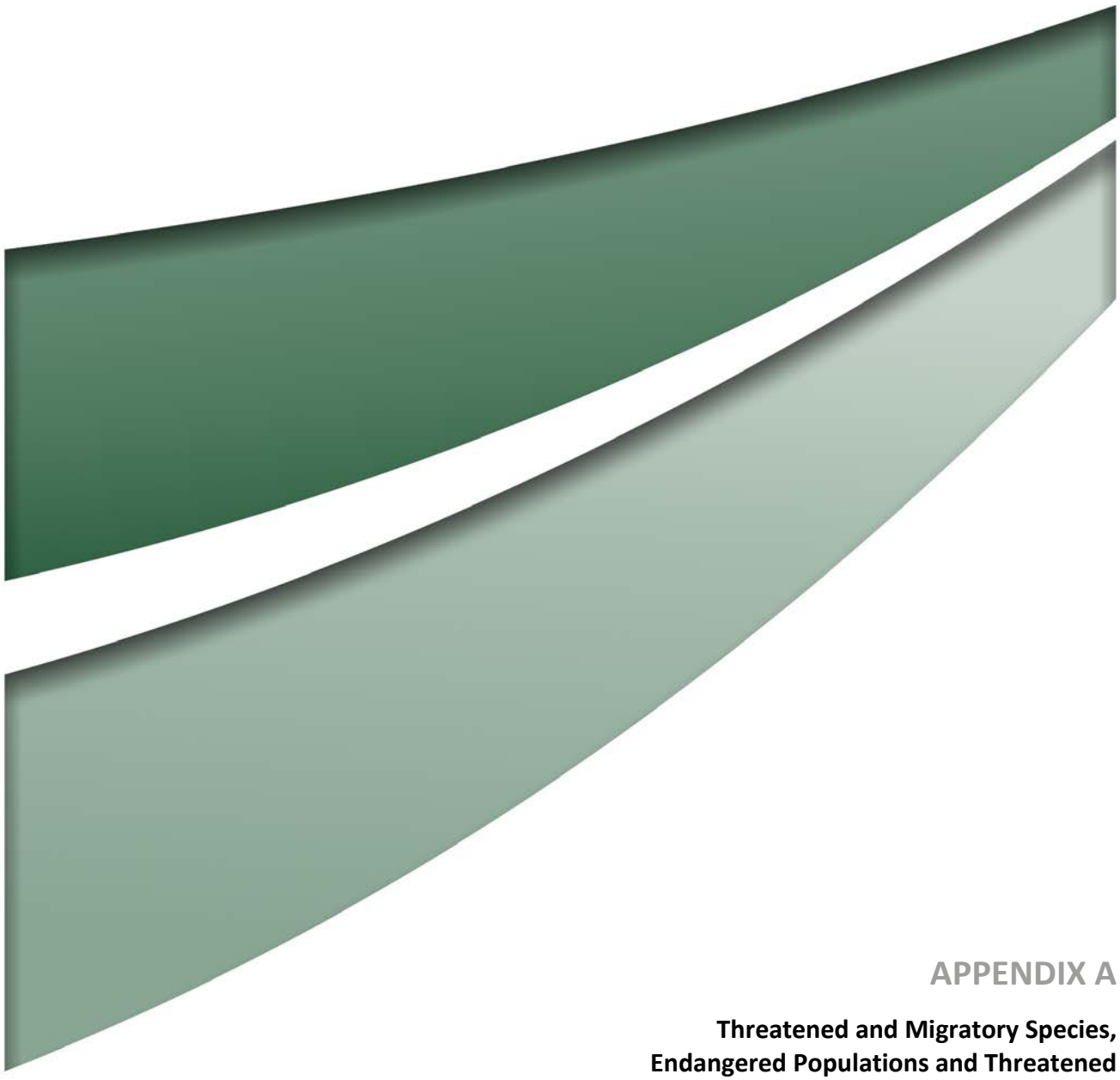


APPENDIX A

Threatened and Migratory Species, Endangered Populations and Threatened Ecological Communities with potential to occur

Threatened and migratory species, endangered populations, and threatened ecological communities (TECs) recorded during surveys of the LWB4-B7 Modification Area, and records from ecological database searches are listed in **Tables A1** and **A2.** To assist in the impact assessment process, the tables also contain relevant ecological details of each listing, including their habitat requirements, known range and reservation within conservation reserves. For the purposes of these tables, the 'region' is broadly defined as the Lower Hunter Valley, the western limit being Singleton and the eastern limit being approximately West Wallsend. The northern and southern boundaries of the region are approximately 30 kilometres north and south of the LWB4-B7 Modification Area.

The tables presented below are intended to streamline the impact assessment process, ensuring that only those species with reasonable potential to occur in the LWB4-B7 Modification Area and with reasonable potential to be impacted by the proposed modification are assessed under a 7 part test.

The 7 part tests of significance for species listed under the TSC Act are provided in **Appendix E** (EP&A Act). Species listed under the EPBC Act with reasonable potential to be impacted by the proposed modification are further assessed in **Appendix F** following the guidelines of that Act.

Table A1 - Threatened Flora, Endangered Populations and TECs Assessment

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
THREATENED FLORA SPECIES						
Bynoes wattle *Acacia bynoeana*	E (TSC) V (EPBC) 3VC- (ROTAP)	Occurs in heath or dry sclerophyll forest on sandy soils. Often prefers open, sometimes slightly disturbed sites such as track margins, edges of roadside spoil mounds and in recently burnt areas.	Occurs in central eastern NSW, from Morisset to the Illawarra region and west to the Blue Mountains. It has recently been found in the Colymea and Parma Creek areas west of Nowra, and in the Kurri Kurri, Cessnock and Ellalong areas in the lower Hunter Valley.	Olney SF Yengo NP	There is a low potential for this species to occur within the woodland habitats of the LWB4-B7 Modification Area. The proposed modification will not modify habitat of this species. There is no potential for a significant impact on potential habitat for this species.	No
Allocasuarina glareicola	E (TSC) E (EPBC)	This species is found in open Castlereagh woodland in lateritic soils.	This species is only known from the north-west Cumberland Plains district, with an additional outlying population at Liverpool.	This species is not known to occur in any reserves in the region.	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
Charmhaven apple *Angophora inopina*	V (EPBC) V (TSC) 2R- (ROTAP)	This species typically occurs on the shallow sandy soils of the Narrabeen Group, on exposed ridges and slopes with westerly or northerly aspect. It has also been recorded on shallow alluvial soils of this geological type, in upper catchments and in embedded clay soil lenses with sandstone. This species is known to naturally hybridise with rough-barked apple (*A. floribunda*) particularly around major drainage lines.	Distribution confined to the Wyong, Lake Macquarie and Port Stephens LGA of NSW. Pure forms of this species have been recorded from the Wallarah catchment in the south and north to the Toronto area. Disjunct populations have been identified at Karuah.	This species is not known to occur in any reserves in the region.	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
Asterolasia elegans	E (TSC) E (EPBC) 2ECa (ROTAP)	This species occurs on Hawkesbury sandstone on the mid to lower slopes of valleys within sheltered forests. This species is typically associated with turpentine (*Syncarpia glomulifera* subsp. *glomulifera*), smooth-barked apple (*Angophora costata*), Sydney Peppermint (*Eucalyptus piperita*), forest oak (*Allocasuarina torulosa*) and Christmas bush (*Ceratopetalum gummiferum*).	This species is known to the Baulkham Hills, Hawkesbury and Hornsby LGAs and is predicted to occur in the Gosford LGA. Only six populations of this species are known, all of which are within either the Colo or Hawkesbury River Catchment. Only one of the known populations of this species occurs within a conservation reserve.	This species is not known to occur in any reserves in the region.	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
nettled bottle brush *Callistemon linearifolius*	V (TSC) 2RCi (ROTAP)	Typically grows in dry sclerophyll forest on the coast and adjacent ranges	The distribution of this species is primarily known from the areas of the Georges River and the Hawkesbury River near Sydney, reaching to Nelsons Bay in the north (although species have been recorded in the past from as far north as Woolgoolga), and to the west at Cessnock in the Hunter Valley.	Heaton SF Werakata NP	This species was identified in the LWB4-B7 Modification Area. This species is potentially sensitive to the proposed modification.	Yes

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
leafless tongue orchid *Cryptostylis hunteriana*	V (TSC) V (EPBC) 3VC- (ROTAP)	This species appears to favour moist soils on the flat coastal plains. Occupies swamp heath, but also in sclerophyll forest and woodland, often on sandy soils. Typically found in communities containing hard-leaved scribbly gum (*Eucalyptus haemastoma*), brown stringybark (*E. capitellata*) and red bloodwood (*Corymbia gummifera*).	This species is known to occur in the Karuah Manning and Wyong CMA sub-regions in the Hunter Central Rivers region.	This species is not known to occur in any reserves in the region.	There is a low potential for this species to occur within the woodland habitats of the LWB4-B7 Modification Area. The proposed modification will not modify habitat of this species. There is no potential for a significant impact on potential habitat for this species.	No
Singleton Mallee *Eucalyptus castrensis*	E (TSC)	Very restricted in range, but locally dominant, occurring as a dense mallee stand over about three hectares, on a low broad ridgetop on loam over sandstone. Occurs on a low broad ridgetop on loam over sandstone. The understorey consists of grasses and scattered shrubs, with bare ground and litter. *Eucalyptus fibrosa* and *Corymbia maculata* grow adjacent to, but not within, the stand.	Known only from a single dense stand near Singleton in the lower Hunter Valley. Here it is locally dominant stand over about ten hectares with a number of smaller outlying stands over a 2.5 km range	This species is not known to occur in any reserves in the region.	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
Broken Back ironbark *Eucalyptus fracta*	V (TSC)	The dominant tree in a narrow band along the upper edge of a sandstone escarpment. Occurs in dry eucalypt woodland in shallow soils. Associated species in slightly deeper soils include *Eucalyptus sparsifolia*, *E. punctata*, *Corymbia maculata* and *Angophora euryphylla*.	Confined largely to State Forest. Locally common but restricted to the northern Broken Back Range near Cessnock, NSW.	Broken Back Range	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
slaty red gum *Eucalyptus glaucina*	V (TSC) V (EPBC) 3VCa (ROTAP)	This species grows in grassy woodland and dry eucalypt forest on deep, moderately fertile and well-watered soils.	Found only on the North Coast of NSW and in separate districts: near Casino (where it can be locally common) and further south, from Taree to Broke, west of Maitland. Scattered occurrences around Singleton.	Pokolbin SF Uffington SF Werakata NP	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
Craven grey box *Eucalyptus largeana*	E (TSC)	Craven grey box is often found in areas of wet forest in the sub-coastal ranges.	Only known to occur in the Gloucester-Craven district from near Pokolbin.	Copeland Tops SCA Berrico NR Talawahl NR Glen NR Willi Willi NP	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
Parramatta red gum *Eucalyptus parramattensis* subsp. *decadens*	V (EPBC) V (TSC) 2V (ROTAP)	Typically grows on deep, low-nutrient sands, often those subject to periodic inundation. Occurs in dry sclerophyll woodland with dry heath understorey and also as an emergent in dry or wet heathland.	There are two separate meta-populations, in the Kurri Kurri and Tomago areas.	Heaton SF Werakata NP Werakata SCA	There is no potential for this species to occur within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
Pokolbin mallee *Eucalyptus pumila*	V (TSC) V (EPBC) 2VCi (ROTAP)	The single known population occupies north-west-facing slopes derived from sandstone.	Currently known only from a few small populations west of Pokolbin in the Hunter Valley. Historical records also exist for Wyong and Sandy Hollow, however, has not been recorded recently in these areas.	Pokolbin SF	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
Euphrasia arguta	CE (TSC) CE (EPBC) 3X (ROTAP)	This species grows in eucalypt forest with a mixed grass and shrub understory; with plants appearing to be most dense in open disturbed areas.	*Euphrasia arguta* was historically recorded in relatively few places extending from Sydney to Bathurst and north to Walcha and was believed extinct until 2008 when it was rediscovered in the Nundle area. This species is not known to occur within 20 km of the centre of the Project area.	This species is not known to occur in any reserves in the region.	There is a low potential for this species to occur within the woodland habitats of the LWB4-B7 Modification Area. The proposed modification will not modify habitat of this species. There is no potential for a significant impact on potential habitat for this species.	No
variable midge orchid *Genoplesium insignis*	E (TSC) CE (EPBC)	Grows in patches of kangaroo grass (*Themeda australis*) amongst shrubs and sedges in heathland and forest.	Recorded from four localities between Chain Valley Bay and Wyong in Wyong LGA.	This species is not known to occur in any reserves in the region.	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
small-flower grevillea *Grevillea parviflora* subsp. *parviflora*	V (EPBC) V (TSC)	Grows in sandy or light clay soils usually over thin shales. Occurs in a range of vegetation types from heath and shrubby woodland to open forest and a range of altitudes from flat, low-lying areas to upper slopes and ridge crests. Often occurs in open, slightly disturbed sites such as along tracks.	Sporadically distributed throughout the Sydney Basin mainly occurring around Picton, Appin, Bargo and possibly Moss Vale, as well as in the north from Putty to Wyong, Lake Macquarie, Cessnock and Kurri Kurri in the lower Hunter.	Werakata NP Werakata SCA	This species was identified in the LWB4-B7 Modification Area over LWB4 and LWB5. This species is potentially sensitive to the proposed modification.	Yes
biconvex paperbark *Melaleuca biconvexa*	V (TSC)	Biconvex paperbark generally grows in damp places, often near streams or low-lying areas on alluvial soils of low slopes or sheltered aspects.	Scattered and dispersed populations of this species are known to occur in the Karuah Manning and Wyong sub-regions of the Hunter-Central Rivers CMA area.	Olney SF Sugarloaf SCA	There is no potential for this species to occur within the LWB4-B7 as it was not identified during surveys and has not been recorded within 10km of the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
Groves paperbark *Melaleuca groveana*	V (TSC) 3RC- (ROTAP)	Groves paperbark grows in heath and shrubland, often in exposed sites, at high elevations, on rocky outcrops and cliffs. It also occurs in dry woodlands.	Widespread, scattered populations in coastal districts north of Port Stephens to south-east Queensland.	Corrabare SF Yengo NP Werakata SCA	There is no potential for this species to occur within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
Omeos stork's-bill *Pelargonium* sp. Striatellum	E (EPBC)	Typically occurs just above the high water level of irregularly inundated or ephemeral lakes. During dry periods it is known to colonise dry lake beds.	This species is known to occur in both Victoria and NSW. It occurs within the south-eastern highlands and South East Corner IBRA Bioregions and the Hawkesbury-Nepean, Murrumbidgee, Southern Rivers and North East Natural Resource Management Regions.	This species is not known to occur in conservation reserves in the region.	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
Singleton mint bush *Prostanthera cineolifera*	V (TSC) V (EPBC) 2K (ROTAP)	Grows in open woodlands on exposed sandstone ridges. Usually found in association with shallow or skeletal sands.	Restricted to only a few localities near Walcha, Scone and St Albans. The species was once known in Yengo NP, however, no records have been made here in many years.	Yengo NP	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
Illawarra greenhood *Pterostylis gibbosa*	E (TSC) E (EPBC) 2E (ROTAP)	All known populations grow in open forest or woodland, on flat or gently sloping land with poor drainage.	Known from a small number of populations in the Hunter region (Milbrodale), the Illawarra region (Albion Park and Yallah) and the Shoalhaven region (near Nowra).	This species is not known to occur in any reserves in the region.	There is a low potential for this species to occur within the woodland habitats of the LWB4-B7 Modification Area. The proposed modification will not modify habitat of this species. There is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
eastern underground orchid *Rhizanthella slateri*	V (TSC) E (EPBC) K (ROTAP)	Habitat requirements are poorly understood and no particular vegetation type has been associated with the species, although it is known to occur in sclerophyll forest. Highly cryptic given that it grows almost completely below the soil surface, with flowers being the only part of the plant that can occur above ground. Therefore usually located only when the soil is disturbed.	Occurs from south-east Queensland to south-east NSW. In NSW, currently known from fewer than 10 locations, including near Bulahdelah, the Watagan Mountains, the Blue Mountains, Wiseman's Ferry area, Agnes Banks and near Nowra.	This species is not known to occur in any reserves in the region.	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
heath wrinklewort *Rutidosis heterogama*	V (TSC) V (EPBC) 2VCa (ROTAP)	Occurs mostly in heath, often along disturbed roadsides, and also in open forest, primarily in coastal districts.	In coastal districts from Maclean to the Hunter Valley and inland to Torrington. It has also been recently recorded at Cooranbong on the Central Coast and extensively around the Cessnock district.	Werakata NP Werakata SCA	This species was identified in the LWB4-B7 Modification Area over LWB4 and LWB5, and is considered potentially sensitive to the development.	Yes
black-eyed Susan *Tetratheca juncea*	V (TSC) V (EPBC) 3VCa (ROTAP)	Low open forest, woodland, heathland and moist forest, with a shrub understorey and grassy groundcover on low nutrient soils. Generally prefers well-drained slopes (often south-facing) and ridges, although it also found on upper and mid-slopes and occasionally in gullies.	Confined to coastal districts from Bulahdelah to Lake Macquarie. Furthest inland occurrences are at Buttai, near Mt Sugarloaf.	Heaton SF Sugarloaf SCA	This species was not recorded in the LWB4-B7 Modification Area and there is no potential for it to occur. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
Austral toadflax *Thesium australe*	V (TSC) V (EPBC)	This species occurs in grassland or grassy woodland and is often found in damp sites in association with kangaroo grass (*Themeda australis*). This species is a root parasite that takes water and some nutrient from other plants, especially kangaroo grass.	This species is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania, Queensland and in eastern Asia. Occurs also at Mangoola, west of Muswellbrook, NSW.	This species is not known to occur in any reserves in the region.	This species was not recorded in the LWB4-B7 Modification Area and there is no potential for it to occur. There is no potential for a significant impact on this species.	No
Zannichellia palustris	E (TSC)	Grows in fresh or slightly saline stationary or slowly flowing water.	Known to occur in the Hunter, Karuah Manning and Wyong sub-regions of the Hunter/Central Rivers CMA area.	This species is not known to occur in any reserves in the region.	This species was not recorded in the LWB4-B7 Modification Area and there is considered to be a very low potential for its occurrence. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
ENDANGERED FLORA POPUALTIONS						
weeping myall *Acacia pendula* in the Hunter Catchment	EP (TSC)	Grows on major river floodplains on heavy clay soils, sometimes as the dominant species and forming low open woodlands. Within the Hunter catchment it typically occurs on heavy soils, sometimes at the margins of small floodplains, but also in more undulating locations remote from floodplains, such as at Jerrys Plains.	There are 17 confirmed and four unconfirmed naturally occurring remnants of the *A. pendula* population in the Hunter catchment. These range as far east as Warkworth, and as far west as Kerrabee, west of Sandy Hollow. *Acacia pendula* is not known to occur naturally further north than the Muswellbrook-Wybong area. Eight planted *A. pendula* populations (not naturally occurring) have been recorded in the Hunter, and it is likely that numerous more planted populations occur.	This population is not known to occur in any reserves in the region.	No individuals of *Acacia pendula* were recorded within the LWB4-B7 Modification Area, and there is no potential for this species to occur. There is no potential for a significant impact on this endangered population.	No
tiger orchid *Cymbidium canaliculatum* in the Hunter Catchment	EP (TSC)	This species occurs within dry sclerophyll forests and woodlands of tablelands and western slopes, growing in hollows of trees. It is usually found occurring singly or as a single clump, typically between two and six metres above the ground.	The population of *Cymbidium canaliculatum* in the Hunter Catchment is at the south-eastern limit of the geographic range for this species.	This population is not known to occur in any reserves in the region.	No individuals of *Cymbidium canaliculatum* were recorded within the LWB4-B7 Modification Area. There is no potential for a significant impact on this endangered population.	No.

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
Leionema lamprophyllum subsp. *obovatum* in the Hunter Catchment	EP (TSC)	Grows in heath on exposed ridges at higher altitudes. The Hunter population occurs on a rocky cliff line in a dry eucalypt forest.	The Hunter Catchment population of *L. lamprophyllum* subsp. *obovatum* is currently known to occur in Pokolbin State Forest. The total number of mature individuals is estimated to be very low with only 4 individuals currently known.	This population is not known to occur in any reserves in the region.	No individuals of *Leionema lamprophyllum* subsp. *obovatum* were recorded within the LWB4-B7 Modification Area. There is no potential for a significant impact on this endangered population.	No
Spyridium burragorang in the Cessnock Local Government Area	PD EP (TSC)	This population is found on a steep hill at 150 m altitude in a dry ridge forest dominated by *Corymbia eximia*, *C. maculata* and *Eucalyptus* aff. *agglomerata*, with *E. squamosa* and *E. punctata* also present. The shrubby understorey is mainly *Leptospermum trinervium* with *Isopogon anemonifolius*, *Dillwynia retorta*, *Xanthorrhoea* sp., *Hakea sericea*, *Grevillea montana*, *Leucopogon* sp., *Bossiaea obcordata*, and the grasses *Rytidosperma pallidum* and *Aristida* sp.	*Spyridium burragorang* is endemic to New South Wales (NSW) and is known from the Lake Burragorang area in the Wollondilly River and adjacent Nattai River Valleys in the Blue Mountains (Thiele and West 2004) and from a disjunct population located approximately 150 km to the north in the Cessnock area of the Hunter Valley.	Werakata SCA	There is a low potential for this species to occur within the woodland habitats of the LWB4-B7 Modification Area. The proposed modification will not modify habitat of this species. There is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
THREATENED ECOLOGICAL COMMUNITIES						
Central Hunter Valley Eucalypt Forest and Woodland Complex	CEEC (EPBC)	This CEEC is dominated by one or more of the following canopy species narrow-leaved ironbark (*Eucalyptus crebra*), spotted gum (*Corymbia maculata*), slaty gum (*Eucalyptus dawsonii*), grey box (*Eucalyptus moluccana*) and may occasionally contain bulloak (*Allocasuarina luehmannii*) as a dominant. This CEEC generally occurs on Permian sedimentary bedrock on valley floors, lower hill slopes and lower ridges.	This CEEC occurs in the central region of the Hunter valley within the Hunter catchment. It is mostly present within the Muswellbrook and Singleton LGAs, with smaller occurrences within the Cessnock, Maitland, Lake Macquarie, Newcastle and Port Stephens LGAs.	Singleton Military Area	This CEEC does not occur within the LWB4-B7 Modification Area. There is no potential for a significant impact on this CEEC.	No
Freshwater Wetlands on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC (TSC)	Associated with coastal areas subject to periodic flooding and in which standing fresh water persists for at least part of the year in most years. Typically occurs on silts, mud or humic loams in low-lying parts of floodplains, alluvial flats, depressions, drainage lines, back-swamps, lagoons and lakes but may also occur in back-barrier landforms where floodplains adjoin coastal sand plains. Generally occur below 20 m elevation on level areas.	Known from along the majority of the NSW coast. There is less than 150 ha remaining on the Tweed lowlands (estimate in 1985); about 10,600 ha on the lower Clarence floodplain (in 1982); about 11,200 ha on the lower Macleay floodplain (in 1983); about 3500 ha in the lower Hunter – Central Hunter region (in 1990s); less than 2700 ha on the NSW south coast from Sydney to Moruya (in the mid 1990s), including about 660 ha on the Cumberland Plain (in 1998) and about 100 ha on the Illawarra Plain (in 2001); and less than 1000 ha in the Eden region (in 1990).	This community is poorly reserved but is known from Hunter Estuary NP	This EEC has no potential to occur within the LWB4-B7 Modification Area. There is no potential for a significant impact on this EEC.	No

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
Hunter Floodplain Red Gum Woodland in the NSW North Coast and Sydney Basin Bioregions	EEC (TSC)	This community generally occurs on floodplains and their associated floodplain rises in along the Hunter River and its tributaries. The community is generally tall woodland, with typical canopy species consisting of rough-barked apple (*Angophora floribunda*), river red gum (*Eucalyptus camaldulensis*), forest red gum (*Eucalyptus tereticornis*) and yellow box (*Eucalyptus melliodora*). Other common species are inclusive of kurrajong (*Brachychiton populneus* subsp. *populneus*) and river oak (*Casuarina cunninghamiana* subsp. *cunninghamiana*)	This community can be found along the Hunter River and its associated tributaries and is only known to occur in the NSW North Coast and Sydney Basin Bioregions. It has been recorded from the LGAs of Maitland, Mid-Western, Muswellbrook, Singleton and Upper Hunter.	This EEC is not known from any conservation reserves in the region.	This EEC does not occur within the LWB4-B7 Modification Area. There is no potential for a significant impact on this EEC.	No
Hunter Lowland Redgum Forest in the Sydney Basin and New South Wales North Coast Bioregion	EEC (TSC)	This EEC occurs on the Permian sediments of the Hunter Valley floor. Much of the remaining community is disturbed and fragmented. The floristic composition and structure of the community is influenced by both the size and disturbance history of the remaining fragments. Consequently at heavily disturbed sites only some of the species which characterise the community may be present.	This EEC occurs from Muswellbrook to the Lower Hunter in the Sydney Basin and North Coast bioregions. It has been recorded from the Maitland, Cessnock, Port Stephens, Muswellbrook and Singleton LGAs, but may occur elsewhere in these bioregions.	Werakata NP Werakata SCA.	This EEC does not occur within the LWB4-B7 Modification Area. There is no potential for a significant impact on this EEC.	No

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
Lower Hunter Spotted Gum – Ironbark Forest in the Sydney Basin Bioregion	EEC (TSC)	This EEC occurs in the central to lower Hunter Valley, principally on Permian geology.	The EEC is restricted to a range of approximately 65 km by 35 km centred on the Cessnock – Beresfield area.	Corrabare SF Pokolbin SF Werakata NP	This EEC occurs within the LWB4-B7 Modification Area, on the drier slopes	Yes
Potential Quorrobolong Scribbly Gum Woodland in the Sydney Basin Bioregion	EEC (TSC)	This EEC occurs on a residual sand deposit overlying the Permian clay sediments in the Hunter Valley.	This EEC is known from a small area between Quorrobolong and Mulbring in the Cessnock LGA but may occur elsewhere.	This EEC is not known from any conservation reserves in the region.	A small quantity of the vegetation is considered potentially consistent with this EEC. This EEC is potentially sensitive to the proposed modification.	Yes
River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions	EEC (TSC)	Given its habitat, the community has an important role in maintaining river ecosystems and riverbank stability. Occurs on with silts, clay-loams and sandy loams, on periodically inundated alluvial flats, drainage lines and river terraces associated with coastal floodplains. Generally occurs below 50 m elevation, but may occur on localised river flats up to 250 m above sea level. The composition of this EEC is highly variable, although typical species include forest red gum (*Eucalyptus tereticornis*), cabbage gum (*E. amplifolia*), rough-barked apple (*Angophora floribunda*) and broad-leaved apple (*A. subvelutina*).	This EEC occurs in numerous LGAs on the south coast of NSW. It is believed to be bounded to the north by Port Stephens, to the south by the NSW-VIC border and to occur no further west than Canberra.	This EEC is not known from any conservation reserves in the region.	This EEC occurs within the LWB4-B7 Modification Area, on the drier slopes associated with drainage lines.	Yes

