Artamidae	*Artamus cyanopterus cyanopterus*	Dusky Woodswallow	V	-	1	Widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. Found in woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. Primarily eats invertebrates, mainly insects, which are captured whilst hovering and sallying above the canopy or over water.	Unlikely to occur. No suitable habitat present within the Subject Site.
Cacatuidae	*Callocephalon fimbriatum*	Gang-gang Cockatoo	V	-	7	Occurs in tall mountain forests and woodlands in summer and drier more open eucalypt forests and woodlands in winter, and often found in urban areas. Require old growth attributes for nesting and roosting.	Unlikely to occur. No suitable habitat present within the Subject Site.
Cacatuidae	*Calyptorhynchus lathami*	Glossy Black-Cockatoo	V	-	45	Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of She-oak species, particularly *Allocasuarina littoralis*, *A. torulosa* or *A. verticillata* occur. Feeds almost exclusively on the seeds of several species of She-oak. Dependent on large hollow-bearing eucalypts for nest sites.	Unlikely to occur. No suitable habitat present within the Subject Site. *Allocasuarina* species not present.
Charadriidae	*Thinornis rubricollis*	Hooded Plover	E	V	14	The species inhabits coastal areas, on or near high energy sandy beaches. They are	Unlikely to occur. No suitable habitat

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Records in locality	Habitat Requirements	Likelihood of Occurrence
						generally found close to the shore but may visit coastal lakes.	present within the Subject Site.
Columbidae	*Ptilinopus superbus*	Superb Fruit-Dove	V	-	3	Inhabits rainforest and similar closed forests where it forages high in the canopy, eating the fruits of many tree species such as palms. It may also forage in eucalypt or acacia woodland where there are fruit-bearing trees. Part of the population is migratory or nomadic. Mainly found NE QLD to NE NSW.	Unlikely to occur. Limited suitable habitat present and species unlikely to occur in the area.
Haematopodidae	*Haematopus fuliginosus*	Sooty Oystercatcher	V	-	15	Coastal wader found around the entire coast of Australia. Favours rocky headlands, rocky shelves, exposed reefs with rock pools, beaches and muddy estuaries. Forages on exposed rock or coral at low tide. Breeds almost exclusively on offshore islands.	Unlikely to occur. No suitable habitat present.
Haematopodidae	*Haematopus longirostris*	Pied Oystercatcher	E	-	20	This wader is mainly distributed around the coastline. Favours intertidal flats of inlets and bays, open beaches and sandbanks.	Unlikely to occur. No suitable habitat present.
Laridae	*Sternula albifrons*	Little Tern	E	Ma, Mi	2	Found in sheltered coastal areas, such as lagoons, harbours and bays with exposed sandbanks or sand-spits as well as exposed ocean beaches.	Unlikely to occur. No suitable habitat present.

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Records in locality	Habitat Requirements	Likelihood of Occurrence
Meliphagidae	*Anthochaera phrygia*	Regent Honeyeater	CE	CE	3	Generally occurs in temperate woodlands and open forests particularly Box-Ironbark woodland and River She-oak riparian forests but also known to occur in drier coastal woodlands.	Unlikely to occur. No suitable habitat present within the Subject Site.
Meliphagidae	*Epthianura albifrons*	White-fronted Chat	V	-	1	Gregarious species found in wetland areas on bare or grassy ground.	Unlikely to occur. No suitable habitat present.
Neosittidae	*Daphoenositta chrysoptera*	Varied Sittella	V	-	3	Eucalypt forest and woodlands, especially with rough barked species, smooth-barks with dead branches, mallee and acacia. Nests in living trees and feeds off insects in dead trees	Potential to occur. Suitable habitat occurs in the form of rough-barked trees.
Petroicidae	*Petroica boodang*	Scarlet Robin	V	-	2	Occurs in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and Tea-tree swamps. Habitat usually contains abundant logs and fallen timber. Nests are often found in a dead branch in a live tree, or in a dead tree or shrub.	Unlikely to occur. No suitable habitat present.

