8. Assessment of impacts unable to be avoided

Assessment of direct and indirect impacts unable to be avoided has been undertaken in accordance with the BAM (DPIE 2020a). The following direct and indirect impacts are unable to be avoided in progressing the project.

8.1. Direct impacts

Direct impacts include vegetation clearing calculated from within the development footprint including WTG hardstands, electrical cabling, access roads, public road upgrades, APZs, and other infrastructure such as construction compounds.

A breakdown of direct impacts arising from the project include:

- Impacts to up to 0.19 ha of PCT 10 River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion
- Impacts to up to 11.44 ha of PCT 13 Black Box – Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion).
- Impacts to up to 3.65 ha of PCT 15 Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion).
- Impacts to up to 2.03 ha of PCT 17 Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion).
- Impacts to up to 800.55 ha of PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion, comprising the following:
    - 342.38 ha to PCT 26 DNG (43%).
    - 341.38 ha to PCT 26 sparse (43%).
    - 116.79 ha to PCT 26 intact (14%).
- Impacts to up to 48.87 ha of PCT 28 White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone.
- Impacts to up to 3.08 ha of PCT 45 Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion.
- Impacts to up to 73.79 ha of PCT 46 Curly Windmill Grass – speargrass – wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion.
- Impacts to up to 4.97 ha of PCT 160 Nitre Goosefoot shrubland wetland on clays of the inland floodplains.
- Impacts to up to:
    - 457.75 ha of Weeping Myall TEC listed under the BC Act (i.e. areas mapped as PCT 26 Sparse and Intact) and 128.73 ha (116.79 ha of Intact and 11.94 ha of Sparse) of Weeping Myall woodland listed under the EPBC Act.

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- 76.87 ha of grasslands considered to align with the Natural Grasslands of the Murray Valley TEC listed under the EPBC Act (ie areas mapped as PCT 45 and PCT 46).
- 48.57 ha of Sandhill Pine woodland TEC listed under the BC Act.
- Impacts to 2.6 ha of confirmed *Swainsona murrayana* and *Swainsona sericea* habitat as well as 391.37 ha of assumed habitat.
- Impacts to 2.38 ha of important mapped areas for Plains Wanderer, note this includes important mapped habitat that occurs across an existing public road (Goolgumbla Road) and existing formed farm tracks.
- Impacts to 82.88 ha of habitat and associated buffers considered suitable for Southern Bell Frog.
- Impacts to 35.96 ha of habitat and associated buffers considered suitable for Superb Parrot.
- Assumed impacts to 5.83 ha of habitat considered marginal for Southern Myotis, of which 2.41 ha is associated with PCT 13.
- Assumed impacts to 22.35 ha of habitat considered marginal for Grey Snake.
- Assumed impacts to potential habitat where representative and adequate survey is yet to be undertaken for
    - Austral Pilwort.
    - Austrostipa wakoolica.
    - Mossgiel Daisy.
    - Claypan Daisy.
    - Winged Peppercress.
    - Lanky Buttons.
    - *Maireana cheelii*.
    - Turnip Copperburr.
    - Red Darling Pea.

A summary and assessment of the above impacts are provided in Table 74 and Table 75, as well as Table 76 and Table 77, with many of these impacts considered permanent, relating to the development footprint, and will occur over the course of the construction phase of the project. Mitigation measures outlined in Section 9 will help to minimise the potential impacts to biodiversity values that remain present within the subject land.

To mitigate impacts to native vegetation as a result of temporary impacts, site rehabilitation and ecological restoration works will be completed in areas such as temporary construction laydown areas and trenching for underground cabling. A Biodiversity Management Plan (BMP) will also look at opportunities for revegetation and restoration plans to buffer areas of important habitat, such as the adjacent retained areas and to provide for biodiversity corridors through the subject land and ensure improve and maintain principles are delivered to these areas.

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8.1.1. Summary of direct impacts

A summary of direct impacts to native vegetation as a result of the project are provided in Table 74, impacts to species credit species are provided in Table 75, and impacts to scattered trees are provided in Table 76 below.

Table 74 Summary of direct impacts to vegetation for the entire development footprint

Zone	PCT	TEC	Area impacted (ha)	VI Score
PCT 10_moderate	River Red Gum - Black Box woodland wetland	No	0.19	29.2
PCT 13_moderate	Black Box - Lignum woodland	No	3.6	70.6
PCT 13_thinned		No	7.9	69.2
PCT 15_moderate	Black Box open woodland wetland	No	2.5	75.7
PCT 15_thinned		No	1.1	67.1
PCT 17_mod_good	Lignum shrubland wetland	No	0.76	84.2
PCT 17_moderate		No	1.3	83.5
PCT 26_DNG	Weeping Myall open woodland	No	342.38	20.3
PCT 26_intact		Yes – Weeping Myall Woodlands	116.8	67.1
PCT 26_sparse			341.38	46.2
PCT 28_low	White Cypress Pine open woodland	Yes - Sandhill Pine Woodland	47.8	57.1
PCT 28_moderate			1.1	73.8
PCT 45_mod_good	Plains Grass grassland	Yes – Natural Grasslands (EPBC ACT ONLY)	2.24	65.1
PCT 45_intersection			0.83	100
PCT 46_moderate	Curly Windmill Grass - speargrass - wallaby grass grassland		73.4	90.6
PCT 46_intersection			0.34	100
PCT 160_mod_good	Nitre Goosefoot shrubland wetland	No	4.97	79

Table 75 Summary of direct impacts species credit habitat or individuals

Species	Biodiversity Risk Weighting	Area impacts (ha)
Austrostipa wakoolica	2	16.41 Assumed
Brachyscome muelleroides **Claypan Daisy**	2	35.62 Assumed
Brachyscome papillosa **Mossgiel Daisy**	2	44.42 Assumed
Hemiaspis damelii **Grey Snake**	2	22.35 Assumed
Lepidium monoplocoides **Winged Peppercress**	2	212.44 Assumed
Leptorhynchos orientalis	2	205.52 Assumed

Species	Biodiversity Risk Weighting	Area impacts (ha)
Lanky Buttons		
Litoria raniformis **Southern Bell Frog**	2	82.88 Known
Maireana cheelii	2	238.04 Assumed
Myotis macropus ***Southern Myotis***	2	2.41 Assumed
Pedionomus torquatus **Plains-wanderer**	3	2.38 Important Mapped Area
Pilularia novae-hollandiae **Austral Pillwort**	3	71.99 Assumed
Polytelis swainsonii **Superb Parrot**	2	35.96 Known
Sclerolaena napiformis **Turnip Copperburr**	2	238.97 Assumed
Swainsona murrayana **Slender Darling Pea**	2	2.60 Known 391.37 Assumed
Swainsona plagiotropis **Red Darling pea**	2	358.47 Assumed
Swainsona sericea **Silky Swainson-pea**	2	2.60 Known 391.37 Assumed

Table 76 Summary of direct impacts to scattered trees

Scattered tree class	No. trees impacted
1	-
2	12
3	4
Associated TEC impacts*	
Trees conforming to Weeping Myall Woodland	12

***Trees noted as TECs are included in those listed above, 16 scattered trees are impacted in total**

Direct impacts per stage is shown in Table 77.

Table 77 Summary of direct impacts per stage

Veg Zone or Species	Total footprint	Enabling Works	Stage 1	Stage 2
Vegetation zones				
PCT 10_moderate	0.19	-	-	0.19
PCT 13_moderate	3.6	-	-	3.6
PCT 13_thinned	7.9	-	2.5	5.4

Veg Zone or Species	Total footprint	Enabling Works	Stage 1	Stage 2
PCT 15_moderate	2.5	-	-	2.5
PCT 15_thinned	1.1	-	-	1.1
PCT 17_mod_good	0.76	-	0.3	0.46
PCT 17_moderate	1.3	-	0.5	0.8
PCT 26_DNG	342.38	18.82	106.95	216.60
PCT 26_intact	116.8	1.2	22.81	92.81
PCT 26_sparse	341.38	8.8	111.89	220.69
PCT 28_low	47.8	-	-	47.8
PCT 28_moderate	1.1	-	-	1.1
PCT 45_mod_good	2.24	-	2.2	-
PCT 45_intersection	0.83	0.83	-	-
PCT 46_moderate	73.4	-	1.3	72.1
PCT 46_intersection	0.34	0.34	-	-
PCT 160_mod_good	4.97	-	-	4.97
Species				
Austrostipa wakoolica	16.41 Assumed	2.11	8.38	5.85
Brachyscome muelleroides	35.62 Assumed	1.17	0.91	33.60
Brachyscome papillosa	44.42 Assumed	1.17	1.13	42.20
Lepidium monoplocoides	212.44 Assumed	4.43	43.72	166.64
Leptorhynchos orientalis	205.52 Assumed	5.6	44.41	188.80
Maireana cheelii	238.04 Assumed	4.77	44.36	188.80
Pilularia novae-hollandiae	71.99 Assumed	3.28	9.25	59.99
Sclerolaena napiformis	238.97 Assumed	4.77	44.36	188.80
Swainsona sericea	2.60 Known 391.37 Assumed	9.58	58.26	326.14
Swainsona murrayana	2.60 Known 391.37 Assumed	9.58	58.26	326.14
Swainsona plagiotropis	358.47 Assumed	9.58	57.66	291.40
Southern Bell Frog	82.88 Known	5.17	28.23	49.26
Grey Snake	22.35 Assumed	-	3.32	18.99
Plains-wanderer	2.38 Important Mapped Area	-	-	2.38
Superb Parrot	35.96 Known	-	4.7	31.42
Southern Myotis	2.41 Assumed	-	-	2.41

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Table 78 Summary of direct impacts to scattered trees per stage

Scattered tree class	No. trees impacted	Stage 1	Stage 2
1	-	-	-
2	4	2	2
3	12	1	11
Associated TEC impacts*			
Trees conforming to Weeping Myall Woodland	12	1	11

8.1.2. Loss of hollow bearing trees

Many patches of woody vegetation dominated by Black Box, with occasional River Red Gum and White Cypress Pine communities, within the development corridor contain a significant number of hollows. The project will result in the loss of nine hollow-bearing trees, out of the 60 recorded within the development corridor that contain small, medium and large hollows, or a combination of all three. This represents a 85% retention of woody vegetation with medium or greater sized hollows.

8.2. Indirect impacts

This section details potential indirect impacts associated with the construction and operation of the project following the implementation of proposed avoidance and minimisation measures. Indirect impacts are considered to potentially occur in areas outside the development footprint, but within the development corridor. In accordance with the BAM, a proponent can retire credits to offset indirect impacts that cannot be avoided or adequately minimised. Total indirect impacts equate to 5,131.49 hectares. All indirect impacts can be adequately mitigated within a BMP via active management and improve and maintain principles. Potential indirect impacts arising from the project are outlined and addressed in Table 79.

Table 79 Assessment of indirect impacts

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
Inadvertent impacts on adjacent habitat or vegetation	All PCT/zones All ecosystem credit species assumed present Weeping Myall TEC (BC Act and EPBC Act listings) Natural grasslands TEC (EPBC Act listing) Sandhill Pine Woodland TEC (BC Act listing) *Swainsona murrayana* *Swainsona sericea* Plains Wanderer important mapped areas Southern Bell Frog habitat Superb Parrot forging habitat Grey Snake habitat Southern Myotis habitat along the Coleambally channel	Within the retained vegetation surrounding the final development footprint within an approximate 30 m – 50 m buffer.	Ongoing in a staged manner for the life of the project (up to 35 years).	Long-term	Construction, operation and Decommissioning	Low. Impacts to adjacent vegetation during construction and operational phase can be prevented or minimised through appropriate exclusion fencing of sensitive areas, implementation of a detailed Biodiversity Management Plan (BMP). A Construction Environmental Management Plan (CEMP) or similar detailing best practice environmental protection measures, strict water quality practices and stormwater controls, and by ensuring any lighting is directed towards the developed area, rather than towards adjacent retained habitat will be implemented.
Reduced viability of adjacent habitat due to edge effects	All PCT/zones	Within the retained vegetation surrounding	Ongoing in a staged manner for the life of	Long-term	Construction and operation	Low-Moderate. The majority of avoided / retained vegetation within the subject land is already subject to some level of edge effects due to the level of historical clearing for

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
	All ecosystem credit species assumed present Weeping Myall TEC (BC Act and EPBC Act listings) Natural grasslands TEC (EPBC Act listing) Sandhill Pine Woodland TEC (BC Act listing) *Swainsona murrayana* *Swainsona sericea* Plains Wanderer important mapped areas Southern Bell Frog Superb Parrot forging habitat Grey Snake habitat Southern Myotis habitat along the Coleambally channel	the final development footprint within an approximate 30 m – 50 m buffer.	the project (up to 35 years).			agricultural purposes and the patchy nature of the vegetation. The irregularly-shaped and linear nature of the project means there will be considerable new edges created, which have the potential for impacts such as the spread of weeds along access tracks. Native vegetation across the subject land is generally in high ecological condition so is likely to be somewhat resilient to edged effects, and large patches will remain so edge to perimeter ratios will remain low overall. No areas considered large and intact will be impacted by the project in a manner that would substantially increase edges and/or edge effects. Weed incursions will be managed through regular weed control as part of the CEMP and OEMP.
Reduced viability of adjacent habitat due to noise, dust or light spill	All PCT/zones All ecosystem credit species assumed present Weeping Myall TEC (BC Act and EPBC Act listings)	Within the retained vegetation surrounding the final development footprint.	Temporary – Construction	Short-term	Predominantly construction	Low-Moderate. It is predicted that the adjacent habitat may be impacted by noise, dust, vibration and light spill, during construction and operation. Dust is likely to be an issue for vegetation adjacent to existing and newly created access tracks, and dust suppression of these areas will be required.

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
	Natural grasslands TEC (EPBC Act listing) Sandhill Pine Woodland TEC (BC Act listing) *Swainsona murrayana* *Swainsona sericea* Plains Wanderer important mapped areas Southern Bell Frog Superb Parrot forging habitat Grey Snake habitat Southern Myotis habitat along the Coleambally channel					It is expected that the majority of noise and dust impacts will occur during the construction phase, with a reduction to near-normal levels following completion of construction. However, there is some consideration of the noise produced by operational turbines continuing to impact upon fauna species utilising maintained habitats. Studies have indicated that narrow space foraging bats have been found to have a decreased presence of 50% within 80 -450 m of wind turbines, due to rotor noise, although open space foragers and edge space foragers were not shown to have any decrease in habitat use due to turbines (Ellerbrook et al. 2022). With an increase in wind speed, rotor speed increases and therefore noise. As wind speed increases, a decrease in activity for forest bats near turbines was recorded due to increased noise (Ellerbrook et al. 2024). In birds, ongoing noise from operational wind turbines has been shown to decrease breeding success, chick survival, displacement of individuals and reduce quality of foraging habitat (Tolvanen et al. 2023). Despite the large size of the project, significant areas of commensurate habitat will remain in the immediate locality, which can continue to be utilised by fauna species, away from noise impacts. Substantial buffers have been established between known nest locations and turbines, and as such nesting is unlikely to be substantially impacted by operational noise. Less mobile species, such as Plains-wanderer, have the potential to be more impacted than other more mobile species,

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
						however the large areas of unaffected habitat that will remain will still reduce the significance of the potential impacts. Operational lighting systems will be designed to minimise light spill onto adjacent retained habitats. Impacts of this nature will be managed via best practices outlined in a BMP and CEMP or similar. Improve and maintain principles will apply within the BMP to ensure retained areas of adjacent habitat do not decline or are subjected to adverse impacts. Ongoing monitoring will ensure any unexpected impact are realised early on (if they occur), rectified, and measures put in-place to minimise the possibility of reoccurrence.
Transport of weeds and pathogens from within the development footprint to adjacent vegetation	All PCT/zones All ecosystem credit species assumed present Weeping Myall TEC (BC Act and EPBC Act listings) Natural grasslands TEC (EPBC Act listing) Sandhill Pine Woodland TEC (BC Act listing) *Swainsona murrayana* *Swainsona sericea*	Within the retained vegetation surrounding the final development footprint within an approximate 30 m – 50 m buffer.	Ongoing in a staged manner for the life of the project (up to 35 years).	Long-term	Construction, operation and rehabilitation	Low-Moderate. Weeds occurring within the disturbance footprint are consistent with those occurring within adjacent vegetation to be retained. However there is likely to be a substantial increase in traffic movement through the subject land during the construction phase of the project, and an ongoing increase in traffic through operation. This increase in vehicle movements, with many vehicles coming from other construction sites, has the potential to spread novel weed species within the subject land and strict biosecurity protocols will need to be established and adhered to prevent outbreaks of weeds. Biosecurity measures will be outlined in the BMP and CEMP or similar. During both the construction and the operational phases of the project regular

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
	Plains Wanderer important mapped areas Southern Bell Frog Superb Parrot forging habitat Grey Snake habitat Southern Myotis habitat along the Coleambally channel					monitoring and management (weed control) will occur within retained areas adjacent to the development footprint.
Increased risk of starvation, exposure and loss of shade or shelter	Plains Wanderer important mapped areas Southern Bell Frog Grey Snake habitat Southern Myotis habitat along the Coleambally channel All ecosystem credit species assumed present	Loss of nine Hollow bearing trees Impacts to 2.38 ha of important mapped areas of Plains Wanderer habitat Loss of intact vegetation	Ongoing for the life of the project (up to 35 years).	Temporary, Possibly long-term	Construction and operation	Low. Improve and maintain principles will apply within the BMP to ensure retained areas of adjacent habitat do not decline or are subjected to adverse impacts. While the removal of sheltering vegetation within the development footprint is linear in nature, and a small proportion of the commensurate habitat available within the subject land and broader study area, the removal of potential roost/sheltering sites is a more adverse impact, but not one that is likely to result in mortality of individuals, however, may result in an increase of competition for remaining habitat features. The level of change is minimal in the context of the subject land and broader locality and the ecosystem is unlikely to be at carrying capacity such that displaced fauna cannot continue to persist in adjacent retained areas.
Loss of breeding habitats	Hollow dependent fauna Southern Bell Frog	Within the retained vegetation surrounding the final	Ongoing for the life of the project.	Long-term	Construction and operation	Low. Nine hollow-bearing trees will be removed by the project. Indirect impacts associated with the loss of breeding habitats are not considered likely to be substantial or

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
	All ecosystem credit species assumed present At risk bird avian fauna and microbats	development footprint within an approximate 30 m – 50 m buffer. Estimated zone of disturbance behind turbine blade, approximately 50m				significant to any locally occurring threatened, or non-threatened, species. Breeding habitats supported by hollow-bearing trees and nest trees have the potential to be indirectly impacted during construction of the project via noise, dust, vibration, lights etc, and during operation by the noise, movement and potential changes to air pressure surrounding operational turbines. Where nests occur adjacent to the development footprint of the wind farm indirect impacts may occur. Impacts will be managed and mitigated through monitoring and adaptive management via the BBAMP, BMP and operational/construction restrictions may occur if breeding is confirmed.
Trampling of threatened flora species	*Swainsona murrayana* *Swainsona sericea* Species assumed present	Areas of known and potential habitat within retained vegetation.	Ongoing for the life of the project (up to 35 years).	Temporary	Construction and operation	Low. Majority of individuals recorded within the subject land have been avoided. Species that occur within retained vegetation will be protected, improved and maintained. Principals will apply within the BMP to ensure retained areas of adjacent habitat and individuals do not decline or are subjected to adverse impacts. Grazing within and adjacent to known records of threatened flora species will be managed wherever possible to ensure potential trampling from livestock is minimised.
Inhibition of nitrogen fixation and increased soil salinity	N/A	N/A	N/A	N/A	N/A	Negligible. Not expected to result from the project. May be associated with ongoing treatment of nearby agricultural land unrelated to the project. Any future excavations or soil disturbance resulting from the project within the development corridor would be largely restricted to areas having undergone

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
						significant previous disturbance through cattle grazing and vehicular traffic. As such it is not considered likely that the future development of the subject land would result in substantial changes to the level of nitrogen fixation or soil salinity in the locality.
Fertiliser drift	N/A	N/A	N/A	N/A	N/A	Negligible. The subject land has a long history of grazing over its total extent. Grazing is still active in all areas. Exotic species dominance and presence is common. No fertiliser is proposed to be used.
Rubbish dumping	N/A	N/A	N/A	N/A	N/A	Negligible. Standard environmental controls for the project will ensure potential impacts are minimised. Works will follow an approved CEMP or similar and specific waste and water management requirements.
Wood collection	N/A	N/A	N/A	N/A	N/A	Low. Temporary on-site construction facilities for a maximum of 450 people, are proposed throughout construction. The potential exists for construction workers to harvest wood for fires during the construction period of the project. Clear guidance around banning of fires, or the provision of firewood for approved fires, will be provided in the BMP and CEMP. Not expected to occur post construction. Future development proposed within the subject land is unlikely to increase access to any retained vegetation, beyond current access capacity. Based on the future use of the subject land, future landholders are not expected to be likely to undertake wood collection beyond existing rural approvals within the retained vegetation to a level that it will have a

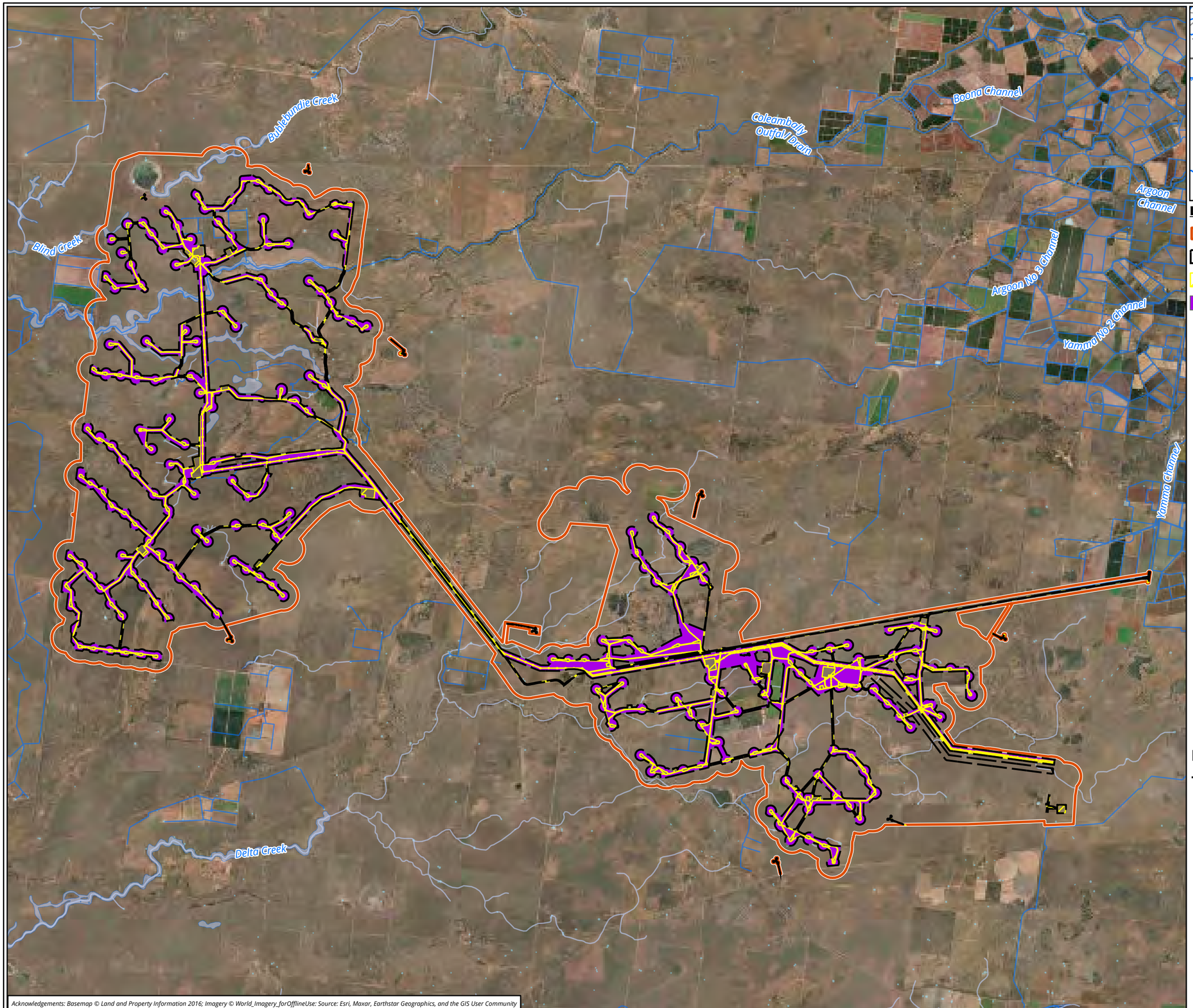
Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
						detrimental effect. Unauthorised access and collection of wood is expected to be negligible.
Removal and disturbance of rocks, including bush rock	N/A	N/A	N/A	N/A	N/A	Negligible. The development corridor does not support bush rock.
Increase in predators and pest animal populations	Plains Wanderer important mapped areas Southern Bell Frog Superb Parrot All ecosystem credit species assumed present	Areas of known and potential habitat within retained vegetation.	Ongoing for the life of the project (up to 35 years).	Long-term	Construction and operation	Moderate. Foxes *Vulpes vulpes* are noted and have been observed regularly during this assessment, however this is a common occurrence in this rural area. The project is not expected to increase numbers with required mitigation, however movement through the subject land may be considered to be exacerbated with construction and improved access roads through the subject land. European Rabbit *Oryctolagus cuniculus* is also known to occur within the soft sandhills. The BMP and BBAMP will detail pest management regimes in order to control foxes and other pests within the subject land during construction and operations.
Changed fire regimes	Unlikely to occur	N/A	N/A	N/A	N/A	Low. Appropriate asset protection zones and fire mitigation systems will be implemented for the project and the implementation of bushfire management and mitigation measures for the project will help to manage risk of fire within the subject land.

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
Disturbance to specialist breeding and foraging habitat, e.g. important mapped areas	Plains Wanderer important mapped areas Southern Bell Frog breeding habitat All ecosystem credit species assumed present	Areas of known and potential habitat within retained vegetation. 9.42 ha of retained important mapped areas for plains wanderer in the development corridor 642 ha within the subject land	One-off	Long-term	Construction and operation	Moderate. Mapped Important Areas for Plains Wanderer occur within the development footprint, development corridor and subject land, and impacts have been limited to 2.38 ha of linear removal, and potential indirect impacts to a further 9.42 ha. This includes areas overlapping an existing formed public road, and farm tracks. Potential indirect impacts to Plains-wanderer and Southern Bell Frog may also occur in the form of invasion by exotic species altering the composition of the species' habitats, or erosion and/or sedimentation negatively impacting on suitable grasslands. Both of these potential indirect impact vectors can be effectively managed, in relation to Plains-wanderer and Southern Bell Frog habitat, as outlined above for impacts to biodiversity values more broadly, however specific mitigation will be implemented via the inclusion of commitments to ensure Plains-wanderer habitat is specifically considered during the preparation of the BMP and on to the CEMP, OEMP and other relevant sub-plans. Improve and maintain principles will apply within the BMP to ensure retained important mapped areas and adjacent potential habitat do not decline or are subjected to adverse impacts. See Section 10.2 and Appendix 5 for further assessment of these impacts in the associated SAII assessment.