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
Swamp Oak Floodplain Forest of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC (TSC)	Associated with grey-black clay-loams and sandy loams, where the groundwater is saline or sub-saline, on waterlogged or periodically inundated flats, drainage lines, lake margins and estuarine fringes associated with coastal floodplains. Generally occurs below 20 m (rarely above 10 m) elevation	This community is known from parts of the LGAs of Tweed, Byron, Lismore, Ballina, Richmond Valley, Clarence Valley, Coffs Harbour, Bellingen, Nambucca, Kempsey, Hastings, Greater Taree, Great Lakes and Port Stephens, Lake Macquarie, Wyong, Gosford, Hornsby, Pittwater, Warringah, Manly, Liverpool, Rockdale, Botany Bay, Randwick, Sutherland, Wollongong, Shellharbour, Kiama and Shoalhaven but may occur elsewhere in these bioregions.	Hunter Estuary NP	This EEC has no potential to occur within the LWB4-B7 Modification Area. There is no potential for a significant impact on this EEC.	No
Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions	EEC (TSC)	Associated with humic clay loams and sandy loams, on waterlogged or periodically inundated alluvial flats and drainage lines associated with coastal floodplains. Generally occurs below 20 m (though sometimes up to 50 m) elevation. The composition of the community is primarily determined by the frequency and duration of water logging and the texture, salinity nutrient and moisture content of the soil, and latitude. The composition and structure of the understorey is influenced by grazing and fire history, changes to hydrology and soil salinity and other disturbance, and may have a substantial component of exotic grasses, vines and forbs.	This community is known to occur in numerous LGAs, but is believed to be restricted to the areas of coastal NSW; no further south than the Shoalhaven LGA and as far north as the NSW-Queensland border, but no further west than Bathurst.	Ellalong Lagoon LCA Hunter Estuary NP	This EEC has no potential to occur within the LWB4-B7 Modification Area. There is no potential for a significant impact on this EEC.	No

Species	Legal Status	Specific Habitat	Distribution in relation to LWB4-B7 Modification Area	Reservation in the Region (Bionet 2016)	Potential to be Impacted	Detailed Assessment of Significance Required?
Hunter Valley Weeping Myall (*Acacia Pendula*) Woodland	CEEC (EPBC)	This TEC consists of weeping myall (*Acacia pendula*) with coobah (*Acacia salicina*) and scrub wilga (*Geijera salicifolia*). Yarran (*Acacia omalophylla*) and stiff canthium (*Canthium buxifolium*) are also present in the small tree/shrub layer. The ground stratum is dense and primarily grassy. Grasses include kangaroo grass (*Themeda triandra/australis*), wallaby grass (*Austrodanthonia* spp.), snow grass (*Poa sieberiana*) and barbed wire grass (*Cymbopogon refractus*).	The CEEC occurs in a small stand on heavy, brown clay soil at Jerrys Plains in the Hunter Valley, in the South Hunter Province of the Sydney Basin Bioregion.	This CEEC is not known to occur in any conservation reserves in the region.	This CEEC has no potential to occur within the LWB4-B7 Modification Area. There is no potential for a significant impact on this EEC.	No

Note:

2:	found over < 100 km	K:	poorly known
3:	found over > 100 km	LCA:	Landscape Conservation Area
a:	adequately reserved	LGA:	Local Government Area
C:	in a conservation reserve	NR:	Nature Reserve
CE:	critically endangered	NP:	National Park
CEEC:	Critically endangered ecological community	R:	rare
E:	endangered	TSC:	Threatened Species Conservation Act
EEC:	endangered ecological community	V:	Vulnerable
EP:	endangered population	X:	extinct
EPBC:	Environment Protection Biodiversity Conservation Act	-	species recorded from a reserve but population size unknown
i:	inadequately reserved	PD	Preliminary determination

Table A2 - Threatened and Migratory Fauna Assessment

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
AMPHIBIANS						
giant burrowing frog *Heleioporus australiacus*	V (TSC) V (EPBC)	Found in heath, woodland and open forest with sandy soils.	Occurs from the NSW Central Coast to eastern Victoria, but is most common on the Sydney sandstone. It has been found from the coast to the Great Dividing Range.	Yengo NP	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
stuttering frog *Mixophyes balbus*	E (TSC) V (TSC)	Found in rainforest and wet, tall open forest in the foothills and escarpment on the eastern side of the Great Dividing Range.	Occur along the east coast of Australia from southern Queensland to the north-eastern Victoria	Killarney NR Watagans NP	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
giant barred frog *Mixophyes iteratuts*	E (TSC) E (EPBC)	This species forages and lives amongst deep, damp leaf litter in rainforests, moist eucalypt forest and nearby dry eucalypt forest, at elevations below 1000 m. They breed around shallow, flowing rocky streams.	Coast and ranges from south-eastern Queensland to the Hawkesbury River in NSW. North-eastern NSW, particularly the Coffs Harbour-Dorrigo area, is now a stronghold.	Watagans NP	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
green and golden bell frog *Litoria aurea*	E (TSC) V (EPBC)	Occurs amongst emergent aquatic or riparian vegetation and amongst vegetation, fallen timber, including grassland, cropland and modified pastures. Breeds in still or slow flowing waterbodies with some vegetation such as *Typha* spp. and *Eleocharis* spp.	NSW North Coast near Brunswick Heads, southwards along the NSW Coast to Victoria where it extends into east Gippsland. The Survey Area is close to the inland limit of this species' known distribution.	This species is not known to occur in any reserves in the region.	There is a low potential for this species to occur in the riparian habitats of the LWB4-B7 Modification Area. The species is potentially sensitive to the proposed modification.	Yes
green-thighed frog *Litoria brevipalmata*	V (TSC)	Occur in a range of habitats from rainforest and moist eucalypt forest to dry eucalypt forest and heath, typically in areas where surface water gathers after rain.	Isolated localities along the coast and ranges from the NSW central coast to south-east Queensland.	This species is not known to occur in any reserves in the region.	There is a low potential for this species to occur in the riparian habitats of the LWB4-B7 Modification Area. The species is potentially sensitive to the proposed modification.	Yes
Littlejohns treefrog *Litoria littlejohni*	V (TSC) V (EPBC)	Occurs along permanent rocky streams with thick fringing vegetation associated with eucalypt woodlands and heaths among sandstone outcrops.	Distribution includes the plateaus and eastern slopes of the Great Dividing Range from Watagan State Forest south to Buchan in Victoria.	Olney SF	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
REPTILES						
broad-headed snake *Hoplocephalus bungaroides*	E (TSC) V (EPBC)	This species is nocturnal and shelters in rock crevices and under flat sandstone rocks on exposed cliff edges during autumn, winter and spring. Moves from the sandstone rocks to shelters in hollows in large trees within 200 m of escarpments in summer.	The broad-headed snake is largely confined to Triassic and Permian sandstones, including the Hawkesbury, Narrabeen and Shoalhaven groups, within the coast and ranges in an area within approximately 250 km of Sydney.	Olney SF Yengo NP	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
Stephens banded snake *Hoplocephalus stephensii*	V (TSC)	Occurs in rainforest and eucalypt forests and rocky areas up to 950 m in altitude.	Coast and ranges from Southern Queensland to Gosford in NSW.	Killarney NR Watagans NP	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
BIRDS						
black-necked stork *Ephippiorhynchus asiaticus*	E (TSC)	Inhabits permanent freshwater wetlands including margins of billabongs, swamps, shallow floodwaters, and adjacent grasslands and savannah woodlands; can also be found occasionally on inter-tidal shorelines, mangrove margins and estuaries.	This species is widespread across coastal northern and eastern Australia, becoming uncommon further south into NSW, and rarely found south of Sydney.	Hunter Estuary NP	There is potential that small ponded areas, farm dams, and a large ponded farm dam water body within the LWB4-B7 Modification Area would provide suitable habitat for this species. The species is potentially sensitive to the proposed modification.	Yes
Australasian bittern *Botaurus poiciloptilus*	E (TSC)	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleoacharis* spp.).	This species may be found over most of the state except for the far north-west.	Hunter Estuary NP	There is potential that small ponded areas, farm dams, and a large ponded farm dam water body within the LWB4-B7 Modification Area would provide suitable habitat for this species. The species is potentially sensitive to the proposed modification.	Yes

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
black bittern *Ixobrychus flavicollis*	V (TSC)	Inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, the species may occur in flooded grassland, forest, woodland, rainforest and mangroves.	Records of the species are scattered along the east coast, with individuals rarely being recorded south of Sydney or inland.	Werakakta NP Yengo NP	There is potential that small ponded areas, farm dams, and a large ponded farm dam water body within the LWB4-B7 Modification Area would provide suitable habitat for this species. The species is potentially sensitive to the proposed modification.	Yes
Eastern bristlebird *Dasyornis brachypterus*	E (TSC) E (EPBC)	The eastern bristlebird inhabits low, dense vegetation across a variety of habitats inclusive of sedgeland, heathland, swampland, shrubland, sclerophyll forest and woodland, and rainforest. This species occurs in coastal areas, tablelands and ranges.	This species occurs in three geographically separate areas of south-east Australia; a northern population in south-eastern Queensland and north-eastern NSW; a central population on the central coast of NSW; and a southern population in the south-east of NSW and eastern Victoria. There are no known records of this species within 20 km of the centre of the Project area.	This species is not known to occur in conservation reserves in the region.	There are no habitats present within the LWB4-B7 Modification Area that would be suitable for this species. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
Australian painted snipe *Rostratula australis*	E (TSC) V (EPBC)	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	In NSW, this species has been recorded at the Paroo wetlands, Lake Cowal, Macquarie Marshes and Hexham Swamp. Most common in the Murray-Darling Basin.	Pambalong NR	There is potential that small ponded areas, farm dams, and a large ponded farm dam water body within the LWB4-B7 Modification Area would provide suitable habitat for this species. The species is potentially sensitive to the proposed modification.	Yes
Curlew sandpiper *Calidris ferruginea*	E (TSC)	The curlew sandpiper is distributed around most of the coastline of Australia (including Tasmania) It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts.	A regular summer migrant from Siberia and other Arctic breeding grounds to most of the Australian coastline. It is uncommon to locally common along the NSW coast, with occasional inland sightings.	This species is not known to occur in any reserves in the region.	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
freckled duck *Stictonetta naevosa*	V (TSC)	This species prefers permanent freshwater swamps and creeks with heavy growth of cumbungi, lignum or tea-tree. During drier times it moves from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. This species generally rests in dense cover during the day, usually in deep water. Nesting usually occurs between October and December but can take place at other times when conditions are favourable. The nests are usually located in dense vegetation at or near water level.	The freckled duck is found primarily in south-eastern and south-western Australia, occurring as a vagrant elsewhere. This species may also occur as far as coastal NSW and Victoria during such times.	This species is not known to occur in any reserves in the region.	There is potential that small ponded areas, farm dams, and a large ponded farm dam water body within the LWB4-B7 Modification Area would provide suitable habitat for this species. The species is potentially sensitive to the proposed modification.	Yes
rose-crowned fruit-dove *Ptilinopus regina*	V (TSC)	Occur mainly in sub-tropical and dry rainforest and occasionally in moist eucalypt forest and swamp forest, where fruit is plentiful.	Coast and ranges of eastern NSW and Queensland, from Newcastle to Cape York. Vagrants are occasionally found further south to Victoria.	Corrabare SF	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
black-breasted buzzard *Hamirostra melanosternon*	V (TSC)	Lives in a range of inland habitats, especially along timbered watercourses which is the preferred breeding habitat. Hunts over grasslands and sparsely timbered woodlands.	Found sparsely in areas of less than 500 mm rainfall, from north-western NSW and north-eastern South Australia to the east coast at about Rockhampton, then across northern Australia south almost to Perth, avoiding only the Western Australian deserts.	Werakata NP	There is no potential for this species to occur in the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
black falcon *Falco niger*	V (TSC)	The black falcon is associated with a wide variety of habitats.	The black falcon is distributed widely yet sparsely across NSW. It is assumed that all individuals comprise a single population.	This species is not known to occur in any reserves in the region.	There is potential foraging and nesting habitat for this species in various habitats throughout the LWB4-B7 Modification Area. There will be no modification to the potential habitats of this species as a result of the proposed modification. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
little eagle *Heiraaetus morphnoides*	V (TSC)	This species is typically identified in open eucalypt forests, woodlands and open woodlands, and other areas where prey are plentiful. The nest in tall living trees within remnant patches.	The little eagle is distributed throughout mainland Australia except for the most densely forested parts of the Great Dividing Range escarpment.	Olney SF Werakata SCA	There is potential foraging and nesting habitat for this species in various habitats throughout the LWB4-B7 Modification Area. There will be no modification to the potential habitats of this species as a result of the proposed modification. There is no potential for a significant impact on this species.	No
square-tailed kite *Lophoictinia isura*	V (TSC)	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.	Scattered records of the species throughout the state indicate that the species is a regular resident in the north, north-east and along the major west-flowing river systems.	This species is not known to occur in any reserves in the region.	The LWB4-B7 Modification Area supports potential foraging and nesting habitat for this species. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
spotted harrier *Circus assimilis*	V (TSC)	Their habitat of choice is open grassy woodland, grassland, inland riparian woodland and shrub steppe. Although mostly associated with native grasslands it has also been identified in agricultural farmland. Their nest is made in a tree and composed of sticks.	The spotted harrier can be found throughout mainland Australia except for areas of dense forest on the coast, escarpments and ranges and rarely ever in Tasmania.	This species is not known to occur in any reserves in the region.	The LWB4-B7 Modification Area supports potential foraging and nesting habitat for this species. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No
white-bellied sea-eagle *Haliaeetus leucogaster*	V (TSC)	These birds are typically sighted perched in tall trees and soaring above bodies of water and land. They are territorial and form permanent breeding pairs (Australian Museum Online 2005).	This species is distributed across Australia, China, India, Indonesia, New Guinea, and south-east Asia. Within Australia it is distributed along and near the coast.	Werakata NP	This species was recorded within the LWB4-B7 Modification Area. This species is potentially sensitive to the proposed modification.	Yes
comb-crested jacana *Irediparra gallinacea*	V (TSC)	Inhabits permanent wetlands with a good surface cover of floating vegetation, especially water-lilies.	Occurs throughout coastal Australia and well inland in the north from the Kimberley to Sydney. Vagrants occasionally appear further south, possibly in response to unfavourable conditions further north in NSW.	This species is not known to occur in any reserves in the region.	There are no habitats suitable for this species within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
little lorikeet *Glossopsitta pusilla*	V (TSC)	This species can be found in dry-open eucalypt forests and woodlands, and have been identified in remnant vegetation, old growth vegetation, logged forests, and roadside vegetation. The little lorikeet usually forages in small flocks, not always with birds of their own species. They nest in hollows, mostly in living smooth-barked apples.	This species is distributed from just north of Cairns, around the east coast of Australia down to Adelaide. In NSW this species is found from the coast to the western slopes of the Great Dividing Range, extending as far west as Albury, Dubbo, Parkes and Narrabri.	Olney SF Pokolbin SF Sugarloaf SCA Werakata NP Werakata SCA Yengo NP	The LWB4-B7 Modification Area provides potential foraging and nesting habitats for this species. The proposed modification will not modify any habitat requirements of this species. As such, there is no potential for a significant impact on potential habitat for this species.	No
glossy black-cockatoo *Calyptorhynchus lathami*	V (TSC)	Habitat for this species includes forests on low-nutrient soils, specifically those containing key *Allocasuarina* feed species. They will also eat seeds from eucalypts, angophoras, acacias, cypress pine and hakeas, as well as eating insect larvae. Breeding occurs in autumn and winter, with large hollows required.	The glossy black-cockatoo has a sparse distribution along the east coast and adjacent inland areas from western Victoria to Rockhampton in Queensland. In NSW, it has been recorded as far inland as Cobar and Griffith.	Killarney NR Watagans NP Werakata NP Yengo NP	The LWB4-B7 Modification Area provides potential foraging habitat, and potential nest sites. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
gang-gang cockatoo *Callocephalon fimbriatum*	V (TSC)	In summer this species occurs in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter this species moves to drier more open eucalypt forests and woodlands. It favours old growth trees for nesting and roosting.	In NSW this species occurs from the south east coast to the Hunter region and inland to the Central Tablelands and South-west Slopes.	Pambalong NR Watagans NP Werakata NP Yengo NP	The LWB4-B7 Modification Area provides potential foraging and nesting habitats for this species. The proposed modification will not modify any habitat requirements of this species. As such, there is no potential for a significant impact on potential habitat for this species.	No
swift parrot *Lathamus discolor*	E (TSC) CE (EPBC)	This species often visits box-ironbark forests, feeding on nectar and lerps. In NSW, typical tree species in which it forages include mugga ironbark, grey box, swamp mahogany, spotted gum, red bloodwood, narrow-leaved red ironbark, forest red gum and yellow box. This bird is a migratory species that breeds in Tasmania during the spring and summer, and migrates to the mainland during the cooler months of the year.	In NSW this species has been recorded from the western slopes region along the inland slopes of the Great Dividing Range, as well as forests along the coastal plains from southern to northern NSW. The project area is within the known distribution of this species.	Werakata NP	Several winter-flowering species occur in the LWB4-B7 Modification Area which may provide foraging resources for this species and the species is known to occur in the local area. The species is potentially sensitive to the proposed modification.	Yes

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
regent honeyeater *Anthochaera phrygia*	CE (TSC) CE (EPBC)	This species generally occurs in temperate eucalypt woodlands and open forests of south eastern Australia. It is commonly recorded from box-ironbark eucalypt associations, wet lowland coastal forests dominated by swamp mahogany, spotted gum and riverine casuarina woodlands. An apparent preference exists for the wettest, most fertile sites within these associations, such as creek flats, river valleys and foothills.	Once recorded between Adelaide and the central coast of Queensland, its range has contracted dramatically in the last 30 years to between north-eastern Victoria and south-eastern Queensland.	Corrabare SF Werakata NP Werakata SCA Yengo NP	Several winter-flowering species occur in the LWB4-B7 Modification Area which may provide foraging resources for this species and it is known to occur in the local area. The species is potentially sensitive to the proposed modification.	Yes
turquoise parrot *Neophema pulchella*	V (TSC)	This species lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. It nests in tree hollows, logs or posts, from August to December.	The turquoise parrots range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range.	This species is not known to occur in any reserves in the region.	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
powerful owl *Ninox strenua*	V (TSC)	The powerful owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. It generally requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats. It roosts by day in dense vegetation.	The powerful owl occurs in eastern Australia, mostly on the coastal side of the Great Dividing Range, from south western Victoria to Bowen in Queensland.	Killarney NP Monkerai NP Werakata NP Yengo NP	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No
barking owl *Ninox connivens*	V (TSC)	Habitat for this species includes dry forests and woodlands, often in association with hydrological features such as rivers and swamps.	The barking owl is distributed sparsely throughout temperate and semi-arid areas of mainland Australia; however it is most abundant in the tropical north. Most records for this species occur west of the Great Dividing Range.	Watagans NP Werakata NP	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
masked owl *Tyto novaehollandiae*	V (TSC)	This species is generally recorded from open forest habitat with sparse mid-storey but patches of dense, low ground cover. It is also recorded from ecotones between wet and dry eucalypt forest, along minor drainage lines and near boundaries between forest and cleared land.	The masked owl occurs sparsely throughout the continent and nearby islands, including Tasmania and New Guinea.	Killarney NR Pokolbin SF Watagans NP Werakata SCA	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No
sooty owl *Tyto tenebricosa*	V (TSC)	Occurs in rainforest, including dry rainforest, subtropical and warm temperate rainforest, as well as moist eucalypt forests. Nests in very large tree hollows.	Occupies the eastern most one-eighth of NSW, occurring on the coast, coastal escarpment and eastern tablelands.	Corrabare SF Heaton SF Olney SF Pokolbin SF Watagans NP	There is no potential habitat for this species to occur within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
brown treecreeper (eastern subsp.) *Climacteris picumnus victoriae*	V (TSC)	Typical habitat for this species includes drier forests, woodlands and scrubs with fallen branches; river red gums on watercourses and around lake-shores; paddocks with standing dead timber; and margins of denser wooded areas. This species prefers areas without a dense understorey.	This species occurs over central NSW, west of the Great Dividing Range and sparsely scattered to the east of the divide in drier areas such as the Cumberland Plain of Western Sydney, and in parts of the Hunter, Clarence, Richmond and Snowy River valleys.	Werakata NP	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No
black-chinned honeyeater (eastern subspecies) *Melithreptus gularis*	V (TSC)	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially mugga ironbark, white box, grey box, yellow box and forest red gum. Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees.	The subspecies is widespread, from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina. It is rarely recorded east of the Great Dividing Range, although regularly observed from the Richmond River district. It has also been recorded at a few scattered sites in the Hunter, Central Coast and Illawarra regions.	Werakata NP	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
speckled warbler *Chthonicola sagittata*	V (TSC)	The speckled warbler occurs in eucalypt-dominated communities that have a grassy understorey, leaf litter and shrub cover, often on rocky ridges or in gullies.	Patchy distribution throughout south-eastern Queensland, eastern half of NSW and into Victoria, as far west as the Grampians.	Werakata NP Yengo NP	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No
grey-crowned babbler (eastern subspecies) *Pomatostomus temporalis temporalis*	V (TSC)	Open box-gum woodlands on the slopes. Box-cypress-pine and open box woodlands on alluvial plains. Also found in acacia shrubland and adjoining areas.	Occurs throughout northern and south-eastern Australia. In NSW, this species occurs on the western slopes of the Great Dividing Range and on the western plains reaching as far west as Louth and Hay. It also occurs in woodlands in the Hunter Valley and in several locations on the north coast of NSW. The Survey Area is not at the limit of this species' known distribution.	Werakata NP Yengo NP	This species was recorded within the LWB4-B7 Modification Area. This species is potentially sensitive to the proposed modification.	Yes

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
varied sittella *Daphoenositta chrysoptera*	V (TSC)	The varied sittella can typically be found in eucalypt forests and woodlands, especially of rough-barked species and mature smooth-barked gums with dead branches, it can also be identified in mallee and acacia woodlands. This species builds a cup shaped nest made of plant fibres and spiders webs which is placed at the canopy level in the fork of a living tree.	The varied sittella is a sedentary species that inhabits the majority of mainland Australia with the exception of the treeless deserts and open grasslands. Its NSW distribution is basically continuous from the coast to the far west.	Corrabare SF Olney SF Pokolbin SF Werakata NP Werakata SCA Yengo NP	This species was recorded within the LWB4-B7 Modification Area. This species is potentially sensitive to the proposed modification.	Yes
olive whistler *Pachycephala olivacea*	V (TSC)	Mostly inhabit wet forests above about 500m. During the winter months they may move to lower altitudes. Forage in trees and shrubs and on the ground.	Inhabits the wet forests on the ranges of the east coast. It has a disjunct distribution in NSW chiefly occupying the beech forests around Barrington Tops and the MacPherson Ranges in the north and wet forests from Illawarra south to Victoria.	Corrabare SF	There is no potential for this species to occur within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
Painted honeyeater *Grantiella picta*	V (TSC)	Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests.	The greatest concentration of this bird species; and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. During the winter it is more likely to be found in the north of its distribution.	This species is not known to occur in any reserves in the region.	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No
Dusky woodswallow *Artamus cyanopterus cyanopterus*	V (TSC)	Woodlands and dry open sclerophyll forests, usually dominated by eucalypts, including mallee associations. It has also been recorded in shrublands and heathlands and various modified habitats, including regenerating forests; very occasionally in moist forests or rainforests.	Widespread in eastern, southern and south-western Australia. In NSW it is widespread from coast to inland, including the western slopes of the Great Dividing Range and farther west. It is sparsely scattered in, or largely absent from, much of the Upper Western region.	This species is not known to occur in any reserves in the region.	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
Hooded robin (south-eastern form) *Melanodryas cucullata*	V (TSC)	Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses.	Widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies cucullata) is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies picata. Two other subspecies occur outside NSW.	This species is not known to occur in any reserves in the region.	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No
scarlet robin *Petroica boodang*	V (TSC)	This robin can be found in woodlands and open forests from the coast through to inland slopes. The birds can sometimes be found on the eastern fringe of the inland plains in the colder months of the year. Woody debris and logs are both important structural elements of its habitat. It forages from low perches on invertebrates either on the ground or in woody debris or tree trunks.	The scarlet robin can be found in south-eastern Australia, from Tasmania to the southern end of Queensland, to western Victoria and south SA.	Olney SF Werakata NP Yengo NP	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
flame robin Petroica phoenicea	V (TSC)	This species is known to breed in moist eucalypt forests and woodlands. It can usually be seen on ridges and slopes in areas where there is an open understorey layer. This species migrates during the winter to more lowland areas such as grasslands where there are scattered trees, as well as open woodland of the inland slopes and plains.	This robin is located in south-eastern Australia from the Queensland border to Tasmania and into Victoria as well as south-east SA.	Chichester SF Yengo NP	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No
diamond firetail *Stagonopleura guttata*	V (TSC)	Habitat includes a range of eucalypt dominated communities with a grassy understorey, including woodland, forest and mallee. It appears that populations are unable to persist in areas where there are no vegetated remnants larger than 200 ha.	The diamond firetail occurs through central and eastern NSW, north into southern and central Queensland and south through Victoria to South Australia. In NSW it mainly occurs west of the Great Dividing Range, although populations are known from drier coastal areas such as the Cumberland Plain and the Hunter, Clarence, Richmond and Snowy River valleys.	Werakata SCA Yengo NP	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
MAMMALS						
spotted-tailed quoll *Dasyurus maculatus*	V (TSC) E (EPBC)	Habitat for this species is highly varied, ranging from sclerophyll forest, woodlands, coastal heathlands and rainforests. Records exist from open country, grazing lands and rocky outcrops. Suitable den sites including hollow logs, tree hollows, rocky outcrops or caves.	In NSW the spotted-tailed quoll occurs on both sides of the Great Dividing Range, with the highest densities occurring in the north-east of the state. It occurs from the coast to the snowline and inland to the Murray River.	Awaba SF Corrabare SF Heaton SF Killarney NP Olney SF Pokolbin SF Uffington SF Watagans NP Watagan SF Werakata SCA Yengo NP	There is potential for this species to occur in the more densely vegetated habitats in the north of the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
koala *Phascolarctos cinereus*	V (TSC) V (EPBC)	This species inhabits eucalypt forest and woodland, with suitability influenced by tree species and age, soil fertility, climate, rainfall and fragmentation patterns. The species is known to feed on a large number of eucalypt and non-eucalypt species; however it tends to specialise on a small number in different areas. *Eucalyptus tereticornis, E. punctata, E. cypellocarpa, E. viminalis, E. microcorys, E. robusta, E. albens, E. camaldulensis* and *E. populnea* are some preferred species.	The koala has a fragmented distribution throughout eastern Australia, with the majority of records from NSW occurring on the central and north coasts, as well as some areas further west. It is known to occur along inland rivers on the western side of the Great Dividing Range.	Awaba SF Corrabare SF Heaton SF Killarney NR Monkerai NR Olney SF Pokolbin SF Uffington SF Watagans NP Watagan SF Werakata NP Werakata SCA Yengo NP	A single atlas of NSW wildlife record of this species is present within the LWB4-B7 Modification Area. However, no records or evidence of this species have been recorded apart from this previous record in 2006. This species is potentially sensitive to the proposed modification.	Yes
greater glider *Petauroides volans*	V (EPBC)	Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelter during the day in tree hollows and will use up to 18 hollows in their home range. Occupy a relatively small home range with an average size of 1 to 3 ha.	The Greater Glider occurs in eucalypt forests and woodlands along the east coast of Australia from north east Queensland to the Central Highlands of Victoria	This species is not known to occur in any reserves in the region.	There is no potential for this species to occur within the LWB4-B7 Modification Area.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
yellow-bellied glider *Petaurus australis*	V (TSC)	Occur in tall mature eucalypt forest generally in areas with high rainfall and nutrient rich soils. Forest type preferences vary with latitude and elevation; mixed coastal forests to dry escarpment forests in the north; moist coastal gullies and creek flats to tall montane forests in the south.	The yellow-bellied Glider is found along the eastern coast to the western slopes of the Great Dividing Range, from southern Queensland to Victoria.	Corrabare SF Heaton SF Olney SF Pokolbin SF Watagans NP Watagan SF Werakata NP Yengo NP	There is no potential for this species to occur within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
squirrel glider *Petaurus norfolcensis*	V (TSC)	Inhabits a variety of mature or old growth habitats, including box, box-ironbark woodlands, river red gum forest, and blackbutt-bloodwood forest with heath understorey. It prefers mixed species stands with a shrub or acacia mid-storey, and requires abundant tree hollows for refuge and nest sites.	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria.	Olney SF Uffington SF Werakata NP Werakata SCA Yengo NP	This species was identified within the LWB4-B7 Modification Area. The species is potentially sensitive to the proposed modification.	Yes