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Records in locality	Habitat Requirements	Likelihood of Occurrence
Psittacidae	*Lathamus discolor*	Swift Parrot	E	CE, Ma	2	Semi-nomadic species foraging in dry box-ironbark forest and woodlands, but also the coastal plains forest. Widespread along the south-eastern coast of Australia, however demonstrate high site fidelity.	Unlikely to occur. No suitable habitat present.
Psittacidae	*Pezoporus wallicus wallicus*	Eastern Ground Parrot	V	-	1	Occurs in high rainfall coastal and near coastal low heathlands and sedgelands, generally below one metre in height and very dense (up to 90% projected foliage cover).	Unlikely to occur. No suitable habitat present.
Scolopacidae	*Numenius madagascariensis*	Eastern Curlew	-	CE, Ma, Mi	1	Generally found in sheltered coastal areas including bays, estuaries, lagoons and intertidal mudflats. Also found at coral reefs and ocean beaches that are located near estuaries.	Unlikely to occur. No suitable habitat present.
Scolopacidae	*Numenius phaeopus*	Whimbrel	-	Ma, Mi	3	Occurs in sheltered coastal areas, including intertidal mudflats, harbours, lagoons and estuaries. Occasionally occurs on sandy and rocky beaches.	Unlikely to occur. No suitable habitat present.
Strigidae	*Ninox strenua*	Powerful Owl	V	-	23	Inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. Also occurs in fragmented habitats.	Potential to occur. Suitable foraging habitat occurs within the forest vegetation within the Subject

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Records in locality	Habitat Requirements	Likelihood of Occurrence
							Site. Breeding habitat in the form of large hollow-bearing trees is absent.
Mammalia							
Dasyuridae	*Dasyurus maculatus*	Spotted-tailed Quoll	V	E	3	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites	Unlikely to occur. No suitable remnant native vegetation present.
Molossidae	*Micronomus norfolkensis*	Eastern Freetail-bat	V	-	2	Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures.	Marginal suitable habitat present, most likely to only use the site as part of a broader foraging range.
Peramelidae	*Isoodon obesulus obesulus*	Southern Brown Bandicoot (eastern)	E	E	1	Generally found in heath or open forest with a heathy understorey on sandy or friable soils. Males have a home range of 5-20 ha while females have a range of 2-3 ha. Nests during the day in a shallow depression in the ground covered by leaf litter, grass, or other plant material, with	Unlikely to occur. Only one record in locality and species is associated with heath/heathy understorey and

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Records in locality	Habitat Requirements	Likelihood of Occurrence
						nests located under grass trees, blackberry bushes and other shrubs, or in rabbit burrows.	there are no areas of heath within the site.
Petauridae	*Petaurus australis*	Yellow-bellied Glider	V	-	3	Occurs in high areas of rainfall in tall mature eucalypt forest where soils are nutrient rich. Dens in the hollows of large trees.	Unlikely to occur. Some sub-optimal suitable habitat present within the Subject Site in the form of moist forest, however habitat is fragmented and lacks an abundance of large hollow-bearing trees.
Petauridae	*Petaurus norfolcensis*	Squirrel Glider	V	-	1	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas.	Unlikely to occur. No suitable habitat and few records in the locality.
Phascolarctidae	*Phascolarctos cinereus*	Koala	V	V	1	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging	Unlikely to occur. No suitable habitat within the Subject Site.