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
Fragmentation of movement corridors	All PCT/zones All ecosystem credit species assumed present Weeping Myall TEC (BC Act and EPBC Act listings) Natural grasslands TEC (EPBC Act listing) Sandhill Pine Woodland TEC (BC Act listing) *Swainsona murrayana* *Swainsona sericea* Plains Wanderer important mapped areas Southern Bell Frog Superb Parrot forging habitat At risk avian fauna Australasian bittern movement	Areas of known and potential habitat within retained vegetation. Flyways and movement corridors	Ongoing for the life of the project (up to 35 years).	Long-term	Construction and operation	Low. Patches utilised for movement of ground dwelling fauna and canopy fliers have been maintained within the development corridor as far as practicable. However, the removal of vegetation associated with the project may impact upon movement corridors at the site scale and the landscape scale for at risk avian fauna and microbats due to meso and macro avoidance. Improve and maintain principles will apply within the BMP to ensure retained adjacent habitat does not decline or is subjected to adverse impacts. Perimeter fencing will be limited to surrounding critical infrastructure for safety reasons (eg. Substations) and not through the entire development corridor. In some areas, this may disturb the movement of larger ground dwelling fauna such as Kangaroos and Emus, but overall, this effect is not likely to be substantially exacerbated beyond the existing rural impacts installed currently.
Impacts to Oolambeyan National Park and the South West Woodland Nature Reserve (Kulki Precinct)	Biodiversity values present in the conservation reserves. Populations of species that occur within the subject land and extend to	Within the subject land and local conservation reserves.	Ongoing for the life of the project (up to 35 years).	Long-term	Construction and operation.	Low. Oolambeyan National Park occurs 10 km to the north-west of the subject land, with South West Woodland Nature Reserve (Kulki) Precinct) occurring eight km north to northeast of the subject land. It is conceivable that highly mobile species utilise habitats within these conservation

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
	the conservation reserves.					reserves as well as the subject land as part of their larger home ranges, and that habitat removal within the development footprint may reduce the total habitat available to these mobile species. The removal of habitat as a result of the project is not considered to be substantial enough to result in the constriction of habitat available to these mobile species, which would be substantial enough to increase the abundance of the species with the reserves to above their carrying capacity. Sufficient habitat supporting similar values will remain within the forage range of any such species to prevent the conservation reserves becoming unsustainable refuge islands. The distance between the development footprint and the conservation reserves is also great enough to prevent any impacts associated with construction and operation of the project, such as noise, light, dust, vibration, from impacting upon the reserves and the habitats and populations they support.
Collision (transmission line strike), electrocution, and exposure to electrical and magnetic fields due to installation of powerlines	Bird and bat species utilising the habitats within the subject land	Transmission line to be constructed within the disturbance corridor	Ongoing for the life of the project (up to 35 years).	Long-term	Construction and operation.	Low. The potential exists for threatened species of birds and bats to be impacted via direct collision (transmission line strike), electrocution, and exposure to electrical and magnetic fields as result of this aspect of the project. Small and large transmission lines currently exist in or adjacent to the development corridor. Birds and bats have high ability to avoid collisions with birds

Indirect impact	Impacted entities	Extent	Frequency	Duration	Project phase/ timing of impact	Likelihood and consequences
						generally accepted as having between a 95 % to 98 % avoidance rate for the dynamic components of operational turbines, and a 99 % avoidance rate for the static components such as towers. It is acknowledged that transmission lines are likely to be less visible to birds and bats and therefore avoidance potential will not be as high as for large static turbine towers, however it can be assumed that the vast majority of the time a bird or bat flies in the vicinity of a powerline it will not result in a collision. Transmission line towers are often used for nesting in this landscape. Collisions are considered likely to be infrequent and will be mitigated by including measures such as those outlined in Section 9 below.



Legend

- Subject land
- Development corridor
- Development footprint
- Indirect impact

Figure 19 Indirect impacts - Overview

0 1 2 3 4 5

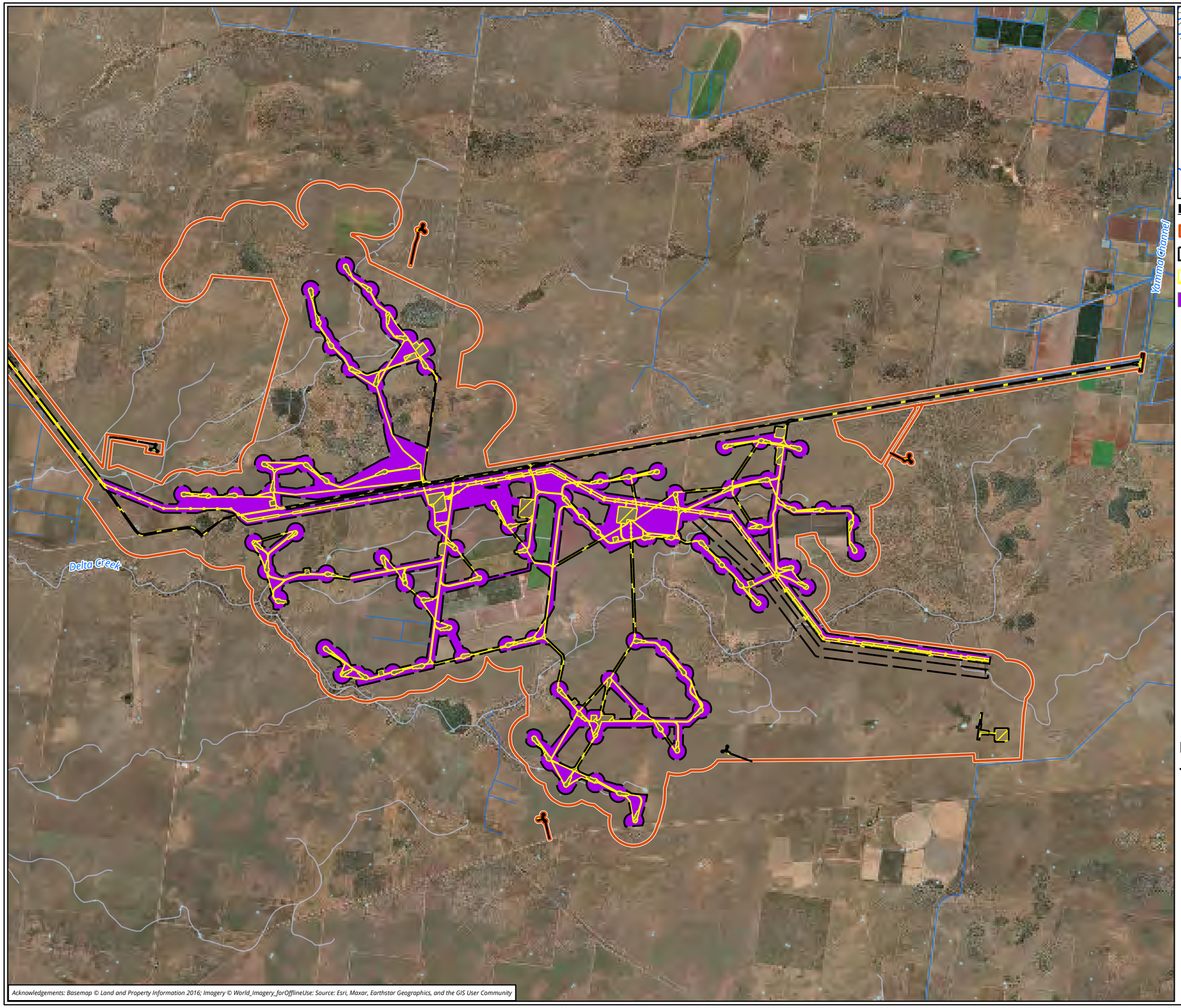
Kilometers
Scale: 1:130,000 @ A3
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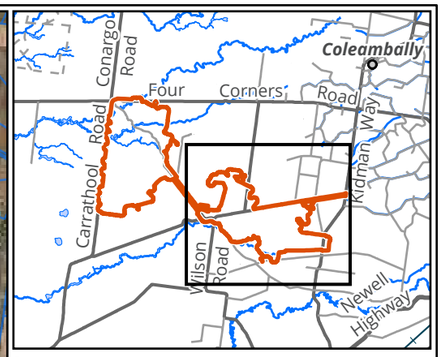
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Matter: 37263, Date: 08 April 2025,
GIS: JB, Checked by: MP, Last edited by: jbeckius
Location: P:\37200s\37263\Mapping\
37263_Dinawan_BDAR_Wind_F18-24.aprx
Layout: 37263_Wind_F19_IndirectImpacts

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Legend

- Subject land
- Development corridor
- Development footprint
- Indirect impact

Figure 19 Indirect impacts - Eastern area

0 1 2 3

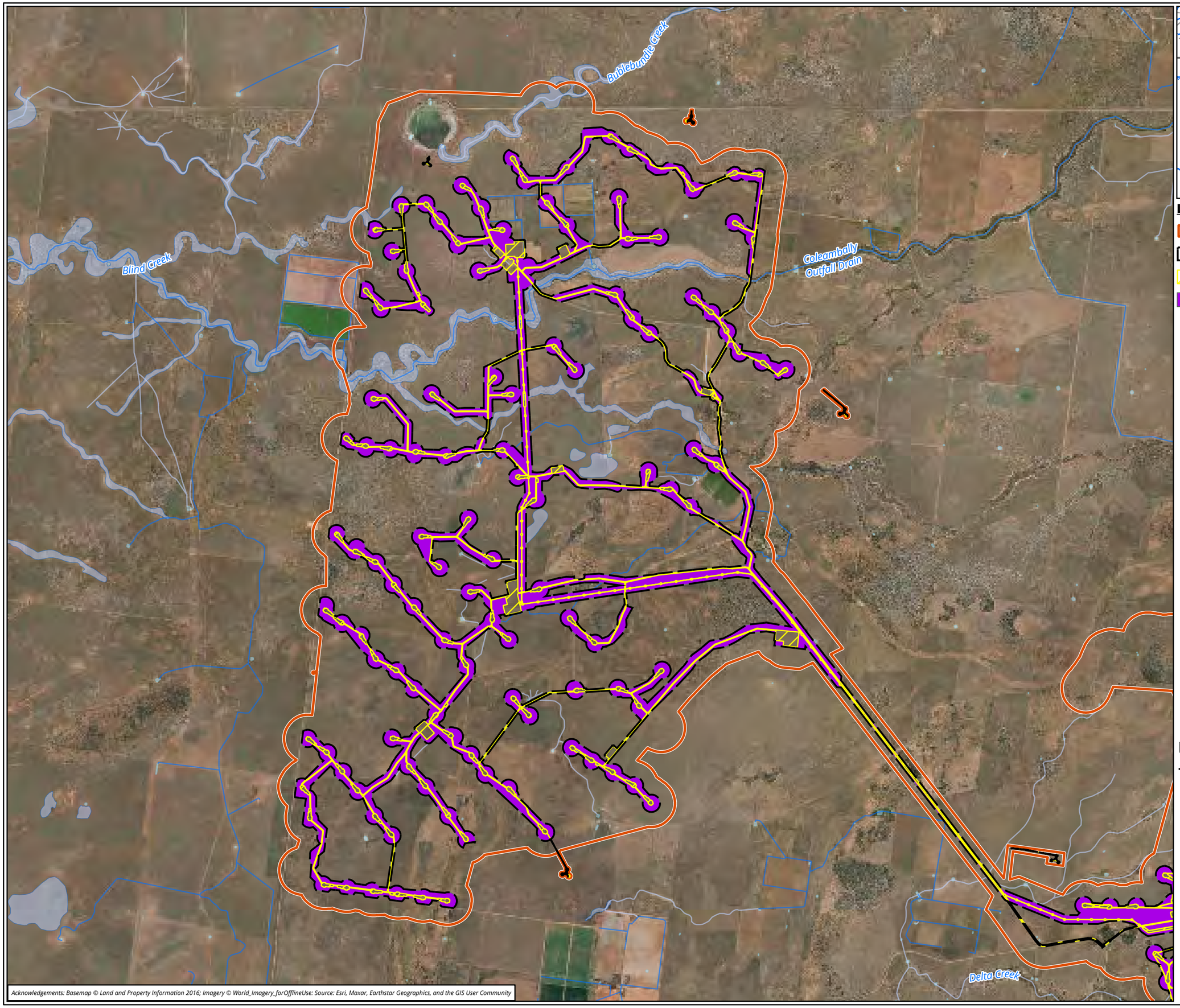
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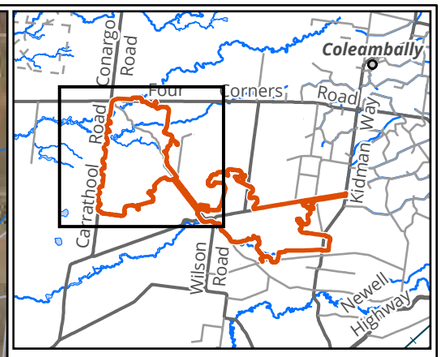
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Layout: 37263_Wind_F19_IndirectImpacts

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Legend

- Subject land
- Development corridor
- Development footprint
- Indirect impact

Figure 19 Indirect impacts - Western area

0 1 2 3

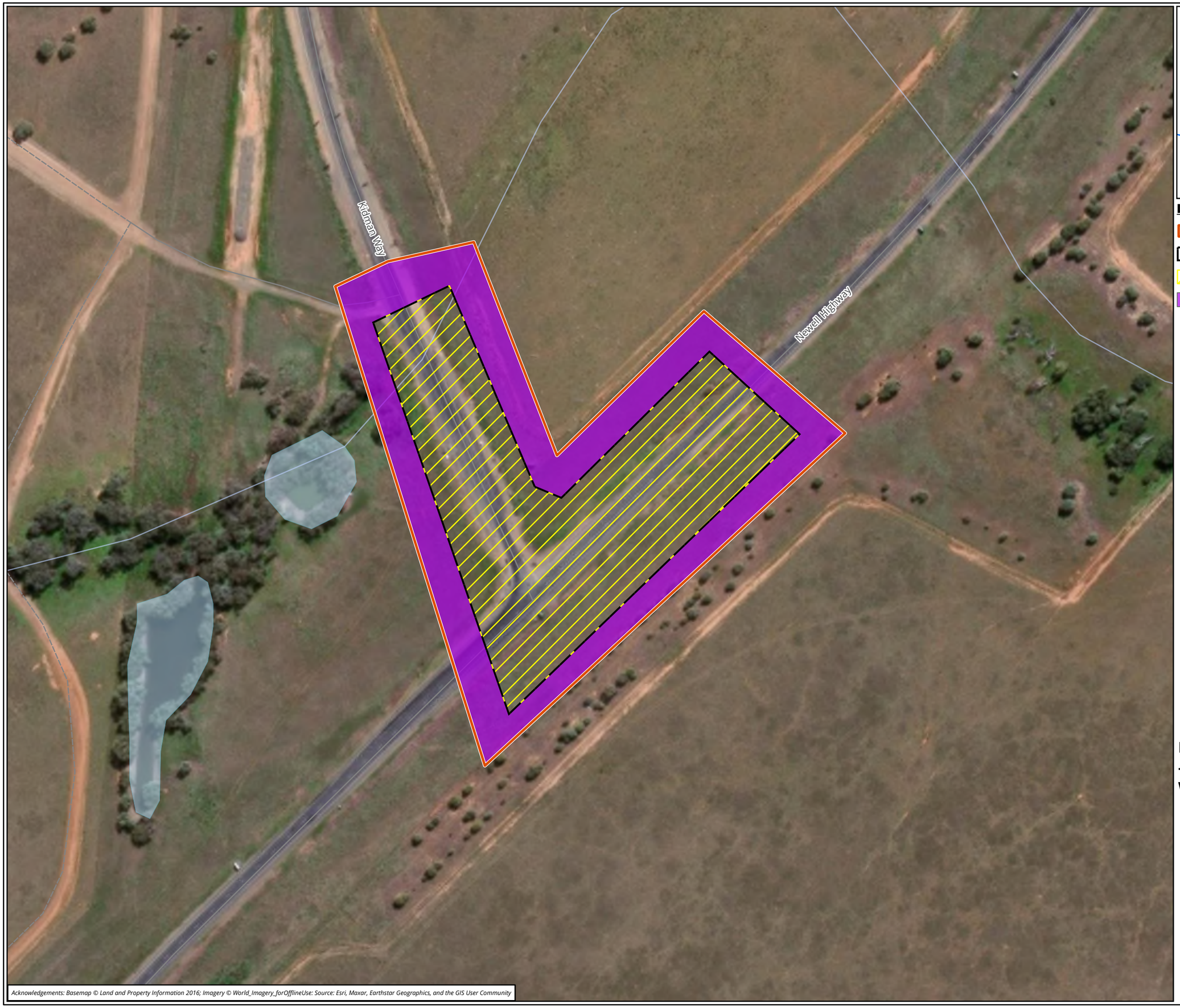
Kilometers
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Coordinate System:
GDA2020 MGA Zone 55

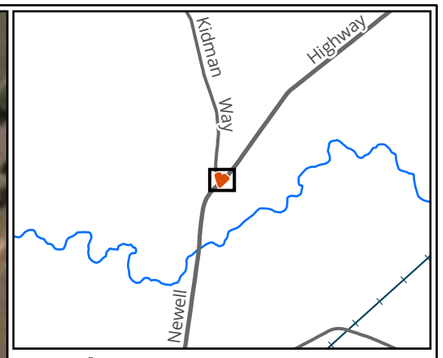
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Legend

- Subject land
- Development corridor
- Development footprint
- Indirect impact

Figure 19 Indirect impacts - Newell Highway/Kidman Way

0 80

Meters
Scale: 1:2,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

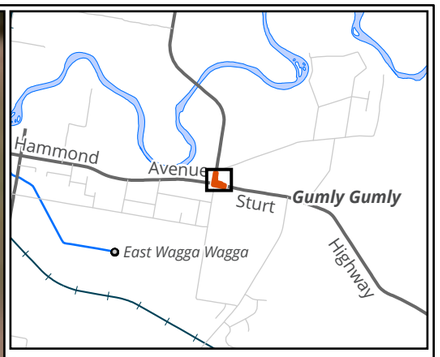
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Legend

- Subject land
- Development corridor
- Development footprint

Figure 19 Indirect impacts - Sturt Highway/Eunony Bridge Road

0 40

Meters
Scale: 1:1,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

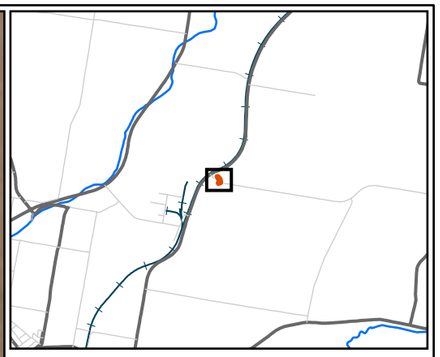
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Legend

- Subject land
- Development corridor
- Development footprint

Figure 19 Indirect impacts - Byrnes Road/West Bomen Road

0 50

Meters
Scale: 1:1,500 @ A3
Coordinate System:
GDA2020 MGA Zone 55

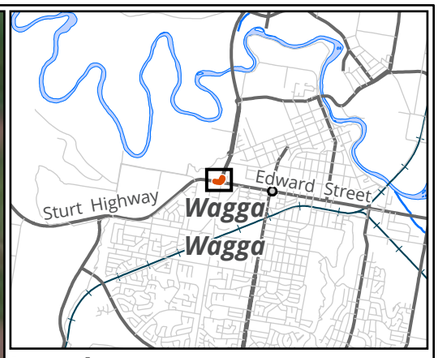
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Legend

- Subject land
- Development corridor
- Development footprint
- Indirect impact

Figure 19 Indirect impacts - Olympic Highway/Sturt Highway

0 50

Meters
Scale: 1:1,500 @ A3
Coordinate System:
GDA2020 MGA Zone 55

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Matter: 37263, Date: 07 May 2025,
GIS: JB, Checked by: MP, Last edited by: jbeckius
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8.3. Prescribed impacts

Identification of prescribed impacts, including a description of relevant habitat features associated with prescribed impacts and threatened species likely to utilise habitat features is provided above in Table 46, and Sections 5.2 and 6. A summary of the importance of habitat feature, relating to potential prescribed impacts, is provided in Table 80 below. Assessment of potential impacts to biodiversity values are provided in the following sections, with prescribed impacts illustrated on Figure 20.

Table 80 Prescribed impacts associated with the subject land

Prescribed impact	Importance of habitat feature to impacted species
Karst, caves, crevices, cliffs, rocks and other geological features of significance	No karst, caves, crevices, cliffs, rocks or other geological features of significance occur within the subject land
Occurrences of human-made structures and non-native vegetation	Where possible, features such as dams, windmills and water troughs will be avoided during micrositing of the projects as they aid in supporting, mainly fauna, populations within the subject land. These features hold a low level of biodiversity value, generally due to their degraded nature from livestock use (dams), or their lack of natural features (windmills and troughs). Exotic vegetation, although utilised by many raptor species holds a low biodiversity value. Irrigated cropped areas will be avoided.
Corridors or other areas of connectivity linking habitat for threatened entities	Connectivity corridors, where present, can have a high biodiversity importance.
Water bodies or any hydrological processes that sustain threatened entities	When containing water, migratory species, and some threatened fauna species may be supported by creeks and floodplain depressions / watercourses within the subject land. These areas would form a matrix of stepping stone wetlands during these wetter times, providing important habitat to some species; however, the wetlands within the subject land comprise only a small fraction of similar habitat types available across the broader locality. Existing hydrological processes also support areas of ephemeral wetland and woodland wetland vegetation that support threatened terrestrial species outside 'flood seasons'. Again, these areas comprise a small fraction of similar habitats across the broader locality. Impacts to these areas would likely negatively impact some local threatened species populations.
Protected animals that may use the proposed wind farm development site as a flyway or migration route	Detailed information is provided in Section 8.3.4 below.
Where the proposed development may result in vehicle strike on threatened fauna or on animals that are part of a threatened ecological community	It can reasonably be expected that the potential for vehicle strikes can be effectively managed. The project is not expected to result in any substantial or significant impacts associated with vehicle strikes.

8.3.1. Human-made structures and non-native vegetation

Nature and Extent

Approximately 10% of the development corridor occurs within areas supporting non-native vegetation such as irrigated and dryland cropping areas. Other agricultural practices and disturbance such as rural storage sheds, farm tracks, dams and irrigation channels occur within or adjacent to the development corridor. Existing small and large transmission lines and towers dissect the subject land and development corridor on occasion.

The Coleambally Outfall Drain bisects the development footprint. The drain itself will not be modified by the project, however crossings are required. Flow regimes will not be modified within or downstream of the drain.

Highly managed non native groundcover and roadside plantings occur within areas of intersection upgrades in the Wagga Wagga locality.

Duration

Roads, farm tracks and fences may be subject to modification and upgrade from the outset of the project. It is not anticipated that rural storage sheds or shearing sheds will be impacted. Existing transmission lines may be temporarily impacted during construction but reinstated should impacts occur. Upgrades to existing water crossings and culverts along the Coleambally Outfall Drain will be temporary in nature during construction, and provides a source of artificial habitat upon operation.

Consequences

Avian fauna species are known to utilise artificial, and human made structures such as transmission towers for nesting due to historic clearing of native vegetation. Numerous small and moderate sized nests were recorded on manmade structures within the subject land, but not within the development corridor. The consequence of the removal of these features is considered to be low.

Exotic vegetation, including cropped land is known to be utilised by fauna species, such as parrots, raptors, waterbirds and large mammals (e.g., Kangaroo) for foraging. Exotic vegetation, although utilised by some fauna species is considered to have a low biodiversity value. Impacts to non-native vegetation will not have more than a negligible impact to threatened and non-threatened species.

Dams and irrigation channels are utilised by fauna species, such as waterbirds and raptors, potentially including threatened and migratory species, and Southern Bell Frog, as permanent water resources throughout the year, with some dams created in areas that likely originally supported natural ephemeral billabongs. Where possible, features such as dams and irrigation channels are to be avoided during micro-siting of the project as they aid in supporting, mainly fauna, populations within the subject land. The consequence of removing dams and troughs, within the broader landscape is considered low, as other large water features will remain in the area. However, at a microscale, any fauna species present in dams such as Southern Bell Frog and other common amphibians, yabby or turtle species may be required to relocate to nearby areas of similar habitat. Any dams to be removed should be subject to mitigation measures, including draining several days prior to removal, and should have an appropriately qualified individual present to relocate any large fauna such as turtles.

Dams have been found to support Southern Bell Frogs and possibly Southern Myotis where they occur in connection to, or in proximity of, irrigated channels and the Coleambally Outfall Drain. These habitat features have been considered in the creation of species polygons for both species, and have generated offsets for

impacts. Whilst some dams will be removed as a result to the project, numerous dams will be maintained and general flow patterns will not be substantially impacted by the project. Habitat for Southern Bell Frog will remain within the subject land, particularly along the Coleambally Outfall Drain, where the majority of the species' recordings were located, and impacts during construction will be managed via implementation of the BMP.

A number of farm tracks would be upgraded for the project, this would include widening of some roads. Existing tracks hold no biodiversity value, however widening of tracks may lead to increases in edge effect for some species. Intersection upgrades within the Wagga Wagga locality primarily occur where highly managed and maintenance via slashing and pesticide use is existing.

Table 81 below details the threatened species considered potentially at risk from the project's impacts to Human-made structures and non-native vegetation, and subject to the above assessment, including those not specifically mentioned above.

Table 81 Threatened (ecosystem and candidate species) species considered in the human-made structures and non-native vegetation impact assessment

Common name	Species name
Australasian Bittern	*Botaurus poiciloptilus*
Australian Painted Snipe	*Rostratula australis*
Blue-billed Duck	*Oxyura australis*
Brolga	*Grus rubicunda*
Curlew Sandpiper	*Calidris ferruginea*
Freckled Duck	*Stictonetta naevosa*
Grey Falcon	*Falco hypoleucos*
Little Eagle	*Hieraaetus morphnoides*
Magpie Goose	*Anseranas semipalmata*
Southern Bell Frog	*Litoria raniformis*
Southern Myotis	*Myotis macropus*
Spotted Harrier	*Circus assimilis*
Square-tailed Kite	*Lophoictinia isura*
White-bellied Sea-Eagle	*Haliaeetus leucogaster*

8.3.2. Habitat connectivity

Nature and extent

Loss of native vegetation and habitat has potential to affect landscape connectivity permanently or temporarily during construction and operation. Habitat connectivity primarily through ephemeral riparian areas, pine sandhills and intact native vegetation occurs throughout the subject land and development corridor. The vast majority of fauna species move through these areas, with exception to more disturbance tolerant species, such as Australian Raven, Galahs as well as Raptor species, which utilise and move throughout more open areas as well.

Within the broader landscape, watercourses such as Coleambally Outfall drain, Delta Creek, Blind Creek and Bublebundie Creeks, as well as smaller unnamed watercourses form part of a large network of ephemeral and non-ephemeral creeks and waterbodies. These key areas of connectivity form a mosaic with a large

number of smaller features subject to disturbance and fragmentation. Although disturbed, these areas aid in maintaining connectivity throughout the landscape between larger core areas of habitat. Smaller features including floodplain lakes, depressional wetlands and other waterbodies in the landscape provide connectivity during flood events, which can be a key dispersal mechanism for frog and other aquatic or semi-aquatic species. Southern Bell Frog is known to benefit from flood induced dispersal and is known to occur in areas where it had previously been absent prior to flood events.

Vegetated roadsides within and between the main subject land also provide critical movement corridors for majority of fauna species, including along the network of Travelling Stock Reserves and public road reserves along roads in the locality (LLS 2024). Conversely, planted roadside native vegetation within the Wagga Wagga locality and where intersection upgrades may occur are in a highly urban environment containing both planted native and non- native trees, but at these locations, provide minimal biodiversity value, outside of occasional transient use by common highly disturbance tolerant fauna, such as Magpies, Ravens and Galahs.

A total of 948.56 hectares of native vegetation is to be removed. The proposed wind turbine infrastructure occurs across a project area of approximately 34,512.14 hectares, with 200 turbines proposed, the design of which reduces the potential impact to habitat connectivity by allowing strategic placement of infrastructure within the landscape. This includes avoidance and minimisation of impacts to key waterbodies, riparian zones and woodland corridors, allowing continued movement through the subject land.

Increased fragmentation within the subject land is not expected to be substantial due to the largely open nature of a wind farm site, where habitats will generally not be fragmented by large-scale, wide disruption, but instead by narrow, linear infrastructure such as access roads, transmission lines and turbine hardstands. It is noted that the new network of access tracks throughout the site has the potential to alter/reduce habitat connectivity, particularly for ground-dwelling threatened fauna and Plains wanderer, however the nature, extent and consequences of this are not considered significant. Tracks to be constructed as part of the development footprint will be level with the ground, or slightly elevated, and similar to the higher condition existing farm tracks through the subject land. Ground-dwelling threatened fauna species such as Plains-wanderer, Australian Bustard, Bush Stone-curlew and Southern Bell Frog (two of which have been assessed as absent from the site) are able to cross these kinds of tracks, and have been recorded on tracks on site, and at other sites in the region, and as such the proposed network of tracks is not expected to substantially or significantly affect habitat connectivity for these species.

Larger areas of impact will occur around ancillary sites, however all occur in large open areas where species will continue to be able to move around or potentially though operational areas.

Barrier effect has been minimised as a result of the proposed layout of WTGs, with substantial areas of airspace remaining available for birds and bats to move through once the wind farm becomes operational. Access road upgrades, and installation of internal access roads will increase impacts to connectivity, however, measures have been taken to avoid and minimise this impact, such as:

- Use of existing tracks, roads and fence lines to delineate sections of the project and used preferentially for locating access tracks and linear infrastructure.
- Access tracks to infrastructure proposed within the adjacent paddock have been located to avoid impacts to TECs, riparian areas and aquatic areas wherever possible.
- Impacts to the hydrology of Coleambally Outfall Drain will not occur and waterflows feeding areas of riparian and aquatic habitat will be maintained.
- Road upgrades will not alter the surface drainage or habitat connectivity for species utilising this habitat.

Further impact of potential barrier effect and threatened bats and birds (i.e. that may use the site as a flyway or migration route), including Southern Myotis and Corben's Long-eared Bat, is provided in Section 5, Section 6, and Section 8.3.4.