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
long-nosed potoroo *Potorous tridactylus*	V (TSC) V (EPBC)	Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature.	This species is found on the south-eastern coast of Australia, from Queensland to eastern Victoria and Tasmania, including some of the Bass Strait islands. In NSW it is generally restricted to coastal heaths and forests east of the Great Dividing Range.	Heaton SF Killarney NR	There is potential for this species to occur within the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No
brush-tailed rock-wallaby *Petrogale penicillata*	E (TSC) V (EPBC)	This species occupies rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges facing north. It browses on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. This species shelters or bask during the day in rock crevices, caves and overhangs and is most active at night.	The brush-tailed rock-wallaby was once abundant and ubiquitous throughout the mountainous country of south-eastern Australia. Its distribution roughly followed the Great Dividing Range for 2500 km from the Grampians in West Victoria to Nanango in south-east Queensland, with outlying populations in coastal valleys and ranges to the east of the divide, and the slopes and plains as far west as Cobar in NSW and Injune (500 km NW of Brisbane) in Queensland.	Watagans NP Heaton SF Olney SF Pokolbin SF Watagans NP Yengo NP	The LWB4-B7 Modification Area does not support suitable habitat for this species. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
parma wallaby *Macropus parma*	V (TSC)	Preferred habitat for this species is moist eucalypt forest with thick, shrubby understorey, often with nearby grassy areas, rainforest margins and occasionally drier eucalypt forest. It typically feeds at night on grasses and herbs in more open eucalypt forest and the edges of nearby grassy areas. During the day it shelters in dense cover.	Although it once occurred from north-eastern NSW to the Bega area in the southeast, its range is now confined to the coast and ranges of central and northern NSW.	Corrabare SF Killarney NR Olney SF Yengo NP	This species has potential to utilise the foraging resources of the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on this species.	No
grey-headed flying-fox *Pteropus poliocephalus*	V (TSC) V (EPBC)	This species occurs in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy.	Grey-headed flying-foxes are found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria.	Olney SF Pokolbin SF Watagan SF Werakata NP Werakata SCA Yengo NP	This species has been recorded. The LWB4-B7 Modification Area supports potential foraging habitat for this species, however, there are no known roost sites.	Yes
East-coast freetail-bat *Mormopterus norfolkensis*	V (TSC)	This species occurs in dry sclerophyll forest and woodland east of the Great Dividing Range. It roosts mainly in tree hollows but will also roost under bark or in man-made structures.	The eastern freetail-bat is found along the east coast from south Queensland to southern NSW.	Awaba SF Werakata NP Werakata SCA Yengo NP	This species was identified within the LWB4-B7 Modification Area. The species is potentially sensitive to the proposed modification.	Yes

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
eastern bentwing-bat *Miniopterus schreibersii oceanensis*	V (TSC)	This species hunts in forested areas and uses caves as the primary roosting habitat, but also uses derelict mines, storm-water tunnels, buildings and other man-made structures. It forms discrete populations centred on a maternity cave that is used annually in spring and summer for the birth and rearing of young.	Eastern bent-wing bats occur along the east and north-west coasts of Australia.	Awaba SF Olney SF Uffington SF Werakata NP Yengo NP	This species was potentially identified within the LWB4-B7 Modification Area. The species is potentially sensitive to the proposed modification.	Yes
eastern false pipistrelle *Falsistrellus tasmaniensis*	V (TSC)	Habitat for this species includes sclerophyll forest. It prefers wet habitats, with trees over 20 m high, and generally roosts in tree hollows or trunks.	This species has a range from south eastern Queensland, through NSW, Victoria and into Tasmania, and occurs from the Great Dividing Range to the coast.	Heaton SF Olney SF Werakata NP Yengo NP	This species was potentially identified within the LWB4-B7 Modification Area. The species is potentially sensitive to the proposed modification.	Yes
little bentwing-bat *Miniopterus australis*	V (TSC)	Prefers moist eucalypt forest, rainforest or dense coastal banksia scrub. This species roost in caves, tunnels and sometimes tree hollows during the day, and at night forage for small insects beneath the canopy of densely vegetated habitats.	Occurs in coastal north-eastern NSW and eastern Queensland.	Awaba SF Uffington SF Werakata NP Werakata SCA	This species was potentially identified within the LWB4-B7 Modification Area. The species is potentially sensitive to the proposed modification.	Yes

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
large-eared pied bat *Chalinolobus dwyeri*	V (TSC) V (EPBC)	The large-eared pied bat is generally found in a variety of drier habitats, including dry sclerophyll forests and woodlands, however, it probably tolerates a wide range of habitats. It tends to roost in the twilight zones of mines and caves, generally in colonies or common groups.	This species has a distribution from south western Queensland to NSW from the coast to the western slopes of the Great Dividing Range.	Awaba SF Olney SF Pokolbin SF Watagans NP Yengo NP	This species was recorded in the LWB4-B7 Modification Area. There is potential for a significant impact on this species.	Yes
southern myotis *Myotis macropus*	V (TSC)	This species generally roosts in groups of 10-15 close to water in caves, mine shafts, hollow-bearing trees, and storm-water channels, buildings, under bridges and in dense foliage. It forages over streams and pools catching insects and small fish by raking its feet across the water surface.	The large-footed myotis is found in the coastal band from the north-west of Australia, across the Top-End and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers.	Awaba SF Pokolbin SF Uffington SF Werakata NP	This species was potentially identified within the LWB4-B7 Modification Area. The species is potentially sensitive to the proposed modification.	Yes
greater broad-nosed bat *Scoteanax rueppellii*	V (TSC)	The greater broad-nosed bat appears to prefer moist environments such as moist gullies in coastal forests, or rainforest. They have also been found in gullies associated with wet and dry sclerophyll forests and open woodland. It roosts in hollows in tree trunks and branches and has also been found to roost in the roofs of old buildings.	The greater broad-nosed bat is found mainly in the gullies and river systems that drain the Great Dividing Range, from north-eastern Victoria to the Atherton Tableland. It extends to the coast over much of its range. In NSW it is widespread on the New England Tablelands, however it does not occur at altitudes above 500 metres.	Awaba SF Olney SF Pokolbin SF Werakata NP Werakata SCA Yengo NP	This species was identified within the LWB4-B7 Modification Area. There is potential for a significant impact on this species.	Yes

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
eastern cave bat *Vespadelus troughtoni*	V (TSC)	This species is a cave-roosting bat that is usually found in dry open forest and woodland, near cliffs or rocky overhangs. It has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals, and is occasionally found along cliff-lines in wet eucalypt forest and rainforest.	The eastern cave bat is found in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT.	Pokolbin SF Yengo NP	This species was potentially identified within the LWB4-B7 Modification Area. The species is potentially sensitive to the proposed modification.	Yes
New Holland mouse *Pseudomys novaehollandiae*	V (EPBC)	This species inhabits a range of habitats from open heathlands, open woodlands with a heath understorey, as well as vegetated dunes. The New Holland mouse lives in a burrow which is shared with other individuals.	This species has a disjunct distribution across Tasmania, Victoria, Queensland and NSW.	This species is not known to occur in any reserves in the region.	The LWB4-B7 Modification Area does not support suitable habitat for this species. There is no potential for a significant impact on this species.	No
Hastings River mouse *Pseudomys oralis*	E (TSC) E (EPBC)	Known to inhabit a variety of dry open forest types with dense, low ground cover and a diverse mixture of ferns, grass, sedges and herbs. Access to seepage zones, creeks and gullies is important, as is permanent shelter such as rocky outcrops. Nests may be in either gully areas or ridges and slopes.	This species has a patchy distribution along the east side of the Northern Tablelands and great escarpment of north-east NSW, usually but not always at elevations between 500 m and 1100 m. Also recorded in south-east Queensland.	This species is not known to occur in any reserves in the region.	This species has potential to utilise the foraging resources of the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
FISH						
Darling River Hardyhead in the Hunter River Catchment	EP (FM Act)	This species is usually found in slow flowing, clear, shallow waters or in aquatic vegetation at the edge of such waters. The species has also been recorded from the edge of fast flowing habitats such as the runs at the head of pools.	The species is rarely recorded in the Hunter catchment but has been found in the headwaters of the Hunter system near Pages River.	This species is not known to occur in any reserves in the region.	The aquatic habitats in the LWB4-B7 Modification Area do not conform with the known habitat range of this species There is no potential for a significant impact on this species.	No
MIGRATORY SPECIES						
fork-tailed swift *Apus pacificus*	MIG (EPBC)	The fork-tailed swift is mostly found in Australia through the months of October through to April. This swift spends most of its time when in flight ahead of storm fonts and updraughts (Slater et al. 2003).	The fork-tailed swift can be found throughout Australia during migrating. In Australia it is most common west of the Great Dividing Range. This species is uncommon in Tasmania.	Pokolbin SF	The LWB4-B7 Modification Area provides potential habitat for this species. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
Japanese snipe *Gallinago hardwickii*	MIG (EPBC)	The Japanese snipe can be found in permanent and ephemeral wetlands up to 2000 m ASL. These water bodies are usually freshwater with low, dense vegetation. They forage in areas of mud with some vegetation cover and roost nearby to these areas. The Japanese snipe does not breed in Australia, only passing through for migration.	This species has been recorded from Cape York through to south-east SA. The range of this species extends from inland of the eastern tablelands in south-east Queensland to west of the Great Dividing Range in NSW. Richmond River, NSW is a favourite area for non-breeding birds.	This species is not known to occur in any reserves in the region.	There is potential that small ponded areas, farm dams, and a large ponded farm dam water body within the LWB4-B7 Modification Area would provide suitable habitat for this species. The species is potentially sensitive to the proposed modification.	Yes
eastern osprey *Pandion cristatus*	V (TSC) MIG (EPBC)	Favours coastal areas, especially the mouths of large rivers, lagoons and lakes.	This species is found right around the Australian coast line, except for Victoria and Tasmania. They are common around the northern coast, especially on rocky shorelines, islands and reefs. The species is uncommon to rare or absent from closely settled parts of south-eastern Australia. There are a handful of records from inland areas.	This species is not known to occur in any reserves in the region.	The LWB4-B7 Modification Area provides potential habitat for this species. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
white-throated needletail *Hirundapus caudacutus*	MIG (EPBC)	This species is only in Australia approximately between the months of October and May. They forage upon flying insects and drink whilst in flight. Feeding is typically associated with rising thermal currents typical with storm fronts and bushfires. (Australian Museum Online 2003)	This species is distributed over eastern and northern Australia	Heaton SF Pokolbin SF Werakata NP Werakata SCA Yengo NP	The LWB4-B7 Modification Area provides potential habitat for this species. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No
rainbow bee-eater *Merops ornatus*	MIG (EPBC)	The preferred habitat of the rainbow bee-eater is open forests and woodlands, shrublands, and cleared or semi-cleared areas (commonly farmland). These areas are usually in close proximity to permanent water, however, during migration this bird may fly over areas of non-preferential habitat.	This species is distributed throughout most of mainland Australia as well as several near-shore islands. It is not found in Tasmania and has only been identified in a thin strip in the most arid regions of central WA.	Corrabare SF Pokolbin SF Werakata SCA Werakata SF Yengo NP	This species has potential to occur in the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
black-faced monarch *Monarcha melanopsis*	MIG (EPBC)	This bird can be identified in coastal scrub, damp gullies, eucalypt woodlands and rainforests. This bird can be seen foraging for insects amongst foliage, and builds a deep, cup-shaped nest in a tree fork (3 to 6 m above the ground) which is made up of cobwebs, casuarinas needles, bark, moss and roots (Australian Museum Online2005).	The black-faced monarch is distributed along the eastern coast of Australia, gradually becoming less common towards the south.	Awaba SF Corrabare SF Heaton SF Pokolbin SF Werakata NP Watagan SF Yengo NP	There is no potential habitat for this species within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
spectacled monarch *Monarcha trivigatus*	MIG (EPBC)	This species prefers habitats with a thick understorey including mangroves, rainforests, wet gullies and waterside vegetation.	This species is found along the coast of north-east and eastern Australis. It is also known from Papua New Guinea, the Moluccas and Timor.	This species is not known from conservation reserves in the region.	There is no potential habitat for this species within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
satin flycatcher *Myiagra cyanoleuca*	MIG (EPBC)	This species typically inhabits wet areas of tall forests, particularly in gullies. The satin flycatcher moves north in the winter and is seldom seen in NSW, Tasmania, Victoria or SA during these times. This bird nests in loose colonies in broad-based cup-shaped nests on a bare horizontal branch. These nests are constructed from bark, grass, lichen and cobwebs (Australian Museum Online 2005).	The satin flycatcher can be found in both Australia and New Guinea. In Australia it is distributed along the east coast from Cape York through to Tasmania, also covering parts of south-eastern SA.	Pokolbin SF	This species has the potential to occur in the LWB4-B7 Modification Area. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No
rufous fantail *Rhipidura rufifrons*	MIG (EPBC)	The rufous fantail typically inhabits areas of dense wet forest, mangrove, rainforest or swamp woodlands. It prefers areas where there is intense shade available and is often seen close to ground. In winter it is seldom found in NSW or Victoria.	This species is distributed across the north and eastern coast of Australia, but is also found in Guam, New Guinea, the Solomon Islands and Sulawesi.	Awaba SF Belford NP Heaton SF Pokolbin SF Uffington SF Watagan SF Werakata NP Werakata SCA Yengo NP	The LWB4-B7 Modification Area provides potential habitat for this species. The proposed modification will not modify any habitat requirements of this species. As such there is no potential for a significant impact on potential habitat for this species.	No

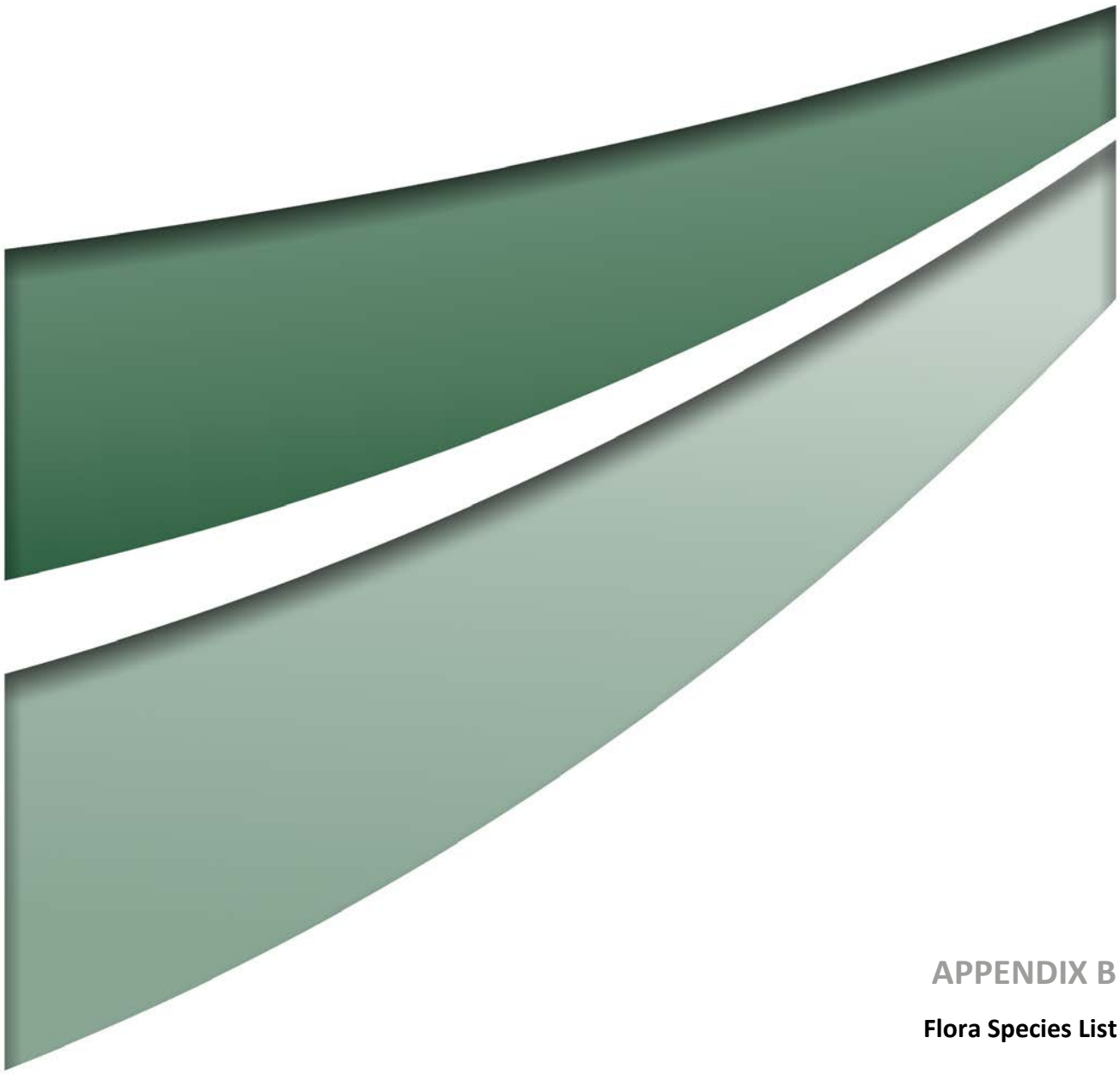
Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
sharp-tailed sandpiper *Calidris acuminata*	MIG (EPBC)	This species prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewage treatment plants, flooded fields, mudflats, mangroves, rocky shores and beaches.	This species is a summer migrant from Arctic Siberia, being found on wetlands throughout Australia.	This species is not known from conservation reserves in the region.	There is potential that small ponded areas, farm dams, and a large ponded farm dam water body within the LWB4-B7 Modification Area would provide suitable habitat for this species. The species is potentially sensitive to the proposed modification.	Yes
common greenshank *Tringa nebularia*	MIG (EPBC)	The common greenshank is a marine and migratory bird species, it is typically found in coastal habitats such as estuaries, mudflats and saltmarshes, but can also be identified in appropriate fresh or saline inland habitats such as clay pans, commercial saltfields, lake margins and sewage ponds (Pizzey & Knight 1997).	This species is known to breed from Scotland to Siberia. It has also been identified in Europe, Asia, Africa, Papua New Guinea, Australia and New Zealand. In Australia, this species is widespread and has been identified in coastal areas across the entire country. On the mainland it does not occur in the central areas of WA and the north-west of SA (Pizzey & Knight 1997).	This species is not known from conservation reserves in the region.	There is potential that small ponded areas, farm dams, and a large ponded farm dam water body within the LWB4-B7 Modification Area would provide suitable habitat for this species. The species is potentially sensitive to the proposed modification.	Yes

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
bridled tern *Onychoprion anaethetus*	MIG (EPBC)	This species inhabits offshore tropical and subtropical seas.	This species occurs across tropical areas of the Pacific and Atlantic oceans. Including Central America, Caribbean, western Africa, India as well as much of south-east Asia and Australasia.	This species is not known from conservation reserves in the region.	There is no potential habitat for this species within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
Oriental cuckoo *Cuculatus optatus*	MIG (EPBC)	Solitary and rather elusive species . Ooccurs in mixed, deciduous and coniferous forest. It is present at all levels of the forest canopy, and can be found at a range of elevations, occasionally being recorded in mountains as high up as 1,100 metres	Breeding occurs from Siberia to the Himalayas, across Southeast Asia, southern China, Korea, Japan and Taiwan. Over winter this species migrates to the Malay Peninsula, Indonesia, the Philippines, New Guinea, the Solomon Islands, northern and eastern Australia, and occasionally as far as New Zealand.	This species is not known from conservation reserves in the region.	There is no potential habitat for this species within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
Yellow wagtail *Motacilla flava*	MIG (EPBC)	Occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra. In the north of its range it is also found in large forest clearings	Has an extremely large range, extending from Europe, east through Siberia to west Asia and north-western China; and south through the Arabian Peninsula to Egypt. Breeds in temperate Europe and Asia.	This species is not known from conservation reserves in the region.	There is no potential habitat for this species within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Species	Legal Status	Specific Habitat	Distribution in relation to Survey Area	Reservation in the Region (BioNet 2015)	Potential to be Impacted	Detailed Assessment of Significance Required?
Curlew sandpiper *Calidris ferruginea*	MIG (EPBC)	The curlew sandpiper is distributed around most of the coastline of Australia (including Tasmania) It occurs along the entire coast of NSW, particularly in the Hunter Estuary, and sometimes in freshwater wetlands in the Murray-Darling Basin. It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts.	A regular summer migrant from Siberia and other Arctic breeding grounds to most of the Australian coastline. It is uncommon to locally common along the NSW coast, with occasional inland sightings.	This species is not known from conservation reserves in the region.	There is no potential habitat for this species within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No
Eastern curlew *Numenius madagascariensis*	MIG (EPBC)	This species is typically found in areas of sheltered coast, particularly bays, coastal lagoons, estuaries, bays, harbours and inlets. They tend to feed on soft-sheltered intertidal sand or mudflats. They are rarely seen in grassy areas and roost on sandy spits and islets.	In Australia this species can be found in all states, but generally along the north, east or south-east coasts. It has been recorded on Lord Howe and Norfolk Islands.	This species is not known from conservation reserves in the region.	There is no potential habitat for this species within the LWB4-B7 Modification Area. There is no potential for a significant impact on this species.	No

Note

CE	critically endangered
E:	endangered
EP:	Endangered Population
EPBC:	Environment Protection Biodiversity Conservation Act
FM	Fisheries Management Act
LGA:	Local Government Area
MIG	migratory
NR:	Nature Reserve
NP:	National Park
SCA	State Conservation Area
SF	State Forest
TSC:	Threatened Species Conservation Act
V:	vulnerable



APPENDIX B

Flora Species List

The following list was developed from surveys as detailed in **Section 4.0** of the main report. It includes all species of vascular plants observed in the LWB4-B7 Modification Area.

Not all species are readily detected at any one time of the year; therefore the list will not necessarily include all plant species likely to occur in the LWB4-B7 Modification Area. Many species flower only during restricted periods of the year, and some flower only once in several years. In the absence of flowering material, many of these species cannot be identified, or even detected.

Names of classes and families follow a modified Cronquist (1981) System.

Any species that could not be identified to the lowest taxonomic level are denoted in the following manner:

sp.	specimens that are identified to genus level only;
poss.	specimens for which identification was considered likely but not definite.
Spp agg	species complex (group of closely related species similar in appearance such that species distinctions are often unclear).

The following abbreviations or symbols may be used in the list:

asterisk (*)	denotes species not indigenous to the LWB4-B7 Modification Area;
subsp.	subspecies; and
var.	variety;

Note: Those species highlighted in bold are threatened species.

All vascular plants recorded or collected were identified using keys and nomenclature in Harden (1992, 1993, 2000 & 2002) and Wheeler et al. (2002). Where known, changes to nomenclature and classification have been incorporated into the results, as derived from *PlantNET* (Botanic Gardens Trust 2017), the on-line plant name database maintained by the National Herbarium of New South Wales.

Common names used follow Harden (1992, 1993, 2000 & 2002) where available, and draw on other sources such as local names where these references do not provide a common name.