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Records in locality	Habitat Requirements	Likelihood of Occurrence
						from less than two ha to several hundred hectares in size.	
Petauridae	*Petauroides volans*	Greater Glider	-	V	9	Inhabits tall, montane, moist eucalypt forests with old growth trees. Prefers forests with a diversity of eucalypt species and large hollows for breeding and shelter.	Unlikely to occur. Some sub-optimal suitable habitat present within the Subject Site in the form of moist forest, however habitat is fragmented and lacks an abundance of large hollow-bearing trees.
Pteropodidae	*Pteropus poliocephalus*	Grey-headed Flying-fox	V	V	66	Roosts in large camps located close to a regular food source, often in gullies with a dense canopy near water. Habits include temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps.	Potential to be present. Foraging habitat present in the vegetated portions of the Subject Site. No camps observed during recent surveys.
Vespertilionidae	*Chalinolobus dwyeri*	Large-eared Pied Bat	V	V	1	The species is associated with areas dominated by sandstone escarpments; sandstone cliffs and fertile woodland valley habitat occurring in close proximity to each other is important for the species.	Unlikely to occur. No suitable habitat present, not recorded in the locality.

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Records in locality	Habitat Requirements	Likelihood of Occurrence
						It roosts in cliff/escarpment areas and forages in fertile forest. Roosting is predominately in arch caves with dome roofs, but has been observed in disused mines shafts, overhangs, and disused Fairy Martin nests.	
Vespertilionidae	*Falsistrellus tasmaniensis*	Eastern False Pipistrelle	V	-	4	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows but has also been found under loose bark on trees or in buildings.	Unlikely to occur. No suitable remnant native vegetation with tall trees.
Vespertilionidae	*Kerivoula papuensis*	Golden-tipped Bat	V	-	2	Occurs in wet and dry sclerophyll forest up to 1000m. Also recorded in tall open forest, *Casuarina*-dominated riparian forest and coastal *Melaleuca* forests. Roosts in abandoned hanging Yellow-throated Scrubwren and Brown Gerygone nests modified.	Unlikely to occur. No suitable habitat present on the Subject Site.
Vespertilionidae	*Miniopterus schreibersii oceanensis*	Eastern Bentwing-bat	V	-	5	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops.	Potential to occur. Foraging habitat present in the vegetated portions of the Subject Site.

Family	Scientific Name	Common Name	TSC Act Status	EPBC Act Status	Records in locality	Habitat Requirements	Likelihood of Occurrence
Vespertilionidae	*Myotis macropus*	Southern Myotis	V	-	4	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Unlikely to occur. No suitable habitat present.
Vespertilionidae	*Scoteanax rueppellii*	Greater Broad-nosed Bat	V	-	3	More commonly found in tall wet forest but also occurs in dry eucalypt forest. Roosts in tree hollows and buildings. Forages along creek and river corridors.	Unlikely to occur. No suitable forest habitat present.

APPENDIX D :
Assessments of Significance

D.1. Grey-headed Flying-fox

D.1.1. Background

The Grey-headed Flying-fox is distributed along the east coast from Bundaberg in Queensland to Melbourne, Victoria. It occurs as far west as the western slopes of the Great Dividing Range in northern NSW. It occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps. Grey-headed Flying-foxes migrate according to the availability of native fruits, nectar and pollen. The species is known to forage in gardens in urban areas on native and exotic plants. They roost in large "camps" which are generally within 20 km of a food source (NSW Scientific Committee 2004). The Grey-headed Flying-fox is listed as Vulnerable under the TSC Act and the EPBC Act.

D.1.2. Assessment of Significance

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Grey-headed Flying-fox has the potential to use the Subject Site as part of a much larger foraging range. This species is highly mobile with a foraging range of up to 20 km^2 and would not depend upon resources contained within the Subject Site. The Grey-headed Flying-fox roosts and breeds in 'roosting camps' of hundreds of individuals. The Subject Site does not constitute a 'roosting camp' for the Grey-headed Flying-fox. Therefore, the proposal is not likely to place a viable local population of the Grey-headed Flying-fox at risk of extinction due to the limited amount of foraging habitat present within the Subject Site.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

> *(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or*
> *(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.*

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

> *(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and*
> *(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and*
> *(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.*

Up to approximately 0.12 ha of Planted Natives/Exotics and Weeds may be removed as a result of the proposed road diversion. However, this is not optimum foraging habitat as it consists of planted vegetation predominately, and no remnant native vegetation communities are present. The Grey-headed Flying-fox as would tend to forage in more vegetated forests and woodlands containing flowering gum trees, such as in Meroo National Park south or Narrawallee Creek Nature Reserve to the north-east of the Subject Site.