Further detail is provided below on the project's expected impacts to local flooding regimes, however it is not considered to be substantial and is unlikely to impact upon habitat connectivity between separate ephemeral wetland / watercourses and more permanent sources of water, such that species like Southern Bell Frog may be impacted.

Duration

Impacts are considered long-term as they will occur over the 30-year life of the project and subject to stringent mitigation measures.

Consequences

Habitat connectivity is critical for maintaining healthy populations, as it promotes biological diversity through the exchange of genes. Due to linear nature of the impacts generally, areas of more abundant and mature woody vegetation, as well as lower lying ephemeral grasslands and drainage lines, have been prioritised for avoidance, with retained areas subject to improvement within criteria set out in a BMP. Retained woody areas within the subject land, create stepping stones for mobile fauna to actively move through the subject land, as well as promoting movement of genetic floristic material into adjacent areas of habitat such as riparian areas, retained grassland areas and roadside vegetation. This would continue to allow for the uninterrupted movement of the majority fauna species to be possible during construction and operation of the project. Perimeter or non-rural exclusion fencing of areas within the development corridor if installed may cause disruption to large ground dwelling fauna such as Kangaroos and Emus. This will primarily be around critical infrastructure only. Overall, this effect is not likely to be substantially exacerbated beyond the existing rural impacts installed currently.

The project may to reduce the width of habitat connectivity areas, but will not remove any key areas of connectivity for aquatic, arboreal or terrestrial species. Key connectivity through the subject land, to external wildlife corridors will be maintained, including woodland, waterways, shrubland and grassland. The project will not result in the loss of, or substantial impacts to key functional corridors within the landscape. It is expected that fauna species will continue to utilise the existing corridors within the subject land and broader landscape, with minor or negligible impact to movement patterns and/or population viability.

Roadside vegetation corridors contain intact remnant vegetation, predominately Weeping Myall and occasional Black Box patches, that act as a conduit to larger intact patches throughout the broader landscape.

While the project would diminish local scale connectivity, this is unlikely to prevent genetic exchange of the threatened entities known, or assumed to be, inhabiting the subject land and broader assessment area.

Habitat connectivity will be maintained, where:

- The proposed design was sited, where possible within areas of non-native vegetation to avoid and minimise impacts to native vegetation.
- Impacts to key movement corridors, including Coleambally Outfall Drain, Delta Creek, Blind Creek and Bublebundie Creeks, have been avoided and minimised to the fullest extent possible.

- As outlined above, substantial efforts have been made to maximise separation distances between WTG RSAs for the purposes of maintaining habitat connectivity for birds and bats through and within the wind farm.
- Habitat connectivity was considered and the proposed design was sited to reduce edge effect by avoiding and minimising impacts on large areas of native vegetation where possible.
- Existing tracks and disturbed areas were used to avoid and minimise impacts to less disturbed areas.
- Where impacts to mapped watercourses are expected to occur, this has been limited to watercourses modified and disturbed from historic agricultural use and clearing.

Impacts associated with barrier effects and collision risks as discussed in Section 8.3.4.

Table 81 below details the threatened species considered potentially at risk from the project's impacts to habitat connectivity, and subject to the above assessment, including those not specifically mentioned above.

Table 82 Threatened species considered in the habitat connectivity impact assessment

Common name	Species name
Australasian Bittern	*Botaurus poiciloptilus*
Australian Bustard	*Ardeotis australis*
Australian Painted Snipe	*Rostratula australis*
Barking Owl	*Ninox connivens*
Black Falcon	*Falco subniger*
Blue-billed Duck	*Oxyura australis*
Brolga	*Grus rubicunda*
Bush Stone-curlew	*Burhinus grallarius*
Curlew Sandpiper	*Calidris ferruginea*
Diamond Firetail	*Stagonopleura guttata*
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*
Freckled Duck	*Stictonetta naevosa*
Gilbert's Whistler	*Pachycephala inornata*
Grey Falcon	*Falco hypoleucos*
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*
Inland Forest Bat	*Vespadelus baverstocki*
Little Eagle	*Hieraaetus morphnoides*
Little Pied Bat	*Chalinolobus picatus*
Magpie Goose	*Anseranas semipalmata*
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*
Masked Owl	*Tyto novaehollandiae*
Painted Honeyeater	*Grantiella picta*
Pied Honeyeater	*Certhionyx variegatus*
Plains Wanderer	*Pedionomus torquatus*
Scarlet Robin	*Petroica boodang*
South-eastern Hooded Robin	*Melanodryas cucullata*

Southern Bell Frog	*Litoria raniformis*
Southern Myotis	*Myotis macropus*
Southern Whiteface	*Aphelocephala leucopsis*
Spotted Harrier	*Circus assimilis*
Square-tailed Kite	*Lophoictinia isura*
Superb Parrot	*Polytelis swainsonii*
Swift Parrot	*Lathamus discolor*
Varied Sittella	*Daphoenositta chrysoptera*
White-bellied Sea-Eagle	*Haliaeetus leucogaster*
White-fronted Chat	*Epthianura albifrons*
White-throated Needletail	*Hirundapus caudacutus*
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*

8.3.3. Water bodies, water quality and hydrological processes

Nature and Extent

The development corridor is largely within a flat uniform landscape on poorly drained red clay soils with minor ephemeral drainage lines or slightly lower lying grey clay depressions which are seasonally and infrequently inundated. Current water quality and hydrological process (how water flows and is distributed across the subject land) contribute to the sustenance and resilience of the vegetation present, and in turn, the flora and fauna species that rely on said vegetation. Watercourse crossings and instream works, where required, will be designed, and constructed to minimise potential impacts to watercourses and water quality. No material impacts to river flow objectives are anticipated as the quantity and timing of runoff leaving the project is expected to be similar to that which currently occurs.

The project will require excavation below existing surface levels to establish suitable foundation conditions for infrastructure, and for the installation of underground services, with primary risk to groundwater quality during construction and operations as a result of accidental spillage of wastewater, fuel or other hazardous materials used to support site activities that may infiltrate through soils to groundwater. Appropriate controls to effectively manage these activities, consistent with best practice and relevant guidelines, will be incorporated CEMP.

A number of wetlands mapped on the Wetlands of NSW dataset (NSW DCCEEW 2010a) occur at the northern and southern ends of the subject land. These areas are likely to be higher quality examples of ephemeral wetlands within the landscape, and have been largely avoided by the project. A series of wetlands are mapped along the northern tributary of Delta Creek, and the project avoids these areas by approximately 1 kilometre in all directions, with the exception of a small transmission line that traverses one section of the watercourse. Impacts associated with a transmission line are not expected to be substantial to the mapped wetlands, and mitigation during construction and operation will be provided in the BMP. Another series of wetlands is mapped further east, along a separate branch of the same Delta Creek tributary, and these wetlands again have the potential to be impacted by the transmission line that joins existing infrastructure along Kidman Way. These areas will again be subject to specific mitigation as detailed in the BMP, to minimise impacts during construction and operation.

Duration

No significant direct impacts are considered likely to occur to major water ways in the region, change hydrological flow, or contribute to the degradation of waterways within the subject land or broadly.

Consequences

If unmanaged, ground disturbance during earthworks and other site activities (e.g. material handling, installation of WTGs, new buildings, new substations, trenching for services and grading for new access roads) may lead to exposure of soils and potential erosion and mobilisation of sediment into receiving watercourses.

Water management will be covered within the CEMP and BMP to ensure:

- Minimisation of discharge from the construction and operational site.
- Maintaining current water flow regimes within the landscape of the subject land.
- Providing industry best practice erosion and sedimentation controls.
- Provide monitoring requirements to ensure longer-term impacts are realised if they are to occur.
- Ensure impacts to areas of identified DPE wetlands are outlined and mitigated in the CEMP and BMP.

The development corridor generally lies outside the 1% AEP flood extent following consideration of flooding constraints during preliminary design (EMM, 2024). A number of services and access corridors cross predicted flooding flow paths; however, flooding at these interactions is typically shallow and low hazard. On this basis, there is low potential for adverse flooding impacts either within or downstream of the development corridor for events up to 1% AEP. The development corridor is likely to have interactions with approximately 29 watercourses. The number of required watercourse crossings has been minimised through the utilisation of the existing access roads and tracks of the existing agricultural operations. Where instream works are proposed (i.e. construction or upgrade of watercourse crossings), these works will be designed and constructed to consider local hydraulic conditions, minimise local flooding impacts, and will be consistent with relevant guidelines.

Impacts to retained vegetation such as areas of Black Box woodland, from built up tracks, turbine hardstands, and other infrastructure altering hydrology on ephemeral floodplains, will be minimised through detailed design and implementing measures to ensure the flow of water maintains the frequent or semi-regular inundation patterns required to maintain vegetation health. Adaptive management measures will be outlined in the BMP to ensure if impacts occur as a result of altered hydrology, mitigation is implemented.

Contamination of surface water as a result of accidental spillage of materials such as fuel, lubricants, herbicides and other chemicals used to support construction activities could also adversely impact water quality. In the event of flooding that impacts, construction work sites or compounds, either as a result of mainstream flooding along watercourses or local overland flooding, there is potential for entrainment of sediment, vegetation, plant/equipment, hazardous substances/chemicals and other debris in floodwaters that is carried downstream. This risk can be adequately managed by suitable construction site planning that considers flood risk, avoids use of higher risk areas (i.e. subject to more frequent and/or severe flooding) and implements suitable controls for areas subject to lower risk (i.e. less frequent and/or less severe flooding). Appropriate controls to effectively manage these activities, consistent with best practice and relevant guidelines, will also be incorporated into the CEMP.

Groundwater is not expected to be intercepted by excavations.

Impacts to threatened species, including Southern Bell Frog, as a result of direct impacts to watercourses, or indirect impacts to hydrological patterns are not expected to be substantial or significant.

The project is not considered an action that would alter the surface drainage, natural drainage systems or flow of watercourses within or adjacent to the subject land. No instream woody debris will be removed and no modifications to key areas of aquatic habitat are proposed. As such, a permit under Part 7 of the FM Act is not required.

Table 83 below details the threatened species considered potentially at risk from the project's impacts to water bodies, water quality and hydrological processes, and subject to the above assessment, including those not specifically mentioned above (and noting all biodiversity could be affected by impacts to water and hydrology to some degree).

Table 83 Threatened species considered in the water bodies, water quality and hydrological processes impact assessment

Common name	Species name
Australasian Bittern	*Botaurus poiciloptilus*
Australian Painted Snipe	*Rostratula australis*
Austrostipa wakoolica	A spear-grass
Blue-billed Duck	*Oxyura australis*
Brachyscome muelleroides	Claypan Daisy
Brachyscome papillosa	Mossgiel Daisy
Brolga	*Grus rubicunda*
Curlew Sandpiper	*Calidris ferruginea*
Eucalyptus leucoxylon subsp. pruinosa	Yellow Gum
Freckled Duck	*Stictonetta naevosa*
Lepidium monoplocoides	Winged Peppercress
Leptorhynchos orientalis	Lanky Buttons
Magpie Goose	*Anseranas semipalmata*
Maireana cheelii	Chariot Wheels
Pilularia novae-hollandiae	Austral Pillwort
Sclerolaena napiformis	Turnip Copperburr
Southern Bell Frog	*Litoria raniformis*
Southern Myotis	*Myotis macropus*
Swainsona murrayana	Slender Darling Pea
Swainsona plagiotropis	Red Darling Pea
Swainsona sericea	Silky Swainsona-pea
White-bellied Sea-Eagle	*Haliaeetus leucogaster*

8.3.4. Collision risk associated with wind farm developments

Mathematical CRM has been undertaken for the project over a 24 month period and eight seasons worth of BUS data, and therefore predictions of flight movements at risk and timing can be estimated for some species (i.e. those recorded flying at RSA height during BUS). Where this data is not available, risk assessments have been undertaken as demonstrated in Section 6.2 and Section 6.3.

A summary of at risk avian fauna and potential for prescribed impacts is shown Table 84.

Table 84 Prescribed impact assessment – wind farm developments

Protected / threatened species	SAII entity	Predicted impact	Rate & timing of impact per turbine per year	Consequences	Cumulative impact	Likelihood and nature of collision impacts	Impact of avoidance behaviour - nomadic and migratory movement
Australasian Bittern	No	Turbine strike and macro avoidance	• Due to flight behaviour, it is less probable than not that the risk event could occur in any year (< 50%). • Collisions more likely to occur between spring and autumn. • High risk turbines near waterways, wetlands and irrigation channels.	• Moderate loss in numbers of individuals, leading to minor reduction in population viability for between one and five years. • Macro avoidance or changes in flight paths to avoid turbines possible, but not substantial.	Likely – further addressed below	Low	Low. Not considered substantial or significant.
Australian Magpie	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions may occur year round. • High risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible 4-6 movements per annum at risk.
Australian Raven	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions may occur year round. • High risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible 4-6 movements per annum at risk.
Australian Painted Snipe	No	Meso and/or macro avoidance	• An event may occur only in unusual circumstances (less than 5 %). The risk event is only theoretically possible, or would require exceptional circumstances to occur. • High risk turbines near waterways, wetlands and irrigation channels.	• Repeated loss of small number of individuals but no reduction in population viability	Likely – further addressed below	Low	Low. Not considered substantial or significant.
Australian White Ibis	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%).	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible

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Protected / threatened species	SAII entity	Predicted impact	Rate & timing of impact per turbine per year	Consequences	Cumulative impact	Likelihood and nature of collision impacts	Impact of avoidance behaviour - nomadic and migratory movement
			• Collisions may occur year round. • High risk turbines near waterways, wetlands and irrigation channels.				1-2 movements per annum at risk.
Australian Wood Duck	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions may occur year round. • High risk turbines near waterways, wetlands and irrigation channels.	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible 1 movement on average per annum at risk.
Black Falcon	No	Turbine strike and meso and/or macro avoidance	• It is equally probable that the risk event could or could not occur in any year (50%). • Collision more likely to occur between spring and autumn • High risk turbines, particularly turbine WT109, WT81, WT63, WT 56, ET43, ET48 where sightings and potential nesting may be occurring	• Moderate loss in numbers of individuals, leading to minor reduction in population viability for between one and five years.	Likely – further addressed below	Moderate	Low. Not considered substantial or significant 1 movement on average per annum at risk.
Black Kite	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions may occur year round. • High and moderate risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible 1-3 movements per annum at risk.
Black-shouldered Kite	No	Turbine strike and meso and/or macro avoidance	• It is more probable than not that the risk event could occur in any year (>50%) • Collisions may occur year round. • High and moderate risk turbines	• Moderate loss in numbers of individuals, leading to minor reduction in population viability for between one and five years.	Likely – further addressed below	Moderate 1 individual at risk of collision per annum	Low. Not considered substantial or significant

Protected / threatened species	SAII entity	Predicted impact	Rate & timing of impact per turbine per year	Consequences	Cumulative impact	Likelihood and nature of collision impacts	Impact of avoidance behaviour - nomadic and migratory movement
							1 movement on average per annum at risk.
Brown Falcon	No	Turbine strike	• It is very probable that the risk event could occur in any year (>95%). • Collisions may occur year round. • High and moderate risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible 1 movement on average per annum at risk.
Fork-tailed Swift	No	Turbine strike	• It is more probable than not that the risk event could occur in any year (>50%) • Collision more likely to occur between spring and early autumn, or prior cold fronts and storm events • High and moderate risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible – species presence infrequent due to the irregularity of its occurrence, and the small numbers possibly affected
Galah	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions may occur year round. • High and moderate risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible 8 movements on average per annum at risk.
Little Egret	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions more likely to occur between spring and autumn.	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible

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Protected / threatened species	SAII entity	Predicted impact	Rate & timing of impact per turbine per year	Consequences	Cumulative impact	Likelihood and nature of collision impacts	Impact of avoidance behaviour - nomadic and migratory movement
			• High risk turbines near waterways, wetlands and irrigation channels.				
Little Pied Cormorant	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions more likely to occur between spring and autumn. • High risk turbines near waterways, wetlands and irrigation channels.	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible
Nankeen Kestrel	No	Turbine strike and meso and/or macro avoidance	• It is very probable that the risk event could occur in any year (>95%). • Collisions may occur year round. • High risk turbines	• Moderate loss in numbers of individuals, leading to minor reduction in population viability for between one and five years.	Likely – further addressed below	Moderate 2-5 individuals at risk of collision per annum	Low. Not considered substantial or significant 2-5 movements on average per annum at risk.
Plumed Whistling-Duck	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions may occur year round. • High risk turbines near waterways, wetlands and irrigation channels.	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible 2-5 movements on average per annum at risk.
Spotted Harrier	No	Turbine strike and meso and/or macro avoidance	• It is more probable than not that the risk event could occur in any year (>50%) • Collisions may occur year round. • High and moderate risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Low Not considered substantial or significant

Protected / threatened species	SAII entity	Predicted impact	Rate & timing of impact per turbine per year	Consequences	Cumulative impact	Likelihood and nature of collision impacts	Impact of avoidance behaviour - nomadic and migratory movement
							1 movement on average per annum at risk.
Straw-necked Ibis	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions may occur year round. • High risk turbines near waterways, wetlands and irrigation channels.	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible 1-2 movements per annum at risk.
Superb Parrot	No	Turbine strike and meso and/or macro avoidance	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions more likely to occur between spring and autumn, less likely in Winter • High risk turbines, particularly turbine WT13, WT7, WT86, ET 47, E48 and E43.	• Moderate loss in numbers of individuals, leading to minor reduction in population viability for between one and five years.	Likely – further addressed below	Moderate	Low. Not considered substantial or significant 1-3 movements per annum at risk.
Wedge-tailed Eagle	No	Turbine strike and meso and/or macro avoidance	• It is very probable that the risk event could occur in any year (>95%). • Collisions may occur year round. • High and moderate risk turbines	• Moderate loss in numbers of individuals, leading to minor reduction in population viability for between one and five years.	Likely – further addressed below	High 3-6 individuals at risk of collision per annum	Low. Not considered substantial or significant 3-6 movements per annum at risk.
Whistling Kite	No	Turbine strike	• It is more probable than not that the risk event could occur in any year (>50%) • Collisions may occur year round.	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible

Protected / threatened species	SAII entity	Predicted impact	Rate & timing of impact per turbine per year	Consequences	Cumulative impact	Likelihood and nature of collision impacts	Impact of avoidance behaviour - nomadic and migratory movement
			• High risk turbines near waterways, wetlands and irrigation channels.				1 movement on average per annum at risk.
White-faced Heron	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions may occur year round. • High risk turbines near waterways, wetlands and irrigation channels.	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible
White-necked Heron	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions may occur year round. • High risk turbines near waterways, wetlands and irrigation channels.	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible 1 movement on average per annum at risk.
Yellow-billed Spoonbill	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collisions may occur year round. • High risk turbines near waterways, wetlands and irrigation channels.	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible 1 to 3 movements on average per annum at risk.
White-striped Free-tailed Bat	No	Turbine strike	• It is very probable that the risk event could occur in any year (>95%). • Collisions may occur year round. • High and moderate risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Low. Not considered substantial or significant
Gould's Wattled Bat	No	Turbine strike	• It is more probable than not that the risk event could occur in any year (>50%)	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Low.

Protected / threatened species	SAII entity	Predicted impact	Rate & timing of impact per turbine per year	Consequences	Cumulative impact	Likelihood and nature of collision impacts	Impact of avoidance behaviour - nomadic and migratory movement
			• Collisions may occur year round. • High risk turbines				Not considered substantial or significant
Inland Free-tailed Bat	No	Turbine strike	• It is more probable than not that the risk event could occur in any year (>50%) • Collision more likely to occur over spring and summer. • High risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible
South-eastern Free-tailed Bat	No	Turbine strike	• It is more probable than not that the risk event could occur in any year (>50%) • Collision more likely to occur over spring and summer • High risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible
Ride's Free-tailed Bat	No	Turbine strike	• It is more probable than not that the risk event could occur in any year (>50%) • Collision more likely to occur over spring and summer • High risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Negligible
Yellow-bellied Sheathtail-bat	No	Turbine strike	• It is equally probable that the risk event could or could not occur in any year (50%). • Collision more likely to occur over spring and summer • High risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Low	Low. Not considered substantial or significant

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Protected / threatened species	SAII entity	Predicted impact	Rate & timing of impact per turbine per year	Consequences	Cumulative impact	Likelihood and nature of collision impacts	Impact of avoidance behaviour - nomadic and migratory movement
Little Red Flying Fox	No	Turbine strike	• It is less probable than not that the risk event could occur in any year (< 50%). • Collisions may occur year round, depending on flowering resources • High risk turbines	• Repeated loss of small number of individuals but no reduction in population viability.	Likely – further addressed below	Negligible	Negligible

a) Predict the impact on species living in, or likely to fly over, the proposed development site, including bat or bird strike and barotrauma.

Impacts that have the potential to occur to bird and bat species within the subject land during the operational phase of the project are associated with turbine strike, as outlined in Table 84 above.

The level at which turbine strike is likely to occur is difficult to predict prior to commissioning of turbines, and as such impacts are considered uncertain. A monitoring and adaptive management approach has been developed to ensure any impacts that may occur are realised as early as possible, mitigation measures are implemented (where possible) to minimise the potential for the impact to reoccur, and where relevant, calculate an offset requirement for the impacted entity.

As outlined in Table 84 above:

- For 12 at risk bird and bat species, it is considered more probable than not that a strike event could occur in any year (>50%).
- For 16 at risk bird and bat species, it is considered equally probable that a strike event could or could not occur in any year (50%).
- For two at risk bird species, it is considered less probable than not that a strike event could occur in any year (<50%).
- For one at risk bird species, it is considered that an event may occur only in unusual circumstances (less than 5 %).

When the consequence of predicted strike events is considered, all of the above at risk species are predicted to be subject to:

- Repeated loss of a small number of individuals but no reduction in population viability, or
- Moderate loss in numbers of individuals, leading to a minor reduction in population viability for between one and five years.

Generally, those with the highest risk of collision are more common raptor species, such as Wedge-tailed Eagles and Nankeen Kestrels, common high flying microbat species, as well as common flocking waterbirds that may congregate in areas of more permanent water. Although collision likelihood is higher, these populations are stable and unlikely to have substantial consequences in the long term. Other less common species, such as the Black Falcon and Superb Parrot, may have a less likelihood of strike, however the consequence of the potential loss of a few individuals is higher.

For Australasian Bittern, satellite tracking and changes in local densities indicate Australasian Bitterns undertake seasonal and dispersive movements between breeding and non-breeding habitats, and as local habitat suitability conditions change (Bitterns in Rice Project 2017, Department of the Environment and Energy 2019). Satellite tracking of the species recorded juveniles and adult males moving from the Riverina rice-growing areas inland, to coastal wetlands in South Australia, Victoria and New South Wales post-breeding season (Bitterns in Rice Project 2017). Wetland habitat, including breeding habitat, is not likely to be impacted by the project. Given the distribution of potential and known habitat south and north of the subject land and the likely local and seasonal movements, a portion of Australasian Bitterns using the wetlands between Victoria and Coleambally/Leeton areas may possibly fly through the subject land, however the potential occurrence and thus potential for collisions still considered low.

Whilst impacts to microbat species may occur as a result of turbine strike, it is considered unlikely that additional impacts will occur as a result of barotrauma. A paper published in December 2020 in the journal PLOS One, by Lawson et al, describes how mortality as a result of barotrauma is unlikely to occur

due to the areas where exposure to the level of pressure variation required to cause mortality are present only in the immediate vicinity of the turbine blades, and that flight paths required for bats to be exposed to these areas are highly improbable. As such, even a small change in flight path would result in the bat being hit by the blade or experiencing a much smaller pressure change. Furthermore, the magnitude of the low-pressures bats could experience when flying near wind turbines is approximately 8 times smaller than the pressure that causes mortality in rats, the smallest mammal for which data are available. The magnitude of the high-pressures that bats may experience are approximately 80 times smaller than the exposure level that causes 50% mortality in mice, which have a body mass similar to several bat species that are killed by wind turbines in the United States (Lawson et al 2020).

The study concludes that, if bats have a physiological response to rapid low- and high-pressure exposure similar to that of other mammals, that it is unlikely that barotrauma is responsible for a significant number of turbine-related bat fatalities, and that impact trauma is the likely cause of the majority of wind-turbine-related bat fatalities. (Lawson et al 2020)

b) Predict the rate and timing of impact per turbine per year for species likely to be affected.

The predicted rate and timing of potential impacts from turbine strike to at risk bird and bat species per turbine per year are outlined in Table 84 above. These predictions are based on the risk assessments completed/summarised in Sections 6.1 and 6.3 above.

c) Predict the consequences of impacts for the persistence of populations.

The predicted consequences of potential impacts from turbine strike to populations of at-risk bird and bat are outlined in Table 84 above. These predictions are based on the risk assessments completed/summarised in Sections 6.1 and 6.3 above.

d) Predict the cumulative impacts of the proposed development alongside existing wind farms, on species mortality, movement patterns and use of adjacent habitat.

As wind farms developments increase in NSW, and in particular the South West REZ, bird and bat species with the potential to move over larger distances can be subject to impacts at multiple wind farms (Biosis, 2006). Wind farms are proposed within 150 kilometres of the project. These are:

- Yanco Delta Wind Farm – adjacent to the subject land
    - Up to 208 wind turbines
- Argoon Wind Farm – adjacent to the subject land
    - Up to 106 wind turbines.
- Pottinger Wind Farm – 45 km south-east of Hay.
    - Up to 247 wind turbines.
- Bullawah Wind Farm – 50 km south-east of Hay.
    - Up to 170 wind turbines.
- Tchelery Wind Farm – 70km south-east of Balranald.
    - Up to 120 wind turbines.
- The Plains Wind Farm – 40 km north-west of Hay.
    - Up to 226 wind turbines.

- Keri Keri Wind Farm – 40 km south-east of Balranald.
    - Up to 170 wind turbines.
- Wilan Wind Farm – 40 km north-east of Balranald.
    - Up to 138 wind turbines.
- Baldon Wind Farm – 60 km south-east of Balranald.
    - Up to 162 wind turbines.
- The Plains Wind Farm – 40 km north-west of Hay.
    - Up to 226 wind turbines.

Each of these wind farms are considered to have the potential to result in some level of mortality to wide ranging aerial species, however there would be limited overlap in species populations for more sedentary species between these wind farms due to their distal locations in the landscape. There is however likely to be a somewhat substantial loss of species' habitats within the region if the numerous large-scale projects are constructed. This cumulative habitat loss will affect all species to some degree, although those most affected (i.e., those with habitat spanning all, or the majority of, the proposed developments) are also those species better able to adapt and utilise a wide range of unimpacted habitats across a region where native dominated habitats are prevalent, albeit in a historically generally degraded state.

The project will operate an estimated 200 turbines, over an area of approximately 7,256 hectares development corridor and 31,384 hectare subject land. If all of the above wind farms are approved and operate at their proposed capacities (i.e. numbers of turbines, estimated at 1,773 in total) and are built at similar densities, the project would contribute approximately 11 % of the numbers of operational turbines and area covered by operation wind farm within approximately 150 kilometres. The project could therefore be considered to contribute a similar percentage to the potential cumulative impacts to bird and bat species in the region.

The majority of the species considered at risk of collision from the project are considered common, widespread and secure species and cumulative impacts would be unlikely to result in substantial impacts to local, regional or national populations. The exception being impacts to Wedge-tailed Eagles, predominantly juveniles and dispersing immature individuals within new ranges, and White Striped Free-tailed Bat, that are consistently impacted by wind farms in Australia. Additionally, Spotted Harrier, Superb Parrots, Black Falcon, and potentially Australasian Bittern, are listed as threatened in NSW and/or federally and cumulative impacts to these species could be more substantial.

Nomadic movements of Australasian Bittern and Black Falcon are likely to put populations at relatively frequent risk of cumulative impacts associated with turbine strike and avoidance of habitat adjacent to operational turbines across multiple operational wind farms. It could reasonably be expected that this risk would be greatest during the initial years of operation before birds have been able to habituate to the turbines in the landscape.

Detailed and adaptive management plans, such as BBAMP, will be required to be developed and implemented consistently to provide an effective monitoring program and strategy to manage and mitigate operational issues relating to the potential cumulative impacts from multiple sites. A coordinated effort will be required to ensure issues that may occur at one wind farm site, and which could be prevented at another, are consistently reported upon and mitigation strategies consistently applied.

e) **Predict the likelihood and nature of impacts on aerial species living in, or likely to fly over, the proposed development site, including barriers to migratory pathways, and breeding, feeding and resting resources.**

The predicted rate and timing of potential impacts from turbine strike to at risk bird and bat species per turbine per year are outlined in Table 84. These predictions are based on the CRM and risk assessments completed/summarised in Section 6.

f) **Predict the impact of avoidance behaviour for migratory species relative to migration distances, and the availability of suitable habitat for breeding, feeding and resting over the migration route.**

Analysis of nomadic and migratory species' flight paths relevant to the subject land is provided in Section 5, Section 6 and illustrated on Figure 13 and Figure 14. Further assessment is provided in Table 84.