Family/Sub Family	Scientific Name	Common Name	2015	2016	2017
FILICOPSIDA (FERNS)					
Dennstaedtiaceae	*Pteridium esculentum*	bracken	x	x	x
Marsileaceae	*Marsilea mutica*	nardoo	x	x	
Pteridaceae	*Adiantum aethiopicum*	common maidenhair fern	x	x	
Pteridaceae	*Cheilanthes sieberi* subsp. *sieberi*	poison rock fern	x	x	
MAGNOLIOPSIDA (FLOWERING PLANTS) – LILIIDAE (MONOCOTS)					
Anthericaceae	*Laxmannia gracilis*	slender wire lily		x	
Commelinaceae	*Commelina cyanea*	scurvy weed		x	x
Cyperaceae	*Baumea* sp.		x		
Cyperaceae	*Carex appressa*	tall sedge	x	x	x
Cyperaceae	*Cyperus* sp.		x	x	
Cyperaceae	*Eleocharis sphacelata*			x	
Cyperaceae	*Schoenoplectus pungens*			x	
Cyperaceae	*Schoenus* sp.		x	x	
Cyperaceae	*Lepidosperma laterale*		x	x	
Iridaceae	**Romulea rosea*	onion grass	x		
Juncaceae	**Juncus acutus* subsp. *acutus*	sharp rush	x		
Juncaceae	*Juncus* sp.	common rush	x	x	
Juncaceae	*Juncus usitatus*		x	x	
Juncaginaceae	*Triglochin procerum*	water ribbons	x	x	
Linaceae	*Linum marginale*	native flax	x		
Lomandraceae	*Lomandra filiformis* subsp. *filiformis*	wattle mat-rush	x	x	
Lomandraceae	*Lomandra glauca*		x		
Lomandraceae	*Lomandra longifolia*	spiny-headed mat-rush	x	x	x
Lomandraceae	*Lomandra multiflora*		x	x	

Family/Sub Family	Scientific Name	Common Name	2015	2016	2017
Orchidaceae	*Caladenia catenata*	white fingers	x		
Orchidaceae	*Calochilus robertsonii*		x		
Orchidaceae	*Diuris sulphurea*		x		
Orchidaceae	*Microtis parviflora*		x		
Orchidaceae	*Thelymitra* sp.		x		
Phormiaceae	*Dianella caerulea var. cinerascens*		x		
Phormiaceae	*Dianella longifolia*		x		
Phormiaceae	*Dianella* sp.		x	x	
Philydraceae	*Philydrum lanuginosum*	frogsmouth	x	x	
Poaceae	**Andropogon virginicus*	whisky grass	x		
Poaceae	*Aristida* sp.	a speargrass	x		
Poaceae	*Aristida ramosa*	purple wire grass		x	
Poaceae	*Aristida vagans*	threeawn speargrass	x		
Poaceae	*Austrostipa scabra.*	spear grass	x		
Poaceae	**Axonopus fissifolius*	narrow-leaved carpet grass		x	x
Poaceae	**Briza maxima*		x		
Poaceae	**Briza minor*	shivery grass	x	x	
Poaceae	**Bromus catharticus*	prairie grass		x	
Poaceae	*Bothriochloa* sp.		x		
Poaceae	*Chloris* sp.		x		
Poaceae	*Cymbopogon refractus*	barbed wire grass	x		
Poaceae	*Cynodon dactylon*	common couch	x	x	x
Poaceae	*Digitaria diffusa*	open summer grass	x		
Poaceae	*Digitaria* sp.		x		
Poaceae	*Echinopogon ovatus*	forest hedgehog grass	x	x	

Family/Sub Family	Scientific Name	Common Name	2015	2016	2017
Poaceae	**Ehrharta erecta*	panic veldtgrass	x	x	
Poaceae	*Eragrostis brownii*		x	x	
Poaceae	*Eragrostis* sp.	a lovegrass	x	x	
Poaceae	*Imperata cylindrica* var. *major*	blady grass	x	x	
Poaceae	*Microlaena stipoides* var. *stipoides*	weeping grass	x	x	X
Poaceae	*Oplismenus aemulus*	Australian basket grass		x	
Poaceae	*Oplismenus imbecilis*	creeping beard grass			X
Poaceae	*Panicum* sp.			x	
Poaceae	**Paspalum dilatatum*	paspalum	x		x
Poaceae	*Paspalum distichum*	water couch		x	
Poaceae	*Paspalum* sp.				x
Poaceae	**Pennisetum clandestinum*	kikuyu grass	x		
Poaceae	*Poa affinis*		x		
Poaceae	*Rytidosperma* sp.		x	x	
Poaceae	**Setaria gracilis*	pigeon grass	x	x	
Poaceae	**Setaria parviflora*				x
Poaceae	*Setaria* sp.	pigeon grass	x		
Poaceae	*Sporobolus creber*	slender rats tail grass	x		
Poaceae	**Stenotaphrum secundatum*	buffalo grass	x		
Poaceae	*Themeda triandra*	kangaroo grass	x	x	
Potamogetonaceae	*Potamogeton cheesemanii*			x	
Typhaceae	*Typha domingensis*	narrow-leaved cumbungi	x	x	
Xanthorrhoeaceae	*Xanthorrhoea* sp.		x		

Family/Sub Family	Scientific Name	Common Name	2015	2016	2017
MAGNOLIOPSIDA (FLOWERING PLANTS) – MAGNOLIIDAE (DICOTS)					
Acanthaceae	*Brunoniella australis*	blue trumpet	x		
Alismataceae	*Alisma plantago-aquatica*	water plantain	x		
Amaranthaceae	*Alternanthera denticulata*	lesser joyweed			x
Apiaceae	*Centella asiatica*	pennywort	x	x	
Apiaceae	**Cyclospermum leptophyllum*	slender celery	x	x	
Apiaceae	*Platysace ericoides*			x	
Apocynaceae	*Parsonsia straminea*	common silkpod	x		
Araliaceae	*Hydrocotyle laxiflora*	stinking pennywort			x
Araliaceae	*Hydrocotyle tripartita*	pennywort			x
Asteraceae	**Ambrosia* sp.	a lacy ragweed	x		
Asteraceae	**Bidens pilosa*	cobblers pegs	x		
Asteraceae	*Chrysocephalum apiculatum*		x	x	
Asteraceae	*Chrysocephalum* sp.		x	x	
Asteraceae	**Cirsium vulgare*	spear thistle	x		
Asteraceae	**Conyza bonariensis*	fleabane	x	x	
Asteraceae	*Cymbonotus lawsonianus*	bears-ear	x	x	
Asteraceae	*Epaltes australis*	spreading nut heads		x	
Asteraceae	**Gamochaeta* sp.	cudweed	x	x	
Asteraceae	*Euchiton involucratus*		x		
Asteraceae	**Hypochaeris radicata*	catsear	x	x	x
Asteraceae	*Lagenophora* sp.		x		
Asteraceae	*Lagenophora stipitata*		x		
Asteraceae	*Ozothamnus diosmifolius*	rice flower	x	x	
Asteraceae	***Rutidosis heterogama***	**heath wrinklewort**	**x**	**x**	
Asteraceae	**Senecio*	fireweed	x	x	x

Family/Sub Family	Scientific Name	Common Name	2015	2016	2017
	madagascariensis				
Asteraceae	**Silybum marianum*	variegated thistle	x	x	
Asteraceae	*Solenogyne bellioides*		x		
Asteraceae	**Soliva sesilis*	Lawn burrweed	x		
Asteraceae	**Sonchus oleraceus*	common sowthistle	x	x	
Asteraceae	**Taraxacum officinale*	dandelion	x		
Brassicaceae	**Lepidium africanum*		x		
Campanulaceae	*Wahlenbergia communis*		x		
Campanulaceae	*Wahlenbergia gracilis*		x		
Campanulaceae	*Wahlenbergia* sp.		x	x	
Caryophyllaceae	**Cerastium glomeratum*	mouse-ear chickweed	x		
Caryophyllaceae	*Polycarpon tetraphyllum*	four-leaved allseed		x	
Caryophyllaceae	**Petrorhagia nanteuilii*		x		
Caryophyllaceae	**Stellaria media*	common chickweed	x		
Casuarinaceae	*Casuarina cunninghamiana*	river oak	x		
Casuarinaceae	*Casuarina glauca*	swamp oak	x	x	X
Celastraceae	*Denhamia silvestris*	narrow-leaved orangebark	x		
Chenopodiaceae	*Einadia hastata*	berry saltbush	x		
Clusiaceae	*Hypericum gramineum*	small St Johns wort	x	x	
Convolvulaceae	*Dichondra repens*	kidney weed	x	x	x
Crassulaceae	*Crassula sieberiana*	Australian stonecrop	x		
Dilleniaceae	*Hibbertia aspera*	rough guinea flower	x		
Dilleniaceae	*Hibbertia obtusifolia*	hoary guinee flower	x		
Dilleniaceae	*Hibbertia pedunculata*		x		
Dilleniaceae	*Hibbertia sp.*		x	x	
Droseraceae	*Drosera peltata*		x		

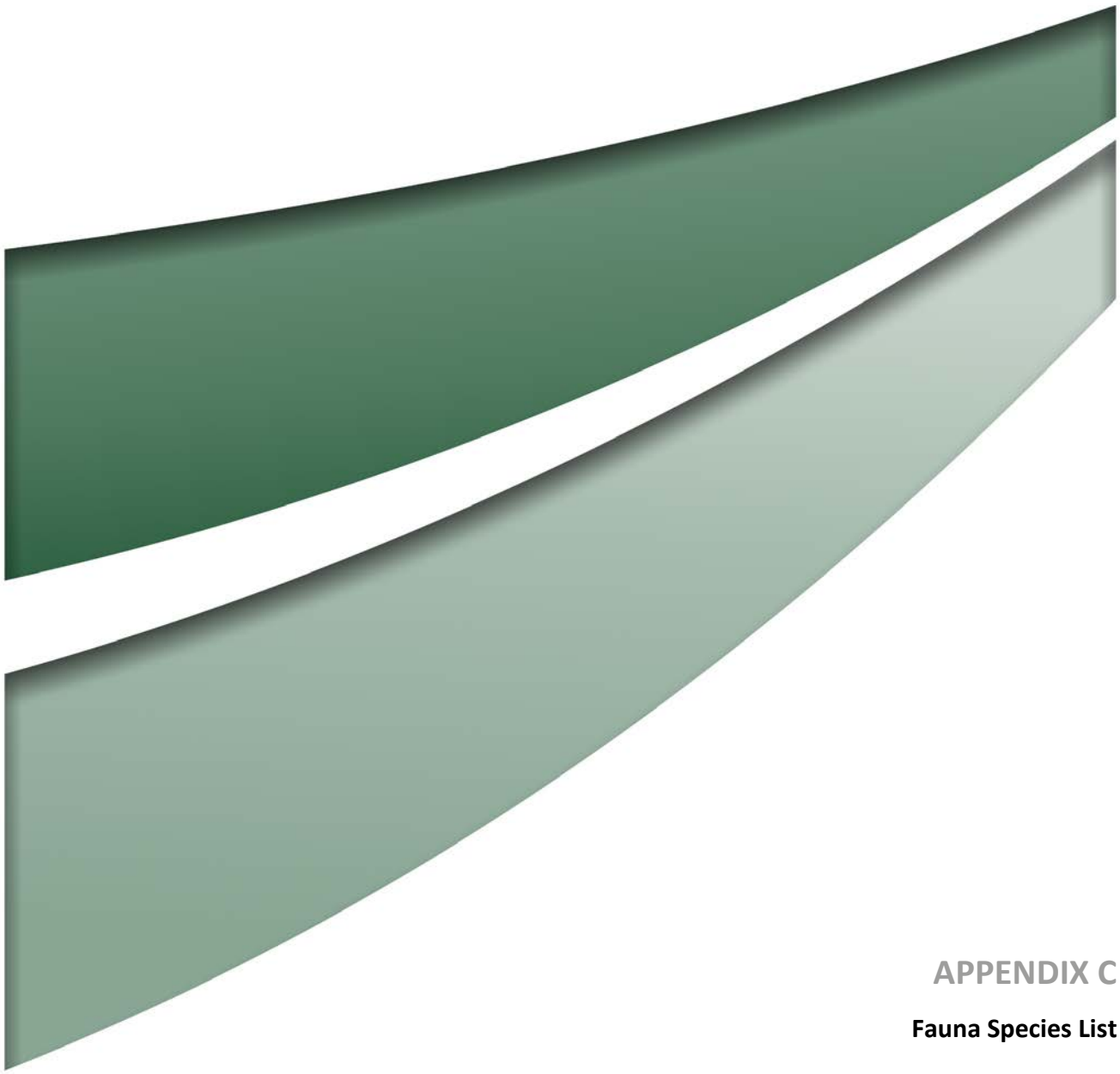
Family/Sub Family	Scientific Name	Common Name	2015	2016	2017
Ericaceae (Epacridoideae)	*Leucopogon juniperinus*	Prickly beard heath		x	
Ericaceae (Styphelioideae)	*Lissanthe strigosa*	peach heath	x		
Ericaceae (Styphelioideae)	*Styphelia triflora*	pink five corners		x	
Ericaceae (Styphelioideae)	*Styphelia viridis*	Green five-corners	x		
Fabaceae (Faboideae)	*Daviesia ulicifolia*	gorse bitter pea	x	x	
Fabaceae (Faboideae)	*Desmodium varians*	slender tick-trefoil	x	x	
Fabaceae (Faboideae)	*Dillwynia retorta*		x		
Fabaceae (Faboideae)	*Glycine clandestina*	twining glycine	x	x	
Fabaceae (Faboideae)	*Glycine microphylla*		x		
Fabaceae (Faboideae)	*Glycine tabacina*	variable glycine	x		x
Fabaceae (Faboideae)	*Hardenbergia violacea*	false sarsparilla	x		
Fabaceae (Faboideae)	*Indigofera australis*	Australian indigo	x		
Fabaceae (Faboideae)	*Jacksonia scoparia*	dogwood	x		
Fabaceae (Faboideae)	**Medicago polymorpha*	burr medic	x		
Fabaceae (Faboideae)	*Mirbelia rubiifolia*	heathy mirbelia	x		
Fabaceae (Faboideae)	*Pultenaea retusa*	notched bush-pea	x		
Fabaceae (Faboideae)	*Pultenaea villosa*	hairy bush-pea	x		

Family/Sub Family	Scientific Name	Common Name	2015	2016	2017
Fabaceae (Faboideae)	**Trifolium dubium*	yellow suckling clover		x	
Fabaceae (Mimosoideae)	*Acacia brownii*	prickly Moses	x		
Fabaceae (Mimosoideae)	*Acacia dealbata*	silver wattle		x	
Fabaceae (Mimosoideae)	*Acacia falcata*	hickory wattle		x	
Fabaceae (Mimosoideae)	*Acacia filicifolia*	fern-leaved wattle		x	
Fabaceae (Mimosoideae)	*Acacia longifolia* var. *longifolia*	Sydney golden wattle	x		
Fabaceae (Mimosoideae)	*Acacia parvipinnula*	silver-stemmed wattle		x	
Fabaceae (Mimosoideae)	*Acacia ulicifolia*	prickly Moses wattle	x		
Geraniaceae	*Geranium homeanum*		x	x	x
Goodeniaceae	*Goodenia hederacea*	ivy goodenia	x	x	
Goodeniaceae	*Goodenia rotundifolia*	a goodenia	x	x	
Haloragaceae	*Gonocarpus tetragynus*	Poverty raspwort	x		
Lamiaceae	*Ajuga australis*	Austral bugal	x		
Lauraceae	**Cinnamomum camphora*	camphor laurel	x		x
Lobeliaceae	*Pratia concolor*	poison pratia	x	x	
Lobeliaceae	*Pratia purpurascens*	whiteroot	x		x
Loranthaceae	*Amyema gaudichaudii*		x		
Malvaceae	**Modiola caroliniana*	red-flowered mallow		x	
Malvaceae	**Sida rhombifolia*	Paddys lucerne	x	x	
Menispermaceae	*Stephania japonica*	snake vine		x	
Myrtaceae	*Angophora costata*	smooth-barked apple	x		
Myrtaceae	*Angophora floribunda*	rough-barked apple	x	x	

Family/Sub Family	Scientific Name	Common Name	2015	2016	2017
Myrtaceae	***Callistemon linearifolius***	**netted bottlebrush**	**x**		
Myrtaceae	*Callistemon linearis*	narrow-leaved bottlebrush		x	
Myrtaceae	*Callistemon rigidus*	stiff bottle brush	x		
Myrtaceae	*Callistemon salignus*	willow bottlebrush	x		
Myrtaceae	*Corymbia maculata*	spotted gum	x	x	
Myrtaceae	*Eucalyptus acmenoides*	white mahogany	x	x	
Myrtaceae	*Eucalyptus amplifolia*	Ccabbage gum	x	x	X
Myrtaceae	*Eucalyptus fibrosa*	red ironbark	x	X	
Myrtaceae	*Eucalyptus longifolia*	woollybutt	x		
Myrtaceae	*Eucalyptus moluccana*	grey box	x	x	
Myrtaceae	*Eucalyptus punctata*	grey gum	x	X	
Myrtaceae	*Eucalyptus tereticornis*	forest red gum	x		
Myrtaceae	*Leptospermum polygalifolium*	tantoon	x	x	
Myrtaceae	*Leptospermum* sp.		x		
Myrtaceae	*Melaleuca thymifolia*	thyme honey-myrtle	x		
Myrtaceae	*Melaleuca linariifolia*	flax-leaved paperbark	x	x	
Myrtaceae	*Melaleuca nodosa*	ball honeymyrtle	x		
Oleaceae	*Notelaea longifolia*	mock-olive		x	
Oxalidaceae	*Oxalis* sp.		x	x	
Oxalidaceae	*Oxalis perennans*			x	x
Onagraceae	*Ludwigia peploides*	water primrose		x	
Phyllanthaceae	*Phyllanthus gunnii*	Scrubby Spurge		x	
Pittosporaceae	*Billardiera scandens*	hairy apple berry	x		
Pittosporaceae	*Bursaria spinosa* var. *spinosa*	blackthorn	x	x	x
Plantaginaceae	**Plantago lanceolata*	lambs tongues	x	x	

Family/Sub Family	Scientific Name	Common Name	2015	2016	2017
Plantaginaceae	*Veronica plebeia*	trailing speedwell		x	
Plantaginaceae	*Plantago* sp.		x		
Polygonaceae	*Persicaria decipiens*	slender knotweed		x	
Polygonaceae	*Rumex brownii*	swamp dock	x		x
Polygonaceae	**Rumex crispus*	curled dock	x		
Proteaceae	*Banksia spinulosa*	hairpin banksia	x		
Proteaceae	*Grevillea montana*		x	x	
Proteaceae	***Grevillea parviflora* subsp. *parviflora***	**small-flower grevillea**	**x**	**x**	
Proteaceae	*Hakea sericea*	needle bush		x	
Proteaceae	*Persoonia linearis*	narrow-leaved geebung	x	x	
Primulaceae	**Anagallis arvensis*	scarlet/blue pimpernel	x	x	
Ranunculaceae	*Clematis glycinoides*	headache vine	x	x	
Ranunculaceae	*Ranunculus inundatus*	river buttercup	x	x	x
Rosaceae	**Rubus fruticosus* sp. agg.	blackberry complex	x	x	
Rosaceae	*Rubus parviflora*	native raspberry		x	
Rubiaceae	*Galium binifolium*				x
Rubiaceae	*Galium propinquum*	Maori bedstraw		x	
Rubiaceae	**Richardia* sp.		x	x	
Rubiaceae	*Pomax umbellata*			x	
Rutaceae	*Geijera salicifolia*	brush wilga	x		
Sapindaceae	*Dodonaea triquetra*	large-leaf hop-bush	x		
Scrophulariaceae	*Myoporum montanum*	western boobialla	x		
Solanaceae	**Cestrum parqui*	green cestrum		x	x
Solanaceae	*Duboisia myoporoides*	corkwood		x	
Solanaceae	**Solanum mauritianum*	wild tobacco bush	x	X	x
Solanaceae	**Solanum nigrum*	black-berry nightshade	x		

Family/Sub Family	Scientific Name	Common Name	2015	2016	2017
Solanaceae	**Solanum pseudocapsicum*	madeira cherry	x		
Solanaceae	*Solanum prinophyllum*	forest nightshade		x	
Solanaceae	*Solanum* sp.		x		
Stackhousiaceae	*Stackhousia viminea*	slender stackhousia	x	x	
Thymelaeaceae	*Pimelea linifolia*	slender rice flower	x		
Ulmaceae	*Trema tomentosa*	poison peach		x	
Verbenaceae	**Lantana camara*	Lantana		x	
Verbenaceae	**Verbena bonariensis*	purpletop	x	x	x
Violaceae	*Viola hederacea*	Ivy-leaved violet		x	



APPENDIX C

Fauna Species List

The following list was developed from surveys as detailed in **Section 4** of the main report. It includes all fauna species observed by Umwelt in the LWB4-B7 Modification Area. This is not an exclusive list, and it is likely that further species are present that were not identified at the time of survey.

All threatened species are indicated in **bold** type.

The following abbreviations or symbols are used in the list:

asterisk (*) denotes species not indigenous to the Stage LWB4-B7 Modification Area;

def	call was identified to a definite level of confidence based on characteristics;
MIG	Listed migratory species under the EPBC Act;
prob	call was identified to a probable level of confidence based on characteristics; and
V	Vulnerable under Schedule 2 of the *Threatened Species Conservation Act 1995* (TSC Act).

Birds recorded were identified using descriptions in Slater *et al.* (2003) and the scientific and common name nomenclature of BirdLife Australia. Reptiles recorded were identified using keys and descriptions in Cogger (2000), Swan *et al*. (2004) and Wilson and Swan (2010) and the scientific and common name nomenclature of Cogger (2000).

Amphibians recorded were identified using keys and descriptions in Cogger (2000) and Robinson (2002) and the scientific and common name nomenclature of Cogger (2000). Mammals recorded were identified using keys and descriptions in Van Dyke and Strahan (2008), Churchill (2008) and Menkhorst and Knight (2011) and the scientific and common name nomenclature of Van Dyke and Strahan (2008).

Table 1 Fauna Species Recorded within the LWB4-B7 Modification Area

Scientific Name	Common Name	Conservation Status		LW B1-B3 Modification (2015)	LW B4-B7 Modification (2016)
		TSC Act	EPBC Act		
BIRDS					
Anatidae					
Chenonetta jubata	Australian wood duck			✓	✓
Anas superciliosa	Pacific black duck			✓	
Ardeidae					
Ardea ibis	cattle egret			✓	
Egretta novaehollandiae	white-faced heron			✓	
Nycticorax caledonicus	nankeen night heron			✓	
Threskiornithidae					
Threskiornis molucca	Australian white ibis			✓	
Accipitridae					
Haliaeetus leucogaster	**white-bellied sea-eagle**	**V**		✓	✓
Haliastur sphenurus	whistling kite				✓
Falconidae					
Falco cenchroides	nankeen kestrel			✓	
Falco berigora	brown falcon			✓	
Rallidae					
Porphyrio porphyrio	purple swamphen			✓	✓
Charadriidae					
Vanellus miles	masked			✓	✓

Scientific Name	Common Name	Conservation Status		LW B1-B3 Modification (2015)	LW B4-B7 Modification (2016)
		TSC Act	EPBC Act		
	lapwing				
Columbidae					
Macropygia amboinensis	brown cuckoo-dove				✓
Ocyphaps lophotes	crested pigeon			✓	✓
Geopelia humeralis	bar-shouldered dove			✓	✓
Leucosarcia melanoleuca	wonga pigeon			✓	✓
Cuculidae					
Chalcites minutillus	little bronze-cuckoo				✓
Cacomantis flabelliformis	fan-tailed cuckoo			✓	
Eudynamis scolopacea	common koel				✓
Cacatuidae					
Cacatua roseicapilla	galah			✓	✓
Cacatua sanguinea	little corella				✓
Psittacidae					
Trichoglossus haematodus	rainbow lorikeet				✓
Platycercus eximius	eastern rosella			✓	✓
Strigidae					
Ninox noveseelandiae	southern boobook			✓	
Podargidae					

Scientific Name	Common Name	Conservation Status		LW B1-B3 Modification (2015)	LW B4-B7 Modification (2016)
		TSC Act	EPBC Act		
Podargus strigoides	tawny frogmouth			✓	✓
Alcedinidae					
Ceyx azurea	azure kingfisher				✓
Halcyonidae					
Dacelo novaeguineae	laughing kookaburra			✓	✓
Todiramphus macleayii	forest kingfisher				✓
Todiramphus sancta	sacred kingfisher				✓
Ptilonorhynchidae					
Ptilonorhynchus violaceus	satin bowerbird			✓	✓
Coraciidae					
Eurystomus orientalis	dollarbird				✓
Climacteridae					
Cormobates leucophaea	white-throated treecreeper				✓
Climacteris affinis	white-browed treecreeper				✓
Maluridae					
Malurus cyaneus	superb fairy-wren			✓	✓
Acanthizidae					
Sericornis frontalis	white-browed scrubwren				✓

Scientific Name	Common Name	Conservation Status		LW B1-B3 Modification (2015)	LW B4-B7 Modification (2016)
		TSC Act	EPBC Act		
Gerygone albogularis	white-throated gerygone				✓
Acanthiza lineata	striated thornbill				✓
Acanthiza chrysorrhoa	yellow-rumped thornbill				✓
Pardalotidae					
Pardalotus punctatus	spotted pardalote				✓
Pardalotus striatus	striated pardalote			✓	
Meliphagidae					
Acanthorhynchus tenuirostris	eastern spinebill				✓
Meliphaga lewinii	Lewin's honeyeater				✓
Lichenostomus chrysops	yellow-faced honeyeater			✓	✓
Entomyzon cyanotis	blue-faced honeyeater			✓	
Anthochaera carunculata	red wattlebird			✓	
Lichenostomus penicillatus	white-plumed honeyeater				
Manorina melanocephala	noisy miner			✓	✓
Phylidonyris niger	white-cheeked honeyeater				✓
Philemon corniculatus	noisy friarbird			✓	✓

Scientific Name	Common Name	Conservation Status		LW B1-B3 Modification (2015)	LW B4-B7 Modification (2016)
		TSC Act	EPBC Act		
Petroicidae					
Petroica rosea	rose robin			✓	
Pomatostomidae					
Pomatostomus temporalis temporalis	**grey-crowned babbler (eastern subspecies)**	**V**		✓	✓
Eupetidae					
Psophodes olivaceus	eastern whipbird			✓	✓
Neosittidae					
Daphoenositta chrysoptera	**varied sittella**	**V**		✓	
Pachycephala rufiventris	rufous whistler			✓	✓
Pachycephala pectoralis	golden whistler			✓	✓
Campephagidae					
Coracina novaehollandiae	black-faced cuckoo-shrike				✓
Corcoracidae					
Corcorax melanorhamphos	white-winged chough			✓	✓
Monarchidae					
Grallina cyanoleuca	magpie-lark			✓	✓
Rhipiduridae					
Rhipidura albiscapa	grey fantail			✓	✓

Scientific Name	Common Name	Conservation Status		LW B1-B3 Modification (2015)	LW B4-B7 Modification (2016)
		TSC Act	EPBC Act		
Rhipidura leucophrys	willie wagtail			✓	✓
Oriolidae					
Oriolus sagittatus	olive-backed oriole				✓
Artamidae					
Cracticus torquatus	grey butcherbird			✓	✓
Cracticus nigrogularis	pied butcherbird				✓
Gymnorhina tibicen	Australian magpie			✓	✓
Strepera graculina	pied currawong				✓
Corvidae					
Corvus coronoides	Australian raven			✓	✓
Monarchidae					
Myiagra cyanoleuca	satin flycatcher				✓
Nectariniidae					
Dicaeum hirundinaceum	mistletoebird				✓
Estrilidae					
Neochmia temporalis	red-browed finch			✓	✓
Cisticolidae					
Cisticola exilis	golden-headed cisticola				✓
Acrocephalidae					

Scientific Name	Common Name	Conservation Status		LW B1-B3 Modification (2015)	LW B4-B7 Modification (2016)
		TSC Act	EPBC Act		
Acrocephalus australis	Australian reed-warbler				
Timaliidae					
Zosterops lateralis	silvereye				✓
Hirundinidae					
Hirundo neoxena	welcome swallow			✓	
Hirundo ariel	fairy martin				✓
REPTILES					
Cheloniidae					
Chelodina longicollis	snake-necked turtle				✓
Agamidae					
Amphibolurus muricatus	Jacky lizard			✓	✓
Physignathus lesueurii ssp. *lesueurii*	eastern water dragon				✓
Pogona barbata	eastern bearded dragon			✓	
Scincidae					
Eulamprus quoyii	eastern water skink			✓	✓
Lampropholis delicata	grass skink				✓
Lampropholis guichenoti	garden skink				✓
Carlia tetradactyla	southern rainbow skink			✓	✓