The habitat occurring within the Subject Site and immediate surrounds has previously been fragmented by various developments and land uses. Within this area, available habitat for these species exists in fragmented patches in varying conditions. The proposed development will not further fragment areas of existing habitat for the mobile species, as it will require the removal of a small amount of planted vegetation only. The Grey-headed Flying-fox is highly mobile and would be able to move across the remaining fragments without inhibition resulting from the vegetation removal.

The proposed action will not remove, modify, fragment or isolate important habitat for the Grey-headed Flying-fox. Habitat within the Subject Site is not important for this species in the locality as it a small area of planted vegetation. The Subject Site would only likely provide minimal foraging habitat. Much larger areas of potential habitat occur throughout the wider locality in more heavily vegetated areas, particularly along Narrawallee Creek or Meroo National Park to the north-east and south, respectively. These tracts of vegetation would provide more favourable roosting and foraging habitat for this species. It is therefore considered that the habitat provided within the Subject Site is not important for the long-term survival of the Grey-headed Flying-fox in the wider locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat for the Grey-headed Flying-fox has currently been identified by the Director- General of the DPIE.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

A National Draft Recovery Plan for the Grey-headed Flying-fox (DECCW 2009) has been prepared. A number of threats to this species are listed in the Plan, including the removal of critical habitat. The proposal will remove or modify a small amount of marginal foraging habitat for this species, which is not critical habitat and is well-represented throughout the locality. Therefore, the proposal is not considered to threaten the objectives of the Recovery Plan.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The following key threatening processes are relevant to the proposed development:

- Clearing of native vegetation;

The key threatening process of 'Clearing of native vegetation', could potentially impact habitat for this species further than current conditions. However, the vegetation within the Subject Site is not considered to constitute significant habitat for the Grey-headed Flying-fox. As potential habitat will remain in the vicinity, the clearing

of planted native vegetation is not likely to significantly impact habitat for potentially occurring threatened species.

D.1.3. Conclusion

A total of up to ~0.12 ha of vegetation is proposed to be removed that is potential foraging habitat for the Grey-headed Flying-fox. This will result in the removal of modified vegetation, dominated by planted native and exotic species. No significant habitat for the Grey-headed Flying-fox will be removed within Subject Site. The proposal is not likely to place a viable local population of this species at risk of extinction. The Grey-headed Flying-fox is highly mobile and is expected to move between areas of remaining habitat within the immediate vicinity of the Subject Site. The project is not likely to have a significant detrimental impact upon the Grey-headed Flying-fox.

D.2. Microbat Species

D.2.1. Background

The following assessment of significance applies for the Large Bent-winged Bat and the Eastern Freetail-bat, as these microbat species have similar foraging habitat requirements.

The Large Bent-winged Bat occurs throughout the east and north-west coast of Australia. They hunt in forested areas above the canopy, and roost primarily in caves, however derelict mines, storm-water tunnels, buildings and other man-made structures can be utilised (DPIE 2020c) The species is listed as Vulnerable under the TSC Act.

The Eastern Freetail-bat is found along the east coast from the southern regions of QLD to southern NSW, where it occurs only to the east of the Great Dividing Range. The species inhabits a diversity of forests types including dry and wet sclerophyll forests, woodlands, swamp forests and mangrove forests (DPIE 2020c).

This species is mainly solitary in nature; however it is occasionally observed roosting in communal groups. The Eastern Freetail-bat forages nocturnally for insects within the treed forest areas and roosts in suitable tree hollows, under bark, or in man-made structures (DPIE 2020b). The Eastern Freetail-bat is listed as a vulnerable species under the TSC Act.