The project is not expected to result in substantial avoidance behaviour in species undertaking longer distance nomadic or migratory flights due to these flights generally occurring over RSA height, or to species undertaking local-scale movements due to the layout of the project allowing sufficient blade-free areas allowing movement corridors through the operational wind farm.

g) **Map the disturbance zone around wind turbines, and the significant landscape and habitat features within that zone, for species likely to be affected, e.g. hollow bearing trees and important habitat for migratory species.**

The project's development corridor was assessed and mapped as the potential disturbance zone around operational wind turbines. Refer to Section 8.1 for direct impacts to landscape and habitat features. Flight paths and discussion of disturbance to migratory species is location within Section 5.2 and Section 6.

The zone of disturbance can be considered to comprise two separate parts, those being the RSA, and an area of air disturbance extending past the blade tip. Potential impacts to aerial species within the RSA are largely associated with blade strike and possibly barotrauma, the risk and likelihood of which has been assessed for bird and bat species in Section 5.2.1 and Section 6 of this BDAR.

Impacts associated with the area of air disturbance, past the end of the blade tips, are less clear but are likely associated with avoidance behaviour and barrier effect due to alteration of forces acting on aerial species, potentially leading to additional indirect habitat loss due to expected avoidance behaviour. It is expected that smaller species would be more likely to experience disturbance from smaller changes in air pressure (etc), and therefore experience disturbance further from the blade tips, when compared to larger species likely to be more tolerant of smaller changes, and thus experiencing disturbance closer to the tips of the blades.

Within the combined zone of disturbance, equating to the RSA and the additional area of air disturbance, habitat features likely to be utilised by aerial fauna include open grassy areas, scattered trees and intact saltbush and mallee vegetation supporting hollows, small dams and watercourses. All of these features are potentially utilised for foraging, roosting and breeding habitat (for some species).

As outlined above, the project has limited potential to result in impacts to habitat connectivity for some species potentially flying through the wind farm to access habitats as part of migratory movements or long-range foraging. However as noted, habitat connectivity is maintained surrounding the development corridor and the likelihood of regular migratory movements through the wind farm at RSA height is considered low.

8.3.5. Vehicle strikes

Nature and extent

The project has the potential to result in increased vehicle strikes during the construction and operational phase of the project as a result of increased vehicle moments, and in particular heavy vehicles, predominantly during construction. The existing public roads, such as Kidman Way as well McLennons Bore Road and Carrathool Road currently act as a major and minor conduit respectively of heavy vehicle traffic in the region, and this may be increased as a result of the project. Further to increased traffic on external roads, is the increased traffic movements within the site, which will be substantial during the construction phase of the project and will remain at levels higher than the current situation during operation. The increased vehicle movements have the potential to impact on ground-dwelling and low-flying fauna, and will require mitigation to prevent impacts to a range of threatened and non-threatened species.

Duration

This impact would be ongoing but have the highest potential to occur during the construction stages. Potential impacts would be predominantly diurnal, but dawn/dusk is a common time for vehicle strike with mammal species, and there is the potential for collisions to occur at night, however vehicle movements will be greatly reduced.

Consequences

Non-threatened, ground dwelling fauna known to inhabit the general area, particularly macropods such as Emu, Eastern Grey Kangaroo and Red Kangaroo are notoriously prone to vehicle strike. Vehicle strike of macropods is likely to be an impact already in place due to the existing road network and traffic levels, which may be exacerbated during construction.

Low flying ground foraging birds such as Grey-crowned Babblers, Red-rump parrots, Blue Bonnets, as well as potentially Superb Parrots when foraging along roadside corridors, are also prone to increased collision due to increase in traffic during construction due to foraging or flying close to road verges. Repeated vehicle impacts to threatened species such as Superb Parrots could cause an impact to local population, however the likelihood of repeated strikes is considered low.

Large raptor species, such as Wedge-tailed Eagles, when feeding on carrion along roadside edges, are also prone to strike due to their slow and often last minute, flight take off.

Plains-wanderer are known to be present within the subject land and could be subject to vehicle strike. If any strikes occur impacts to the local population may be substantial due to the low numbers and density of the population.

Amphibians (including Southern Bell Frog) and reptiles are the most threatened vertebrates by vehicle impacts. Reptiles will likely bask on the open, hot bitumen or gravel roads, as well as hunt at night for frogs, gecko and insects, which have themselves come out on the open road for warmth, particularly where roads and access tracks are in proximity to areas such as wetlands and wooded areas used for more frequent movement. Amphibian mortality from vehicle strike is likely to be more frequent during the summer, whereas reptile mortality is more likely to be more frequent in spring and at the end of the summer. Existing risk of vehicle strike occurs currently however, with a temporary increase in the number of vehicle movements particularly during construction, the risk of vehicle strike will increase in the short term.

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It can reasonably be expected that the potential for vehicle strikes can be effectively managed through:

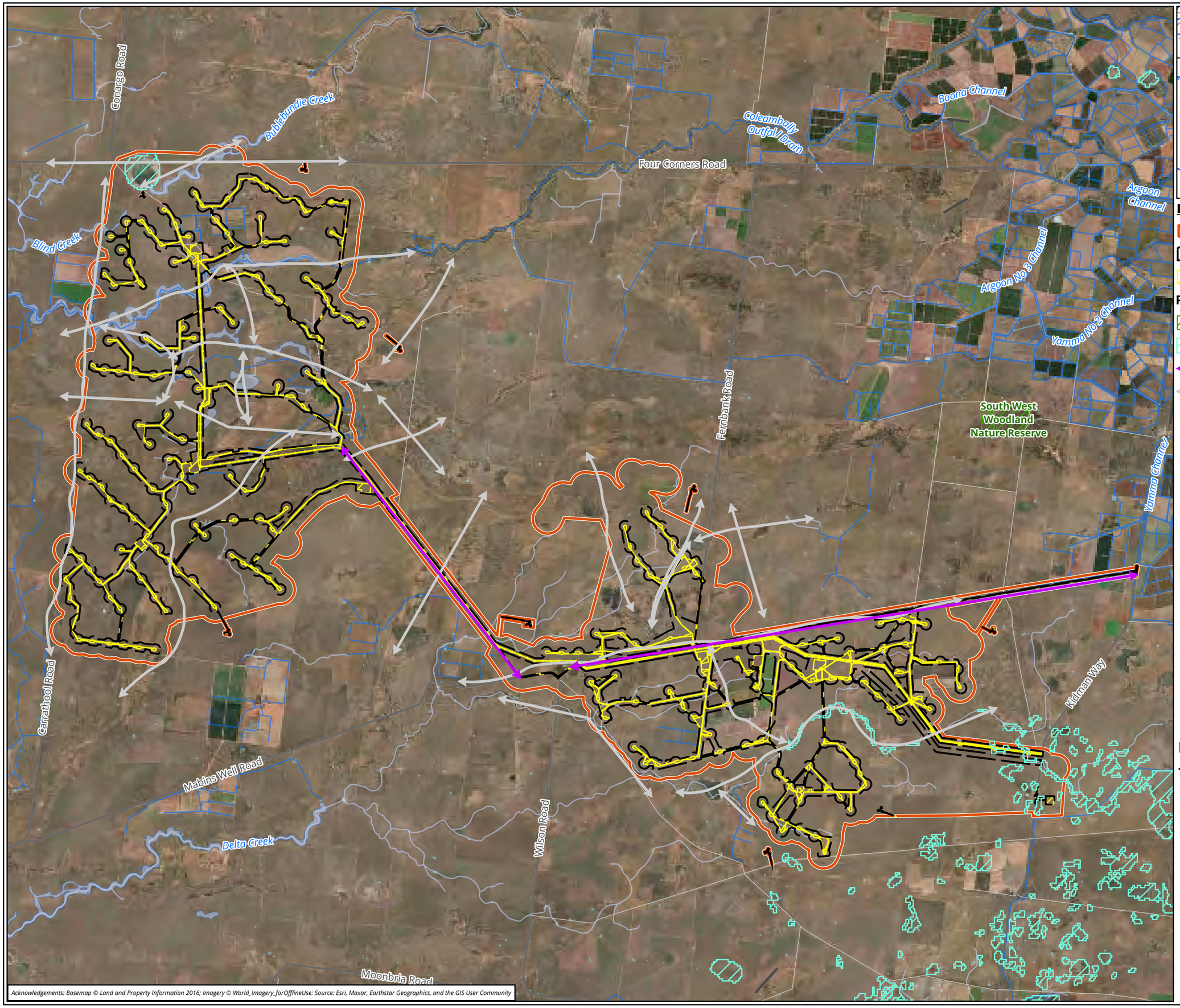
- Reduced speed limits and signage.
- Education on fauna species, particularly threatened species, at risk from vehicle strike.
- Minimising driving from construction or operational related vehicle from dusk – dawn.
- Driver awareness training of potential fauna to occur.
- Vehicle strike protocols, including contact numbers (e.g. WIRES) and steps to be undertaken in the event of a vehicle strike with an animal.
- Prompt carcass removal, if collisions do occur to prevent further potential collisions with scavengers.
- Monitoring of roads and collisions and mapping of any hotspots where increased mitigation may be required.
- Mapping of Plains-wanderer habitat as part of the BMP and ensuring suitable mitigation is implemented where roads occur within or close to potential habitat for the species.

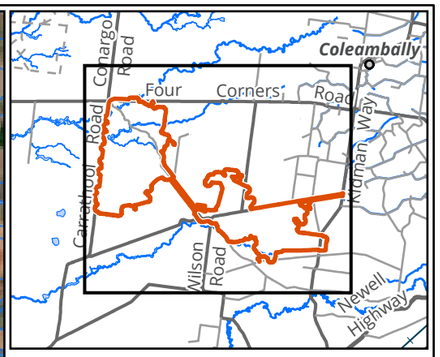
The project is not expected to result in any substantial or significant impacts associated with vehicle strikes in the long term.

Table 85 below details the threatened species considered potentially at risk from the project's impacts associated with vehicle strike, and subject to the above assessment, including those not specifically mentioned above.

Table 85 Threatened species considered in the vehicle strike impact assessment

Common name	Species name
Australian Bustard	*Ardeotis australis*
Bush Stone-curlew	*Burhinus grallarius*
Freckled Duck	*Stictonetta naevosa*
Major Mitchell's Cockatoo	*Lophochroa leadbeateri*
Plains Wanderer	*Pedionomus torquatus*
Southern Bell Frog	*Litoria raniformis*
Southern Whiteface	*Aphelocephala leucopsis*
Spotted Harrier	*Circus assimilis*
Superb Parrot	*Polytelis swainsonii*
Swift Parrot	*Lathamus discolor*
White-fronted Chat	*Epthianura albifrons*





Legend

- Subject land
- Development corridor
- Development footprint

Prescribed impacts

- National Park/Reserve
- Local wetlands
- Vehicle impacts
- Connectivity

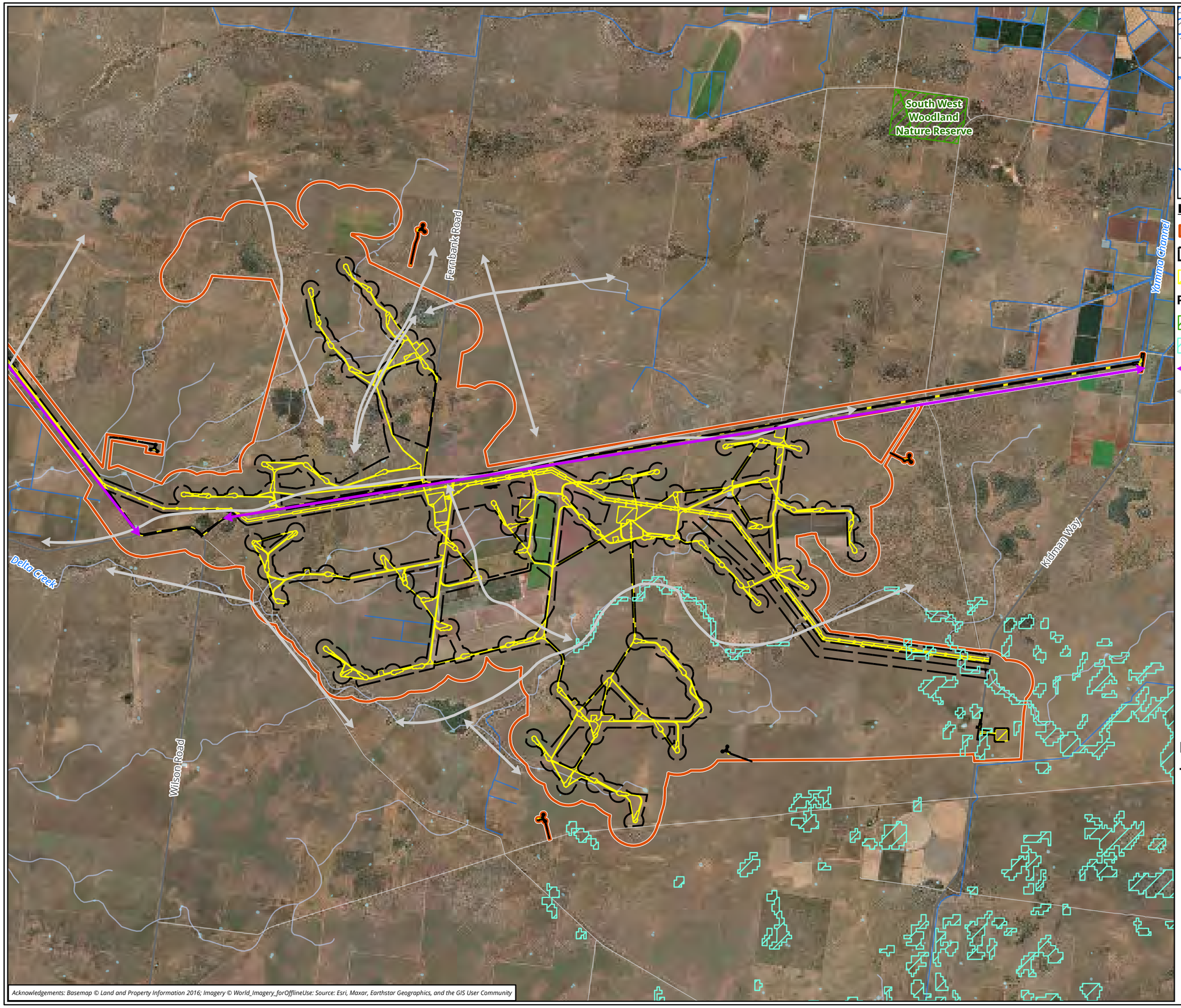
Figure 20A Prescribed impacts - Overview

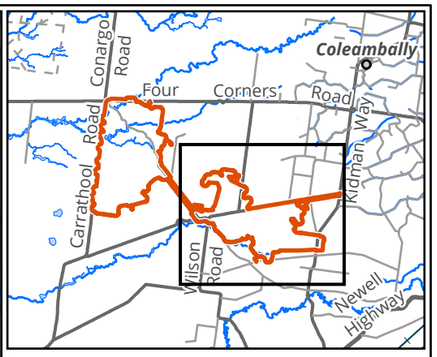
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Legend

- Subject land
- Development corridor
- Development footprint

Prescribed impacts

- National Park/Reserve
- Local wetlands
- Vehicle impacts
- Connectivity

Figure 20A Prescribed impacts - Eastern area

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Kilometers
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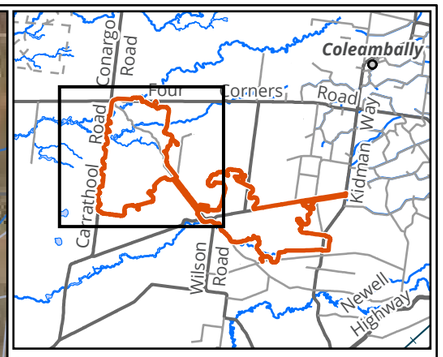
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Legend

- Subject land
- Development corridor
- Development footprint

Prescribed impacts

- National Park/Reserve
- Local wetlands
- Vehicle impacts
- Connectivity

Figure 20A Prescribed impacts - Western area

0 1 2 3

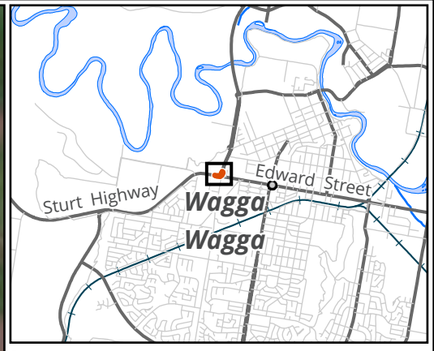
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Legend

- Subject land
- Development corridor
- Development footprint

Prescribed impacts

- Local wetlands
- Connectivity

Figure 20A Prescribed impacts - Olympic Highway/Sturt Highway

0 50

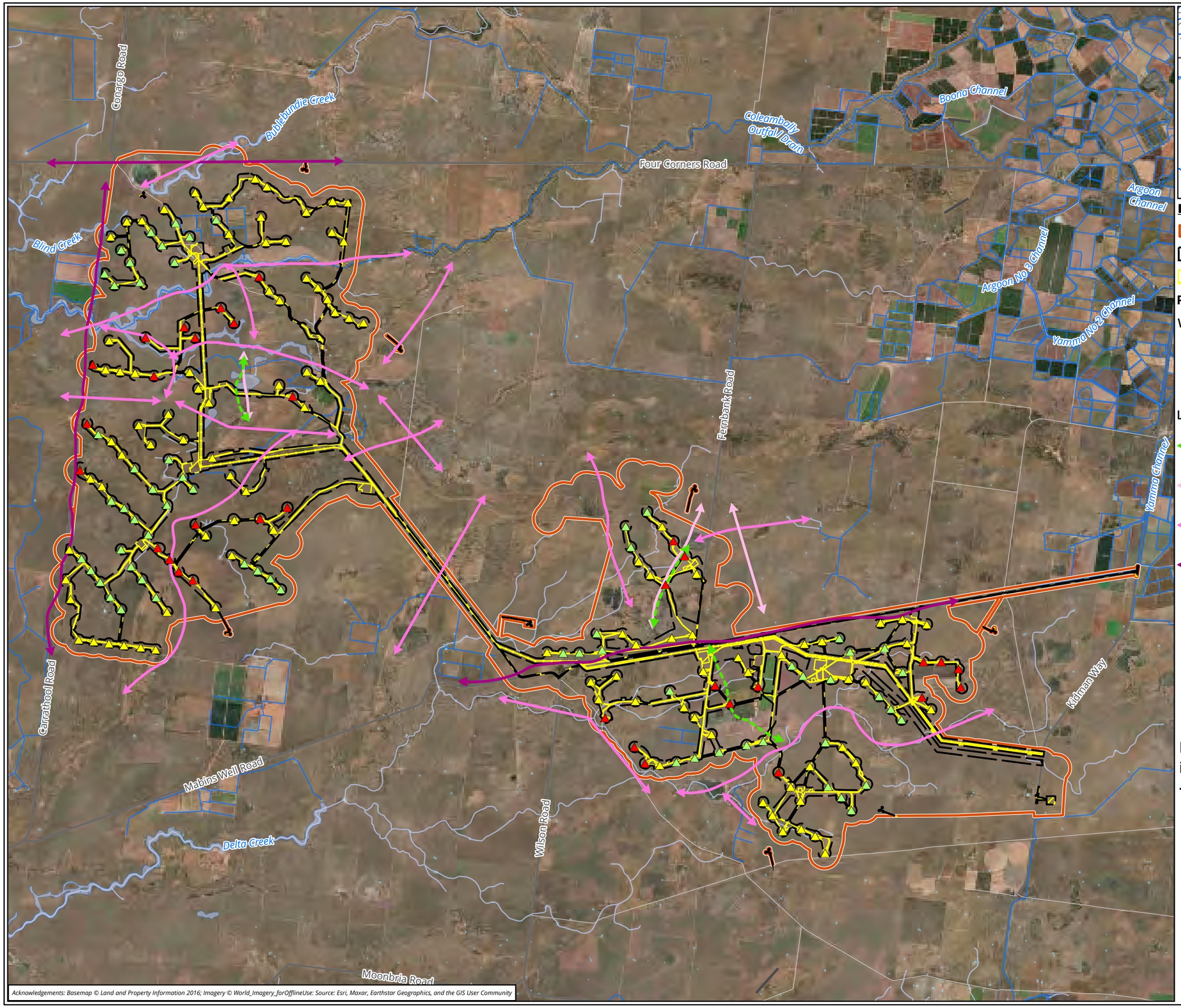
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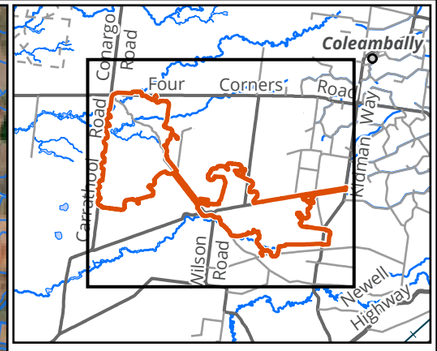
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Legend

- Subject land
- Development corridor
- Development footprint

Prescribed impacts

Wind turbine constraint

- High
- Moderate
- Low

Local flight paths

- Minor pathway - Observed local at risk species
- Minor pathway - Woodland and waterbirds fliers
- Major pathway - Woodland and waterbirds fliers
- Roadside pathway - Woodland and waterbirds fliers

Figure 20B Prescribed impacts (wind only) - Overview

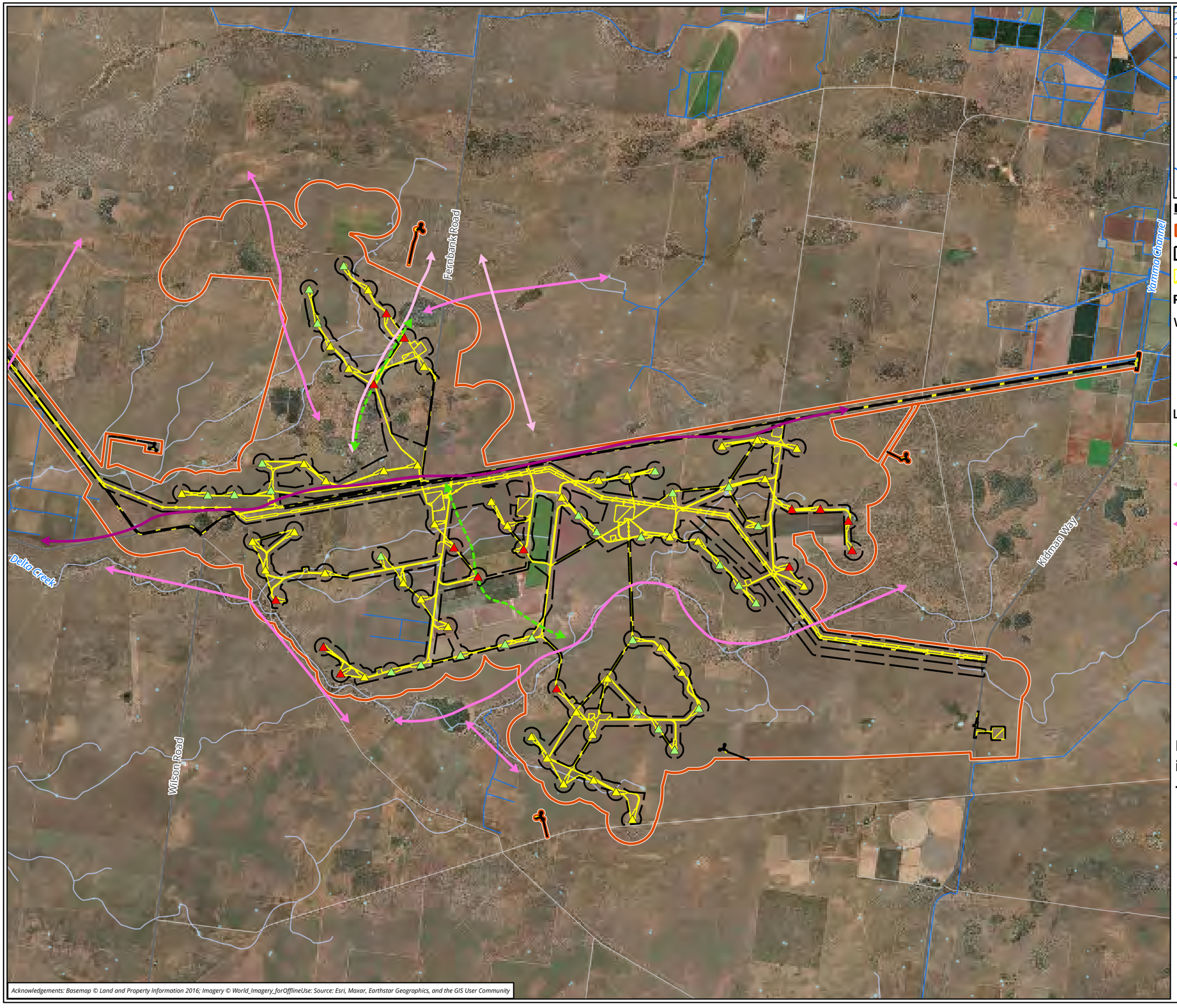
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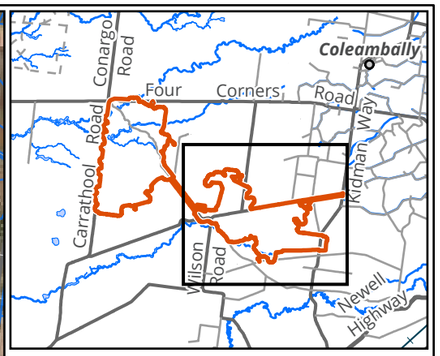
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Legend

- Subject land
- Development corridor
- Development footprint

Prescribed impacts

Wind turbine constraint

- High
- Moderate
- Low

Local flight paths

- Minor pathway - Observed local at risk species
- Minor pathway - Woodland and waterbirds fliers
- Major pathway - Woodland and waterbirds fliers
- Roadside pathway - Woodland and waterbirds fliers

Figure 20B Prescribed impacts (wind only) - Eastern area

0 1 2 3

Kilometers

Scale: 1:80,000 @ A3

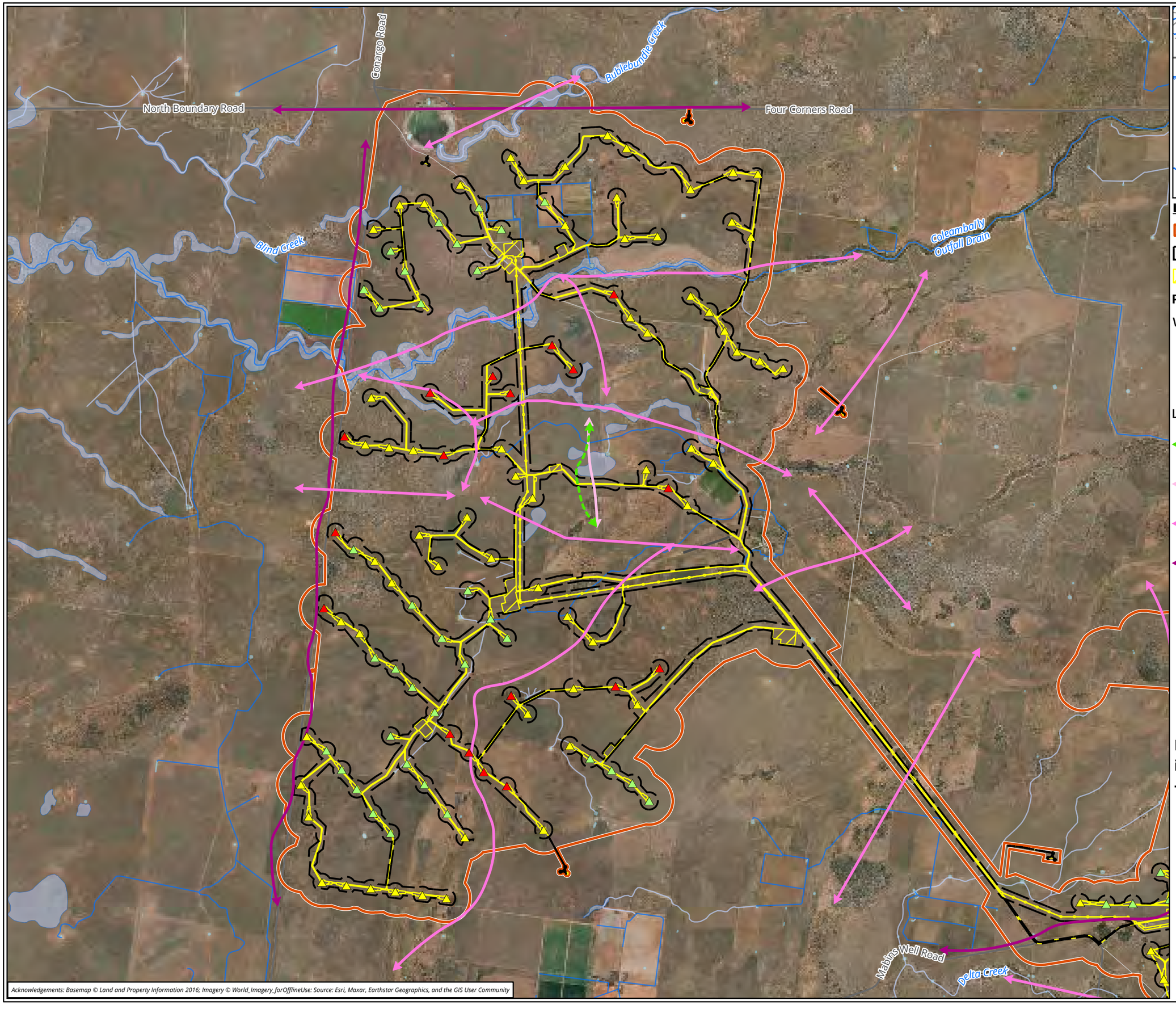
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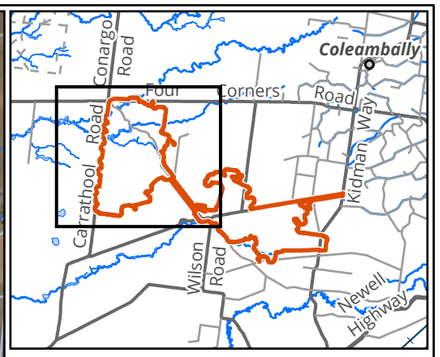
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Layout: 37263_Wind_F20B_Prescribed_Wind

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Legend

- Subject land
- Development corridor
- Development footprint

Prescribed impacts

Wind turbine constraint

- High
- Moderate
- Low

Local flight paths

- Minor pathway - Observed local at risk species
- Minor pathway - Woodland and waterbirds fliers
- Major pathway - Woodland and waterbirds fliers
- Roadside pathway - Woodland and waterbirds fliers

Figure 20B Prescribed impacts (wind only) - Western area

0 1 2 3

Kilometers
Scale: 1:80,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

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Layout: 37263_Wind_F20B_Prescribed_Wind

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8.4. Impacts to Groundwater Dependent Ecosystems (GDE)

GDEs are ecosystems that are partially or completely dependent on underground water, or the surface expression of this water, for their existence or health. These ecosystems include flora and fauna species and communities that are dependent on water discharge to the surface at a level where they can access, to persist in permanently wet environments, or to persist during times of extended low rainfall via the access to subsurface water reserves. The mapped GDEs intersecting the development corridor are typically associated with River Red Gum, Lignum and Canegrass wetland vegetation communities.