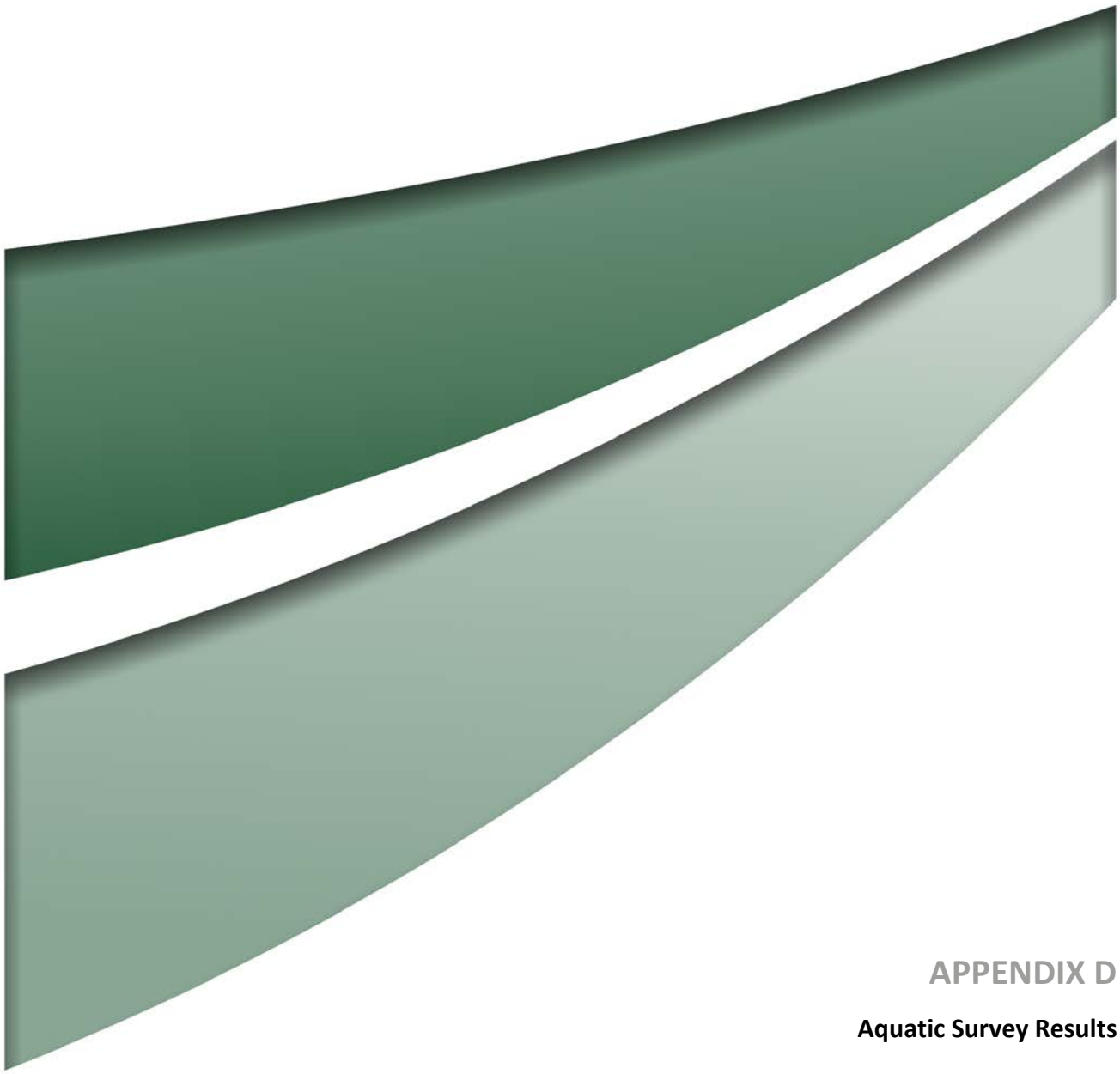
Scientific Name	Common Name	Conservation Status		LW B1-B3 Modification (2015)	LW B4-B7 Modification (2016)
		TSC Act	EPBC Act		
Saiphos equalis	three-toed skink			✓	
Varanidae					
Varanus varius	lace monitor			✓	
Elapidae					
Pseudechis porphyriacus	red-bellied black snake				✓
AMPHIBIANS					
Myobatrachidae					
Crinia signifera	brown froglet			✓	
Limnodynastes fletcheri	barking marsh frog			✓	
Limnodynastes tasmaniensis	spotted marsh frog			✓	
Limnodynastes peronii	striped marsh frog			✓	✓
Uperoleia laevigata	smooth toadlet			✓	
Hylidae					
Litoria dentata	bleating tree frog				✓
Litoria fallax	dwarf tree frog			✓	✓
Litoria latopalmata	broad-palmed frog			✓	✓
Litoria peronii	Peron's tree frog			✓	✓
Litoria tyleri	Tyler's tree frog				✓
Litoria verreauxii	Verreauxs			✓	

Scientific Name	Common Name	Conservation Status		LW B1-B3 Modification (2015)	LW B4-B7 Modification (2016)
		TSC Act	EPBC Act		
	tree frog				
MAMMALS					
Vombatidae					
Vombatus ursinus	common wombat			✓	
Tachyglossidae					
Tachyglossus aculeatus	echidna			✓	
Petauridae					
Petaurus breviceps	sugar glider				✓
Petaurus norfolcensis	**squirrel glider**	**V**		✓	
Petaurus sp.	unidentified glider			✓	
Phalangeridae					
Trichosurus vulpecula	common brushtail possum			✓	✓
Pseudocheiridae					
Pseudocheirus peregrinus	common ringtail possum			✓	✓
Macropodidae					
Macropus giganteus	eastern grey kangaroo			✓	✓
Macropus rufogriseus	red-necked wallaby				✓
Wallabia bicolor	swamp wallaby				✓
Pteropodidae					

Scientific Name	Common Name	Conservation Status		LW B1-B3 Modification (2015)	LW B4-B7 Modification (2016)
		TSC Act	EPBC Act		
Pteropus poliocephalus	grey-headed flying-fox	V	V		✓
Emballonuridae					
***Saccolaimus flaviventris* (prob)**	**yellow-bellied sheathtail-bat**	**V**			✓
Molossidae					
***Mormopterus norfolkensis* (def)**	**East-coast - freetail-bat**	**V**			✓
Mormopterus ridei (def)	Ride's freetail-bat				✓
Mormopterus planiceps (def)	southern freetail-bat				✓
Nyctinomus australis (def)	white-striped freetail-bat				✓
Scotorepens balstoni (sg)	inland broad-nosed bat				✓
Scotorepens orion (sg)	eastern broad-nosed bat				✓
Vespertilionidae					
***Miniopterus australis* (prob)**	**little bentwing-bat**	**V**			✓
Nyctophilus gouldi (sg)	Gould's long-eared bat				✓
Nyctophilus geoffroyi	lesser long-eared bat			✓	
***Chalinolobus dwyeri* (def)**	**large-eared pied bat**	**V**	**V**	✓	
Chalinolobus gouldii (def)	Gould's wattled bat			✓	✓

Scientific Name	Common Name	Conservation Status		LW B1-B3 Modification (2015)	LW B4-B7 Modification (2016)
		TSC Act	EPBC Act		
Chalinolobus morio (def)	chocolate wattled bat			✓	✓
***Scoteanax rueppellii* (prob)**	**greater broad-nosed bat**	**V**		✓	
***Falsistrellus tasmaniensis* (sg)**	**eastern falsistrelle**	**V**			✓
***Miniopterus schreibersii oceanensis* (sg)**	**eastern bentwing-bat**	**V**			✓
***Myotis macropus* (sg)**	**southern myotis**	**V**			✓
***Vespadelus troughtoni* (sg)**	**eastern cave bat**	**V**			✓
Vespadelus darlingtoni (sg)	Large forest bat				✓
Vespadelus pumilus (sg)	Eastern forest bat				✓
Vespadelus regulus (sg)	Southern forest bat				✓
Vespadelus vulturnus (sg)	Little forest bat				✓
Canidae					
**Vulpes vulpes*	fox			✓	✓
Leporidae					
**Oryctolagus cuniculus*	rabbit			✓	✓
Bovidae					
**Bos taurus*	cow			✓	
Cervidae					
**Dama dama*	fallow deer				✓

Scientific Name	Common Name	Conservation Status		LW B1-B3 Modification (2015)	LW B4-B7 Modification (2016)
		TSC Act	EPBC Act		
**Cervus timoriensis*	rusa deer				✓
Equidae					
**Equus caballus*	horse			✓	



APPENDIX D

Aquatic Survey Results

This appendix provides the results of the aquatic assessment undertaken as provided within **Section 4.4** of the Ecological Assessment. **Table 1** provides the results of the Habitat Assessments undertaken at the five separate aquatic habitat assessment locations shown on **Figure 2.3**:

- Quorrobolong Creek above LWB6 in the far north of the LWB4-B7 Modification Area
- Unnamed tributary of Quorrobolong Creek above LWB3, north of Sandy Creek Road
- Unnamed tributary of Quorrobolong Creek south of Sandy Creek Road above LWB1.

Table 2 provides a summary of the Riparian Channel and Environmental Inventory (RCE) categorisation undertaken at these sites. Both sets of data are qualitative in nature and were collected to inform the likelihood of occurrence of significant aquatic ecological values base on habitat.

Table 1 Aquatic Habitat Attributes

		2016	2015	2015	2017	2017
Habitat Attribute		**Quorrobolong Creek (North) centre LWB6**	**Unnamed Tributary of Quorrobolong Creek – North of Sandy Creek Rd (LWB3)**	**Unnamed Tributary of Quorrobolong Creek – South of Sandy Creek Rd (LWB1)**	**Quorrobolong Creek (west most of Study Area)**	**Quorrobolong Creek (Base of LW B7)**
Easting		344640.4	345397.3	345008.8	344110	344188
Northing		6356720	6356328	6355259	6356879	6356810
Bank height (m)		0.5	0.5	1.8	0.5*	0.8
Bank full width (m)		4.5m	>5m	10	5*	5
Length of reach (m)		200m	300m	500m	200m	200m
Stream width (m)	minimum	2	0.5	0.5	1.5*	2
	maximum	4	3	3	3*	3
	mode	2.5	1.5	1	2*	2.5
Riffle		Absent	Absent	Small amount of riffling present at man-made weir. Very slow moving.	None identified	Very small amount of riffling present due to fallen logs/branches
Pool %		20	Absent	10	10*	10
Run %		80	100%	90	90*	90
Macrophyte		Absent	Absent	Small amounts of water ribbons	Absent	Absent
Riparian zone width (m)	left	>50m	3m	3m	>50m	>50m
	right	>50m	3m	3m	>50m	>50m
% cover of riparian zone	trees (>10 m)	10	15	15	30%*	25%
	trees (<10 m)	20	40	15	15%*	10%
	shrubs	40		0	30%*	50%
	grasses/ferns/ sedges	95	90	80	80%*	60%
Vegetation description		Riparian Swamp Oak Open Forest	Riparian Swamp Oak Open Forest (dominated by planted *Casuarina cunninghamiana*)	Riparian Swamp Oak Open Forest – Eucalypt Dominant Variant	Riparian Swamp Oak Open Forest	Riparian Swamp Oak Open Forest
Shading of river%		60	90	80	70%	70%
Vegetation %	native	95	50	80	60	60
	exotic	5	50	20	20	40
Water odour		nil	nil	nil	nil	nil

		2016	2015	2015	2017	2017
Habitat Attribute		**Quorrobolong Creek (North) centre LWB6**	**Unnamed Tributary of Quorrobolong Creek – North of Sandy Creek Rd (LWB3)**	**Unnamed Tributary of Quorrobolong Creek – South of Sandy Creek Rd (LWB1)**	**Quorrobolong Creek (west most of Study Area)**	**Quorrobolong Creek (Base of LW B7)**
Water oils (natural or manmade)		None	nil	None. Small level of tannins	Yes-slight	Yes-slight
Turbidity		Moderate	nil	low	low	low
Plume		Nil	nil	nil	nil	nil
Sediment oils		Nil	nil	nil	nil	nil
Sediment odours		nil	Could not be identified as could not access water course	nil	nil	nil
Flow level		Not flowing	Low	Moderate	Moderate	Moderate
Bare ground above water mark (%)	left	10	5	5	5	10
	right	10	5	5	5	10
Are the undersides of stones that are not deeply embedded black?		No	No -not stony	No	No -not stony	No -not stony
Sediment deposits		Very little	None observed	Very little	Minor	Minor
Local catchment erosion		Minor	Minor	Minor	Minor	Minor
Local point source pollution		Agriculture	Agriculture	Agriculture	Agriculture	Agriculture
Local non-point source pollution		None likely	None likely	None likely – maybe small amount of road runoff and waste from grazing cattle	None likely	None likely
Dams/barriers		None identified	None identified	Culvert to north from Sandy Creek Road Crossing and small weir. Does not appear to be impeding flow.	None identified	None identified
River braiding		nil	nil	nil	nil	nil
Land use Left bank		Remnant	Fenced and protected	Grazing	Remnant	Remnant
Land use Right bank		Remnant	Fenced and protected	Grazing	Remnant	Remnant
Bars		Some minor sand bar occurrences	Nil	Nil	Nil	Nil

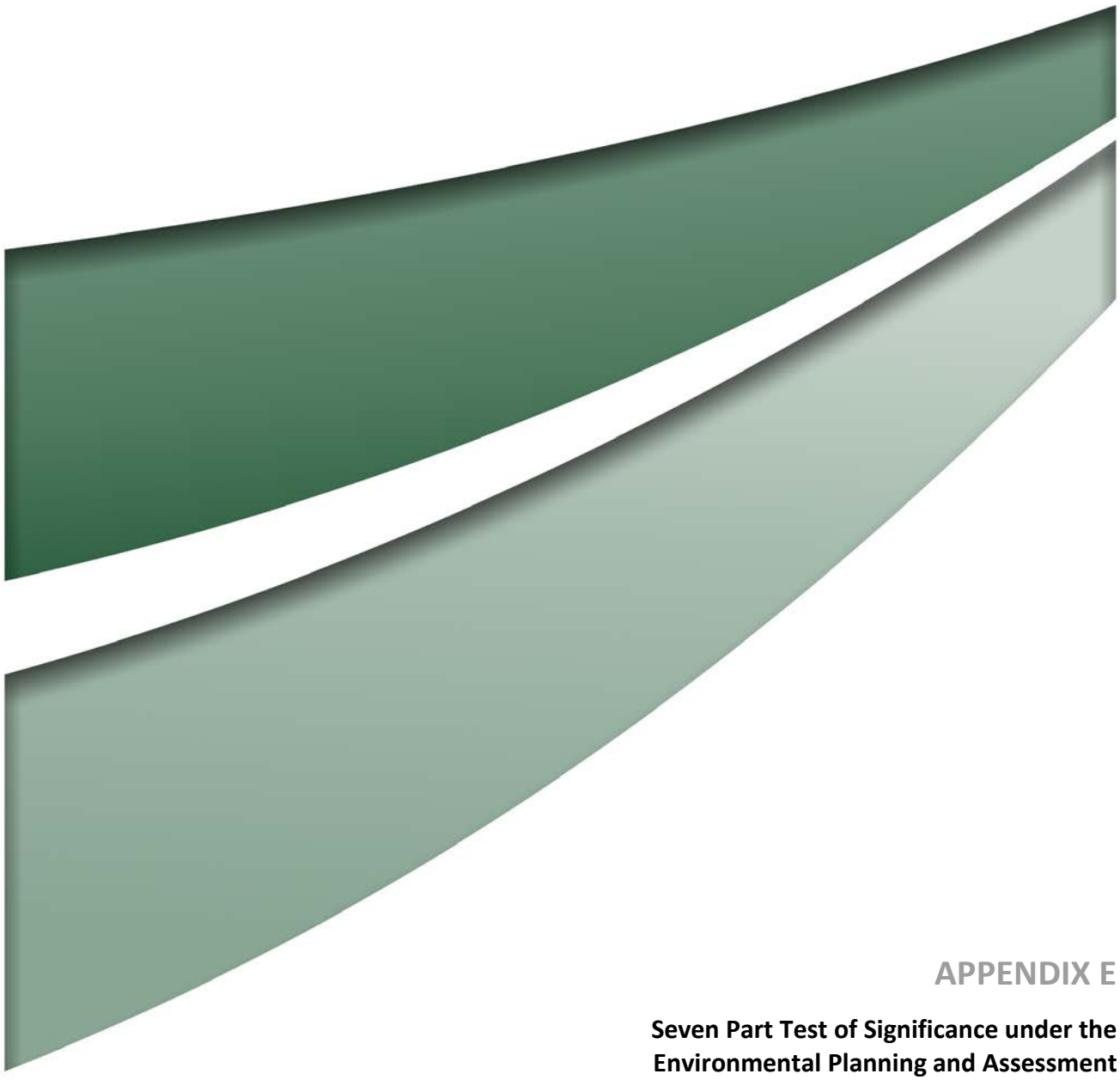
		2016	2015	2015	2017	2017
Habitat Attribute		**Quorrobolong Creek (North) centre LWB6**	**Unnamed Tributary of Quorrobolong Creek – North of Sandy Creek Rd (LWB3)**	**Unnamed Tributary of Quorrobolong Creek – South of Sandy Creek Rd (LWB1)**	**Quorrobolong Creek (west most of Study Area)**	**Quorrobolong Creek (Base of LW B7)**
Reach: substratum description (% cover)	bedrock	0	0	0	0	0
	boulder	0	0	0	0	0
	cobble	10	0	0	0	0
	pebble	10	0	0	1	0
	gravel	5	0	0	1	0
	sand	75	0	80	20	20
	silt	0	80 (based on observation- could not access)	10	70	70
	clay	0	20 (based on observation- could not access)	10	8	10
Organic substratum	detritus (sticks, wood)	5%	15%	<5%	10	5
	muck/mud	Nil	Could not be observed as could not access	Nil	0	0
Percent of reach covered by	periphyton	0	0	5	0	0
	moss	0	0	0	0	0
	filamentous algae	0	0	10	0	0
	macrophytes	0	0	5	0	0
Macrophytes	submerged/floating	0	<5	5 (water ribbons)	0	0
	emergent	*0*	0	0	15	15

Note many of these factors such as presence of riffles and runs are likely to be dependent on the presence and level of water flow occurring in the tributary at the time of survey

* not documented and subsequently data has been extrapolated based upon photography

Table 2 AUSRIVAS Physical and Chemical Assessment Habitat Attributes (low gradient streams)

Habitat variable	Quorrobolong Creek (North) centre LWB6		Unnamed Tributary of Quorrobolong Creek – North of Sandy Creek Rd (LWB3)		Unnamed Tributary of Quorrobolong Creek – South of Sandy Creek Rd (LWB1)		Quorrobolong Creek (west most of Study Area)		Quorrobolong Creek (Base of LW B7)	
Bottom substrate/available cover	Sub-optimal (13)		Sub-optimal (14)		Sub-optimal (11)		Poor (5)		Sub-optimal (13)	
Pool Substrate Characterisation	Sub-optimal (12)		Sub-optimal (11)		Sub-optimal (11)		Poor (5)		Poor (5)	
Pool Variability	Marginal (10)		Marginal (6)		Marginal (8)		Marginal (10)		Marginal (10)	
Sediment Deposition	Optimal (15)		Optimal (18)		Optimal (16)		Optimal (20)		Optimal (19)	
Channel flow status	Poor (3)		Optimal (18)		Optimal (17)		Optimal (20)		Optimal (19)	
Channel Alteration	Optimal (19)		Sub-optimal (16)		Optimal (17)		Optimal (20)		Optimal (19)	
Channel Sinuosity	Sub-optimal (15)		Marginal (7)		Marginal (9)		Marginal (10)		Optimal (18)	
Bank Stability	Optimal (9)	Optimal (9)	Optimal (9)	Optimal (9)	Sub-optimal (8)	Sub-optimal (8)	Sub-optimal (8)	Sub-optimal (8)	Good (6)	Good (7)
Vegetation Protection	Optimal (8)	Optimal (8)	Optimal (9)	Optimal (9)	Marginal (5)	Marginal (4)	Marginal (4)	Sub-optimal (8)	Optimal (9)	Optimal (9)
Riparian Zone	Optimal (10)	Optimal (10)	Marginal (5)	Marginal (5)	Poor (2)	Marginal (3)	Optimal (10)	Optimal (10)	Optimal (10)	Optimal (10)
Total Score	**141**		**136**		**119**		**138**		**154**	



APPENDIX E

Seven Part Test of Significance under the Environmental Planning and Assessment Act 1979

Assessments of significance have been used to determine potential impacts as a result of the proposed modification. The tables presented in **Appendix A** are intended to streamline the impact assessment process, ensuring that only those species with reasonable potential to occur in the LWB4-B7 Modification Area and with reasonable potential to be impacted by the proposed modification are assessed under a 7 part test.

A 7 part test of significance was prepared in accordance with the requirements of Section 5A of the EP&A Act for each threatened species, population or EECs potentially impacted as a result of the proposed modification. As discussed in **Section 4** of the Ecological Assessment, biodiversity values have the potential to be directly impacted by subsidence related surface cracking, and by any associated remediation of surface cracking post mining. Secondary impacts associated with hydrological changes are also possible and typically impact greatest on riparian areas. Such secondary impacts could include:

- changes to runoff and flow volumes through subsidence induced changes to catchment boundaries
- changes to bank stability and channel alignment
- changes to in-channel and out of channel ponding through changes to the bed profile of the creeks which may result in drying or waterlogging of root systems
- loss of water to near-surface groundwater flows due to subsidence-induced cracks occurring beneath a stream or other surface water body (valley closure)
- increased ponding.

Due to the depth of mining within the proposed modification area (minimum 400 metres), and the small magnitude of predicted ground curvatures and strains, the potential for surface cracking is low. This is supported by monitoring evidence within the Stage 2, Stage 3 and LWB1-B3 mining areas, where there has been no significant or visible surface cracking above previously extracted longwalls A3 to A8 or LWB2. Any surface cracking that does occur is expected to be minor and isolated and unlikely to directly or adversely impact site vegetation communities and fauna habitat.

Based on previous experience within the Austar Coal Mine, remediation of surface cracking is unlikely to be required within the LWB4-B7 Modification Area.

Flood modelling indicates that the potential for secondary impacts such as increased erosion of the landscape as a result of the proposed modification is also expected to be minimal.

Based on the preliminary impact assessment detailed in **Appendix A**, further assessment is required for the following EECs and species:

- River-flat Eucalypt Forest EEC
- Lower Hunter Spotted Gum – Ironbark Forest EEC
- potential Quorrobolong Scribbly Gum Woodland EEC
- netted bottle-brush (*Callistemon linearifolius*)
- heath wrinklewort (*Rutidosis heterogama*)

- small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*)
- green-thighed frog (*Litoria brevipalmata)*
- green and golden bell frog (*Litoria aurea*)
- Australasian bittern (*Botaurus poiciloptilus*)
- black bittern (*Ixobrychus flavicollis*)
- black-necked stork (*Ephippiorhynchus asiaticus*)
- Australia painted snipe (*Rostratula australis*)
- freckled duck (*Stictonetta naevosa*)
- swift parrot (*Lathamus discolor*)
- white-bellied sea eagle (*Haliaeetus leucogaster*)
- regent honeyeater (*Anthochaera phrygia*)
- grey-crowned babbler (*Pomatostomus temporalis temporalis*)
- varied sittella (*Daphoenositta chrysoptera*)
- grey-headed flying fox (*Pteropus poliocephalus*)
- squirrel glider (*Petaurus norfolcensis*)
- koala (*Phascolarctos cinereus*)
- large-eared pied bat (*Chalinolobus dwyeri*)
- southern myotis (*Myotis macropus*)
- east-coast freetail bat (*Mormopterus norfolkensis*)
- little bentwing-bat (*Miniopterus australis*)
- eastern bentwing-bat (*Miniopterus schreibersii oceanensis*)
- greater broad-nosed bat (*Scoteanax rueppellii*)
- yellow-bellied sheathtail-bat (*Saccolaimus flaviventris*)
- eastern falsistrelle (*Falsistrellus tasmaniensis*)
- eastern cave bat (*Vespadelus troughtoni*).

Below is a 7 part test of significance for each of these, which is prepared in accordance with the requirements of the EP&A Act.

River-flat Eucalypt Forest EEC

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

Not applicable.

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

A total of 56.7 hectares of River-Flat Eucalypt Forest EEC occurs within the LWB4-B7 Modification Area. The potential for surface cracking or significant deformation of the ground surface within the LWB4-B7 Modification Area as a result of subsidence is expected to be minimal and therefore very little disturbance of surface and groundwater flow patterns is predicted. Some minor ponding is proposed to occur within this vegetation community over approximately 4.4 hectares. This increased ponding duration and frequency is likely to gradually alter the composition of the understorey of this small area of vegetation; however not to the extent that the vegetation type is likely to change and become incompatible with that of this EEC

Based on the subsidence predictions summarised in **Section 4**, it is not likely that the proposed modification will result in the loss or substantial modification of any areas of River-flat Eucalypt Forest EEC and therefore the local occurrence of the community will not be placed at risk of extinction.

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

The proposed modification is predicted to have very minor surface impacts and minor impacts on surface and groundwater flows. The proposed ponding impacts may alter the understory composition so that it contains species that are more capable of coping with longer periods of water inundation such as sedges and rushes, however such changes would remain compatible with this EEC. Based on the subsidence predictions, it is not likely that the proposed modification will adversely modify the composition of the River-flat Eucalypt Forest EEC such that its local occurrence will be placed at risk of extinction.

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

The proposed modification will not lead to the removal of habitat for the River-flat Eucalypt Forest EEC; however is likely to alter the composition of the understory vegetation of approximately 4.4 ha of this EEC. It is predicted that the proposed modification will result in negligible changes to the habitat characteristics of the EEC in the LWB4-B7 Modification Area.

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

The proposed modification does not involve any clearing of vegetation that would result in the fragmentation or isolation of any areas of the River-flat Eucalypt Forest EEC, within or adjacent to the LWB4-B7 Modification Area.

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

The LWB4-B7 Modification Area comprises approximately 56.7 hectares of River-flat Eucalypt Forest, which also occurs in several other locations within the locality. Bell and Driscoll (2008) identify approximately 1531.31 hectares of this EEC within the Cessnock-Kurri Region. The remnants of River-flat Eucalypt Forest within the LWB4-B7 Modification Area are in moderate condition, with evidence of historic clearing, fragmentation and ongoing grazing management practices, and are regarded to have moderate conservation significance.

Given that the proposed modification will not involve the removal or modification of any areas of this EEC, there will be no impact on the long-term viability of this EEC within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this EEC or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to this EEC and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this EEC.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant.

Lower Hunter Spotted Gum – Ironbark Forest EEC

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

Not applicable.

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

Approximately 104.2 hectares of Lower Hunter Spotted Gum – Ironbark Forest EEC occurs in the LWB4-B7 Modification Area, where it occupies lower slopes. Large areas of this EEC are protected in the nearby Werakata SCA and elsewhere in the locality and region.

The potential for surface cracking or significant deformation of the ground surface within the LWB4-B7 Modification Area as a result of subsidence is expected to be minimal and therefore very little disturbance of surface and groundwater flow patterns is predicted. The secondary impacts of subsidence (decreased creek bank stability, hydrological changes, tree fall etc.) typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor.

As a consequence of the above there is very low potential for this EEC to be impacted. Based on the subsidence predictions summarised in **Section 4** and in the main EA, it is not likely that the proposed modification will result in the loss or modification of any areas of the Lower Hunter Spotted Gum - Ironbark EEC and therefore the local occurrence of the community will not be placed at risk of extinction.