D.2.2. Assessment of Significance

(a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The two species of microbats listed above are likely to use the Subject Site as foraging habitat as part of a much larger foraging range. The Subject Site does not represent a suitable roosting or breeding habitat for the Large Bent-winged Bat because caves, the habitat used by the species for roosting and breeding, are not present there. This species was recorded in recent surveys and in previous surveys by BES (2005), however the lack of caves suggests the species only uses the Subject Site occasionally as part of its foraging range. They are all highly mobile species that accesses resources from across a wide area and would not depend upon resources contained in the Subject Site for their survival.

Roosting and potential breeding habitat for the Eastern Freetail-bat is also absent as there are no hollow bearing trees and/or trees with decorticating bark in the Subject Site. The proposal is not likely to place a viable local population of either of these species at risk of extinction due to the limited amount of foraging habitat present.

(b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

Not applicable.

(c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

(d) In relation to the habitat of a threatened species, population or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and
(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.

Up to approximately ~0.12 ha of Planted Natives/Exotics and Weeds may be removed as a result of the proposed road diversion. This represents a relatively small area of potential foraging habitat within the locality for these species. This is not optimum foraging habitat for these threatened microbat species as it consists predominately of a thin strip of planted vegetation and they would tend to forage in more vegetated forests and woodlands, such as in Meroo National Park south or Narrawallee Creek Nature Reserve to the north-east of the Subject Site.

The habitat occurring within the Subject Site and immediate surrounds has previously been fragmented by various developments and land uses. Within this area, available habitat for these species exists in fragmented patches in varying conditions. The proposed road diversion in the Subject Site will not significantly further fragment areas of existing habitat due to the small area of vegetation to be removed. The potentially occurring microbats are highly mobile and would be able to move across the remaining fragments without significant inhibition due to the removal of vegetation in the Subject Site.

The proposed action will not remove, modify, fragment or isolate important habitat. Habitat within the Subject Site is not important for these species in the locality as it is a small area of planted vegetation. The Subject Site would only likely provide minimal foraging habitat. Much larger areas of potential habitat occur throughout the wider locality in more heavily vegetated areas, particularly along Narrawallee Creek or Meroo National Park to the north-east and south, respectively, of the Subject Site. These tracts of vegetation would provide more favourable roosting and foraging habitat for these species. It is therefore considered that the habitat provided within the Subject Site is not important for the long-term survival of these two threatened microbat species in the wider locality.

(e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly).

No critical habitat for any of these species has currently been identified by the Director- General of the DPIE.

(f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan.

No specific recovery plan or threat abatement plans have been prepared for the threatened microbat species assessed.

(g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

The following key threatening processes are relevant to the proposed development:

- Clearing of native vegetation.

The key threatening process of 'Clearing of native vegetation', could potentially impact habitat for these species further than current conditions. However, the vegetation within the Subject Site is not considered to constitute significant habitat for these microbat species. As potential habitat will remain in the vicinity of the Subject Site, the clearing of native vegetation is not likely to significantly impact habitat for the two potentially occurring threatened microbat species.

D.3. Conclusion

A total of up to ~0.12 ha of vegetation will be removed for the proposed road diversion. No significant habitat for the two assessed microbat species will be removed within the Subject Site. The proposal is not likely to place a viable local population of these microbat species at risk of extinction. These species are highly mobile and are expected to move between areas of remaining habitat within the immediate vicinity of the Subject Site and wider area. The project is not likely to have a significant detrimental impact upon either of these two potentially occurring threatened microbat species.

FIGURES

Legend

Subject Site

Image Source:
Image © NearMap 2020
Dated: 31/1/2020

Coordinate System: MGA Zone 56 (GDA 94)

cumberland ecology

0 50 m

I:\...\16245\Figures\Letter 11\20200803\Figure 1. Location of the subject site

Figure 1. Location of the subject site

Figure 2. Survey effort

Figure 3. Vegetation communities