The project construction activities are not anticipated to intersect the regional water table. No material impacts to water quality objectives are anticipated as the water quality of runoff leaving the project is expected to be similar to the water quality of the receiving environment during discharge. No material impacts to groundwater are expected. Groundwater will form a source of non-potable water supply for the project; however, this is proposed to be temporary and consumed as part of an existing landowner entitlement linked to approved works.

8.5. Impacts considered uncertain

Operational impacts to bird and bat species associated primarily with collision risk and to a lesser extent potential barrier effects, are predicted as stringently as possible, however, are still considered uncertain at this stage. As such, a monitoring and adaptive management strategy has been developed for the project to ensure any negative effects are realised early, mitigated where possible, and offset if required. The monitoring and adaptive management strategy is summarised in Section 9.

8.6. Cumulative impacts

An assessment of proposed and current renewable and other projects within similar PCTs, habitats and sited in the South West REZ has been carried out to provide a summary of potential cumulative impacts to biodiversity (Table 86). Nineteen large scale renewable energy related projects in the South West REZ, all impacting upon similar PCTs, habitats and threatened species have been considered.

It is important to recognise that the South West REZ is currently a highly competitive landscape for renewable energy development and project outcomes will largely be determined by the NSW Government allocation of access rights to the limited transmission infrastructure present. For example, the NSW Government registration of interest for the South West REZ received 49 registrations, representing 34 gigawatts of electricity (more than 13 times the intended 2.5 gigawatts capacity) from potential generation and storage projects. Access to the South West REZ transmission lines will be managed by the NSW Government in accordance with the NSW Electricity Infrastructure Investment Act 2020 (EII Act). A competitive tender process for transmission "access rights" will be administered by AEMO Services (ASL). The mix of technologies and size of projects that will be built in the South West REZ will, to a large extent, be determined by the outcomes of this competitive auction process. This process would limit the scale of development within the South West REZ and means that the cumulative impacts required to build the South West REZ to its maximum capacity would be less than that predicted for the full extent of all projects currently proposed.

The Dinawan Energy Hub as a whole also includes the Dinawan Solar Farm currently under a separate assessment. Overall impacts related to the solar farm are currently under assessment, with a detailed description of potential biodiversity impacts provided within the Dinawan Solar Farm BDAR (Biosis, 2023). Dinawan Solar Farm is currently within the RTS phase and a revised BDAR will be submitted as part of an amendment report that includes a reduction to the size of the development footprint.

Generally, impacts resulting from the project are largely consistent with impacts that are considered to occur at other nearby proposals, more so with those occurring within 50km or less.

The summary of biodiversity impacts from publicly available information was reviewed to gain an understanding of the main biodiversity impacts and how these may contribute to cumulative impacts when considering the development of the project.

Table 86 Cumulative Impacts

Project, description and location	Distance	Overview	Potential biodiversity impacts
Dinawan Solar Farm (RTS stage)	0 km	Includes construction and operation of 800 MW solar farm on approximately 2,000 ha.	Potential impacts to 1,783 ha of native vegetation, including six PCTs and two TECs. Weeping Myall and Natural Grasslands impacts are anticipated. Minor impacts to *Swainsona murrayana* and *Swainsona sericea*. Impacts to dispersal habitat for *Litoria raniformis,* however impacts to primary habitat has been minimised.
Project EnergyConnect (Approved project)	0 km	Includes construction and operation of 330 kV and 500 kV transmission line and Dinawan Substation.	38 PCTs directly impacted. 1,615.20 ha of native vegetation. 232.16 ha of TECs, including 101 ha of Weeping Myall. Loss of habitat of 74 ecosystem species. 20 candidate species impacted.
Argoon Wind Farm (Scoping stage)	1 to 5 km southeast	Up to 106 wind WTGs, battery storage facilities and associated infrastructure	18 PCTs potentially directly impacted including PCT 10, PCT 13, PCT15, PCt 24, PCT, PCT 45 and PCT46. Study area of 10,888 ha. Cumulative impacts to “at risk birds”.
Yanco Delta Wind Farm (Approved project)	1 to 5 km south	Includes construction and operation of 1.5 GW wind farm, including approximately 225 WTGs across 24,000 ha.	10 PCTs directly impacted. 173.4 ha of native vegetation. 88.3 ha of EPBC listed natural grassland TEC impacted. 29.69 ha of Weeping Myall TEC impacted. Loss of habitat of 14 threatened species. Impacts to 1.78 ha of Plains Wanderer habitat. Cumulative impacts to “at risk birds”.
Coleambally BESS (Approved project)	30 km north	Includes construction and operation of 100 MW capacity BESS across 4 ha	Impacts to 2.75 ha of PCT 16 Black Box woodland 2.86 ha of PCT 26 Weeping Myall woodland. Impacts to 0.45 ha of Superb Parrot

Project, description and location	Distance	Overview	Potential biodiversity impacts
			breeding habitat.
Coleambally Solar Farm (Approved project)	30 km north	Includes 150 MW solar farm constructed on 570 ha formerly used to support irrigation cropping	Impacts to 0.74 ha of native vegetation including 0.66 ha PCT 16 Black Box woodland and 0.08 ha of PCT 26 Weeping Myall woodland.
Wanganella Wind Farm (Scoping stage)	35 km north west	Construction, operation and decommissioning of a wind farm with an estimated capacity of 840 MW, up to 105 turbines and a maximum height of 270m (to blade tip), a 600 MW / 2400 MWh BESS, and temporary worker accommodation	Potential impacts to 11 PCTS, including Weeping Myall Woodlands (63 ha) and Natural Grasslands (1,752 ha). Potential impacts to Plains Wanderer habitat and species such Black Falcon, Pied Honeyeater and White-Fronted Chat.
Bullawah Wind Farm (Scoping stage)	38 km north west	Includes construction and operation of 1 GW wind farm, including approximately 170 WTGs across 33,000 ha.	Estimated impacts to 1012.6 ha of native vegetation including impacts to Weeping Myall Woodland and Natural grasslands. Cumulative impacts to "at risk birds".
Boags Creek Solar Farm (Scoping stage)	40 km north-east	300 MW solar farm, energy storage facility and associated infrastructure	Potential impacts to three PCTS, two TECs and five threatened species.
Booroorban (Saltbush) Wind Farm (Scoping stage)	45 km west	Construction and operation of a 400 MW wind farm,including 70 wind turbines up to 280m in height, and a 600 MW / 1200 MWh BESS	Impacts to eight PCTs, including two TECs, Sandhill Pine woodland and Natural Grasslands. Potential impacts to 11 threatened flora and fauna species. Cumulative impacts to "at risk birds".
Darlington Point Solar Farm (Approved project)	45 km north	Includes 275 MW solar farm (constructed) and 200 MW BESS (under construction) on 1,042 ha formerly used for grazing.	Impacts to PCT 45 Plains Grassland and impacts to PCT 16 Black Box woodland.
Woodland BESS (Scoping stage)	45 km north	Includes construction and operation of 200 MW BESS across 16 ha.	Potential impacts to five TECs and 17 threatened species.
Yarrabee Solar Farm (Approved project)	45 km south	Includes construction and operation of 900 MW solar farm and BESS on approximately 2,600 ha	Impacts to three PCTs, including one TEC. Impacts to two threatened species.
Devlins Bridge Wind Farm	50 km north-eas	Construction and operation of a wind farm with up to 94 wind turbines and associated infrastructure	Potential impacts to 12 PCTS (390 ha), including five TECs. (175 ha). Potential impacts to 3 SAII species. Cumulative impacts to "at risk birds".
Pottinger Wind	50 km west	Includes construction and operation of	Impacts to 470 ha of native vegetation

Project, description and location	Distance	Overview	Potential biodiversity impacts
and Solar Farm (EIS stage)		750 GW wind farm, 300 solar farm and 500 MW BESS., including approximately 108 WTGs across approximately 15,160 ha.	for the wind farm and 630 ha for the solar farm, including potential impacts to Weeping Myall Woodland and Natural Grasslands TECs. Cumulative impacts to "at risk birds".
Currawarra Solar Farm (Approved project)	60 km south	Includes construction and operation of 195 MW solar farm and BESS on approximately 472 ha.	Impacts to three PCTs, including one TEC totalling 3.8 ha of native vegetation.
Tarleigh Park Solar Farm (Approved project)	75 km south	Includes construction and operation of 90 MW solar farm and BESS on approximarely 250 ha.	Impacts to three PCTs, including one TEC totalling 3.37 ha of native vegetation.
Tchelery Wind Farm (EIS stage)	>100km west	Includes construction and operation of 800 MW wind farm, including approximately 120 WTGs	Potential impacts to 16 PCTs, 4 TECs including Weeping Myall Woodland. Potential impacts to seven flora species and five fauna species known to occur. Cumulative impacts to "at risk birds".
Baldon Wind Farm (EIS stage)	>100 km west	Includes construction and operation of 1 GW wind farm, including approximately 162 WTGs across approximately 42,000 ha.	Potential impacts to 17 PCTs including Natural grassland TEC. Potential impacts to three threatened species, including Plains Wanderer. Cumulative impacts to "at risk birds".
The Plains Wind Farm (EIS Stage)	>100km north west	Includes construction and operation of 1.8 GW wind farm, including approximately 226 WTGs across approximately 58,000 ha.	Potential impacts to 558 ha of native vegetation, including 15 PCTs and two TECs, including Weeping Myall Woodland. Potential impacts to Plains Wanderer habitat. Cumulative impacts to "at risk birds".
Wilan Wind Farm (EIS stage)	>100 km west	Includes construction and operation of 800 MW wind farm, including approximately 138 WTGs	Potential impacts to 607 ha of native vegetation, including 12 PCTs. Potential impacts to two threatened flora species. Cumulative impacts to "at risk birds".
Keri Keri Wind Farm (EIS stage)	>100 km west	Includes construction and operation of 1 GW wind farm, including approximately 176 WTGs and 200 MW BESS.	Potential impacts to 2,625 ha of native vegetation, including nine PCTs and one TEC, and one threatened flora species. Cumulative impacts to "at risk birds".
Junction Rivers Wind Farm (EIS stage)	>100 km west	Includes construction and operation of 750 MW wind farm, including approximately 96 WTGs	Impacts to 68.16 ha of native vegetation, including seven PCTS and two TECs. Cumulative impacts to "at risk birds".

9. Mitigation and management of impacts

Residual impacts occur once all efforts have been made to avoid and minimise impacts through the design phase of the project. Mitigation of unavoidable impacts is the next step in the impact reduction hierarchy and includes commitments made by the Applicant to further minimise impacts to biodiversity.

Identification of measures to mitigate or manage impacts has been undertaken in accordance with the BAM (DPIE 2020a), including considerations such as:

- Techniques, timing, frequency and responsibility.
- Identification of measures for which there is risk of failure.
- Evaluation of the risk and consequence of any residual impacts.
- Documentation of any adaptive management strategy proposed.

Identification of measures for mitigating impacts related to:

- Displacement of resident fauna.
- Indirect impacts on native vegetation and habitat.
- Mitigating prescribed biodiversity impacts.
- Protecting threatened flora and fauna habitat, especially threatened flora populations identified within the subject land, but outside the development footprint.
- Details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain.

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Table 87 Measures to mitigate and manage impacts

	Measures to mitigate and manage impacts	Action	Timing	Responsibility
	Direct and indirect impacts			
B1	Removal of native vegetation and TECs	• Wherever possible the project will look to avoid impacts to native vegetation and TECs through minimisation of clearing footprint during detailed design and preferentially locating infrastructure/plant/materials etc in areas of existing disturbance. • Prescriptions for mitigation of potential impacts of construction activities on retained native vegetation and habitat will be addressed in a site-specific CEMP and BMP sub-plan. The plan will include all measures outlined below: o Minimise vegetation clearance and disturbance, including impacts to standing dead trees and riparian zones. o Where possible, limit clearing to trimming rather than the removal of whole plants. o Micro-siting of all construction related access roads, stockpiles, vehicle parking and site compounds should occur and where possible these should be located in areas that do not contain moderate or high condition native vegetation or fauna habitat. o Physically delineate vegetation to be cleared and/or protected on site and install appropriate signage prior to works commencing. o No-Go Zones should be erected during the construction phase at the extent of clearing works in patches of vegetation to ensure clearing limit is not exceeded and no vehicle or plant equipment movement occurs outside the clearing limit. These areas should be checked as part of the pre-clearing survey. o Protect trees in accordance with the requirements of Australian Standard 4970-2009 for the Protection of Trees on Development Sites. o Do not damage tree roots unless absolutely necessary, and engage a qualified arborist where roots >50mm are impacted within the Tree Protection Zone. o Retain dead tree trunks, bush rock or logs in-situ unless they are in the development footprint and moving is unavoidable. Reposition material elsewhere on the site or approved adjacent sites. Dead wood and Coarse Woody Debris (CWD) should be lifted and placed into adjacent vegetation, not pushed. o Undertake pre-clearance inspections by a licenced ecologist of vegetation to ensure all no-go areas are appropriately fenced. o If any threatened species (flora or fauna) is discovered during the works, stop work immediately at the site of species identification and notify the onsite Manager. Work will	Prior to construction – during construction	Applicant / Principal contractor

	Measures to mitigate and manage impacts	Action	Timing	Responsibility
		only recommence once the impact on the species has been assessed and appropriate control measures provided. o If any damage occurs to vegetation outside of the impact area (as shown in the CEMP), notify the onsite Manager and Environmental Representative so that appropriate remediation strategies can be developed. • A biosecurity management plan will be prepared as part of the project's CEMP and will detail measures to prevent the spread of weeds and pathogens, and other biosecurity items into or out of the impact area upon implementation. • Secure biodiversity offsets in accordance with the NSW BOS.		
B2	Removal of fauna and flora habitat Removal of threatened fauna habitat	• Wherever possible the project will look to avoid removal of hollow-bearing trees and trees supporting nests during detailed design. • The CEMP will include a plan for pre-clearance surveys. Pre-clearance surveys will include: o Fauna general: ▪ Survey of all areas to be cleared prior to construction to identify and mark all fauna habitat to be impacted including hollow-bearing trees (HBTs) ▪ All HBTs to be removed will follow a two-stage removal process, including knocking of the tree to be removed 24 hours prior to removal. ▪ All fauna habitat to be removed will be surveyed by a suitably qualified ecologist, prior, during and after removal. ▪ As far as practicable, active nests will be avoided from clearing. If clearing is required, clearing cannot occur until young have fledged, or clearing supervised as per below. ▪ If native fauna is likely to be present, a licenced ecologist should inspect the removal and undertake fauna relocation. o Flora general: ▪ All vegetation to be removed is to be clearly marked for removal. ▪ No-Go fencing is to be erected along the clearing extent where partial clearing of a patch is to occur. No-Go fencing is to be retained until the completion of the construction phase for each relevant stage. • If native fauna is encountered on site, stop work and allow the fauna to move away un-harassed. Engage a licenced ecologist if assistance is required to move fauna.	Prior to construction – during construction	Applicant / Principal contractor

	Measures to mitigate and manage impacts	Action	Timing	Responsibility
		Hollow dependent fauna • Further baselines surveys of areas of expected high use for Superb Parrot are to be undertaken once the final development footprint has been determined at least one month prior to scheduled vegetation removal. • Pre-clearance surveys are to be undertaken to determine if these areas of habitat are being used by the species 24-48 hours before vegetation removal. • Removal of hollow bearing trees to occur outside breeding season for Superb Parrot, September to November, as far as practicable, and potentially prior to the main vegetation clearing program. It would be ensured that this would not result in the removal of potential nest trees more than one breeding season prior to the main vegetation clearing program. • Two-staged tree removal under ecologist supervision is required for the removal of all trees within potential Superb Parrot high use areas.		
		Threatened raptor species (incl. non-threatened at risk species) • All potential raptor nests within 200 metres of the finalised development footprint are to be mapped at least one month prior to vegetation removal. • Pre-clearance surveys are to be undertaken within one week of scheduled vegetation removal to determine whether nests are in use by threatened raptors, **or** non-threatened at risk raptors (See Section 6.2.3). • Clearing of raptor nests with juveniles present will not be undertaken. • Removal of potential nest trees could occur as early works, outside breeding season, and prior to the main vegetation clearing program. It would be ensured that this would not result in the removal of potential nest trees more than one breeding season prior to the main vegetation clearing program. • Clearing of vegetation within 200 m of raptor nests with juveniles present will be avoided wherever possible. • Two-staged tree removal under ecologist supervision is required for the removal of all raptor nests.		
		Southern Bell Frog • Construction within waterbodies and irrigation channels if required will be preferentially undertaken when dry as far as practicable.		

	Measures to mitigate and manage impacts	Action	Timing	Responsibility
		• A suitable location for the relocation of Southern Bell Frog outside the development corridor should be determined prior to clearing taking place, ensuring any areas proposed for relocation do not contain *Gambusia* species. • Engaging a qualified and licensed ecologist to be present during dewatering of farm dams is required, to undertake fauna relocation (e.g. turtles, frogs, etc.) into an appropriate nearby habitat. • Once dewatering is complete, dams are to be left for a minimum of 48 hours to allow species such as frogs and yabbies to naturally relocate. Where possible, dewatered dams should be left dry for a minimum of 1 week.		
		Plains Wanderer • Pre-clearance nocturnal surveys will be undertaken when vegetation removal is proposed within PCT 46 or impacted Important Mapped Areas. • BMP to include priorities and strategies to reduce predators such as foxes and weed ingress. • BMP to specifically map areas of Plains-wanderer habitat within the subject land, comprising Mapped Important Areas and areas considered to support higher quality habitats for the species, and ensure these areas are considered in other relevant management plans, such as (but not limited to) Biosecurity Management Plan, Erosion and Sediment Control Plan, Traffic Management Plan (reduction of potential vehicle strike). • During final design, maximise connectivity opportunities where impacts to optimal habitat and Important Mapped Areas are predicted.	Prior to construction – during construction	Applicant / Principal contractor
		Other threatened species (MNES) • Pre-clearance surveys will be undertaken when vegetation removal is proposed during the breeding season of threatened species (for example between July – October for Southern Whiteface). • Survey results will trigger the implementation of mitigation measures to minimise impacts to breeding individuals, to be further detailed in the BMP.		
B3	Construction adjacent to identified threatened flora populations	**Swainsona Species** • Ensure No-Go Zones are established early and maintained throughout the life of the construction phase of the project. • Regular monitoring of the health of the retained population will be undertaken throughout the life of the project as guided by the BMP and, if identified, negative pressures acting on the population will be subject to management.	Prior to construction – during construction	Applicant / Principal contractor

	Measures to mitigate and manage impacts	Action	Timing	Responsibility
B4	Indirect impacts on retained native vegetation, habitat and native species	• Project fencing will be designed so as not to create barriers to fauna movement, nor to funnel fauna species into dead ends. Egress points will be provided for fauna that do enter the project site (both construction and operational). • Ensure all works areas and access routes are clearly delineated and sign-posted from the outset of the project construction phase to avoid unauthorised/accidental access to retained areas. • Develop and implement specific erosion and sediment controls described in a CEMP, such as: o Minimising the area and duration of soil disturbance. o Progressively rehabilitate disturbed areas. o Temporary or permanent earth banks and silt fences. Trench blocks (i.e. trench/sack breakers) and compaction of backfilled soils to be used to prevent subsurface erosion. o Specific Erosion and Sediment Control Plans for waterway crossings. • All material stockpiles, vehicle parking and machinery storage, and other ancillary works are to be located within areas considered within the current assessment and not be located within retained vegetation outside the development footprint. • A waste management plan will be developed to ensure rubbish and construction waste are properly managed, and do not attract pest species. • Collection of firewood from within retained vegetation will be prevented through education of staff around the sensitive nature of woodland vegetation within the site and either a total fire ban within temporary construction camps, and within the operational site, or if fires are permissible within the construction camp ensuring sufficient firewood constantly available. • Cleared vegetation, which may be mulched or stored for re-use on site, should be: o Stockpiled separately from topsoil in a manner which facilitates respreading or salvaging, avoids damage to adjacent live vegetation and does not impede wildlife. o Where possible, mulch produced from native vegetation should be reused for landscaping and site rehabilitation and spread <10cm deep to aid in retention of native seed bank. • Commit to undertaking ongoing pest animal control in conjunction with a local/regional pest control program (or providing a monetary contribution towards), and relevant landowners, to ensure a strategic approach can be achieved.	Prior to construction – during construction	Applicant / Principal contractor
B5	Reduced viability of adjacent habitat due to edge effects	• The CEMP will include a landscaping and rehabilitation management plan that will ensure areas of temporary disturbance are rehabilitated via best practice ecological restoration techniques.	Prior to construction	Applicant / Principal contractor

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	Measures to mitigate and manage impacts	Action	Timing	Responsibility
		• Re-use felled vegetation (logs and tree-hollows) and other habitat features such as rocks/boulders to increase the habitat values of any retained and adjacent vegetation. • Any revegetation / rehabilitation or vegetation screening works within and/or contiguous with areas of native vegetation are to use locally sourced (local provenance) seed stock only. All species installed are to be locally indigenous and suitable and characteristic of the surrounding PCTs.	– during construction	
B6	Reduced viability of adjacent habitat due to noise, dust or light spill	• The CEMP will include a plan to ensure: o Minimisation of the amount of time that noise, light and vibration impacts are occurring. o Ensure the smallest machinery that can complete the required works are used to reduce potential noise and vibration impacts. o Regularly train workers and contractors to use equipment in ways to minimise noise. o Site managers periodically check the site and nearby residences for noise problems so that solutions can be quickly applied. o All plant and equipment will be turned off when not in use. o Known breeding habitat such as tree hollows and nests adjacent to works areas will be considered in noise management strategies. • The CEMP will include dust suppression to be undertaken as required using water sprays, water carts or other media on: o Unpaved work areas subject to traffic or wind. o Sand, spoil and aggregate stockpiles. o During the loading and unloading of dust generating materials. • Lighting will be designed in general accordance with Australian Standard 4282-2019 Control of obtrusive effects of outdoor lighting. • Lighting will be designed so as not to shine onto adjacent retained vegetation and habitats where possible.	Prior to construction – during construction	Applicant / Principal contractor
B7	Transport of weeds and pathogens to/from the site to/from adjacent vegetation	• A biosecurity management plan will be prepared as part of the project's CEMP and will detail measures to prevent the spread of weeds and pathogens, and other biosecurity items into or out of the impact area upon implementation. • The plan will include prescriptions for regular monitoring and control of weeds.	Prior to construction – during construction	Applicant / Principal contractor
B8	Adaptive management strategies proposed to monitor and respond	• All plans will be progressively reviewed and updated throughout operations. • All adaptive management strategy plans, including the BMP, will form part of an overarching Environmental Management Strategy (EMS).	Prior to construction – during	Applicant / Principal contractor

	Measures to mitigate and manage impacts	Action	Timing	Responsibility
	to impacts on biodiversity values that are uncertain		construction-operation	
		• Preparation of a BMP will ensure mitigation strategies are properly implemented during construction and operation of the project. o The BMP will be prepared by a qualified ecologist or consulting company in consultation with regulators including NSW DCCEEW (BCS). o The BMP will be implemented for all stages of the project (pre-construction, construction, operation and decommissioning). o Mitigation strategies included in the plan will include (but are not limited to): ▪ Permit system for the clearing of native vegetation. ▪ Installation of no-go zones and delineation of vegetation to be removed/retained. ▪ Pre-clearance procedures for vegetation to be removed. ▪ Unexpected finds procedure that includes strategies to minimise, mitigate and potentially offset unexpected impacts to threatened species not recorded during the preparation of the BDAR. ▪ Details of protection procedures for direct impacts on threatened flora. ▪ Requirements for revegetation or screening works including suitable species and requirements around local provenance and seed sources, and the re-use of felled vegetation and salvaged habitat features. ▪ Fencing requirements for No-Go Zones. ▪ Management requirements for stockpiles, vehicle parking, machinery storage, other ancillary works. ▪ Pest management requirements. ▪ An adaptive management strategy and timing of regular review/updates. ▪ Further detail as provided in Section 9.1.1 below. • The BMP will also provide detail on survey requirements prior to micro-siting of infrastructure components within the development corridor and provide criteria that must be met to ensure there are no increase to biodiversity impacts as a result of micro-siting during detailed design.	Prior to construction – construction – operation.	Applicant / Principal contractor
B9		• A BBAMP will be prepared to measure any operational impacts on bird and bat species, and ensure suitable mitigation and adaptive management strategies are implemented. The plan will:	Prior to construction –	Applicant / Principal contractor

	Measures to mitigate and manage impacts	Action	Timing	Responsibility
		o Address the prescribed impacts associated with blade strike impacts and include trigger levels to manage impacts during operations. o Provide guidance and develop a framework for monitoring of impacts, including baseline and ongoing monitoring requirements, including for nesting sites on man-made structures. o Utilise survey data and complete statistical analysis of species, and develop triggers for number of species incidents. o Develop strategies on consultation with NSW DCCEEW (BCS) for reducing bird and bat collision risk. o Identify additional mitigation measures, further detailed in Section 9.1.2 below. If any amendments to the hub height are required, the CRM will be updated prior to construction and the revised results will be included in the BBAMP.	construction – operation.	
B10		• Preparation of a Groundwater and Soil and Water Management Plan (or similar) that will: o Describe measures that will be employed to minimise soil erosion and the discharge of sediment and other pollutants from the site during construction and operation of the project. o Describe how water will be managed to achieve compliance with consent and EPL licence conditions. o Establish responsibilities and reporting requirements. o Establish surface water quantity and quality monitoring requirements. o Establish trigger action response plans to enable progressive improvement.	Prior to construction – construction – operation.	Applicant / Principal contractor
	Prescribed impacts			
B11	Turbine strike and barriers to movements	• All turbines considered high risk, as initial shown in Section 6.3.3, or upgraded to high during adaptive management strategies, will be feathered at wind speeds below operational cut-in speeds as a form of proactive mitigation strategy to minimise the potential for turbine strike impacts. • Seasonal curtailment - During rare flood events, it is possible that habitat provided by larger ephemeral waterbodies may increase in area such that suitable habitat for 'at-risk' waterbirds occurs in close proximity to operational turbines. If this occurs, it is recommended that: o Monitoring of turbines within 500m of ephemeral waterbodies and creek lines increases during major flooding events. The criteria for what is considered a major flooding event would be determined during preparation of the BBAMP, but likely to be considered to	During construction - operation	Applicant / Principal contractor