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

The proposed modification is predicted to have very minor surface impacts and minor impacts on surface and groundwater flows. Based on the subsidence predictions, it is not likely that the proposed modification will adversely modify the composition of the Lower Hunter Spotted Gum – Ironbark Forest EEC such that its local occurrence will be placed at risk of extinction.

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

The proposed modification will not lead to the removal or modification of habitat for the Lower Hunter Spotted Gum – Ironbark Forest EEC. It is predicted that the proposed modification will result in negligible changes to the floristic composition or extent of this EEC.

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

The proposed modification does not involve any clearing of vegetation that would result in the fragmentation or isolation of any areas of Lower Hunter Spotted Gum – Ironbark Forest EEC, within or adjacent to the LWB4-B7 Modification Area.

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

The LWB4-B7 Modification Area comprises approximately 104.2 hectares of the Lower Hunter Spotted Gum – Ironbark Forest EEC that is in moderate condition. High conservation value examples of this community are protected widely within the Werakata State Conservation Area which occurs in proximity to the LWB4-B7 Modification Area.

Given that the proposed modification will not involve the removal or modification of any areas of the Lower Hunter Spotted Gum – Ironbark Forest EEC, there will be no impact on the long-term viability of this EEC within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for the Lower Hunter Spotted Gum – Ironbark Forest EEC or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to the Lower Hunter Spotted Gum – Ironbark Forest EEC or the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this EEC.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant to this community.

Potential Quorrobolong Scribbly Gum EEC

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

Not applicable.

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

Approximately 1.6 hectares of potential Quorrobolong Scribbly Gum Woodland EEC occurs in the LWB4-B7 Modification Area, where it occupies lower slopes in the north-west. The known geographic distribution if this community is highly restricted.

The potential for surface cracking or significant deformation of the ground surface within the LWB4-B7 Modification Area as a result of subsidence is expected to be minimal and therefore very little disturbance of surface and groundwater flow patterns is predicted. The secondary impacts of subsidence (decreased creek bank stability, hydrological changes, tree fall etc.) typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. Therefore there is very low potential for this potentially occurring EEC to be impacted.

Based on the subsidence predictions summarised in **Section 4** and in the main EA, it is not likely that the proposed modification will result in the loss or modification of any areas of the potential Quorrobolong Scribbly Gum Woodland EEC and therefore the local occurrence of the community will not be placed at risk of extinction.

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

The proposed modification is predicted to have very minor surface impacts and minor impacts on surface and groundwater flows. Based on the subsidence predictions, it is not likely that the proposed modification will adversely modify the composition of the potential Quorrobolong Scribbly Gum Woodland EEC such that its local occurrence will be placed at risk of extinction.

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

The proposed modification will not lead to the removal or modification of habitat for the potential Quorrobolong Scribbly Gum Woodland EEC. It is predicted that the proposed modification will result in negligible changes to the floristic composition or extent of this EEC.

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

The proposed modification does not involve any clearing of vegetation that would result in the fragmentation or isolation of any areas of potential Quorrobolong Scribbly Gum Woodland EEC, within or adjacent to the LWB4-B7 Modification Area.

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

The LWB4-B7 Modification Area comprises approximately 1.6 hectares of potential Quorrobolong Scribbly Gum Woodland EEC that is in moderate condition. The other known occurrences of this EEC are more consistent with the determination and contain greater biodiversity value than the extent present in the LWB4-B7 Modification Area.

Given that the proposed modification will not involve the removal or modification of any areas of the potential Quorrobolong Scribbly Gum Woodland EEC, there will be no impact on the long-term viability of this EEC within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for the potential Quorrobolong Scribbly Gum Woodland EEC or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to the potential Quorrobolong Scribbly Gum Woodland EEC or the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this EEC.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant to this community.

Netted bottlebrush (*Callistemon linearifolius*)

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

Netted bottlebrush (*Callistemon linearifolius*) was identified within the eastern part of the LWB4-B7 Modification Area. Approximately 30 individuals were recorded. This threatened flora species is also known to occur within the proximate Werakata State Conservation Area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor.

There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats. Therefore there is very low potential for an impact on this species which occurs in dry habitats on slopes and ridges. The proposed modification will not have an adverse effect on the life cycle of any netted bottlebrush (*Callistemon linearifolius*) such that a viable local population of the species is likely to be placed at risk of extinction.

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

Not applicable.

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

Known and potential habitat for the netted bottlebrush (*Callistemon linearifolius*) within the LWB4-B7 Modification Area will not be removed or modified as a result of the proposed modification.

There is no potential for the habitats this species occurs within to be impacted by the proposed modification.

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

As there will be no removal or modification of habitat for the netted bottlebrush (*Callistemon linearifolius*) within the LWB4-B7 Modification Area, there is no potential for habitats to be fragmented or isolated.

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

Known and potential habitat for the netted bottlebrush (*Callistemon linearifolius*) occurs in the areas of remnant vegetation in the LWB4-B7 Modification Area. Known and potential habitat for netted bottlebrush (*Callistemon linearifolius*) also occurs widely within the locality, including within Werakata State Conservation Area which occurs in proximity to the LWB4-B7 Modification Area. The habitats present in the LWB4-B7 Modification Area are not considered to be important for the long-term survival of the species in the local area.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to this species or the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant to this species.

Heath wrinklewort (*Rutidosis heterogama*)

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

Approximately 500 heath wrinklewort (*Rutidosis heterogama*) were identified within the middle part of the LWB4-B7 Modification Area in the vicinity of LWB4 and LWB5, and it is considered likely that more than this is present. This threatened flora species is also known to be widespread within the large remnant of the proximate Werakata State Conservation Area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor.

There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats. The proposed modification will not have an adverse effect on the life cycle of any occurring or potentially occurring heath wrinklewort (*Rutidosis heterogama*) such that a viable local population of the species is likely to be placed at risk of extinction.

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

Not applicable.

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

Approximately 500 heath wrinklewort (*Rutidosis heterogama*) were identified within the LWB4-B7 Modification Area, in addition 162.5 ha of potential habitat was identified comprising areas of forest vegetation. Neither known nor potential habitat will be removed or modified as a result of the

proposed modification. It is unlikely that the heath wrinklewort will be adversely affected by the proposed modification.

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

As there will be no removal or modification of known or potential habitat for the heath wrinklewort (*Rutidosis heterogama*) within the LWB4-B7 Modification Area, there is no potential that any habitats will be fragmented or isolated.

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

The heath wrinklewort (*Rutidosis heterogama*) occurs in the remnant vegetation in the north-west of the LWB4-B7 Modification Area. Known and potential habitat for heath wrinklewort (*Rutidosis heterogama*) occurs widely within the locality, including within Werakata State Conservation Area which occurs in proximity to the LWB4-B7 Modification Area. The habitats present in the LWB4-B7 Modification Area are not considered to be important for the long-term survival of the species in the local area.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to this species or the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant to this species.

Small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*)

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

Small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) was identified within the middle part of the LWB4-B7 Modification Area in the vicinity of LWB4 and LWB5. Approximately 86 individuals were identified and it is anticipated that more occur in this area. This threatened flora species is also known to be widespread within the large remnant of the proximate Werakata State Conservation Area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor.

There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats. The proposed modification will not have an adverse effect on the life cycle of any potentially occurring small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) such that a viable local population of the species is likely to be placed at risk of extinction.

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

Not applicable.

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

Approximately 86 individuals of this species were identified in the north-west of the LWB4-B7 Modification Area. Known and potential habitat will not be removed or modified as a result of the

proposed modification. It is unlikely that the small-flower grevillea (*Grevillea parviflora* subsp*. parviflora*) will be adversely affected by the proposed modification.

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

As there will be no removal or modification of known or potential habitat for the small-flower grevillea (*Grevillea parviflora* subsp*. parviflora*) within the LWB4-B7 Modification Area, there is no potential that any habitats will be fragmented or isolated.

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

The small-flower grevillea (*Grevillea parviflora* subsp*. parviflora*) occurs in the remnant vegetation in the north-west of the LWB4-B7 Modification Area in moderate numbers. Known and potential habitat for small-flower grevillea (*Grevillea parviflora* subsp*. parviflora*) occurs widely within the locality, including within Werakata State Conservation Area which occurs in proximity to the LWB4-B7 Modification Area. The habitats present in the LWB4-B7 Modification Area are not considered to be important for the long-term survival of the species in the local area.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to this species or the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant for this species.

Green-thighed frog (*Litoria brevipalmata*)

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

Although not identified, there is a low possibility that the riparian habitats of the LWB4-B7 Modification Area provide potential habitat for the green-thighed frog (*Litoria brevipalmata*).

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

Based on the subsidence predictions summarised in **Section 4**, it is not likely that the proposed modification will result in the loss or modification of any areas of potential habitat for the green-thighed frog (*Litoria brevipalmata*) and therefore a viable local population of the species will not be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of potential habitat for the green-thighed frog (*Litoria brevipalmata*). It is expected that the proposed modification will result in negligible changes to the habitat characteristics available to this species.

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

The proposed modification is expected to have only very minor surface impacts, and will not result in the disturbance to any characteristics of the potential habitat for the green-thighed frog (*Litoria brevipalmata*). Areas of potential habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The riparian habitats of the LWB4-B7 Modification Area comprise potential habitat for the green-thighed frog (*Litoria brevipalmata*), with most areas of potential habitat being disturbed or modified. The likelihood of this species occurring within these habitats is regarded to be low.

Given that the proposed modification will not involve the removal or modification to any areas of potential habitat for the green-thighed frog (*Litoria brevipalmata*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor and are not predicted to result in changes to surface water flows, the implications of these KTPs are not considered significant.

Green and golden bell frog (*Litoria aurea*)

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

Although not identified, there is a low possibility that the riparian habitats of the LWB4-B7 Modification Area provide potential habitat for the green and golden bell frog (*Litoria aurea*). The last record of this species from the local area was made at Ellalong Lagoon approximately 2.5km west in 1993. Although it is unlikely that an extant population of this species persists, there is potential that this species could occur due to the presence of appropriate habitat.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

Based on the subsidence predictions summarised in **Section 4**, it is not likely that the proposed modification will result in the loss or modification of any areas of potential habitat for the green and golden bell frog (*Litoria aurea*) and therefore a viable local population of the species will not be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of potential habitat for the green and golden bell frog (*Litoria aurea*). It is expected that the proposed modification will result in negligible changes to the habitat characteristics available to this species.

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

The proposed modification is expected to have only very minor surface impacts, and will not result in the disturbance to any characteristics of the potential habitat for the green and golden bell frog (*Litoria aurea*). Areas of potential habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The riparian habitats of the LWB4-B7 Modification Area comprise potential habitat for the green and golden bell frog (*Litoria aurea*), with most areas of potential habitat being disturbed or modified. The likelihood of this species occurring within these habitats is regarded to be low.

Given that the proposed modification will not involve the removal or modification to any areas of potential habitat for the green and golden frog (*Litoria aurea*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

The Draft Recovery Plan for the Green and Golden Bell Frog Litoria aurea (NSW DEC 2015) identifies the following as being the man threatening processes interfering with the recovery of this species:

- Habitat loss, habit modification and disturbance
- Fragmentation and isolation of habitat
- Predation by introduced fish
- Disease
- Water quality and pollution
- Predation of introduced terrestrial fauna.

The project will not result in direct habitat clearing and impacts of subsidence are not predicted to result in the modification of any of the water bodies that would be likely to be utilised by this species if it were present. In addition, the project will not cause any disturbance that would lead to an increase in predation by introduced fish or terrestrial fauna, or disease (particularly chytridomycosis) or that would modify water quality or cause water pollution.

Based on the former, the Project is not in contravention with any of the management objectives for this species.

There is also a draft Management Plan- Green and Golden Bell Frog Population Middle Hunter (DECC 2007) which identifies Ellalong Lagoon as one of its target locations (in spite of the lack of recent records). The identified threats to this species in the Middle Hunter are similar to those of the Draft Recovery Plan:

- The small population sizes
- Loss of habitat
- Disease
- Habitat degradation
- Introduced predators
- Native predators
- Water quality
- Anthropogenic climate change

The Project will not cause any population bottlenecking that would interfere with any potentially present local populations. As above no habitats will be removed and water bodies are not likely to be modified. Water quality will not be altered and the project will not result in substantial local anthropogenic climate change impacts that would be likely to interfere with any potentially present local populations

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor and are not predicted to result in changes to surface water flows, the implications of these KTPs are not considered significant.

Australasian bittern (*Botaurus poiciloptilus*)

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

Although this species was not recorded, the LWB4-B7 Modification Area provides potential habitat for the Australasian bittern (*Botaurus poiciloptilus*) in the aquatic habitats with dense fringing vegetation, particularly in the north of the LWB4B7 Modification Area. There is one record of this species within 10km of the LWB4-B7 Modification Area from 2015 at Pokolbin to the north-west.

Moderate to high conservation value habitat for this species also occurs in the nearby Ellalong Lagoon which is a protected offset area for Port Waratah Coal Services.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas and waterbodies, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of habitats for this species. As such, there is very low potential for an impact on the Australasian bittern (*Botaurus poiciloptilus*).

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of potential habitat for the Australasian bittern (*Botaurus poiciloptilus*). It is expected that the proposed modification will result in negligible changes to the habitat characteristics available to this species.

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

The proposed modification is expected to have only very minor surface impacts, and will not result in the disturbance to any characteristics of the potential habitat for the Australasian bittern (*Botaurus poiciloptilus*). Areas of potential habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area provides 6.5 ha of moderate conservation value habitat for the Australasian bittern (*Botaurus poiciloptilus*). Known and potential habitat for the Australasian bittern (*Botaurus poiciloptilus*) is moderately widespread within the locality, including within Ellalong Lagoon which occurs within 2.5 km west of the LWB4-B7 Modification Area.

There are a number of areas of high conservation habitat within the region, only some of which are conserved. The LWB4-B7 Modification Area is not considered to provide important habitat for this species.

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

The LWB4-B7 Modification Area does not support any critical habitat for the Australasian bittern (*Botaurus poiciloptilus*) or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in Section 4.6 of the main report. Given that the predicted surface impacts of the proposed modification will be very minor and are not predicted to result in changes to surface water flows, the implications of these KTPs are not considered significant.

Black bittern (*Ixobrychus flavicollis*)

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

Although this species was not recorded, the LWB4-B7 Modification Area provides potential habitat for the black bittern (*Ixobrychus flavicollis*) in the aquatic habitats with dense fringing vegetation, particularly in the north of the LWB4B7 Modification Area. There is one record of this species within 10km of the LWB4-B7 Modification Area from 2005 within Werakata National Park near Lovedale, NSW.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas and waterbodies, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of habitats for this species. As such, there is very low potential for an impact on the black bittern (*Ixobrychus flavicollis*).

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

Not applicable.

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

There will be no vegetation loss as a result of direct clearing, or as a result of subsidence impacts associated with the proposed modification. There will be no removal or modification of potential habitats for the black bittern (*Ixobrychus flavicollis*).

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

The proposed modification is expected to have only very minor surface impacts, and will not result in the disturbance to any characteristics of the potential habitat for the black bittern (*Ixobrychus flavicollis*). Areas of potential habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area provides 6.5 ha moderate conservation value habitat for the black bittern (*Ixobrychus flavicollis*). Known and potential habitat for the black bittern (*Ixobrychus flavicollis*) is moderately widespread within the locality, including within Ellalong Lagoon which occurs within 2.5 km west of the LWB4-B7 Modification Area.

There are a number of areas of high conservation habitat within the region, only some of which are conserved. The LWB4-B7 Modification Area is not considered to provide important habitat for this species.

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

The LWB4-B7 Modification Area does not support any critical habitat for the black bittern (*Ixobrychus flavicollis*) or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in Section 4.6 of the main report. Given that the predicted surface impacts of the proposed modification will be very minor and are not predicted to result in changes to surface water flows, the implications of these KTPs are not considered significant.

Black-necked stork (*Ephippiorhynchus asiaticus*)

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

Although this species was not recorded, the LWB4-B7 Modification Area provides potential habitat for the black-necked stork (*Ephippiorhynchus asiaticus*) in the aquatic habitats with dense fringing vegetation, particularly in the north of the LWB4B7 Modification Area. There is one record of this species within 10km of the LWB4-B7 Modification Area from 1993 from Weston near Kurri Kurri, NSW.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas and waterbodies, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of habitats for this species. As such, there is very low potential for an impact on the black-necked stork (*Ephippiorhynchus asiaticus*).

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

Not applicable.

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

There will be no vegetation loss as a result of direct clearing, or as a result of subsidence impacts associated with the proposed modification. There will be no removal or modification of potential habitats for the black-necked stork (*Ephippiorhynchus asiaticus*).

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

The proposed modification is expected to have only very minor surface impacts, and will not result in the disturbance to any characteristics of the potential habitat for the black-necked stork (*Ephippiorhynchus asiaticus*). Areas of potential habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area provides 6.5 ha moderate conservation value habitat for the black-necked stork (*Ephippiorhynchus asiaticus*). Known and potential habitat for the black-necked stork (*Ephippiorhynchus asiaticus*) is moderately widespread within the locality, including within Ellalong Lagoon which occurs within 2.5 km west of the LWB4-B7 Modification Area.

There are a number of areas of high conservation habitat within the region, only some of which are conserved. The LWB4-B7 Modification Area is not considered to provide important habitat for this species.

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

The LWB4-B7 Modification Area does not support any critical habitat for the black-necked stork (*Ephippiorhynchus asiaticus*) or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in Section 4.6 of the main report. Given that the predicted surface impacts of the proposed modification will be very minor and are not predicted to result in changes to surface water flows, the implications of these KTPs are not considered significant.

Australian painted snipe (*Rostratula australis*)

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

Although this species was not recorded, the LWB4-B7 Modification Area provides potential habitat for the Australian painted snipe (*Rostratula australis*) in the aquatic habitats with dense fringing vegetation, particularly in the north of the LWB4B7 Modification Area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas and waterbodies, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of habitats for this species. As such, there is very low potential for an impact on the Australian painted snipe (*Rostratula australis*).

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

Not applicable.

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

There will be no vegetation loss as a result of direct clearing, or as a result of subsidence impacts associated with the proposed modification. There will be no removal or modification of potential habitats for the Australian painted snipe (*Rostratula australis*).

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

The proposed modification is expected to have only very minor surface impacts, and will not result in the disturbance to any characteristics of the potential habitat for the Australian painted snipe (*Rostratula australis*). Areas of potential habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area provides 6.5 ha moderate conservation value habitat for the Australian painted snipe (*Rostratula australis*). Other potential habitat for the Australian painted snipe (*Rostratula australis*) is moderately widespread within the locality, including within Ellalong Lagoon which occurs within 2.5 km west of the LWB4-B7 Modification Area.

There are a number of areas of high conservation habitat within the region, only some of which are conserved. The LWB4-B7 Modification Area is not considered to provide important habitat for this species.

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

The LWB4-B7 Modification Area does not support any critical habitat for the Australian painted snipe (*Rostratula australis*) or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in Section 4.6 of the main report. Given that the predicted surface impacts of the proposed modification will be very minor and are not predicted to result in changes to surface water flows, the implications of these KTPs are not considered significant.

Freckled duck (*Stictonetta naevosa*)

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

Although this species was not recorded, the LWB4-B7 Modification Area provides potential habitat for the freckled duck (*Stictonetta naevosa*) in the aquatic in the north of the LWB4-B7 Modification Area. There is one record of this species within 10km of the LWB4-B7 Modification Area from 1983 from Ellalong Lagoon, approximately 2.5km west.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas and waterbodies, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of habitats for this species. As such, there is very low potential for an impact on the freckled duck (*Stictonetta naevosa*).

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

Not applicable.

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

There will be no vegetation loss as a result of direct clearing, or as a result of subsidence impacts associated with the proposed modification. There will be no removal or modification of potential habitats for the freckled duck (*Stictonetta naevosa*).

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

The proposed modification is expected to have only very minor surface impacts, and will not result in the disturbance to any characteristics of the potential habitat for the freckled duck (*Stictonetta naevosa*). Areas of potential habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area provides 6.5 ha moderate conservation value habitat for the freckled duck (*Stictonetta naevosa*). Other potential habitat for the freckled duck (*Stictonetta naevosa*) is moderately widespread within the locality, including within Ellalong Lagoon which occurs within 2.5 km west of the LWB4-B7 Modification Area.

There are a number of areas of high conservation habitat within the region, only some of which are conserved. The LWB4-B7 Modification Area is not considered to provide important habitat for this species.

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

The LWB4-B7 Modification Area does not support any critical habitat for the freckled duck (*Stictonetta naevosa*) or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in Section 4.6 of the main report. Given that the predicted surface impacts of the proposed modification will be very minor and are not predicted to result in changes to surface water flows, the implications of these KTPs are not considered significant.

Swift parrot (*Lathamus discolor*)

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 LWB4-B7 Modification Area provides potential habitat for the swift parrot (*Lathamus discolor*), in particular within the Lower Hunter Spotted Gum – Ironbark Forest and the Riparian Cabbage Gum Open Forest which both support winter flowering tree species that are known to be used by this species in the local area. Moderate to high conservation value habitat for this species also occurs in the nearby Werakata State Conservation Area. This highly mobile species is known to forage at a number of suitable locations within the local area in the cooler months; however it has not been recorded in the LWB4-B7 Modification Area. There are over 40 records of this species within 10km of the LWB4-B7 Modification Area, including within the township of Ellalong less than 1.5km away.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats. As such, there is very low potential for an impact on the swift parrot (*Lathamus discolor*).

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

Not applicable.

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

There will be no vegetation loss as a result of direct clearing, or as a result of subsidence impacts associated with the proposed modification. There will be no removal or modification of potential habitats for the swift parrot (*Lathamus discolor*).

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

The proposed modification is expected to have only very minor surface impacts, and will not result in the disturbance to any characteristics of the potential habitat for the swift parrot (*Lathamus discolor*). Areas of potential habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area provides moderate conservation value habitat for the swift parrot (*Lathamus discolor*). Known and potential habitat for the swift parrot (*Lathamus discolor*) is moderately widespread within the locality, including within Werakata State Conservation Area which occurs within 2 km of the LWB4-B7 Modification Area. There are a number of areas of high conservation habitat within the region, only some of which are conserved. The LWB4-B7 Modification Area is not considered to provide important habitat for this species.

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

The LWB4-B7 Modification Area does not support any critical habitat for the swift parrot (*Lathamus discolor*) or any other threatened species or populations.

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

The key actions from the swift parrot recovery plan (Swift Parrot Recovery Team 2001) are summarised below:

- Identify and map priority foraging habitats and to identify important breeding sites.
- Implement a strategy to protect priority sites and habitats.
- Identify degraded habitats that have potential to benefit the recovery of the swift parrot.
- Monitor collisions and collision hazards, particularly during the breeding season.
- Monitor the density of the breeding population and the extent and quality of habitat.
- Increase public awareness about the recovery program.
- Involve the community in the recovery.

None of the above recovery actions would be compromised as a result of the proposed modification.

The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant.

White-bellied sea eagle (Haliaeetus leucogaster)

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 LWB4-B7 Modification Area provides known habitat for the white-bellied sea-eagle (*Haliaeetus leucogaster*), including breeding habitats as nesting was identified in tall canopy vegetation adjacent to the large water body in the north. Moderate to high conservation value habitat for this species also occurs in the nearby Werakata State Conservation Area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats. As such, there is very low potential for an impact on the white-bellied sea eagle (*Haliaeetus leucogaster*).

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

Not applicable.

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

There will be no vegetation loss as a result of direct clearing, or as a result of subsidence impacts associated with the proposed modification. There will be no removal or modification of known or potential habitats for the white-bellied sea eagle (*Haliaeetus leucogaster*).

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

The proposed modification is expected to have only very minor surface impacts, and will not result in the disturbance to any characteristics of the habitats for the white-bellied sea eagle (*Haliaeetus leucogaster*). Areas of potential habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area provides moderate conservation value habitat for the white-bellied sea eagle (*Haliaeetus leucogaster*). Known and potential habitat for the white-bellied sea eagle (*Haliaeetus leucogaster*) is moderately widespread within the locality, including within Werakata National Park and Ellalong Lagoon which occurs within 2.5 km of the LWB4-B7 Modification Area. There are a number of areas of high conservation habitat within the region, only some of which are conserved. The LWB4-B7 Modification Area is not considered to provide important habitat for this species.

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

The LWB4-B7 Modification Area does not support any critical habitat for the white-bellied sea eagle (*Haliaeetus leucogaster*) or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant.

Regent honeyeater (*Anthochaera phrygia*)

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 LWB4-B7 Modification Area provides suitable habitat for the regent honeyeater (*Anthochaera phrygia*), in particular within the Lower Hunter Spotted Gum – Ironbark Forest and the Riparian Cabbage Gum Open Forest which both support winter flowering tree species that are known to be used by this species. Moderate to high conservation value habitat for this species also occurs in the large remnant of the nearby Werakata State Conservation Area. This highly mobile species is known to forage at a number of suitable locations within the local area in the cooler months.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats. As such, there is very low potential for an impact on the regent honeyeater (*Anthochaera phrygia*).

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

Not applicable.

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

There will be no vegetation loss as a result of direct clearing, or as a result of subsidence impacts associated with the proposed modification. There will be no removal or modification of potential habitats for the regent honeyeater (*Anthochaera phrygia*).

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

The proposed modification is expected to have only very minor surface impacts, and will not result in the disturbance to any characteristics of the potential habitat for the regent honeyeater (*Anthochaera phrygia*). Areas of potential habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area provides moderate conservation value habitat for the regent honeyeater (*Anthochaera phrygia*). Known and potential habitat for the regent honeyeater (*Anthochaera phrygia*) is moderately widespread within the locality, including within Werakata State Conservation Area which occurs within 3 kilometres of the LWB4-B7 Modification Area. There are a number of areas of high conservation habitat within the region, only some of which are conserved. It is not considered that the habitats provided by the LWB4-B7 Modification Area are of particular importance to this species.

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

The LWB4-B7 Modification Area does not support any critical habitat for the regent honeyeater (*Anthochaera phrygia*) or any other threatened species or populations.

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

The specific recovery actions from the Regent Honeyeater Recovery Plan (Department of Natural Resources and Environment 1999) are:

- effectively organise and administer the recovery effort
- maintain and enhance habitat
- monitor trends in population size and range
- facilitate strategic research
- maintain and increase community awareness, understanding and involvement and
- maintain the captive population.

None of the above recovery actions would be compromised as a result of the proposed modification.

The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant.

Grey-crowned babbler (*Pomatostomus temporalis temporalis*)

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 LWB4-B7 Modification Area provides known habitat and a likely resident population of the grey-crowned babbler (*Pomatostomus temporalis temporalis*) within remnant vegetation areas. Moderate to high conservation value habitat for this species also occurs in the large remnant of the nearby Werakata State Conservation Area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance to surface and groundwater flow. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is not likely that subsidence will lead to loss of vegetation or modification of habitats. As such, there is very low potential for an adverse impact on grey-crowned babbler (*Pomatostomus temporalis temporalis*) such that a viable local population of the species is placed at risk of extinction.