	Measures to mitigate and manage impacts	Action	Timing	Responsibility
		be once extensive inundation of structures and roads occurs from prolonged rainfall within the locality. o Turbines may be curtailed to reduce the risk of turbine collision when suitable habitat occurs within 500m of a blade tip of a turbine during the flooding event. These areas will be identified within the final BBAMP. o End of curtailment would be determined via field survey confirmation that birdlife and habitat value had reduced significantly enough back to pre-flood conditions for operation of the turbines to not increase collision risk for 'at risk' species. Further information is provided in Section 9.1.2. • Consideration of automated avian detection systems at high risk turbines to allow for detection of bird species and the triggering of curtailment of high risk turbines, such as the IdentiFlight avian detection system (IDF), or other technologies, as a means of pre-emptively reducing any potential mortality events. Installation at the construction phase of the project, is expected to allow IDF to have captured enough data to be able to recognise target species such as Wedge-tailed Eagle with a high level of confidence. Further information is provided in Section 9.1.2. • Consideration of SMART (Song Meter with Analysis and Remote Transfer) system by Wildlife Acoustics for microbats at turbines within 500m of ephemeral Blackbox dominated vegetation. • Pest animal control to reduce the occurrence of foxes, cats and dogs, likely to scavenge microbat carcasses, potentially skewing the results or searches. • Establishment of lighting systems that reduce insect (prey) attraction. • Minimising availability of raptor perches on infrastructure within close proximity to turbines and overhead powerlines. • Prompt animal carcass removal within 200m of a turbine (within 24 hrs of discovery) to minimise raptor scavenging opportunities and reviewed annually. • Annual reporting requiring accounting for all events over the preceding 12 months and reinvestigation of the effectiveness of the current mitigation strategy. • Where blade strike triggers are found to occur, implement adaptive management strategies as outlined in Section 9.1.2 below.		
B12	Vehicle strikes	• Speed limit for construction vehicles along McLennons Bore Road, Fernbank Road, Wilsons Road and Goolgumbla Road, should be reduced to minimise increased risk of vehicle strike on fauna. • Speed limits within the subject land should be enforced for the life of the project. • Fauna species (particularly threatened species) susceptible to vehicle strike will be included in project inductions to increase knowledge of the wildlife occurring within the subject land.	During construction - operation	Applicant / Principal contractor

	Measures to mitigate and manage impacts	Action	Timing	Responsibility
		• A vehicle strike protocol, including details of local WIRES contacts will be created and made available to all staff. • Suitable speed limit reductions will be determined during preparation of the BMP. • Prompt carcass removal, if collision do occur to prevent further potential collisions with scavengers. • Monitoring of roads and collisions and mapping of any hotspots where increased mitigation may be required. • Mapping of Plain-wanderer habitat as part of the BMP and ensuring suitable mitigation is implemented where roads occur within or close to potential habitat for the species.		
B13	Construction in waterways & removal of dams	• Construction within waterbodies will be preferentially undertaken when dry. • During the micro siting process, where possible, construction in wet areas including dams, drainage lines and creek lines should be avoided. • Where avoidance or undertaking works when waterbodies are dry is not possible, all areas containing water, e.g. dams, must be surveyed as part of the pre-clearance and clearing survey outlined in the CEMP including: o Engaging a qualified and licensed ecologist to be present during dewatering of farm dams, to undertake fauna relocation (e.g. turtles, frogs, etc.) into an appropriate nearby habitat. o Once dewatering is complete, dams are to be left for a minimum of 48 hours to allow species such as frogs and yabbies to naturally relocate. Where possible, dewatered dams should be left dry for a minimum of 1 week.	Prior to construction – during construction.	Applicant / Principal contractor
B14	Fragmentation of movement corridors	• Investigate the establishment of Biodiversity Stewardship Sites in the immediate locality of the project to ensure local habitats outside the project are improved and conserved in perpetuity. • Ensure ongoing protection of roadside corridors as far as practicable and prevent indirect impacts through implementation of the BMP. • The following opportunities will be fully explored as a part of the detailed design: o Opportunities to further minimise the development footprint and clearing within important movement corridors for fauna. o Opportunities for post-works restoration of habitat connectivity within important movement corridors for fauna.	Prior to construction – construction.	Applicant / Principal contractor

	Measures to mitigate and manage impacts	Action	Timing	Responsibility
		o Areas subject to temporary disturbance will be rehabilitated using a native species planting schedule as much as practical considering any operational and safety constraints. o The total area exposed and cleared at any one time will be minimised and planned to allow for fauna movement during construction and periods of temporary disturbance		
B15	Impact to hydrological patterns	• Impacts to retained vegetation such as areas of Black Box woodland, from built up tracks, turbine hardstands, and other infrastructure altering hydrology on ephemeral floodplains, will be minimised through detailed design and implementing measures to ensure the flow of water maintains the frequent or semi-regular inundation patterns required to maintain vegetation health. • Hydrology modelling will be undertaken if it is determined that a risk of substantial changes to hydrological regimes could occur. • Wetlands mapped on the Wetlands of NSW dataset (NSW DCCEEW 2010a) are to be assessed in the preparation of the BMP and included in ongoing monitoring where there is a potential for longer-term indirect impacts from changes to hydrology to occur. • Adaptive management measures will be outlined in the BMP that ensure if impacts occur as a result of altered hydrology mitigation is implemented.	Prior to construction – construction – Post construction	Applicant / Principal contractor / Operator

9.1. Adaptive management strategy

Construction and operational management plans will all contain an adaptive management component. Adaptive management strategies will be receptive to any new and relevant data that may arise through ongoing assessment and monitoring and are key to the successful implementation of crucial objectives yet also allow flexibility to changing dynamics and ongoing feedback and results. This includes measures to monitor predicted and uncertain impacts which will trigger adaptive management actions and allow for effective and quick responses.

It is expected that an overall EMS would be developed with specific sub management plans that will entail an adaptive management strategy component. Those sub management plans in relation to biodiversity include but are not limited to a:

- Biodiversity Management Plan (BMP).
- Bird and Bat Adaptive Management Plan (BBAMP).

Adaptive management plans (or components of pans) will include the following key components:

- Framework and objectives.
- Baseline information.
- Monitoring methods, frequency and Before After Control Impact (BACI) design.
- Trigger-level and unacceptable impacts for further investigation and responsive adaptive management.
- Monitor and report on the effectiveness of impacts and trigger levels.
- Operational mitigation measures.
- Residual prescribed impacts, compensatory measures and additional offset calculation framework.
- Compliance management and summary.

9.1.1. Biodiversity Management Plan (BMP)

A BMP would be implemented demonstrating adaptive management strategies to ensure key milestones are achieved including the following project commitments:

- Protecting vegetation and fauna habitat outside the development footprint and managing the remaining remnant vegetation and fauna habitat within or surrounding the development corridor using improve and maintain principles, minimising indirect impacts, especially to known threatened flora species and potential fauna species such as Plains Wanderer, Southern Bell Frog and Superb Parrot.
- Demarcation of retained areas of vegetation and particularly important mapped areas or potential optimal habitat for Plains Wanderer.
- Fauna monitoring and management protocols including identification and reporting of fauna mortalities to the relevant BCS office.
- Collection of detailed baseline weed data and ensuring no increase of key emerging weeds or invasive pests.

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- Commit to ongoing consultation on vertebrate pest control baiting programs working cooperatively with local landholders.
- Training and education awareness for all construction staff and operational staff on key threatened species, both flora and fauna, relevant to the region and project. This would include tool box talks and supplying information in break rooms on relevant species information.
- Mapping and identification of individual tree hollows and stick nests and developing measures to minimise impacts to these features.
- Pre-clearing protocols, including pre-clearing inspections, establishment of exclusion zones and on-ground identification of specific habitat features to be retained and/ or relocated.
- Monitoring of soil and water controls to prevent indirect impacts associated with water pollution to all waterways.
- Clear performance targets and monitoring criteria.
- Corrective actions.
- Timing and responsibilities.

A recommended outline of the BMP is provided below with further details demonstrated within the mitigation measures listed in Table 87.

- Introduction
  - Background
  - Management scope and objectives
- Planning requirements
- Construction and operational activities
- Habitat management
  - Flora and fauna values
  - Soils
  - Weeds and pests (i.e. key emerging weeds and priority weeds)
  - Baseline data
- Environmental mitigation measure
- Site specifics
  - Inductions
  - Erosion /sediment control
  - Retained vegetation and rehabilitation works
- Adaptive management
  - Performance criteria, triggers, and responses
- Compliance management

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- Review and Improvement

The BMP will also provide detail on survey requirements prior to micro-siting of infrastructure components within the development corridor and provide criteria that must be met to ensure there are no increase to biodiversity impacts as a result of micro-siting during detailed design.

9.1.2. Bird and Bat Adaptive Management Plan (BBAMP) Framework

Framework and objectives

The overall objectives of the BBAMP are to provide an effective monitoring program and strategy to manage and mitigate operational issues relating to bird and bat impacts for the wind farm, to monitor and assess for impacts considered uncertain at the time of approval, and prescribe additional compensatory measures for residual prescribed impacts, if required. Additionally, the framework aims to provide certainty to the consent authority and stakeholders prior to approval that measures for minimising biodiversity impacts during operation have been clearly defined that address potential prescribed impacts that cannot be quantified prior to approval.

Guided by the collision risk assessment and turbine risk assessment, and additional baseline data to be collected from within the subject land, a detailed BBAMP will be developed prior to operation of the wind farm, in conjunction with relevant stakeholders, to confirm adaptive management measures around the potential for collision mortality, barrier effects and behavioural displacement of select resident, nomadic and migratory bird and bat species. A draft BBAMP will be submitted during RTS, and once more detailed designs and turbine locations are known.

The Applicant will commit to mitigation measures that must be underpinned by a rigorous monitoring program involving at least three years of carcass searches, including those undertaken by conservation detection dogs when available, and a robust Trigger Action Response Plan (TARP). The BBAMP will be finalised in consultation with DPHI and NSW DCCEEW prior to commissioning of any turbines, however a framework of the key elements of the Draft BBAMP is provided in Appendix 9.

Baseline information

The BBAMP will include the existing baseline data on threatened bird and bat species as well as any non-threatened species considered to be at risk of collision impacts ('at-risk' species) from the project. One of the key objectives for the collection of detailed baseline data is to gather adequate replicable information on the existing bird and bat species abundance and activity (site utilisation) prior to commencement of operation of the wind farm. This baseline data was collected across two years and eight seasons, and utilised to form risk assessments and CRM presented in this BDAR. This includes the setup of impact zones and control zones that will continue to be monitored pre commissioning of turbines, during construction and during operation for an agreed period of time. The data collected is utilised to detect changes in the species use of the site (including changes in activity patterns such as avoidance) post-commissioning and during operation of the wind farm, and allow for stringent mitigation measures to be implemented as, and when, they are required.

Investigations of the site utilisation patterns of bird and bat species within the subject land have been established as a Before-After-Control-Impact (BACI) assessment design. It is important that bird and bat surveys continue once the wind farm becomes operational and that the survey methods used prior to construction are replicated such that results from before and after operation are appropriately comparable.

As such the bird and bat utilisation survey points established, and monitored to date, will continue to be used through the implementation phase of the BBAMP.

Following commissioning of turbines, ongoing monitoring would mirror the baseline surveys, across all seasons, for three to five years following commissioning of the wind farm, dependent upon individual turbine risk and adaptive management.

Trigger-level and unacceptable impacts for further investigation and responsive adaptive management

In order to effectively measure impacts to any at-risk populations or species during the operation phase of the development, and to actively re-assess the suitability of turbine curtailment strategies the development of alerts, trigger levels and adaptive mitigation response to a potential event is required.

Triggers for responsive management actions will apply where the number of collisions per annum represents a low, but uncertain potential to result in a negative effect on the local population of a species. This is a precautionary objective, as it will be implemented at levels substantially below numbers of collision mortality events that are considered likely to represent a significant impact on the viability of the overall population of any species.

A detailed decision framework will be included for triggers and mitigation associated with both the threatened and non-threatened at-risk species during the development of the BBAMP, and will be finalised prior to commissioning of turbines. The Draft BBAMP is provided in Appendix 9.

Monitor and report on the effectiveness of impacts and trigger levels

Purpose-trained dogs have been shown to be highly efficient at detecting carcasses (Mathews *et al.* 2013) and have been used for this purpose at a number of wind farms in in Australia. Using purpose-trained dogs obviates the need for formal transects to be established in the search zones as dogs use scent to detect carcasses and are permitted to roam to do so. Every dog would be fitted with a GPS tracking device while undertaking searches. GPS tracks will be downloaded and maintained for future reference and used for analyses of search effort and coverage. GIS maps showing routes taken by dogs will be made available to NSW DCCEEW on request. The use of trained dogs is the preferred method for searches and will be used, provided appropriately trained dogs and handlers are available. Dog handler(s) must have demonstrated capacity to identify bird and bat species of NSW. As far as practicable, a target of at least 50% of the required annual carcass searches will be undertaken by purpose-trained dogs.

However, if the use of dogs is not practicable or are unavailable for the project the alternative is to engage suitably trained ecologists or environmental officers. Observers will search by walking transects through the potential fall zone, in this case, an estimated 200 meter radius, and a repeated 100 meter pulse search. Searches will be undertaken by persons with demonstrated capacity to identify bird and bat species of NSW and relevant to the subject land. Transects will be spaced 6 meters apart, or as near to 6 meters as is practical, and observers will thus search the ground for 3 meters either side of each transect. Each observer will carry a hand-held GPS unit and record transects they walk. GPS tracks will be downloaded and maintained for future reference and used for analyses of search effort and coverage. GIS maps showing transects walked and will be made available to NSW DCCEEW on request.

It is proposed that carcass searches be undertaken in accordance with the schedule in Appendix 9 pending adaptive management, triggers and introduction or amendments to mitigation measures.

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It is considered that ensuring all turbines are regularly monitored, rather than focusing on a subset of turbines, will better suit adaptive management objectives of the BBAMP, including ensuring correct ongoing risk ratings for each operational turbine.

It is likely (but uncertain at present) that carcasses of bats and small birds will be scavenged quickly within the subject land. Carcass persistence trials will be undertaken during the course of the operational monitoring, and prior to its commencement, particularly to inform analyses required to extrapolate from numbers of carcasses detected to estimate total number of collisions. In order for the search regime to accommodate the likelihood of rapid scavenging, a relatively short period between initial searches is important.

Further details on carcass searches/monitoring, persistence trials, incidental finds and data analysis are included in the detailed BBAMP in Appendix 9.

Carcass searches/monitoring and carcass persistence trials will also be completed in conjunction with searcher efficiency trials, of which two will be conducted per year for the first three to five years of monitoring. Searchers do not routinely find all carcasses, so it is necessary to ascertain the efficiency of searches in order to determine and apply appropriate correction factors for carcasses missed to inform estimation of total collision mortality for species of concern.

Operational mitigation measures

It is not feasible to foresee what potential factors might lead to an unexpectedly high level of collisions by any species, and therefore appropriate mitigation measures can be prepared only if a cause, or causes, of ecologically significant impacts on the relevant species is known. Additionally, flexibility in mitigation shall be designed to encourage the implementation of innovative and new technologies over the operational life of the wind farm where appropriate.

If a cause is not readily apparent, then investigation of the reason(s) for the impact must be undertaken prior to proposal of a mitigation strategy. Advice from NSW DCCEEW will be sought with regard to design and implementation of any such investigations and of an ultimate mitigation strategy, if required. NSW DCCEEW will be notified within two working days of determination by the wind farm operator or the contracted qualified ecologist that a trigger level or unacceptable impact for any species of concern is detected.

The BBAMP will detail considerations of mitigation measures to reduce the number of Tier 1, Tier 2 and Tier 3 impacts. Broadly, these will include general mitigation measures and specific trigger related mitigation, including but not limited to, those demonstrated in Appendix 9.

The need for adjustments to the mitigation strategy will be determined through regular monitoring on the efficacy of the current strategy (as prescribed in the BBAMP). Adjustments may include additional curtailment measures if an unacceptable number of strikes are found to occur, however the option to reduce the level of curtailment will also be prescribed, if sufficient evidence can be provided that it is safe to do so. Such evidence may include few, to no, recorded bird/bat strikes at a given turbine, combined with a comparison to the results of a trial period of reduced curtailment. As such, turbines currently assessed as low risk of impact may become curtailed in the future, or those turbines currently considered to present a moderate risk of impacts may be removed from the curtailment strategy, or have curtailment strategies increased. All such changes would be guided by the monitoring and adaptive management processes outlined in the BBAMP.

Detailed monitoring on the efficacy of the mitigation strategies, including proactive mitigation and responsive management triggers, has been committed to by the Applicant, as is detailed herein. This includes a schedule of proposed carcass searches utilising trained sniffer dogs (when available) focusing on an intensive search period over the initial six months of operation (must include the first spring/summer season) whilst animals habituate to the presence of the turbines. This is then followed by regular ongoing searches of all turbines for

a period of three to five years, and then ongoing based on the results of the searches. Triggers have been developed and committed to, which based on the results of the carcass searches, will ensure that mitigation strategies (scaled based on the severity of the trigger) are promptly implemented and will arrest the occurrence of any unacceptable events (i.e. strikes). Mitigation strategies include the ongoing opportunities for alternative actions to turbine curtailment such as audible and ultrasonic noise broadcasting to create avoidance behaviour, or the use of radar to induce turbine shutdowns, with such technologies expected to develop greatly over the life of the project.

SMART curtailment

'Blanket curtailment' approaches although often successful in reducing bat fatalities, also result in a reduced energy generation capacity and often coincide with periods of high electrical demand thus rendering them potentially unsustainable in the long-term for many wind generation operations.

In an attempt to reduce bat fatalities while optimizing energy production, more tailored strategies can be developed to increase the time during which turbines can continue operation and power production relative to blanket operational mitigation approaches. 'Smart curtailment' approaches are being developed that use and combine information about real-time bat activity and environmental information, such as weather conditions, in order to guide curtailment decisions based on real-time risks to bats. Smart curtailment provides wind energy facilities with a pathway for reducing bat fatalities whilst also reducing curtailment time when compared to blanket curtailment techniques thereby maximising energy production whilst minimising impacts to bats.

Studies trialling the approach overseas have achieved significant reductions in bat mortality without the need for blanket curtailment of turbines at lower wind speeds (Hayes et al. 2019). However, there are no comparable studies available for Australian wind farms. Furthermore, overseas studies have often been used in conjunction with automated bat call identification software, which is not currently available for Australian bat species. Automated identification allows bat calls to be identified to species level in real-time and in a consistent, repeatable and time-efficient way.

Recent technological advances have seen the release of smart curtailment systems that are considered applicable to the project. For example, the SMART (Song Meter with Analysis and Remote Transfer) system by Wildlife Acoustics, allows ultrasonic detectors to be mounted to the nacelles of turbines and files containing probable bat call information to be transmitted in real-time via modems and the cellular network to a database system where the information can then be analysed. The SMART system allows for user defined alarms which match bat call parameters that can be directly input into curtailment decision-making processes in real-time. Technology such as the SMART system provides real potential for a tailored curtailment approach for the project that would provide operational flexibility in allowing turbines to continue producing energy when they might otherwise be curtailed based only on wind speed information.

When the smart curtailment acoustic monitoring system is engaged, real-time monitoring of microbat activity would allow turbines to be curtailed when bat activity reaches a pre-determined threshold. The SMART curtailment acoustic monitoring system can also be switched off when wind speeds reach thresholds above which bat activity (and therefore collision risk) are considered to be negligible. Under these circumstances, electricity generation would proceed without intervention until wind speeds fall below the pre-determined threshold. This approach has been the subject of a study by Hayes et al (2019) that found implementing a similar acoustic monitoring and remote curtailment system when wind speeds were below 7.9 m/s, without the use of blanket low wind speed curtailments, reduced bat fatalities by 85 %.

Technologies such as the SMART system will be included in the BBAMP as possible mitigation strategies available to the operational project if an unacceptable level of impacts to bats was found to be occurring.

Automated avian detection systems

Technology related to smart curtailment systems for birds are also advancing at a rapid rate. Automated avian detection systems allow for detection of bird species and the triggering of curtailment of select turbines. The IdentiFlight avian detection system (IDF) was designed in the USA specifically to reduce Golden Eagle mortalities on wind farms, with testing suggesting that use of the system has achieved an 85 percent reduction in eagle fatalities at a wind farm site in Wyoming, USA (McClure et al. 2022).

The IDF system combines high-precision optical technology with artificial intelligence to detect raptors and other protected bird species within a 1 kilometre range. The IDF System tracks the movement of objects within its range, and quickly determines whether any objects are birds, and can learn to recognise key species of interest such as eagles. If a bird of interest is identified, the system begins to track the target, recording its position, predictive trajectory, and course probability relative to turbines in real time. Curtailment conditions are pre-determined, and if the target is predicted to cross into the rotor swept area of a turbine, the IDF Base Station issues a signal to the wind farm SCADA (supervisory control and data acquisition) system, which sends control signals to curtail relevant turbines to avert any collision. The system provides the visual and quantitative data needed to reduce or avoid collisions, but does not detect or document the collisions *per se*. This requires a carcass monitoring program, which is detailed above.

Unlike radar and other technological approaches to automated curtailment for birds, what distinguishes the IDF system is its ability to recognise different species and make curtailment decisions based on target species. Assessment of the effectiveness of the IDF system in Australia, at the Cattle Hill Wind Farm in Tasmania (Goldwind 2022), concluded that IDF significantly reduced eagle collisions at the site. Furthermore, the data collected from the IDF system has provided detailed monitoring information on avifauna activity, and valuable insights into the understanding of eagle behaviours. The volume and quality of information captured by IDF is considered far more comprehensive than what is possible using traditional bird survey methods conducted by human observers.

For the IDF system to work accurately, it requires a large volume of bird images to be collected and classified to build a convolutional neural network that allows the system to recognise target species accurately, and minimise false triggers. It is therefore not suitable as a reactive management approach, but a means of pre-emptively reducing any potential mortality events. If installed early in the construction phase of the project, by the time wind farm operations commence IDF is likely to have captured enough data to be able to recognize target species such as Wedge-tailed Eagle with a high level of confidence, and may also be able to group other bird species that have similar morphological characteristics based on their wingspan and dimensional data. The IDF curtailment prescription relevant to the site could also be adjusted as additional knowledge of eagle populations utilising the site is gained through the IDF system.

The commissioning stage is also likely to be the highest collision risk period for eagles, being the first time they will encounter the operational turbines, therefore having the IDF system (or its more advanced equivalent) tested and validated as fully operational by the time operations commence is almost certainly going to reduce future mortalities.

The effectiveness of the system is likely to vary between sites and performance will be dependent on site topography, vegetation, wind farm layout and the number of IDF towers able to be accommodated within the wind farm footprint. A detailed implementation plan would need to be developed to ensure that the system could work effectively for the project.

IDF is far from the only new and emerging technology available to operational wind farms to reduce potential bird and bat collisions. A recent peer-reviewed paper published by Orsted (an offshore wind energy developer) and DHI (a water software development and engineering firm) provides a catalogue and assessment of available monitoring technologies for flying birds and bats at offshore wind farms in operation, with a focus on managing the risk of collision (Skov et al. 2023). Whilst the focus of the paper relates to offshore wind farms, the technologies reviewed have application potential onshore, and for the project. The assessment includes a comparison of the multiple applications for the following technologies:

- Radar (2D and 3D).
- Digital camera.
- Accelerometer.
- Acoustic equipment.
- Large-scale survey platform and large-scale telemetry.

		Implementation			Density		Species				Avoidance			Collision	
Type	Equipment	Retrofit	Installation Complexity	Cost of equipment	Flux outside OWF[1]	Flux inside OWF[1]	Distribution and behaviour	Species id	Flight speed	Flight height	Macro avoidance	Meso avoidance	Micro avoidance	Collision rate	Shutdown
Radar	3D Radar[2]	●	▼	▼	▲▲	▲▲	▲	▼	▲▲	▲▲	▲▲	▲▲	▼	▼	▲
	2D Radar[2]	●	▼	●	▲▲	▲▲	▲	▼	▲▲	-	▲▲	▲▲	▼	▼	▲
	Radar coupled to camera[2]	●	▼	▼	▲▲	▲▲	▲▲	▲▲	▲▲	▲▲	▲▲	▲▲	▲▲	▲▲	▲▲
	Radar with fixed antenna[2]	●	●	●	●	●	▼	▲	●	-	▲	▲	▼	▼	●
Camera	Fixed camera[2]	▲	▲	▲	-	-	▼	▲	▼	-	▼	▼	▲▲	▲▲	●
	Dome with multiple fixed cameras	●	●	▼	-	-	▲▲	▲▲	▼	-	▼	▼	▲▲	▲▲	●
	Moving camera	▲	▲	●	-	-	▲▲	▲▲	▼	-	▼	▼	▲▲	▲▲	●
Other	Accelerometer as single sensor	▼	▼	▼	-	-	-	-	-	-	-	-	-	●	-
	Accelerometer coupled to camera	▼	▼	▼	-	-	-	-	-	-	-	-	-	▲	-
	Microphone[2]	▲	▲	▲▲	-	-	-	▲▲	-	-	-	-	-	-	●
Survey Platform	Ship-based surveys	-	-	▼	●	●	▲	▲▲	-	▲▲	▲▲	●	▼	▼	▼
	Aerial visual surveys	-	-	▼	▼	▼	●	▲▲	-	▲▲	▲▲	●	▼	▼	▼
	Aerial digital surveys	-	-	▼	▼	▼	●	▲▲	-	▲▲	▲▲	●	▼	▼	▼
	UAV/drone surveys	-	-	▼	▼	▼	●	▲▲	-	▲▲	▲▲	●	▼	▼	▼
Telemetry	Radio transmitters	▼	▼	●	▼	▼	▲▲	▲▲	▲▲	▲▲	▲▲	●	▼	▼	▼
	Satellite transmitters	▼	▼	●	▼	▼	▲▲	▲▲	▲▲	▲▲	▲▲	●	▼	▼	▼
	Archival tags	▼	▼	●	▼	▼	▲▲	▲▲	▲▲	▲▲	▲▲	▼	▼	▼	▼
	Acoustic telemetry	▼	▼	●	▼	▼	▲▲	▲▲	▲▲	-	●	▼	▼	▼	▼

Very good	▲▲
Good	▲
Average	●
Bad	▼
Not Available	-

Plate 1 **Scoring system applied in the assessment of monitoring technologies (Skov et al. 2023)**

Plate 1 provides an overview of the results of the comparison and provides insight into the suitability of the various technologies available depending on the desired application and mitigation requirements. The paper goes on to recommend the combination of technologies that best meet the aims of the mitigation. For example, if the mitigation objective were to shut down a turbine to prevent collision with a certain highly at-risk species, Skov et al (2023) recommend the following (Plate 2).

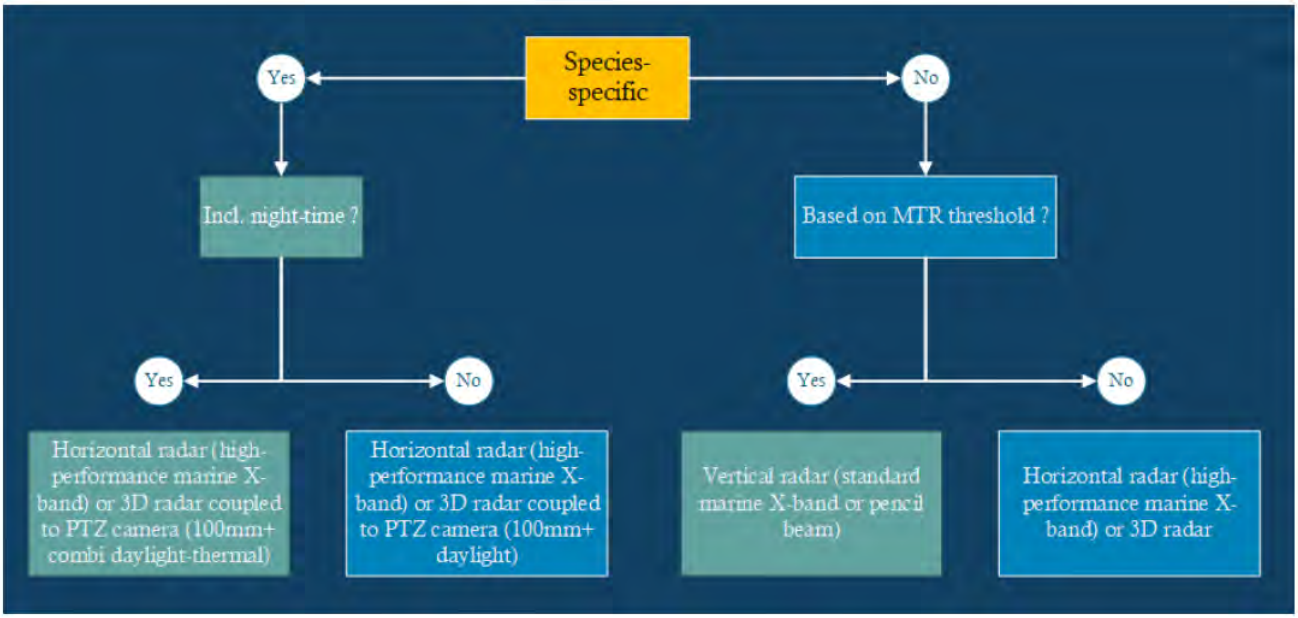


Plate 2 **Recommended solution for turbine shutdowns (MTR is migration traffic rate, and relates to birds flying per hour, per kilometre).**

The applicability and use of automated detection systems for the project requires further critical assessment, which will be undertaken during the finalisation of the BBAMP. However, assuming the site is suitable for installation of such technologies, automated detection systems may be a valuable method to avoid potential collisions for at-risk species. The effectiveness of any installed automated system would be monitored using carcass search methods as detailed above.

Further effective mitigation strategies that will be considered further as part of the BBAMP include pest animal control to reduce the occurrence of foxes, cats and dogs, likely to scavenge microbat carcasses, potentially skewing the results of searches, establishment of lighting systems that reduce insect (prey) attraction, and annual reporting requiring accounting for all events over the preceding 12 months and reinvestigation of the effectiveness of the current mitigation strategy. In the event of trigger level investigations being required, the Applicant has committed to increased carcass searches to determine the actual severity of the event, potential temporary turbine shutdowns (while the investigation is underway), re-assessment of existing low-wind speed curtailment strategy, and ultimately greater curtailment of turbines if unacceptable events are found to be re-occurring.

The Applicant is prepared to work with authorities to share data and continue to contribute to the growing body of literature around bird and bat collisions at operational wind farms. Operational monitoring and adaptive management will ensure that any unacceptable events that may occur are captured and mitigated, thus providing an ongoing feedback loop to further reduce the potential for the project to result in substantial operational impacts to bird and bat species and populations.

Seasonal curtailment

A key strategy to minimise the potential for at-risk waterbird and other nomadic species, such as Australasian Bittern, to collide with operational turbine blades is the implementation of increased monitoring during rare flood events.

Flooding events, such as that observed within 2022, may occur every 5 - 7 years, and it is possible that habitat provided by larger ephemeral creeklines and waterbodies may increase in area such that suitable habitat for at-risk waterbirds occurs in close proximity to operational turbines. Across the lifespan of the project currently, it is anticipated that these events could occur up to three times. During these events, it is proposed to;

- Increase monitoring of turbines within 500m of ephemeral waterbodies and creek lines during flooding events.
- Turbines may be curtailed to reduce the risk of turbine collision when suitable habitat occurs within 500m of a blade tip of a turbine during the flooding event.
- End of curtailment would be determined via field survey confirmation that birdlife and habitat value had reduced significantly enough back to pre-flood conditions for operation of the turbines to not increase collision risk for at risk species.

Finalisation of the BBAMP will include details of catchment-scale flood event monitoring requirements that would trigger additional monitoring of habitats in proximity to the project.

Residual prescribed impacts and compensatory measures

Following implementation of required mitigation, additional offset requirements for prescribed impacts may be required to offset residual impacts in accordance with the BAM. This may be achieved via the retiring of credits or payment to the Biodiversity Conservation Fund. The amount of credits required to be offset would be calculated by the number of actual and modelled impacts, accounting for scavenger impacts, to individual species in a given year, multiplied by the biodiversity risk weighting (BRW) for the relevant species. This method is commensurate with Equation 3 (Section 10.1.3) of the BAM for calculating species credit requirements for flora species assessed by a count of the number of individuals, which is aligned with the calculation of offsets required for impacts to individual bird and bat strikes. This method also captures the relevance of a current threatened listing for a species, and is in accordance with the expectations of BAM implementation for prescribed impacts (Section 8.6 of the BAM).

Where an unacceptable impact to a non-threatened 'at risk' species is encountered or estimated, following mitigation, then a like for like risk weighting may be applied from a similar threatened species i.e. – Wedge-tailed Eagle to Little Eagle, following consultation with NSW DCCEEW. Any credit generation required to offset residual prescribed impacts would be calculated during the annual reporting, which will also demonstrate that credits required for the preceding 12 months have been retired under the BOS.

Monitoring and adaptive management triggers for barrier effect impacts

Whilst the focus of the above section is on mitigation of the impacts associated with collision risk, it is acknowledged that there remains some potential for impacts associated with barrier effects for threatened and/or at-risk species. During operational monitoring, if there is a noted discernible statistical reduction or anomaly in abundance of an at-risk or threatened species, additional investigations into possible causes would occur. If it is determined that the operational wind farm was a key factor, additional assessments against key relevant Test of Significance criteria or Significant Impact Criteria would be used to quantify or

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measure the level of impact. If these assessments determined that an event resulting from barrier effects warranted additional mitigation, compensatory measures or species specific offsetting, these would be employed. This detail and decision framework is to be provided within the finalised BBAMP.

9.1.3. Mitigation cost estimates for significant impacts and management plans

Costs of mitigation as result of significant impacts from the project will be included in the BMP once final designs are known and post approval.

10. Impact summary

10.1. Direct and indirect impact to biodiversity values

The project is expected to impact upon the following biodiversity values:

- Nine native PCTs mapped as 17 separate vegetation zones, and 16 scattered paddock trees.
- Two BC Act listed TECs – Weeping Myall woodland and Sandhill Pine Woodland.
- Two EPBC Act listed TEC – Weeping Myall woodland and Natural grasslands of the Murray Valley Plains
- Assumed habitat for threatened flora and Grey Snake species credit species.
- Small impacts to habitat for recorded threatened *Swainsona* species, *Swainsona murrayana* and *Swainsona sericea*.
- Small linear impacts and minor fragmentation of important mapped areas for Plains wanderer, in conjunction with impacts to potential future habitat within dynamic grassland communities.
- Known forage and assumed breeding habitat for two fauna species credit species – Superb Parrot and Southern Bell Frog.
- Known and predicted habitat for a range of fauna ecosystem credit species.
- 30 species of bird and bat considered at risk of operational impact mainly associated with turbine strike.

As detailed in the above section of this BDAR, the Applicant has undertaken significant efforts to avoid and minimise impacts to all biodiversity values present within the subject land, and the residual impacts to the above listed biodiversity values will continue to be minimised, mitigated and offset through the duration of the project.

No direct or indirect impacts are expected to occur as a result of the project to the Oolambeyan National Park or the South West Woodland Nature Reserve.

10.2. Serious and irreversible impacts

In accordance with Clause 6.7 of the BC Regulation an impact is to be regarded as serious and irreversible if it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct because:

(a) Principle 1: It will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline.
(b) Principle 2: It will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size.
(c) Principle 3: It is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution.

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(d) Principal 4: The impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.

Three species considered to meet the above principles, two of which may be impacted by the project:

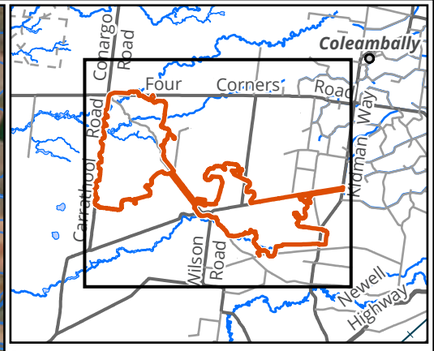
- Plains Wanderer *Pedionomus torquatus.*
- Claypan Daisy *Brachyscome muelleroides.*

Detailed SAII assessment is provided in Appendix 5. A summary of the results of the SAII is provide below in Table 88.

Table 88 SAII Summary

SAII entity	Summary of assessment
Claypan Daisy *Brachyscome muelleroides*	*Brachyscome muelleroides* has been surveyed for throughout the development footprint in September and November 2022, 2023 and 2024 and has not been recorded. Limited spatial gaps in survey effort do occur in areas based on more recent design refinements, as well as flooding impacts, and will be subject to further survey in September and November 2025. However, overall, the amount of survey undertaken is representative to the size and requirements of each vegetation zone where habitat for this species is present. It is considered highly unlikely, given survey effort of microhabitats undertaken to date, that species will be recorded within the development footprint. Due to survey gaps, up to 35.62 ha of habitat is assumed present, but this considered to be very precautionary and inflated, based on the gaps occurring in similar habitat that has been surveyed, with no records to date. In terms of avoidance, detailed constraints assessment modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat, were avoided as much as possible. This includes areas within the development corridor considered potential habitat including within seasonally damp situations such as shallow depression sand around the margins of swamps, lagoons and claypans, on heavy grey cracking clays to lighter clay loam soils, in grassland and grassy woodland. This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. This species prefers seasonally moist grey gilgaied soils on the floodplains within PCTs such as PCT 45 and PCT 46, which occur within the development corridor. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 8.2, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.
Bindweed *Convolvulus tedmoorei*	*Convolvulus tedmoorei* has been surveyed for throughout the development footprint despite being impacted by flooding in spring 2022, with surveys conducted in September 2022, 2023 and 2024, as well as July 2025, and has not been recorded. No records have been observed, and no known records occur within the broader locality. It is considered highly unlikely, given survey effort of microhabitats undertaken to date, that species will be present within the development footprint. No further detailed assessment is required givens surveys did not record this species. In terms of avoidance, detailed constraints assessment modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat, were avoided as much as possible. This includes areas of grey clay soils as far as practicable. This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. This species prefers grey clay soils on the floodplains of the Darling and Murrumbidgee Rivers within PCTs such as PCT 17, PCT 24, PCT 26, PCT 45 and PCT 46, which all within the development corridor. Although not considered present, indirect impacts to areas of suitable habitat will be managed through mitigation measures which are outlined in Section 8.2, which includes but not limited

SAII entity	Summary of assessment
	to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.
Plains Wanderer ***Pedionomus torquatus***	Throughout the development of the project layout, design decisions have been implemented to avoid impacts to Plains Wanderer habitat from a very early stage. This includes the avoidance of areas of Important Mapped Habitat as far as practicable, and restricting development to only 2.38 ha of the important mapped area. In total, there is 645 ha of important mapped area in the subject land, and 11.8 hectares within the development corridor. In total, the development footprint equates to 0.36% and the development corridor equates to 1.8% of the total area of mapped important habitat within the subject land. All of the 2.38 ha of direct impact relates to road upgrades and transmission line infrastructure proposed along Goolgumbla Road, an existing public road, or upgrades to existing farm access tracks that intersect with mapped important habitat. Due to the dynamic nature of the grasslands critical to this species, areas within the subject land may be suitable for this species in the future, however, the most optimal areas have been avoided within the development footprint as far as practicable. Supplementary surveys undertaken in April 2023 did not detect this species, however, one individual was incidentally recorded when flushed from habitat within the northwest of the subject land. A 300m exclusion zone has been implemented within this area. Based on extent of occurrence, the area of occupancy and carrying capacity, the overall subject land could potentially support 4 pairs of birds. Additional surveys for Plains Wanderer focused on identifying grasslands outside of NSW DCCEEW Mapped Important Areas that nonetheless contained similar structural characteristics to these areas. At the time of surveys (April 2023), limited areas of the grasslands observed were considered optimal within the development corridor, including the nearby Mapped Important Areas, where minimal areas contained optimal habitat structure. This is considered an effect of the dynamic nature of Riverine grasslands responding to above average rainfall conditions and flood events in Spring 2022, which created above average grass coverage generally through the broader locality. Indirect impacts associated with disruption or abiotic process, the loss of functionally important species, and/or exacerbation of fragmentation and isolation are considered unlikely to be substantial as a result of the project.



Legend

- Subject land
- Development corridor
- Development footprint
- Assessment area
- Plains-wanderer important habitat

Threatened fauna species records (Biosis)

- Plains-wanderer - *Pedionomus torquatus*

Threatened flora species polygon

- *Brachyscome muelleroides*

Figure 21 Serious and irreversible impacts (SAII) - Overview

0 1 2 3 4 5

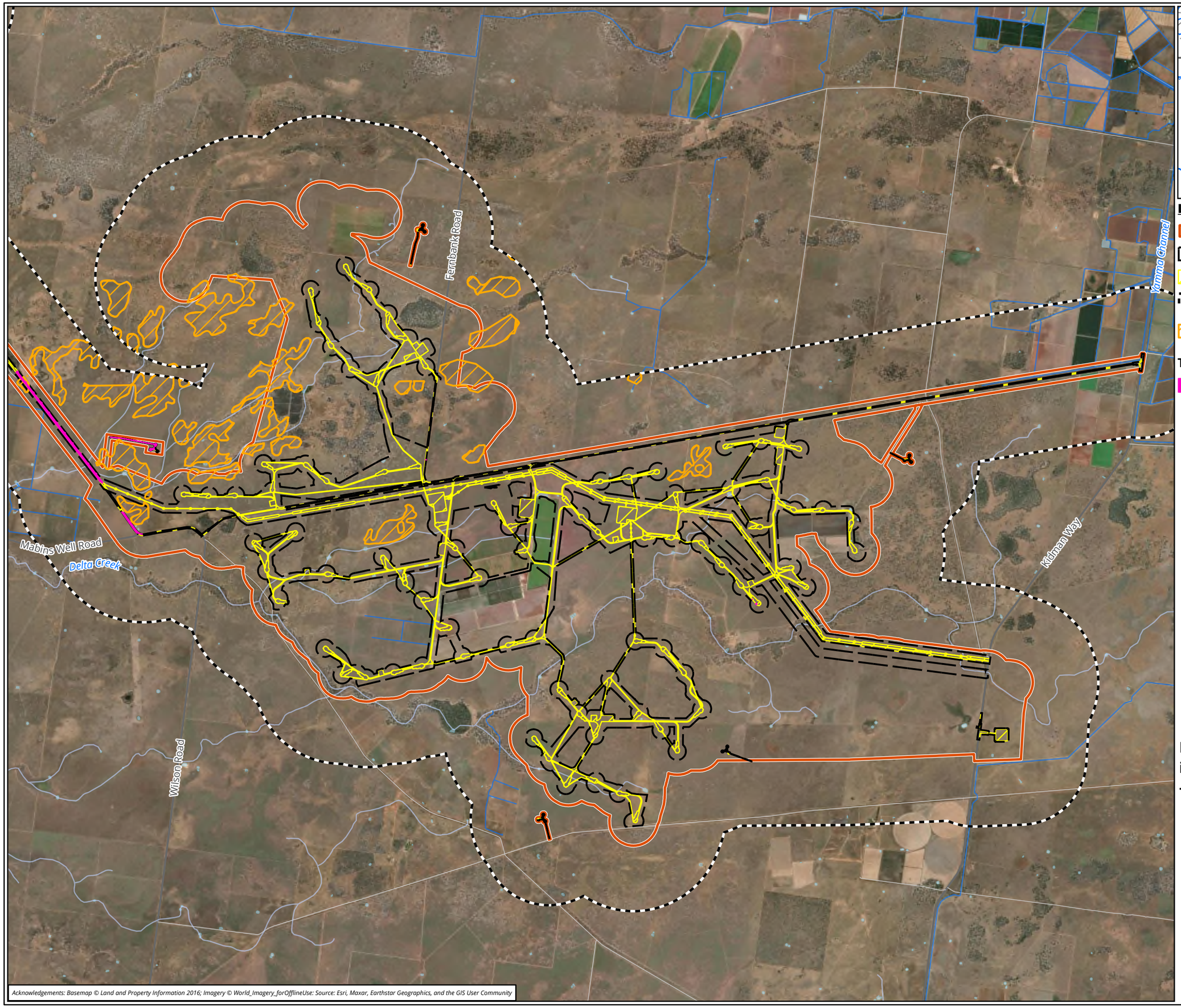
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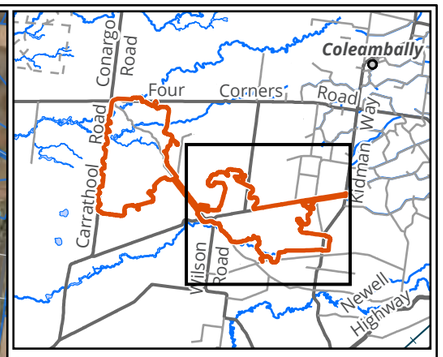
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Layout: 37263_Wind_F21_SAII

Acknowledgements: Basemap © Land and Property Information 2016; Imagery © World_Imagery_forOfflineUse: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community





Legend

- Subject land
- Development corridor
- Development footprint
- Assessment area
- Plains-wanderer important habitat

Threatened flora species polygon

- *Brachyscome muelleroides*

Figure 21 Serious and irreversible impacts (SAII) - Eastern area

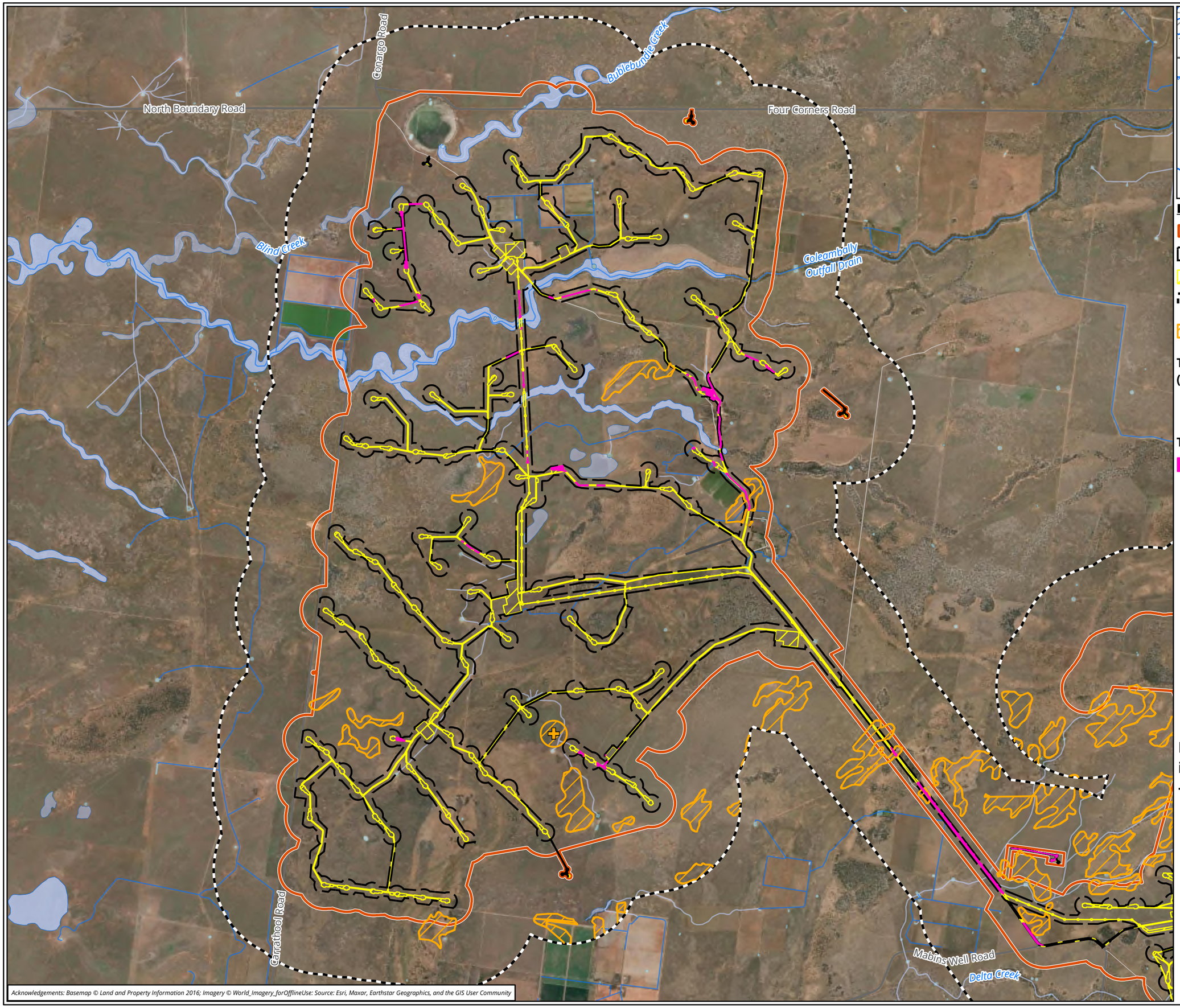
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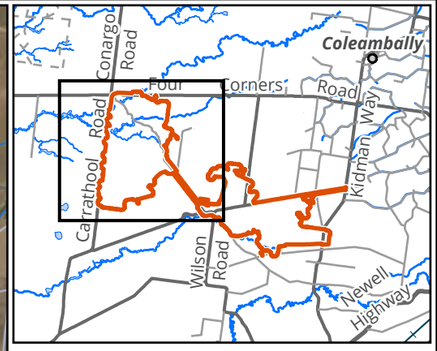
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Layout: 37263_Wind_F21_SAII





Legend

- Subject land
- Development corridor
- Development footprint
- Assessment area
- Plains-wanderer important habitat

Threatened fauna species records (Biosis)

- Plains-wanderer - *Pedionomus torquatus*

Threatened flora species polygon

- *Brachyscome muelleroides*

Figure 21 Serious and irreversible impacts (SAII) - Western area

0 1 2 3

Kilometers
Scale: 1:80,000 @ A3
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Layout: 37263_Wind_F21_SAII

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10.3. Identification of impacts requiring offset, not requiring offset and areas not requiring assessment

The following section provides information on the project's impacts requiring offset, not requiring offset and areas not requiring assessment. Each category is displayed on Figure 22.

10.3.1. Impact requiring offset

Impacts to native vegetation (ecosystem credits)

As outlined in Section 9.2.1 of the BAM, the assessor must determine an offset for all impacts of proposals on PCTs that are associated with a vegetation zone that has a vegetation integrity score of:

- ≥15, where the PCT is representative of an EEC or a CEEC.
- ≥17, where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community.
- ≥20, where the PCT does not represent a TEC and is not associated with threatened species habitat.

The offset requirement for the project was calculated using the BAM Calculator. Table 89 provides a summary of the ecosystem credit offsets required for impacts from the project.

Table 89 Offsets required (ecosystem credits) – Total development footprint, as per Bam-C

Vegetation zone	Impact (ha)	VI score	TEC	HBTs	Credit requirement
PCT 10_moderate	0.19	29.2	No	Yes	2
PCT 13_moderate	3.6	70.6	No	Yes	110
PCT 13_thinned	7.9	69.2	No	Yes	238
PCT 15_moderate	2.5	75.7	No	Yes	84
PCT 15_thinned	1.1	67.1	No	Yes	32
PCT 17_mod_good	0.76	84.2	No	No	28
PCT 17_moderate	1.3	83.5	No	No	46
PCT 26_DNG	342.3	20.3	No	No	3,475
PCT 26_intact	116.8	67.1	Weeping Myall Woodland	No	3,917
PCT 26_sparse	341	46.2	Weeping Myall Woodland	No	7,890
PCT 28_low	47.8	57.1	Sandhill Pine woodland	Yes	1,364
PCT 28_moderate	1.1	73.8	Sandhill Pine woodland	Yes	41
PCT 45_mod_good	2.24	65.1	Natural grasslands of Murray Valley Plains (EPBC Only)	No	91

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Vegetation zone	Impact (ha)	VI score	TEC	HBTs	Credit requirement
PCT 45_Intersection	0.83	100	Natural grasslands of Murray Valley Plains (EPBC Only)	No	52
PCT 46_moderate	73.4	90.6	Natural grasslands of Murray Valley Plains (EPBC Only)	No	4,158
PCT 46_Intersection	100	0.34	Natural grasslands of Murray Valley Plains (EPBC Only)	No	21
PCT 160_mod_good	5	79	No	No	147
					21,696

Impacts to threatened species and their habitat

As outlined in Section 9.2.2 of the BAM, an offset is also required for the impacts of the project on the habitat of species credit species. Table 90 provides a summary of the species credit offsets required for impacts from the project.

Table 90 Offsets required (species credits)

Species	Impact	Vegetation zone	Area (ha)	Biodiversity risk weighting	Credit requirement
Swainsona murrayana	Direct Assumed	PCT 15 moderate PCT 15 thinned PCT 26 DNG PCT 26 intact PCT 26 sparse PCT 28 low PCT 28 moderate PCT 45 mod_good PCT 45 Intersection PCT 46 moderate PCT 46 Intersection	2.60 Known 391.37 Assumed	2	9,121
Swainsona sericea	Direct Assumed	PCT 15 moderate PCT 15 thinned PCT 26 DNG PCT 26 intact PCT 26 sparse PCT 28 low PCT 28 moderate PCT 45 mod_good PCT 45 Intersection PCT 46 moderate PCT 46 Intersection	2.60 Known 391.37 Assumed	2	9,121

Species	Impact	Vegetation zone	Area (ha)	Biodiversity risk weighting	Credit requirement
Austrostipa wakoolica	Assumed	PCT 17_Mod_Good PCT 17_Moderate PCT 26 DNG PCT 26 intact PCT 26 sparse	16.41	2	322
Brachyscome muelleroides	Assumed	PCT 45 mod_good PCT 45 Intersection PCT 46 moderate PCT 46 Intersection	35.62	3	2,428
Brachyscome papillosa	Assumed	PCT 13 moderate PCT 13 thinned PCT 15 moderate PCT 15 thinned PCT 45 mod_good PCT 45 Intersection PCT 46 moderate PCT 46 Intersection	44.42	2	1,930
Lepidium monoplocoides	Assumed	PCT 10 moderate PCT 13 moderate PCT 13 thinned PCT 15 moderate- PCT 15 thinned PCT 26 DNG PCT 26 Intact PCT 26 sparse	212.44	2	3,985
Leptorhynchos orientalis	Assumed	PCT 26 DNG PCT 26 Intact PCT 26 sparse PCT 45 mod_good PCT 45 Intersection PCT 46 moderate PCT 46 Intersection	205.52	2	5,285
Maireana cheelii	Assumed	PCT 26 DNG PCT 26 Intact PCT 26 sparse PCT 46 moderate PCT 46 Intersection	238.04	2	5,241
Pilularia novae-hollandiae	Assumed	PCT 13 moderate PCT 13 thinned PCT 15 moderate PCT 15 thinned	71.99	3	2,772

Species	Impact	Vegetation zone	Area (ha)	Biodiversity risk weighting	Credit requirement
		PCT 26 DNG PCT 26 Intact PCT 26 sparse PCT 45 mod_good PCT 45 Intersection PCT 46 moderate PCT 46 Intersection			
Sclerolaena napiformis	Assumed	PCT 26 DNG PCT 26 Intact PCT 26 sparse PCT 45 mod_good PCT 46 moderate PCT 46 Intersection	238.97	2	5,241
Swainsona plagiotropis	Assumed	PCT 26 DNG PCT 26 Intact PCT 26 sparse PCT 45 mod_good PCT 45 Intersection PCT 46 moderate PCT 46 Intersection	358.47	2	8,054
Grey Snake	Assumed	PCT 10 moderate PCT 13 moderate PCT 13 thinned PCT 15 moderate PCT 15 thinned PCT 17 mod_good PCT 17 moderate PCT 160 mod_good	22.35	2	815
Plains Wanderer	Direct	Important mapped area	2.38	3	125
Superb Parrot	Direct/ Prescribed	100m buffer of associated PCTs that contain suitable hollows PCT 10 moderate PCT 13 moderate PCT 13 thinned PCT 15 moderate PCT 15 thinned PCT 17 moderate PCT 26 DNG PCT 26 sparse PCT 26 intact	35.96	2	988

Species	Impact	Vegetation zone	Area (ha)	Biodiversity risk weighting	Credit requirement
		PCT 28 low PCT 28 moderate PCT 45 mod_good PCT 46 moderate PCT 160 mod_good			
Southern Bell Frog	Direct/ Prescribed	200m buffer of habitat and associated PCTs in accordance with relevant guidelines. PCT 13 moderate PCT 13 thinned PCT 15 thinned PCT 17 mod_good PCT 26 DNG PCT 26 sparse PCT 26 intact PCT 28 low PCT 45 mod_good PCT 45 Intersection PCT 46 moderate PCT 46 Intersection PCT 160 mod_good	82.88	2	1,946
Southern Myotis	Direct/ Prescribed	PCT 13 moderate PCT 13 thinned	2.41	2	83

Species polygons for the above species credit species impacted by the project are illustrated in Figure 22 below.