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

Not applicable.

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

There will be no vegetation loss as a result of direct clearing, or as a result of subsidence impacts associated with the proposed modification. There will be no removal or modification of habitats for the grey-crowned babbler (*Pomatostomus temporalis temporalis*).

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

The proposed modification is expected to have only very minor surface impacts, and will not result in the disturbance to any characteristics of the habitat required for the grey-crowned babbler (*Pomatostomus temporalis temporalis*). Areas of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area provides moderate conservation value habitat for the grey-crowned babbler (*Pomatostomus temporalis temporalis*). Known and potential habitat for the grey-crowned babbler (*Pomatostomus temporalis temporalis*) is widespread within the locality, including within Werakata State Conservation Area which occurs within 3km of the LWB4-B7 Modification Area. As such the LWB4-B7 Modification Area is not considered of particular importance to this species.

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

The LWB4-B7 Modification Area does not support any critical habitat for the grey-crowned babbler (*Pomatostomus temporalis temporalis*) or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant.

Varied sittella (*Daphoenositta chrysoptera*)

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 LWB4-B7 Modification Area provides known habitat for the varied sittella (*Daphoenositta chrysoptera*), in particular within the areas of remnant vegetation. The LWB4-B7 Modification Area is likely to provide habitat for a resident population of the varied sittella (*Daphoenositta chrysoptera*) given the relatively sedentary nature of this species compared to other birds. Moderate to high conservation value habitat for this species also occurs in the large remnant of the Werakata State Conservation Area which is within 3 km of the LWB4-B7 Modification Area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance to surface and groundwater flow. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats. As such, there is very low potential for an impact on varied sittella (*Daphoenositta chrysoptera*).

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

Not applicable.

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

There will be no vegetation loss as a result of direct clearing, or as a result of subsidence impacts associated with the proposed modification. There will be no removal or modification of habitat available to this species in the LWB4-B7 Modification Area as a result of the proposed modification.

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

The proposed modification is expected to have only very minor surface impacts, and will not result in the disturbance to any characteristics of the required habitat for the varied sittella (*Daphoenositta chrysoptera*). Areas of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area provides moderate conservation value habitat for the varied sittella (*Daphoenositta chrysoptera*). Known and potential habitat for the varied sittella (*Daphoenositta chrysoptera*) is widespread within the locality, including within Werakata State Conservation Area which occurs within 3 km of the LWB4-B7 Modification Area. As such the LWB4-B7 Modification Area is not considered of particular importance to this species.

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

The LWB4-B7 Modification Area does not support any critical habitat for varied sittella (*Daphoenositta chrysoptera*) or any other threatened species or populations.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant for this species.

Grey-headed flying-fox (*Pteropus poliocephalus*)

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 (*Pteropus poliocephalus*) was recorded in the LWB4-B7 Modification Area and potentially forages within the riparian habitats during periods of eucalypt flowering. No camps that provide breeding habitat for the species were identified during surveys and record comprised lone individuals.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance to surface and groundwater flow. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats. The proposed modification will therefore not affect the life-cycle of the grey-headed flying-fox (*Pteropus poliocephalus*) such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of potential habitat for the grey-headed flying-fox (*Pteropus poliocephalus*). There will be no removal or modification of habitat characteristics available to this species in the LWB4-B7 Modification Area as a result of the proposed modification.

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

The proposed modification is expected to result in negligible surface impacts, and will not result in the disturbance to potential habitat for the grey-headed flying-fox (*Pteropus poliocephalus*). As such, an area of potential habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area comprises suitable foraging habitat for the grey-headed flying-fox (*Pteropus poliocephalus*). This species could utilise this site for foraging, however suitable breeding and roosting habitat was not identified. It is not considered that the habitats provided are important for this species.

Given that the proposed modification will not involve the removal or modification to any areas of potential habitat for the grey-headed flying-fox (*Pteropus poliocephalus*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

The Draft National Recovery Plan for the Grey-Headed Flying-Fox (Department of Environment, Climate Change and Water 2009) lists the following priority actions:

- identify and protect foraging habitat critical to the survival of grey-headed flying-foxes
- enhance winter and spring foraging habitat for grey-headed flying-foxes
- identify, protect and enhance roosting habitat critical to the survival of grey-headed flying-foxes
- significantly reduce levels of deliberate grey-headed flying-fox destruction associated with commercial horticulture
- provide information and advice to managers, community groups and members of the public that are involved with controversial flying-fox camps
- produce and circulate educational resources to improve public attitudes toward grey-headed flying-foxes, promote the recovery program to the wider community and encourage participation in recovery actions
- monitor population trends for the grey-headed flying-fox
- assess the impacts on grey-headed flying-foxes of electrocution on powerlines and entanglement in netting and barbed wire, and implement strategies to reduce these impacts

- oversee a program of research to improve knowledge of the demographics and population structure of the grey-headed flying-fox and

- maintain a National Recovery Team to oversee the implementation of the grey-headed flying-fox National Recovery Plan.

None of the above recovery actions would be compromised as a result of the proposed modification.

The proposed modification is additionally not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant for this species.

Squirrel glider (*Petaurus norfolcensis*)

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 squirrel glider (*Petaurus norfolcensis*) was recorded in the LWB4-B7 Modification Area, and it is considered that a resident population is likely present, utilising the habitats of the LWB4-B7 Modification Area as part of a wider habitat range in surrounding areas of vegetation. This species could be denning in hollow-bearing tree present.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

It is not likely that proposed modification will result in the loss or modification of any areas of habitat for this species. The proposed modification will not affect the lifecycle of the squirrel glider (*Petaurus norfolcensis*) such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of habitat for the squirrel glider (*Petaurus norfolcensis*). There will be no removal or modification of habitat for this species in the LWB4-B7 Modification Area a result of the proposed modification.

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

The proposed modification is expected to result in negligible surface impacts, and will not result in the disturbance to any characteristics of habitats available for the squirrel glider (*Petaurus norfolcensis*). As such, an area of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area comprises known foraging habitat and potential denning habitat for the squirrel glider (*Petaurus norfolcensis*).

Given that the proposed modification will not involve the removal or modification to any areas of habitat for the squirrel glider (*Petaurus norfolcensis*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

As part of the Saving Our Species program for this species currently listed on the OEH website (OEH 2016), protection of known occurrences and habitat are recommended management actions. However as no habitats for this species will be removed, the proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant for this species.

Koala (*Phascolarctos cinereus*)

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

There is an existing Atlas record of the koala (*Phascolarctos cinereus*) from the LWB4-B7 Modification Area as well as over 50 records of this species within 10km. The record occurring within the LWB4-B7 Modification Area (if accurate as the Atlas data indicates that the accuracy was within 1000 metres off the coordinates provided (BioNet 2016)) likely represents a dispersing individual, as a resident population of the species (or signs of presence) was not recorded during surveys and potential foraging resources for the species were low.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

It is not likely that proposed modification will result in the loss or modification of any areas of habitat for this species. The proposed modification will not affect the lifecycle of the koala (*Phascolarctos cinereus*) such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of habitat for the koala (*Phascolarctos cinereus*). There will be no removal or modification of habitat characteristics available to this species in the LWB4-B7 Modification Area a result of the proposed modification.

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

The proposed modification is expected to result in negligible surface impacts, and will not result in the disturbance of habitat for the koala (*Phascolarctos cinereus*). As such, an area of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area comprises a small amount of low to moderate quality foraging habitat for the koala (*Phascolarctos cinereus*) and a resident population was not identified. Given that the proposed modification will not involve the removal or modification to any areas of habitat for the koala (*Phascolarctos cinereus*) there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

The 'Recovery plan for the koala (*Phascolarctos cinereus*)' (DECC 2008) is relevant to this species. The proposed action does not contravene with any of the objective or actions listed within this recovery plan. No threat abatement plans are pertinent to this threatened species. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant for this species.

Large-eared pied bat (*Chalinolobus dwyeri*)

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 large-eared pied bat (*Chalinolobus dwyeri*) was recorded in the LWB4-B7 Modification Area. Due to an absence of appropriate roosting habitat (as a cave-roosting species), it is considered that this species would only be utilising the habitats available as part of a larger foraging range.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

It is not likely that proposed modification will result in the loss or modification of any areas of habitat for this species. The proposed modification will not affect the lifecycle of large-eared pied bat (*Chalinolobus dwyeri*) such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of foraging or roosting habitat for the large-eared pied bat (*Chalinolobus dwyeri*). There will be no removal or modification of habitat characteristics available to this species in the LWB4-B7 Modification Area a result of the proposed modification.

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

The proposed modification is expected to result in negligible surface impacts, and will not result in the disturbance of foraging or roosting habitat for the large-eared pied bat (*Chalinolobus dwyeri*). As such, an area of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area comprises foraging habitat for the large-eared pied bat (*Chalinolobus dwyeri*). Given that the proposed modification will not involve the removal or modification to any areas of habitat for the large-eared pied bat (*Chalinolobus dwyeri*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

The only current relevant recovery plan for this species is the National Recovery plan for the Large-eared Pied Bat Chalinolobus dwyeri (Department of Environment and Resource Management 2011). Specific objectives of this plan are:

- Identify priority roost and maternity sites for protection
- Implement conservation and management strategies for priority sites
- Educate the community and industry to understand and participate in the conservation of the large-eared pied bat
- Research the large-eared pied bat to augment biological and ecological data to enable conservation management
- Determine the meta-population dynamics throughout the distribution of the large-eared pied bat

As this species would not be roosting in the LWB4-B7 Modification Area, this site would not be considered as a priority roost and maternity site for protection. All the subsequent actions are flow on points from this. The project des not contravene any of these objectives.

The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant for this species.

Southern myotis (*Myotis macropus*)

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 southern myotis (*Myotis macropus*) was identified as potentially present as it was recorded as part of a species group during Anabat echolocation surveys. This species potentially forages and roosts within the riparian habitats present. There is potential that a local population is present that utilises the habitats present as part of a wider area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

It is not likely that proposed modification will result in the loss or modification of any areas of habitat for this species. The proposed modification will not affect the lifecycle of southern myotis (*Myotis macropus*) such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of potential habitat for the southern myotis (*Myotis macropus*). There will be no removal or modification of habitat characteristics available to this species in the LWB4-B7 Modification Area a result of the proposed modification.

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

The proposed modification is expected to result in negligible surface impacts, and will not result in the disturbance of potential habitat for the southern myotis (*Myotis macropus*). As such, an area of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area comprises potential foraging and roosting habitat for the southern myotis (*Myotis macropus*).

Given that the proposed modification will not involve the removal or modification to any areas of habitat for the southern myotis (*Myotis macropus*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant for this species.

East-coast freetail-bat (*Mormopterus norfolkensis*)

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 east-coast freetail-bat (*Mormopterus norfolkensis*) was recorded in the LWB4-B7 Modification Area, and potentially forages and roosts (tree-hollow roosting species) within the woodland habitats present.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

It is not likely that proposed modification will result in the loss or modification of any areas of habitat for this species. The proposed modification will not affect the lifecycle of east-coast freetail bat (*Mormopterus norfolkensis*) such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of habitat for the east-coast freetail bat (*Mormopterus norfolkensis*). There will be no removal or modification of habitat characteristics available to this species in the LWB4-B7 Modification Area as a result of the proposed modification.

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

The proposed modification is expected to result in negligible surface impacts, and will not result in the disturbance to potential habitat for the east-coast freetail bat (*Mormopterus norfolkensis*). As such, an area of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area comprises potential foraging and roosting habitat for east-coast freetail bat (*Mormopterus norfolkensis*). Given that the proposed modification will not involve the removal or modification to any areas of habitat for the east-coast freetail bat (*Mormopterus norfolkensis*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant for this species.

Little bentwing-bat (*Miniopterus australis*)

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 little bentwing-bat (*Miniopterus australis*) was identified in the LWB4-B7 Modification Area, and potentially forages and roosts within the habitats present. This species roosts in tree-hollows and caves however no cave habitats were present in the LWB4-B7 Modification Area. There is potential that a local population is present however it is most likely that this species would utilise the habitats present as part of a wider area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance to surface and groundwater flow. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

It is not likely that proposed modification will result in the loss or modification of any areas of habitat for this species. The proposed modification will not affect the lifecycle of the little bentwing-bat (*Miniopterus australis*) such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of potential habitat for the little bentwing-bat (*Miniopterus australis*). There will be no removal or modification of habitat characteristics available to this species in the LWB4-B7 Modification Area as a result of the proposed modification.

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

The proposed modification is expected to result in negligible surface impacts, and will not result in the disturbance to potential habitat for the little bentwing-bat (*Miniopterus australis*). As such, an area of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area comprises potential foraging and roosting habitat for the little bentwing-bat (*Miniopterus australis*).

Given that the proposed modification will not involve the removal or modification to any areas of habitat for the little bentwing-bat (*Miniopterus australis*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant for this species.

Eastern bentwing-bat (*Miniopterus schreibersii oceanensis*)

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 eastern bentwing-bat (*Miniopterus schreibersii oceanensis*) was possibly recorded within the LWB4-B7 Modification Area as part of a species group. However for the purposes of this impact assessment this species has been assumed to occur. Although this species could be foraging in the LWB4-B7 Modification Area, there are no cave habitats present that could be utilised by this species for roosting. There is potential that a local population is present that utilises the habitats present as part of a wider area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance to surface and groundwater flow. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

It is not likely that proposed modification will result in the loss or modification of any areas of habitat for this species. The proposed modification will not affect the lifecycle of the eastern bentwing-bat (*Miniopterus australis*) such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of potential habitat for the eastern bentwing-bat (*Miniopterus schreibersii oceanensis*). There will be no removal or modification of habitat characteristics available to this species in the LWB4-B7 Modification Area as a result of the proposed modification.

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

The proposed modification is expected to result in negligible surface impacts, and will not result in the disturbance to potential habitat for the eastern bentwing-bat (*Miniopterus schreibersii oceanensis*). As such, an area of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area comprises potential foraging and roosting habitat for the eastern bentwing-bat (*Miniopterus schreibersii oceanensis*).

Given that the proposed modification will not involve the removal or modification to any areas of habitat for the eastern bentwing-bat (*Miniopterus schreibersii oceanensis*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant for this species.

Greater broad-nosed bat (*Scoteanax rueppellii*)

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 greater broad-nosed bat (*Scoteanax rueppellii*) was recorded in the LWB4-B7 Modification Area, and potentially forages and roosts (tree-hollow roosting species) within the woodland habitats present.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance to surface and groundwater flow. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

It is not likely that proposed modification will result in the loss or modification of any areas of habitat for this species. The proposed modification will not affect the lifecycle of the greater broad-nosed bat (*Scoteanax rueppellii*) such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of habitat for the greater broad-nosed bat (*Scoteanax rueppellii*). There will be no removal or modification of habitat characteristics available to this species in the LWB4-B7 Modification Area as a result of the proposed modification.

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

The proposed modification is expected to result in negligible surface impacts, and will not result in the disturbance to foraging or roosting habitat for the greater broad-nosed bat (*Scoteanax rueppellii*). As such, an area of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area comprises foraging and potential roosting habitat for the greater broad-nosed bat (*Scoteanax rueppellii*). Given that the proposed modification will not involve the removal or modification to any areas of habitat for the greater broad-nosed bat (*Scoteanax rueppellii*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant for this species.

Yellow bellied sheathtail-bat (*Saccolaimus flaviventris*)

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 yellow bellied sheathtail-bat (*Saccolaimus flaviventris*) was identified in the LWB4-B7 Modification Area, and potentially forages and roosts within the habitats present. There is potential that a viable population exists, but it is unlikely that it would be exclusively dependent on the habitats provided by the LWB4-B7 Modification Area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

It is not likely that proposed modification will result in the loss or modification of any areas of habitat for this species. The proposed modification will not affect the lifecycle of yellow bellied sheathtail-bat (*Saccolaimus flaviventris*) such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of potential habitat for the yellow bellied sheathtail-bat (*Saccolaimus flaviventris*). There will be no removal or modification of habitat characteristics available to this species in the LWB4-B7 Modification Area a result of the proposed modification.

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

The proposed modification is expected to result in negligible surface impacts, and will not result in the disturbance of potential habitat for the yellow bellied sheathtail-bat (*Saccolaimus flaviventris*). As such, an area of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area comprises potential foraging and roosting habitat for the yellow bellied sheathtail-bat (*Saccolaimus flaviventris*). Given that the proposed modification will not involve the removal or modification to any areas of habitat for the yellow bellied sheathtail-bat (*Saccolaimus flaviventris*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant to this species.

Eastern falsistrelle (*Falsistrellus tasmaniensis*)

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 eastern falsistrelle (*Falsistrellus tasmaniensis*) was possibly recorded within the LWB4-B7 Modification Area as part of a species group. However for the purposes of this impact assessment this species has been assumed to occur. Although this species could be foraging in the LWB4-B7 Modification Area, there are no cave habitats present that could be utilised by this species for roosting. The eastern falsistrelle (*Falsistrellus tasmaniensis*) potentially occurs in the LWB4-B7 Modification Area, and potentially forages and roosts (tree-hollow roosting species) within the habitats present. There is potential that a local population is present that utilises the habitats present as part of a wider area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

It is not likely that proposed modification will result in the loss or modification of any areas of habitat for this species. The proposed modification will not affect the lifecycle of the eastern falsistrelle (*Falsistrellus tasmaniensis*) such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of potential habitat for the eastern falsistrelle (*Falsistrellus tasmaniensis*). There will be no removal or modification of habitat characteristics available to this species in the LWB4-B7 Modification Area a result of the proposed modification.

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

The proposed modification is expected to result in negligible surface impacts, and will not result in the disturbance of potential habitat for the eastern falsistrelle (*Falsistrellus tasmaniensis*). As such, an area of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area comprises potential foraging and roosting habitat for the eastern falsistrelle (*Falsistrellus tasmaniensis*).

Given that the proposed modification will not involve the removal or modification to any areas of habitat for the eastern falsistrelle (*Falsistrellus tasmaniensis*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant.

Eastern cave bat (*Vespadelus troughtoni*)

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 eastern cave bat (*Vespadelus troughtoni*) was possibly recorded within the LWB4-B7 Modification Area as part of a species group. However for the purposes of this impact assessment this species has been assumed to occur. Although this species could be foraging in the LWB4-B7 Modification Area, there are no cave habitats present that could be utilised by this species for roosting. There is potential that a local population is present that utilises the habitats present as part of a wider area.

Subsidence modelling and predictions indicate that the potential for surface cracking and significant deformation of the ground surface is minimal, and therefore the proposed modification will cause very little disturbance of surface and groundwater flow patterns. The secondary impacts (decreased creek bank stability, hydrological changes, tree fall etc.) of subsidence typically have greatest impact on riparian areas, and these secondary impacts are also predicted to be minor. There will be no loss of vegetation as a result of direct clearing, and it is very unlikely that subsidence will lead to loss of vegetation or modification of habitats.

It is not likely that proposed modification will result in the loss or modification of any areas of habitat for this species. The proposed modification will not affect the lifecycle of the eastern cave bat (*Vespadelus troughtoni*) such that a viable local population of the species would be placed at risk of extinction.

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

Not applicable.

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

The proposed modification will not lead to the removal or modification of any areas of potential habitat for the eastern cave bat (*Vespadelus troughtoni*). There will be no removal or modification of habitat characteristics available to this species in the LWB4-B7 Modification Area a result of the proposed modification.

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

The proposed modification is expected to result in negligible surface impacts, and will not result in the disturbance of potential habitat for the eastern cave bat (*Vespadelus troughtoni*). As such, an area of habitat for this species will not become fragmented or isolated from other areas of habitat (known or potential) as a result of the proposed modification.

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

The LWB4-B7 Modification Area comprises potential foraging habitat for the eastern cave bat (*Vespadelus troughtoni*).

Given that the proposed modification will not involve the removal or modification to any areas of habitat for the eastern cave bat (*Vespadelus troughtoni*); there will not be an impact on the long-term viability of this species within the locality.

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

The LWB4-B7 Modification Area does not support any critical habitat for this species or any other threatened species, populations or EECs.

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

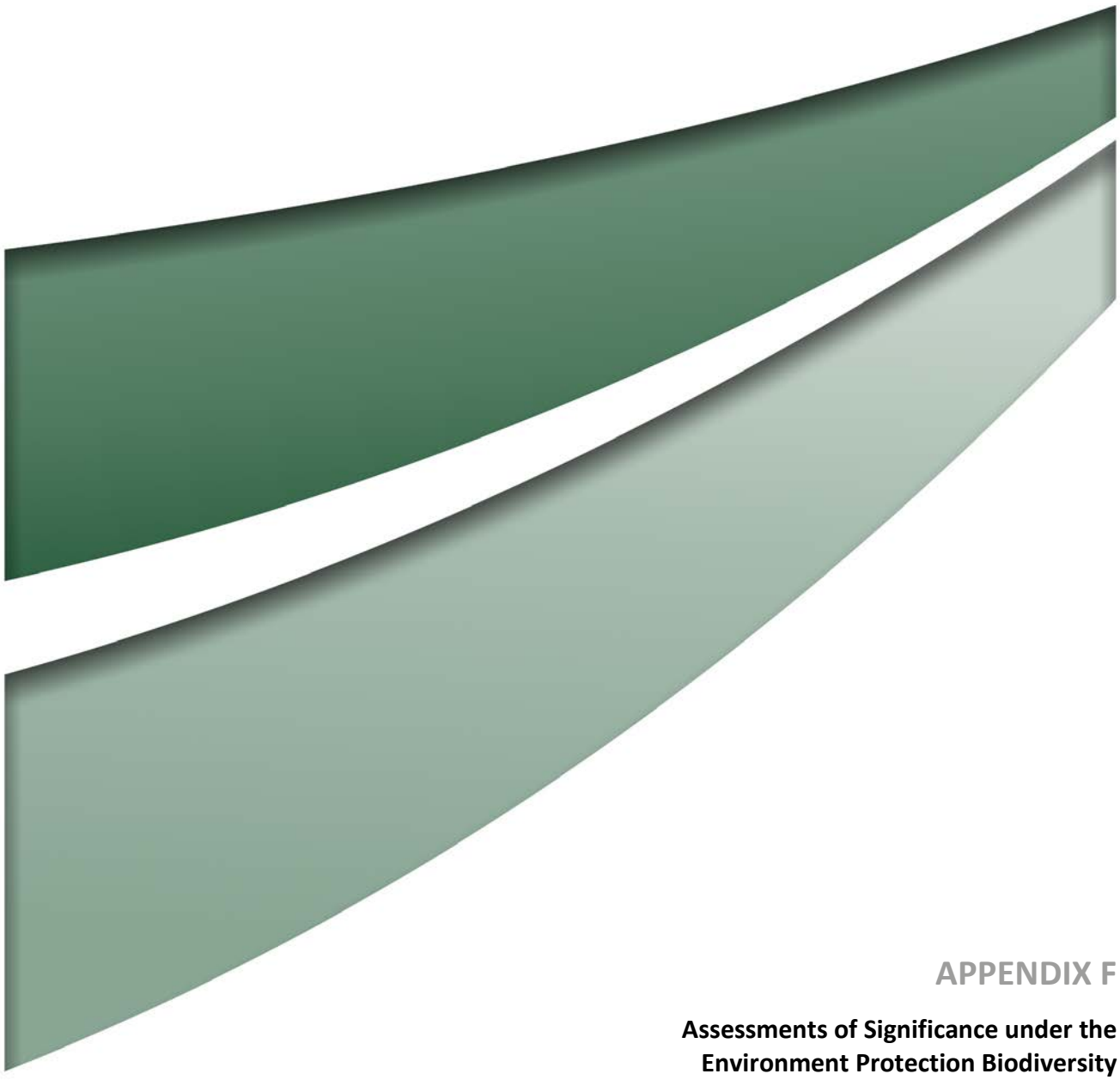
There is not currently a recovery plan or threat abatement plan which relates to this species and the proposed modification. The proposed modification is not in contravention of the Saving Our Species program for this threatened species.

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.

There are two KTPs most relevant to the proposed modification, being 'Alterations due to subsidence associated with longwall mining' and 'Alteration to the natural flow regimes of rivers, streams, floodplains and wetlands'. Several other KTPs were considered for their relevance to the project: these are discussed in **Section 4.6** of the main report. Given that the predicted surface impacts of the proposed modification will be very minor, the implications of these KTPs are not considered significant for this species.

Conclusion

The proposed modification will not result in a significant impact on any threatened species, populations or EECs recorded or potentially occurring within the LWB4-B7 Modification Area.



APPENDIX F

Assessments of Significance under the Environment Protection Biodiversity Conservation Act 1999

A search of the Department of the Environment (DotE) Protected Matters Database identified threatened and migratory species (EPBC Act listed) known to occur or considered likely to occur, on the basis of habitat modelling, within a 10 kilometre radius of the LWB4-B7 Modification Area. No EPBC Act listed endangered populations or threatened ecological communities (TECs) are known or have potential to occur within the LWB4-B7 Modification Area.

Given that the proposed modification comprises underground mining that is predicted to have very minor impacts on surface habitats, an assessment was only undertaken for those species regarded to have reasonable potential to occur and reasonable potential to be impacted by the proposed modification. Consequently, six threatened species and one migratory species require assessment. An assessment of the potential impacts of the proposed modification on these species is provided below.

The aim of this assessment is to determine whether the proposed modification is likely to have a significant impact on any EPBC Act matters of national environmental significance (MNES). In this instance, MNES with potential to occur within the LWB4-B7 Modification Area include:

- listed threatened species (including critically endangered, endangered and vulnerable species)
- listed migratory species.

Each category is addressed separately below.

Endangered and Critically Endangered Species

The following EPBC Act listed endangered and critically endangered species respectively are considered in this assessment:

- swift parrot (*Lathamus discolor*)
- regent honeyeater (*Anthochaera phrygia*)
- Australian painted snipe (*Rostratula australis*)
- Australasian bittern (*Botaurus poiciloptilus*)

An assessment in accordance with the DotE principal significant impact guidelines (DotE 2013) is provided below for these species.

In this case, a *population* means:

- a geographically distinct regional population, or collection of local populations
- a regional population, or collection of local populations, that occurs within a particular bioregion.

The swift parrot (*Lathamus discolor*) and regent honeyeater (*Anthochaera phrygia*) are not known to occur in the LWB4-B7 Modification Area, however have potential to occur due to the presence of winter flowering eucalypt species and the presence of local records. Both are migratory species, and are known to occur in the locality in the cooler months where they forage on winter-flowering resources such as spotted gum (*Corymbia maculata*) and ironbarks (primarily broad-leaved ironbark (*Eucalyptus fibrosa*)). It is considered that the habitats provided by the LWB4-B7 Modification Area provide only moderate quality habitat for these species due to the fragmented and modified nature of the woodland habitat available as a result of historic clearing and ongoing grazing practices.

The swift parrot occurs as a single population, although it migrates annually from breeding grounds in Tasmania to the winter foraging grounds on the coastal plains and slope woodlands of mainland eastern Australia (Saunders 2002). Approximately 200 mature birds (10 per cent of the total estimated population) are known to over-winter in the Lower Hunter Region of New South Wales (Saunders 2002). The Modification Area is considered to form part of a regional dispersal route close to important winter foraging areas in the lower Hunter Valley.

Although there appears to be minor behavioural differences between regent honeyeaters in the three main areas inhabited by the species (the Bundarra-Barraba area in NSW, the Capertee Valley in NSW, and north-eastern Victoria), the direction and extent of movements, including evidence of movement between breeding sites, and a lack of discernible genetic differences between the sites suggest that the regent honeyeater occurs as a single, contiguous population (Garnett and Crowley 2000).

The Australian painted snipe and Australasian bittern were not identified in the LWB4-B7 Modification Area however have potential (albeit low) to occur in the large waterbody in the north. If these species were to occur, it would be unlikely that it would be exclusively reliant on the habitats present, particularly given the proximity to known area of higher quality and more appropriate habitat provided by Ellalong Lagoon. Based on the former definition, it is unlikely that the LWB4-B7 Modification Area supports a population of these species.

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:

- **lead to a long-term decrease in the size of a *population*; or**

Neither the swift parrot or regent honeyeater were recorded within the LWB4-B7 Modification Area, however there is potential for these species to occur, in particular in the Lower Hunter Spotted Gum – Ironbark Forest community and to a lesser extent the Riparian Cabbage Gum Forests, Coastal Foothills Transition Forest and Melaleuca Shrubland with Emergent Eucalypts. As these species are winter migrants, they would utilise the resources of the LWB4-B7 Modification Area as part of a wider foraging range at appropriate times of the year. The proposed modification will not result in the loss of vegetation as a result of direct clearing or in relation to secondary impacts related to subsidence. The subsidence predictions indicate that any modifications to surface habitats resulting would be minor. As such, there is no potential for the proposed modification to lead to a long-term decrease in the size of a population of swift parrot or regent honeyeater.

Neither the Australian painted snipe nor Australasian bittern were recorded within the LWB4-B7 Modification Area, however there is potential for these species to occur, in the large water body in the north of the LWB4-B7 Modification Area. It is likely that they would utilise the habitats present as part of a wider range. The proposed modification will not result in the loss of vegetation as a result of direct clearing or in relation to secondary impacts related to subsidence. The subsidence predictions indicate that any modifications to surface habitats resulting would be minor. As such, there is no potential for the proposed modification to lead to a long-term decrease in the size of a population of Australian painted snipe or Australasian bittern.

- **reduce the area of occupancy of the species; or**

Neither the swift parrot, regent honeyeater, Australian painted snipe or Australasian bittern were recorded within the LWB4-B7 Modification Area, however it does support potential habitat for them to occur. Given that surface impacts will be minor, the proposed modification will not reduce the area of potential habitat for these species, and sizeable areas of similar potential habitats for these species are protected within the nearby (within 3 km) Werakata State Conservation Area and Ellalong Lagoon.

- **fragment an existing *population* into two or more populations; or**

Neither the swift parrot, regent honeyeater, Australian painted snipe or Australasian bittern were recorded within the LWB4-B7 Modification Area, however potential habitat for these species is present. The proposed modification will not result in the loss of vegetation as a result of direct clearing or in relation to secondary impacts related to subsidence. The subsidence predictions indicate that any modifications to surface habitats resulting would be minor. As such, there is no potential for the proposed modification to lead to the fragmentation of an existing population of the swift parrot, regent honeyeater, Australian painted snipe or Australasian bittern into two or more populations.

- **adversely affect habitat critical to the survival of a species; or**

Neither the swift parrot, regent honeyeater, Australian painted snipe or Australasian bittern were recorded within LWB4-B7 Modification Area. The LWB4-B7 Modification Area is not known to support any areas of critical habitat for either species. The proposed modification will not adversely affect habitat critical to the survival of these species.

- **disrupt the breeding cycle of a population; or**

Potential habitat for the swift parrot, regent honeyeater, Australian painted snipe or Australasian bittern occurs within the LWB4-B7 Modification Area; however there is no known breeding habitat. The proposed modification does not involve any clearing or fragmentation of habitats. As such, the proposed modification will not disrupt the breeding cycle of any population of any endangered species.

- **modify, destroy, remove isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline; or**

Potential foraging habitat for the swift parrot and regent honeyeater occurs within the LWB4-B7 Modification Area, in particular within the Lower Hunter Spotted Gum – Ironbark Forest community. The proposed modification is underground and will result in minor surface disturbances that are not expected to alter the habitats of these two critically endangered species.

Potential habitat for the Australian painted snipe and Australasian bittern occurs within the LWB4-B7 Modification Area, in the large water body in the north. The proposed modification is underground and will result in minor surface disturbances (including water bodies) that are not expected to alter the habitats of the two endangered species.

Consequently, the proposed modification will not modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that these critically endangered and endangered species are likely to decline.

- **result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat; or**

Given that the proposed modification comprises underground mining and will have minimal surface impacts, it is not expected to result in the establishment of invasive species that are harmful to these critically endangered and endangered species.

- **Interfere with the recovery of the species.**

The proposed modification will not lead to the loss, alteration or fragmentation of known or potential habitats for the swift parrot, regent honeyeater, Australian painted snipe or Australasian bittern. As such, the proposed modification will not interfere with the recovery of these species.

Vulnerable Flora Species

The following EPBC Act listed vulnerable flora species are considered in this assessment:

- heath wrinklewort (*Rutidosis heterogama*)
- small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*)

An assessment in accordance with the DotE principal significant impact guidelines (DotE (2013) is provided below for these species.

In this case, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity
- populations that are near the limit of the species range.

Approximately 500 heath wrinklewort (*Rutidosis heterogama*) and 86 small-flower grevillea (*Grevillea parviflora* subsp. *parviflora*) were recorded in the LWB4-B7 Modification Area. Although these are likely to comprise viable local populations, based upon the above definitions, these would not comprise *important populations*. These species are known to occur in substantial numbers throughout the Quorrobolong area, particularly within the nearby Werakata SCA. Based on the above definition, it is not considered that the LWB4-B7 Modification Area supports an important population of heath wrinklewort (*Rutidosis heterogama*) or small-flower grevillea (*Grevillea parviflora* susbp. *parviflora*).

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of an *important population* of a species; or**

The LWB4-B7 Modification Area supports known habitat for heath wrinklewort (*Rutidosis heterogama*) and small-flower grevillea (*Grevillea parviflora* susbp. *parviflora*), however it does not support an important population of either of these species. The proposed modification involves underground mining and as such there will be only minor surface impacts. Based on subsidence modelling and predictions, there will be no alteration to potential habitats of the heath wrinklewort (*Rutidosis heterogama*) or small-flower grevillea (*Grevillea parviflora* susbp. *parviflora*). As such, there is no potential for the proposed modification to lead to a long-term decrease in the size of an important population of these species.

- **reduce the area of occupancy of an *important population*; or**

As described above, the proposed modification will not involve any activities that would alter the known or potential habitats of the heath wrinklewort (*Rutidosis heterogama*) or small-flower grevillea (*Grevillea parviflora* susbp. *parviflora*). As such, there is no potential for the proposed modification to lead to a reduction in the area of occupancy of a population of these species.

- **fragment an existing important population into two or more populations; or**

Given that any surface disturbances associated with the proposed modification would only be minor; there is no potential for known or potential populations of heath wrinklewort (*Rutidosis heterogama*) or small-flower grevillea (*Grevillea parviflora* susbp. *parviflora*) within the LWB4-B7 Modification Area to become fragmented or isolated.

- **adversely affect habitat critical to the survival of a species; or**

The LWB4-B7 Modification Area does not contain any habitats that are critical to the survival of heath wrinklewort (*Rutidosis heterogama*) or small-flower grevillea (*Grevillea parviflora* susbp. *parviflora*). Regardless, there will not be any modifications to the habitats of these species as a result of the proposed modification.

- **disrupt the breeding cycle of an important population; or**

The proposed modification does not comprise any actions that would disrupt the breeding cycle of heath wrinklewort (*Rutidosis heterogama*) or small-flower grevillea (*Grevillea parviflora* susbp. *parviflora*).

- **modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline; or**

The LWB4-B7 Modification Area supports known habitat for heath wrinklewort (*Rutidosis heterogama*) and small-flower grevillea (*Grevillea parviflora* susbp. *parviflora*), however it does not support an important population of either of these species. The proposed modification involves underground mining and as such there will be only minor surface impacts. Based on subsidence modelling and predictions, there will be no alteration to known or potential habitats of the heath wrinklewort (*Rutidosis heterogama*) or small-flower grevillea (*Grevillea parviflora* susbp. *parviflora*). As such, there is no potential for the proposed modification to modify, destroy, remove, isolate or decrease the availability or quality of habitat for these species to the extent that they would be likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat; or**

Given that the proposed modification is underground and will have minimal surface impacts, it is not expected to result in the establishment of invasive species that are harmful to these species.

- **interfere substantially with the recovery of the species.**

The proposed modification will not lead to the loss, alteration or fragmentation of potential habitats for heath wrinklewort (*Rutidosis heterogama*) or small-flower grevillea (*Grevillea parviflora* susbp. *parviflora*). As such, the proposed modification will not interfere with the recovery of these species.

Vulnerable Fauna Species

An assessment in accordance with the DotE principal significant impact guidelines (DotE 2013) is provided below for the green and golden bell frog (*Litoria aurea*), koala (*Phascolarctos cinereus*), large-eared pied bat (*Chalinolobus dwyeri*) and grey-headed flying-fox (*Pteropus poliocephalus*).

In this case, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity
- populations that are near the limit of the species range.

Koala (*Phascolarctos cinereus*)

There is one NSW Atlas of NSW Wildlife record of the koala (*Phascolarctos cinereus*) from within the LWB4-B7 Modification Area, from 2006 that has an accuracy of 1000m (BioNet 2015). Based on the habitats provided by the LWB4-B7 Modification Area it is considered that this record (if accurate); likely comprised a single individual passing through the LWB4-B7 Modification Area to a more appropriate area of habitat. No actual koalas or evidence of koalas (sightings, scats, scratchings) were observed during surveys undertaken by Umwelt for this assessment. Potential food resources were identified for this species, however these were typically only in low densities (except in areas of Riparian Cabbage Gum Forest).

The Assessment of Significance for the koala has been prepared with consideration of the EPBC Act Referral Guidelines for the Vulnerable Koala (DoE 2014).

The Referral Guidelines advise that the assessment of significant impacts on the koala is undertaken primarily through the assessment of habitat critical to the survival of the koala and actions that interfere substantially with the recovery of the koala. This approach aims to avoid and address habitat loss as well as promote a streamlined assessment and approval process.

In accordance with the Referral Guidelines, the habitat assessment tool was applied to determine the extent of vegetation that contains at least one known koala food tree within the Central Coast Koala Management Area (Phillips 2000). Koala feed trees for the Central Coast Koala Management Area (OEH 2014) that occur in the LWB4-B7 Modification Area include:

Primary Food Tree Species:

- Cabbage gum (*Eucalyptus amplifolia*).
- Forest red gum (*Eucalyptus tereticornis*)

Secondary Food Tree Species:

- Grey box (*Eucalyptus moluccana*)
- Grey gum (*Eucalyptus punctata*)

These species predominantly occur in the Riparian Cabbage Gum Open Forest and to a lesser extent in the Spotted-Gum Ironbark Forest, Coastal Foothills Transition Forest and Melaleuca Shrublands with Emergent Eucalypts. Together these areas comprise 163.8 ha of habitat. Although at least one primary food tree species and at least one secondary food tree species were present in the LWB4-B7 Modification Area.

Table 1 below applies the Koala Habitat Assessment Tool as outlined in Table 3 of the Referral Guidelines.

Table 1 Assessment of Koala Habitats

Koala Habitat Assessment Tool (Table 3 from DoE 2014)			**LWB4-B7 Modification Area Assessment**	
Attribute	**Score**	**Coastal**	**Allocated Score**	**Score Justification**
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 2 years.	**0**	Atlas of NSW Wildlife point buffer search identified 1 koala records within the LWB4-B7 Modification Area from 9 years ago. No evidence of the koala was recorded during the Umwelt surveys (call playback, SATT assessment, searches for signs of presence and spotlighting) of the LWB4-B7 Modification Area in 2015 or 2016.
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 5 years.		
	0 (low)	None of the above.		
Vegetation composition	+2 (high)	Has forest or woodland with 2 or more known koala food tree species, OR 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	**+2**	This Referral Area contains known koala feed trees for the Hunter-Central Rivers region including cabbage gum (*Eucalyptus amplifolia*), forest red gum (*Eucalyptus tereticornis*), grey gum (*Eucalyptus punctata*) and grey box (*Eucalyptus moluccana*).
	+1 (medium)	Has forest or woodland with only 1 species of known koala food tree present.		
	0 (low)	None of the above.		
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 500 ha.	**+2**	The north-west areas of the LWB4-B7 Modification Area are connected to the higher quality habitats of Werakata State Conservation Area in the north. Potential habitat within the LWB4-B7 Modification Area for this species will not be removed by works and subsidence will not substantially impact these habitats.
	+1 (medium)	Area is part of a contiguous landscape < 500 ha, but ≥ 300 ha.		
	0 (low)	None of the above.		

Koala Habitat Assessment Tool (Table 3 from DoE 2014)			LWB4-B7 Modification Area Assessment	
Attribute	**Score**	**Coastal**	**Allocated Score**	**Score Justification**
Key existing threats	+2 (low)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence.	**1**	One BioNet Wildlife Atlas record notes two koala road mortalities since 2002 within 10km of the LWB4-B7 Modification Area It is expected that any local koala populations are substantially affected by the agricultural land uses in the locality that would likely expose any local koala population to dog attack.
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, OR areas which score 0 for koala occurrence are likely to have some degree of dog or vehicle threat present.		
	0 (high)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, OR areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.		
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	**0**	Table 1 of the Draft Referral Guidelines (DoE 2014) prescribes, that for coastal areas, the interim recovery objective(s) are to: *"Protect and conserve large, connected areas of koala habitat, particularly large, connected areas that support koalas that are:-of sufficient size to be genetically robust/operate as a viable sub-population OR free of disease or have a low incidence of disease OR breeding and to maintain corridors and connective habitat that allow movement of koalas between large areas of habitat."* The habitats of the LWB4-B7 Modification Area are of a lower quality (subject to grazing, clearing etc.) compared to connected vegetation in Werakata State Conservation Area to the north-west which would provide preferential
	+1 (medium)	Uncertainty exists as to whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.		
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.		

Koala Habitat Assessment Tool (Table 3 from DoE 2014)			LWB4-B7 Modification Area Assessment	
Attribute	**Score**	**Coastal**	**Allocated Score**	**Score Justification**
				habitat for this species. No clearing of this potential koala habitat is proposed. Subsequently the proposed modification will not cause fragmentation of retained habitats and is not likely to influence the interim recovery objectives. Preferred/primary koala habitat will not be directly impacted by the Project.
TOTAL SCORE			**5**	**≥ 5 indicates habitat critical for the survival of the koala.**

As the habitats identified in the LWB4-B7 Modification Area scored five using the Referral Guidelines habitat assessment tool, the LWB4-B7 Modification Area is considered to contain habitat critical to the survival of the koala (DoE 2014). However these guidelines state that:

> *the actions are likely to have a significant impact on a vulnerable species if they adversely effect habitat critical to the survival of the species*

As the impacts of underground mining are not predicted to cause substantial impacts as a result of subsidence, the project is not anticipated to adversely effect these areas of identified critical habitat. The modifications are not expected to result in substantial inference to the recovery of the koala. Further consideration of the impacts of the Proposed Action is detailed in the Assessment of Significance below.

In this case, an *important population* is a population that is necessary for a species' long-term survival and recovery. This may include populations that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity
- populations that are near the limit of the species range.

The koala is known to occur in eucalypt woodlands and forests from north-eastern Queensland, along the eastern coast of NSW, to the south-east corner of South Australia. The vulnerable listing for the koala extends from north-eastern Queensland to the Victoria border. In the Central-Hunter Rivers Catchment of NSW, the koala population is predominantly centred in the Port Stephens LGA, with scattered records located elsewhere throughout the catchment. One single unconfirmed record of this species has been recorded in the LWB4-B7 Modification Area; however the species has been recorded elsewhere in the locality. This one record from 2006 was recorded by way of community wildlife surveys and its accuracy was very low (i.e. 1000 metres). No evidence of the koala (sightings, scats, scratchings) were recorded in the LWB4-B7 Modification Area during the surveys undertaken for this assessment during 2015, 2016 or 2017.

Atlas records indicate approximately 80 known records within 10 kilometres of the LWB4-B7 Modification Area, primarily in areas that provide higher habitat value (due to higher levels of connectivity, less fragmentation and greater diversity and abundance of feed tree species) than that of the LWB4-B7 Modification Area.

The known records surrounding the LWB4-B7 Modification Area (in higher quality habitats) are unlikely to be key source populations for breeding or dispersal, necessary for maintaining genetic diversity or at the limit of the known range of the species. It is unlikely that any potential population occurring in the LWB4-B7 Modification Area constitutes part of an important population that occurs in the Hunter-Central Rivers CMA.

An action has, will have, or is likely to have a significant impact on threatened species if it does, will, or is likely to:

- **lead to a long-term decrease in the size of an important population of a species;**

The Proposed Action will not result in the loss of any of the moderate quality habitat available to this species. Evidence of their previous or current occupation, such as scratches and scats, were not recorded in the LWB4-B7 Modification Area. It is considered that the LWB4-B7 Modification Area contains some moderate habitat for the species, however it is not known to be regularly utilised by the individuals that may occur in the locality. The proposed modification is not expected to lead to a long-term decrease in the size of an important population of the species.

- **reduce the area of occupancy of an important population, or;**

The Proposed Action will not result in the loss of any of the moderate quality habitat available to this species. Evidence of their current occupation, such as scratches and scats, were not recorded in the LWB4-B7 Modification Area. It is considered that the LWB4-B7 Modification Area contains some moderate habitat for the species, however it is not known to be utilised by the individuals that may occur in the locality. The proposed modification is not expected to reduce the area of occupancy of an important population of the species.

- **fragment an existing important population into two or more populations, or;**

The proposed modification will not result in the loss of any of the moderate quality habitat available to this species. Evidence of their previous or current occupation, such as scratches and scats, were not recorded in the LWB4-B7 Modification Area. It is considered that the LWB4-B7 Modification Area contains some marginal habitat for the species, however it is not known to be utilised by the individuals that may occur in the locality.

The proposed modification will not fragment any areas of potential or known habitat for this species.

- **adversely affect habitat critical to the survival of a species, or;**

The proposed modification will not result in the loss of any of the moderate quality potential habitat for the koala. Although using the Koala Habitat Assessment Tool outlined in the Koala Draft Referral Guidelines (DoE 2014) (refer to **Table 1** above) identified that the habitats present were consistent with critical habitat for the koala, the proposed modification will not affect habitat critical to the survival of the species.

- **disrupt the breeding cycle of an important population, or;**

No koalas or evidence of koalas were been recorded in the LWB4-B7 Modification Area during targeted surveys and therefore there is no evidence of breeding or territorial behaviour to indicate the LWB4-B7 Modification Area is important for the breeding cycle of an important population of the koala. It is likely that surrounding records are dispersing individuals from other quality habitats in the wider locality including within Werakata SCA. The proposed modification will not alter habitat available for this species and is subsequently unlikely to disrupt the breeding cycle of an important population of the species.

- **modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or;**

The proposed modification will not modify or destroy any of the available koala habitats in the LWB4-B7 Modification Area. The koala (if present) would be expected to occur in low densities while dispersing and subsequently the proposed modification is considered unlikely to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;**

No invasive species are likely to become established as a result of the proposed modification that may impact upon any habitat relevant to the koala.

- **introduce disease that may cause the species to decline; or**

The koala is known to contract strains of *Chlamydia* and the koala retrovirus. Chlamydia infections are known to cause reduced female fertility and are expected to reduce the reproductive potential of koala populations. There is potential that at least some of the Hunter-Central Rivers population is infected with Chlamydia. The koala retrovirus can cause a range of conditions including leukaemia and immunodeficiency syndrome. It is estimated that up to 100 per cent of koala populations in Queensland and New South Wales have the koala retrovirus (TSSC 2012).

The proposed modification does not involve any processes that are likely to introduce a disease on site for the koala or that may cause this species to decline.

- **interfere substantially with the recovery of the species.**

The Approved Recovery Plan for the Koala (DECC 2008) contains specific recovery objectives and performance criteria including maintaining existing populations, improving the extent and quality of priority habitat areas, increasing numbers of breeding females, increasing the health of individuals in the wild, expanding the distribution of the species and increasing community reports of sightings.

The proposed modification will not result in the loss of any of the moderate quality habitat provided by the LWB4-B7 Modification Area, which is not an area known to contain a population of the species. No significant effect on the recovery of the koala is expected to occur as a result of the proposed modification.

Conclusion

The proposed modification is unlikely to result in a significant impact on an important population of koala as the proposed modification will not impact habitat critical to the survival for the species as described in the Referral Guidelines (DoE 2014) or as presented in the assessment of significance under the EPBC Act.

Green and golden bell frog, Grey-headed Flying-Fox and Large-eared Pied Bat

The green and golden bell frog was not identified in the LWB4-B7 Modification Area however has potential (albeit low) to occur in the large waterbody in the north. The most recent record of this species in the local area was at Ellalong Lagoon from 1993. It is unlikely that this species persists as an extant population in his area. Based on the former definition, as this species was not identified, it is unlikely that the LWB4-B7 Modification Area supports an important population of this species.

The grey-headed flying-fox was identified as lone individuals in the LWB4-B7 Modification Area, and this species potentially forages in riparian habitats. No roost sites for this species occur were identified or are likely to occur in the LWB4-B7 Modification Area. Based on the definition described above, the LWB4-B7 Modification Area does not support an important population of this species. It is expected that individuals of this highly mobile species would utilise the resources of the LWB4-B7 Modification Area as part of a wider foraging range, and no populations would rely exclusively on the resources identified in the LWB4-B7 Modification Area.

The large-eared pied bat was recorded using an Anabat Echolocation Detector in the western habitats of the LWB4-B7 Modification Area. No roosting sites (cave roosting species) for this species occur, however there are appropriate foraging habitats available. This species is likely to be utilising the habitats present in the LWB4-B7 Modification Area as part of a much larger area of habitat. It is subsequently not considered that the LWB4-B7 Modification Area supports an important population of this species.

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- **lead to a long-term decrease in the size of an *important population* of a species; or**

The LWB4-B7 Modification Area provides potential habitat for the green and golden bell frog, grey-headed flying-fox and known foraging habitat for the large-eared pied bat, however it does not support an important population of these species under the former definition.

The proposed modification involves underground mining and subsidence predictions indicate that there will be minor surface impacts. Any potential loss of foraging resources for the green and golden bell frog, grey-headed flying-fox or large-eared pied bat is expected to be very minor and would not have potential to lead to a decrease in the size of a population of these species.

- **reduce the area of occupancy of an *important population*; or**

The proposed modification will not disturb or modify any areas of habitat for the green and golden bell frog, grey-headed flying fox or the large-eared pied bat. The LWB4-B7 Modification Area does not comprise an important population for these species.

The proposed modification involves underground mining and subsidence predictions indicate that there will be minor surface impacts from subsidence. Any potential loss of habitat for the green and golden bell frog, grey-headed flying-fox or large-eared pied bat is expected to be very minor and would not have potential to lead to a reduction in the area of occupancy of these species.

- **fragment an existing important population into two or more populations; or**

Given that surface disturbances associated with the proposed modification are expected to be minor, there is no potential for any potentially existing population of green and golden bell frog, grey-headed flying-fox or large-eared pied bat to become fragmented or isolated.

- **adversely affect habitat critical to the survival of a species; or**

The LWB4-B7 Modification Area does not contain any habitats that are critical to the survival of the green and golden bell frog, grey-headed flying-fox or large-eared pied bat. The nearby (within 3 km) Werakata State Conservation Area and Ellalong Lagoon protect larger areas of higher quality habitats compared to those present within the LWB4-B7 Modification Area.

- **disrupt the breeding cycle of an important population; or**

The LWB4-B7 Modification Area does not support any important population for the green and golden bell frog, grey-headed flying-fox or large-eared pied bat. Breeding sites/ camps/roosting habitat of the green and golden bell frog, grey-headed flying-fox and large-eared pied bat respectively were not recorded during surveys and the proposed modification is not expected to result in any actions that would disrupt the breeding cycle of these species.

- **modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline; or**

The LWB4-B7 Modification Area provides potential habitat for the green and golden bell frog, as well as known habitat for the grey-headed flying-fox and large-eared pied bat, however it does not support an important population of these species under the above definition.

The proposed modification involves underground mining and subsidence predictions indicate that there will be minor surface impacts. There is no potential for the proposed modification to modify, destroy, remove, isolate, or decrease the availability or quantity of habitat for green and golden bell frog, grey-headed flying-fox or large-eared pied bat to the extent that the species are likely to decline.

- **result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat; or**

Given that the proposed modification comprises underground mining and is predicted to have minimal surface impacts, it is not expected to result in the establishment of invasive species that are harmful to these vulnerable species.

- **interfere substantially with the recovery of the species.**

The potential habitats for the green and golden bell frog, grey-headed flying-fox and known foraging habitats for the large-eared pied bat identified within the LWB4-B7 Modification Area are smaller and of a lower quality than those protected in nearby Ellalong Lagoon and Werakata State Conservation Area. Due to the very minor surface impacts predicted, the proposed modification will not interfere substantially with the recovery of the green and golden bell frog, grey-headed flying-fox or large-eared pied bat.

Migratory Species

Three migratory species, the Japanese snipe (*Gallinago hardwickii*), sharp-tailed sandpiper (*Calidiris acuminata*) and common greenshank (*Tringa nebularia*) have been considered in this assessment.

An assessment in accordance with the DotE principal significant impact guidelines (DotE 2013) is provided below for these species.

An area of important habitat is:

- habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species
- habitat utilised by a migratory species which is at the limit of the species range
- habitat within an area where the species is declining.

None of these species were recorded during surveys of the LWB4-B7 Modification Area; however all have been identified within a 10km radius, including at the nearby Ellalong Lagoon. Potential habitat is present for each of them to occur and forage in the habitats provide by the large waterbody in the north. However, based on the above definition, the LWB4-B7 Modification Area is not regarded to be *important habitat* for these species based on the above definition.

An action is likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

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

The proposed modification will not result in the loss of vegetation due to direct clearing or as a result of secondary impacts relating to subsidence. The subsidence predictions indicate that any modifications to surface habitats would be minor. There is no potential for the proposed modification to result in a substantial modification, destruction or isolation of habitats for these migratory species.

- **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**

Given that the proposed modification relates to underground mining that is predicted to have minimal surface impacts, it is not expected to result in the establishment of invasive species that are harmful to these migratory species.

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

The nature of the proposed modification is such that there will be very minor disturbances to surface vegetation and habitats within the LWB4-B7 Modification Area. As such, there is no potential that the lifecycle of these migratory species could be seriously disrupted. There is no potential that an ecologically significant proportion of the population of these migratory species could be affected by the proposed modification.

Conclusion

The proposed modification will not result in a significant impact on any EPBC Act listed threatened species or migratory species.