Impacts to scattered trees

Offsets are required for the clearing of Class 2 and Class 3 paddock trees.

Table 91 Offsets required (scattered trees)

PCT	Class	Contains hollows	No. of trees	Credit required
PCT 13 Black Box - Lignum woodland wetland	2	No	1	1
	3	Yes	2	2
PCT 26 Weeping Myall open woodland	2	No	13	7

PCT	Class	Contains hollows	No. of trees	Credit required
TOTAL				**10**

10.3.2. Impacts not requiring offset

As outlined in Section 9.2.1 of the BAM, offsets are not required for impacts to vegetation zones that have a vegetation integrity score of ≥17, where the PCT is associated with threatened species habitat (as represented by ecosystem credits) or represents a vulnerable ecological community.

Indirect impacts do not require offsetting and are subject to detailed mitigation and management to improve and maintain vegetation within criteria set in the BMP and BBAMP.

10.3.3. Impacts not requiring assessment

As outlined in Section 9.3 of the BAM, areas within the subject land that do not contain native vegetation do not need to be assessed for ecosystem credits. Areas of land mapped as Category 1 Exempt land under the LLS Act also do not require assessment under the BAM.

Areas of land that do not contain native vegetation must still be assessed for threatened species habitat and prescribed biodiversity impacts in accordance with the BAM.

The project will impact upon approximately 149.44 hectares of land that does not contain native vegetation, that occurs on Category 1 – Exempt land.

10.3.4. Staged offsetting

The development corridor and development footprint has been broken up into three stages to facilitate the staged retirement of the project's biodiversity credit liability. Spark Renewables will confirm the offset staging plan with DPHI prior to the commencement of construction. This is discussed further in Section 11.

Table 92 Offsets required (ecosystem credits) – Enabling Works

Vegetation zone	Impact (ha)	Credit requirement
Ecosystem credits		
PCT 26_DNG	191	191
PCT 26_intact	40	40
PCT 26_sparse	203	203
PCT 45_Intersection	52	52
PCT 46_Intersection	21	21
Total		507
Species credits		
Swainsona murrayana	9.58	195
Swainsona sericea	9.58	195
Austrostipa wakoolica	2.11	32

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Vegetation zone	Impact (ha)	Credit requirement
Brachyscome muelleroides	1.17	88
Brachyscome papillosa	1.17	59
Lepidium monoplocoides	4.43	79
Leptorhynchos orientalis	5.6	138
Maireana cheelii	4.77	96
Pilularia novae-hollandiae	3.28	99
Sclerolaena napiformis	4.77	96
Swainsona plagiotropis	9.58	195
Grey Snake	-	-
Plains-wanderer	-	-
Southern Bell Frog	5..17	92
Southern Myotis	-	-
Superb Parrot	-	-

Table 93 Offsets required (ecosystem credits) – Stage 1

Vegetation zone	Impact (ha)	Credit requirement
Ecosystem credits		
PCT 10_moderate	-	-
PCT 13_moderate	-	-
PCT 13_thinned	2.5	76
PCT 15_moderate	-	-
PCT 15_thinned	-	-
PCT 17_mod_good	0.3	12
PCT 17_moderate	0.5	18
PCT 26_DNG	107	1,085
PCT 26_intact	23	765
PCT 26_sparse	112	2,586
PCT 28_low	-	-
PCT 28_moderate	-	-
PCT 45_mod_good	2.2	91
PCT 45_Intersection	-	-
PCT 46_moderate	1.3	76
PCT 46_Intersection	-	-
PCT 160_mod_good	-	-
Total		4,709

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Vegetation zone	Impact (ha)	Credit requirement
Species credits		
Swainsona murrayana	58.26	1,160
Swainsona sericea	58.26	1,160
Austrostipa wakoolica	8.38	190
Brachyscome muelleroides	0.91	60
Brachyscome papillosa	1.13	49
Lepidium monoplocoides	43.72	810
Leptorhynchos orientalis	44.41	843
Maireana cheelii	44.36	841
Pilularia novae-hollandiae	9.25	225
Sclerolaena napiformis	44.36	841
Swainsona plagiotropis	57.66	1,155
Grey Snake	3.32	121
Plains-wanderer	-	-
Southern Bell Frog	28.23	546
Southern Myotis	-	-
Superb Parrot	4.7	125
Scattered trees		
PCT 13	Two trees	2
PCT 26	Two trees	1

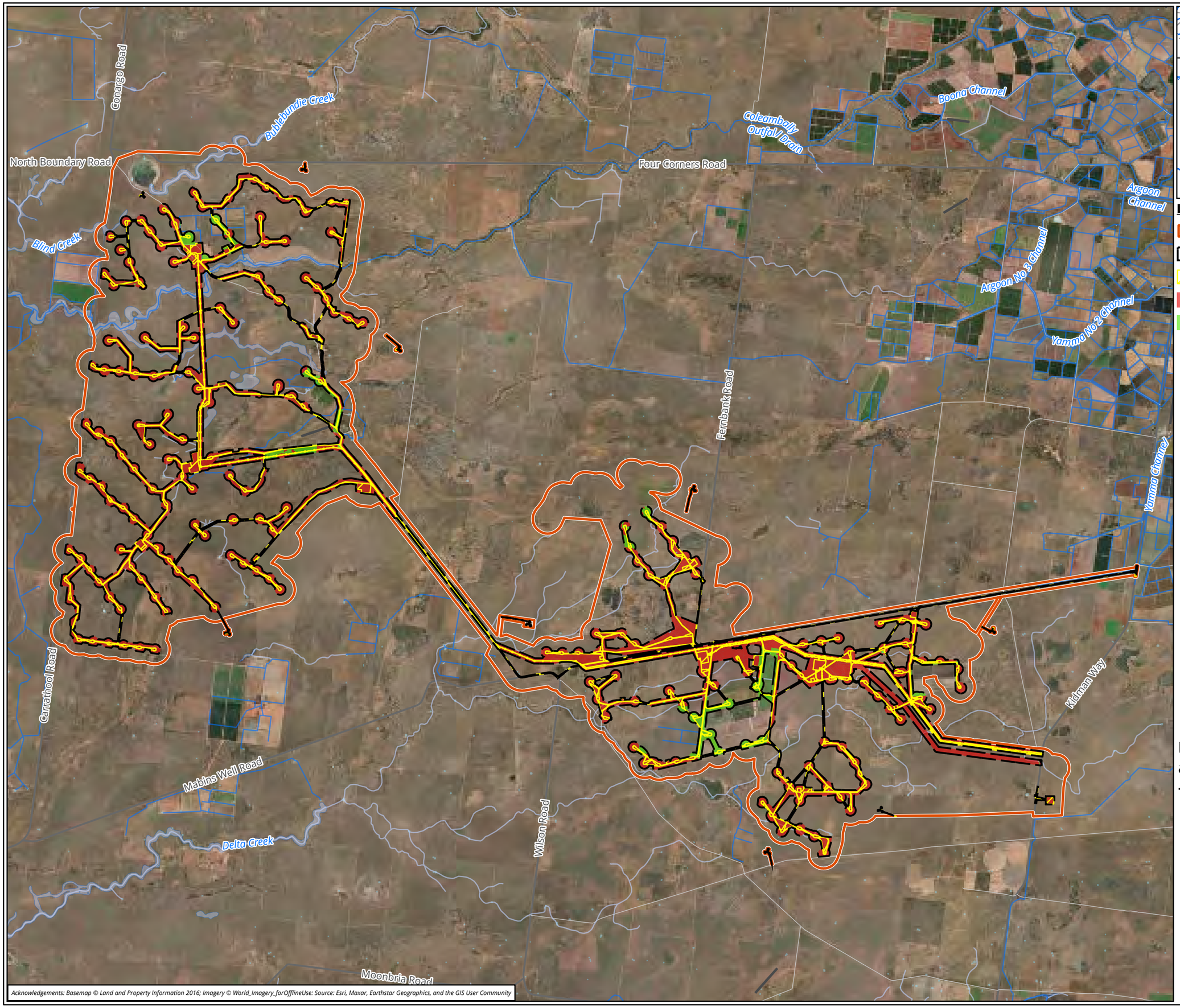
Table 94 Offsets required (ecosystem credits) – Stage 2

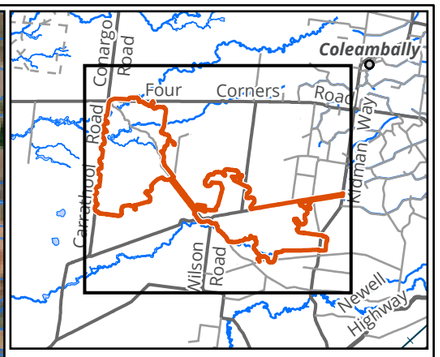
Vegetation zone	Impact (ha)	Credit requirement
Ecosystem credits		
PCT 10_moderate	0.2	2
PCT 13_moderate	3.6	110
PCT 13_thinned	5.4	162
PCT 15_moderate	2.5	84
PCT 15_thinned	1.1	32
PCT 17_mod_good	0.4	16
PCT 17_moderate	0.8	28
PCT 26_DNG	217	2,198
PCT 26_intact	93	3,113
PCT 26_sparse	221	5,100
PCT 28_low	48	1,364

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Vegetation zone	Impact (ha)	Credit requirement
PCT 28_moderate	1.1	41
PCT 45_mod_good	-	-
PCT 45_Intersection	-	-
PCT 46_moderate	72	4,083
PCT 46_Intersection	-	-
PCT 160_mod_good	5	147
Total		16,480
Species credits		
Swainsona murrayana	326.14	7,766
Swainsona sericea	326.14	7,766
Austrostipa wakoolica	5.85	97
Brachyscome muelleroides	33.60	2,279
Brachyscome papillosa	42.20	1,822
Lepidium monoplocoides	166.64	3,088
Leptorhynchos orientalis	188.80	4,304
Maireana cheelii	188.80	4,304
Pilularia novae-hollandiae	59.99	2,454
Sclerolaena napiformis	188.80	4,304
Swainsona plagiotropis	291.40	6,715
Grey Snake	18.99	693
Plains-wanderer	2.38	125
Southern Bell Frog	49.26	1,308
Southern Myotis	2.41	83
Superb Parrot	31.42	863
Scattered Trees		
PCT 13	One tree	1
PCT 26	11 trees	6

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Legend

- Subject land
- Development corridor
- Development footprint
- Impacts requiring offset
- Impacts not requiring offset

Figure 22 Impacts requiring and not requiring offsets - Overview

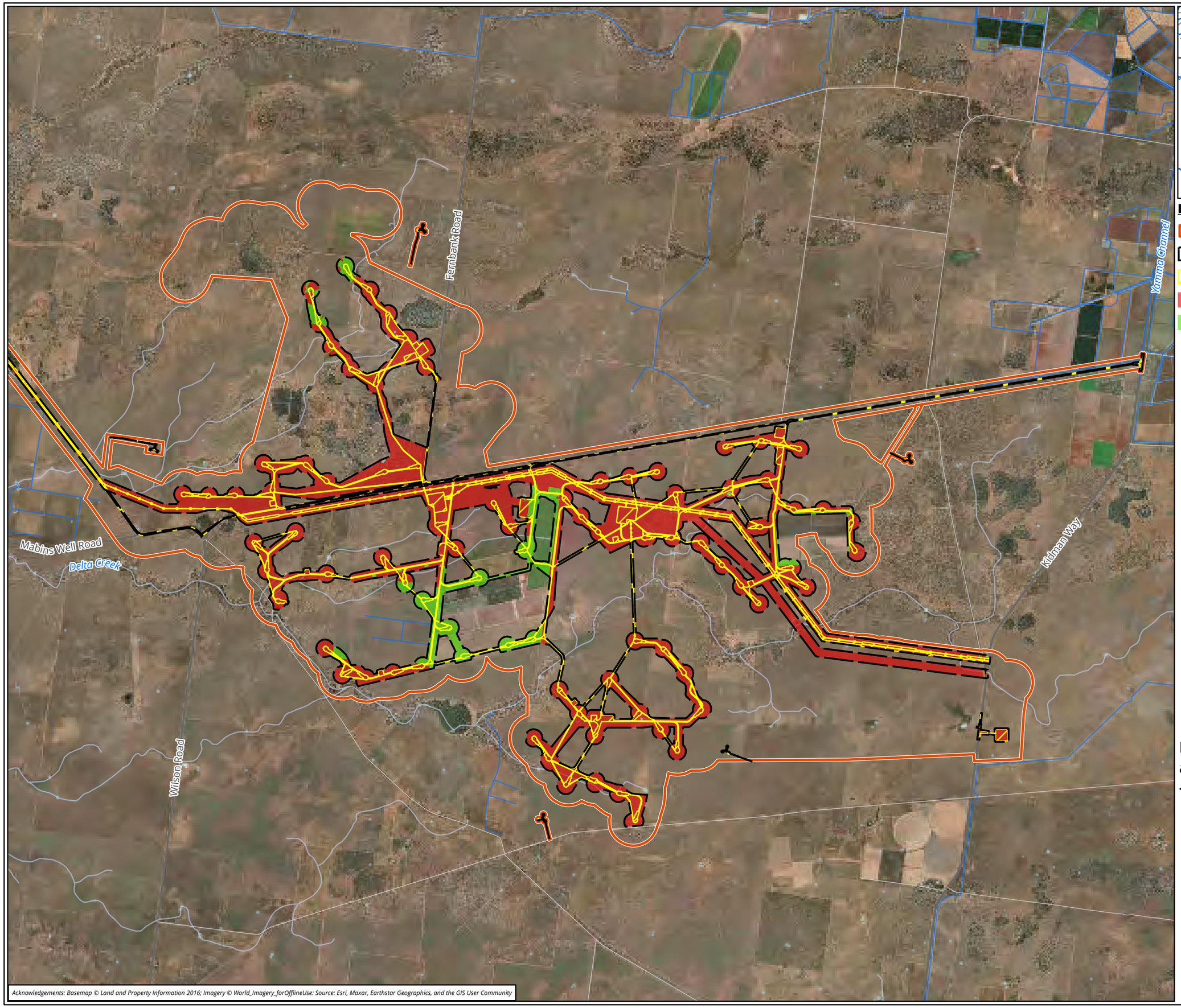
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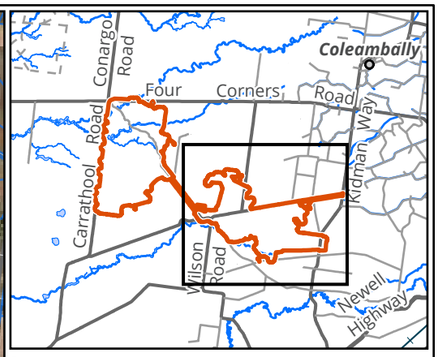
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Layout: 37263_Wind_F22_Offset





Legend

- Subject land
- Development corridor
- Development footprint
- Impacts requiring offset
- Impacts not requiring offset

Figure 22 Impacts requiring and not requiring offsets - Eastern area

0 1 2 3

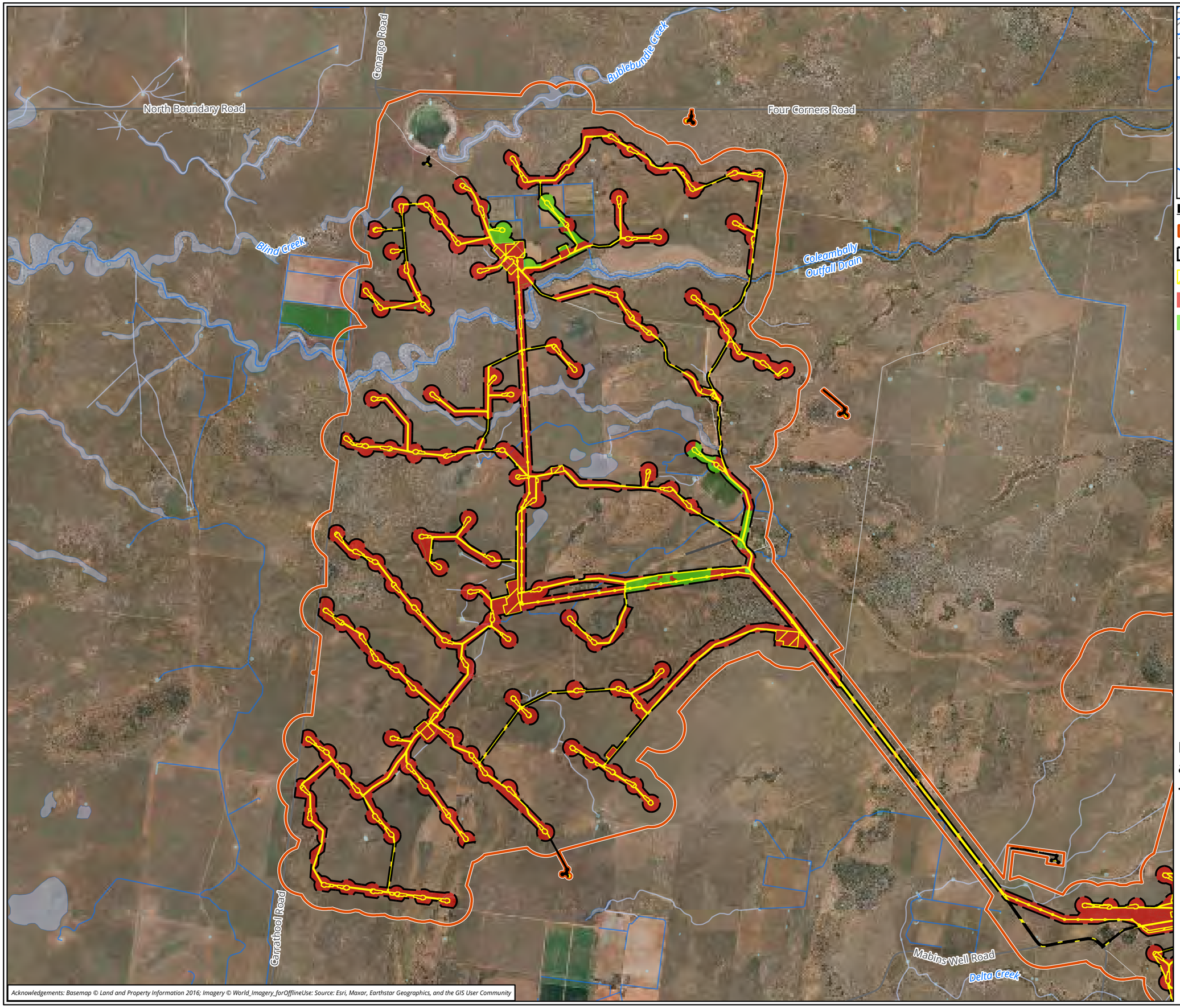
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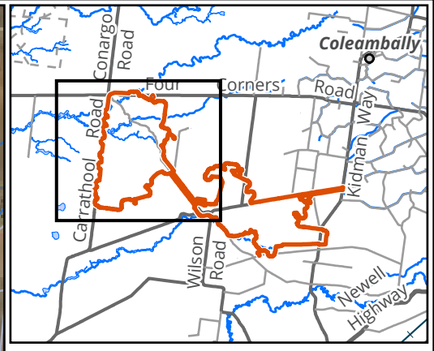
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Legend

- Subject land
- Development corridor
- Development footprint
- Impacts requiring offset
- Impacts not requiring offset

Figure 22 Impacts requiring and not requiring offsets - Western area

0 1 2 3

Kilometers
Scale: 1:80,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

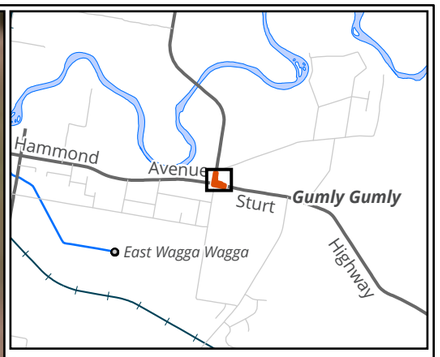
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Legend

- Subject land
- Development corridor
- Development footprint
- Impacts not requiring offset

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Figure 22 Impacts requiring and not requiring offsets - Sturt Highway/Eunony Bridge Road

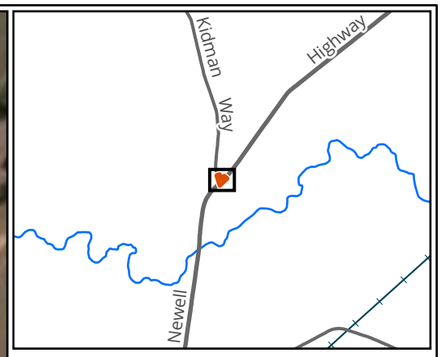
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Meters
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Layout: 37263_Wind_F22_Offset_P5-8





Legend

- Subject land
- Development corridor
- Development footprint
- Impacts not requiring offset

Figure 22 Impacts requiring and not requiring offsets - Newell Highway/Kidman Way

0 50

Meters
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Coordinate System:
GDA2020 MGA Zone 55

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Legend

- Subject land
- Development corridor
- Development footprint
- Impacts not requiring offset

Figure 22 Impacts requiring and not requiring offsets - Byrnes Road/West Bomen Road

0 50

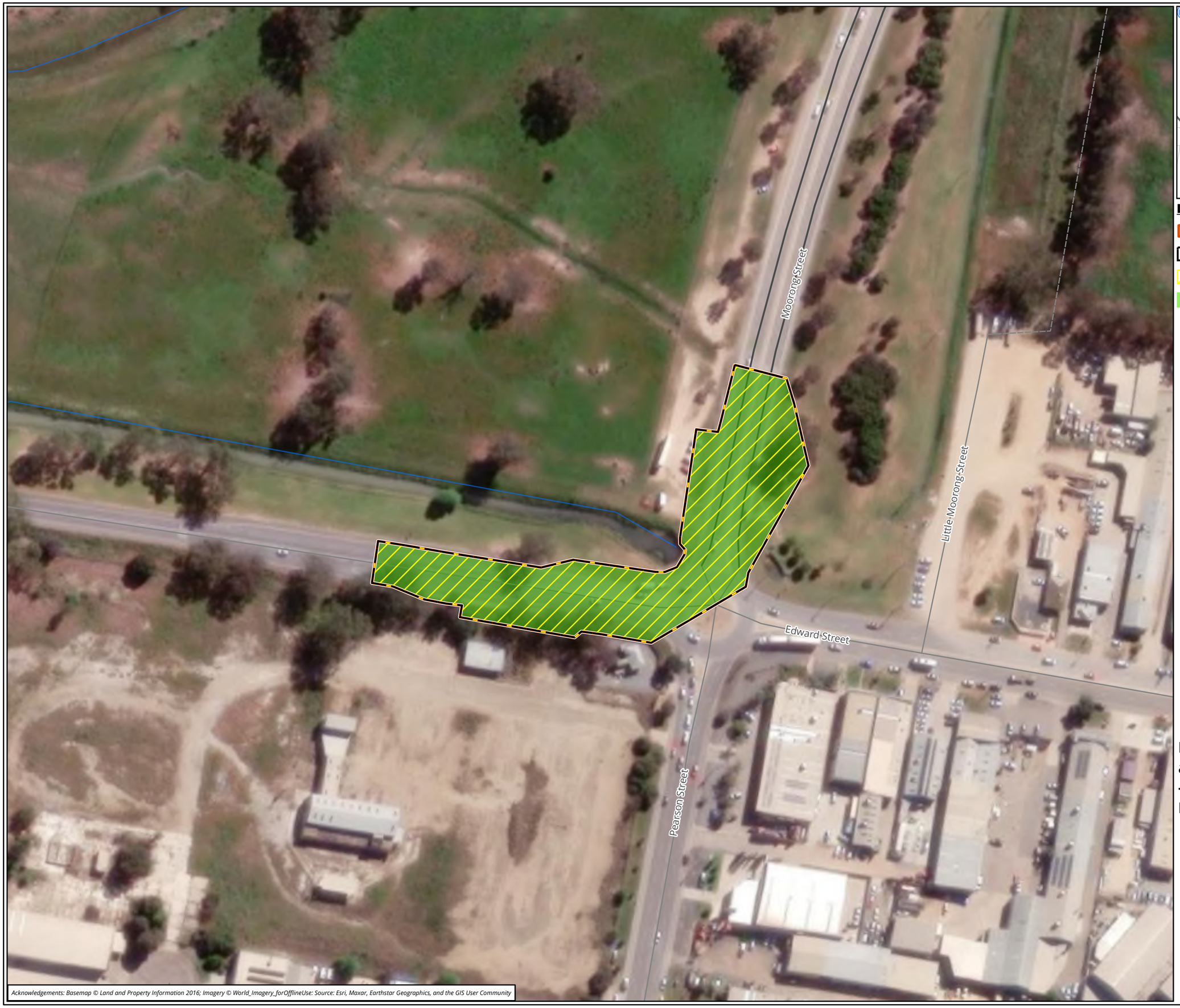
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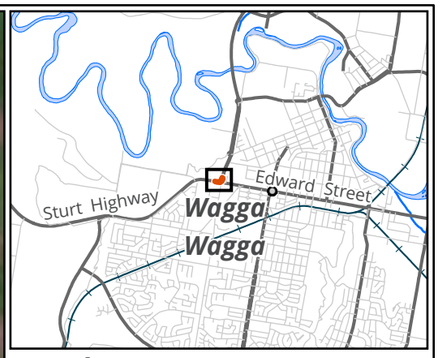
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Legend

- Subject land
- Development corridor
- Development footprint
- Impacts not requiring offset

Figure 22 Impacts requiring and not requiring offsets - Olympic Highway/Sturt Highway

0 50

Meters
Scale: 1:1,500 @ A3
Coordinate System:
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11. Biodiversity offset strategy

11.1. Overview

In order to secure the biodiversity offset liability expected to be required for the project's residual unavoidable impacts, Spark Renewables has commenced investigations into the establishment of local Biodiversity Stewardship Sites.

Five properties have been subject to desktop and on-ground assessment to determine their suitability for establishment of Biodiversity Stewardship Sites, and to generate offset credits suitable for the project's requirements, these properties are as follows:

- Offset area one – Approx. 4200 ha area to the north-west of the wind farm subject land.
- Offset area two – Approx. 2100 ha area to the north of the wind farm subject land.
- Offset area three – Approx. 1100 ha area to the north of the solar farm subject land.
- Offset area four – Approx. 3400 ha area to the south of the wind farm subject land.
- Offset area five – Approx. 950 ha area near the centre of the wind farm subject land.

Additionally, a sixth site is currently under early stage feasibility which is also located to the north of McLennons Bore Road and within local proximity to the subject land. Assessment is also being undertaken on areas excised and avoided within the Dinawan Solar Farm subject land, which contains highest quality habitats that have been avoided by that project.

11.2. Offsetting obligations and options

As outlined above in Table 89 through to Table 94, the project is expected to require offsets for residual unavoidable impacts and subsequent credit liabilities. The tables above demonstrate the total liabilities based on the development footprint as a whole, as well as total liabilities for Stage 1 and Stage 2.

Additionally, the Dinawan Wind Farm is under assessment in conjunction with the Dinawan Solar Farm, with credit liabilities generated for both. In order to adequately demonstrate the availability of credits in the currently assessed and potential stewardship sites, a total credit for both developments (including the revised development footprint for Dinawan Solar Farm), and credits potentially available is shown in Table 97. Additionally, a further summary is provided to demonstrate the residual credits and credits available at potential stewardship sites based on Stage 1 only for both Dinawan Wind Farm and Stage 1 and Stage 2 for the Dinawan Solar Farm.

To secure the above offset liability Spark Renewables has three broad options, which include:

- Payment to the Biodiversity Conservation Fund (the Fund) managed by the Biodiversity Conservation Trust (BCT).
- Purchase of credits from the open market.
- Establishment of a Biodiversity Stewardship Site(s) to generate credits for offsetting the project specifically.

Each of these options has some potential benefits and drawbacks, which are briefly outlined below.

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Option 1: Payment to the Biodiversity Offset Fund managed by the BCT

Satisfying an offset obligation by paying to the Biodiversity Offset Fund (the Fund) has the major benefit of being an expedited and unambiguous way for a proponent to meet their obligations. However, it does include increased costs associated with the 'Risk premium', and an administrative cost per credit added on top of the costs to source/generate the credits, calculated by the BCT. As such, Payment to the Fund is considered likely to be the most expensive option available to a proponent, however it requires the least amount time and effort in offset security, which can both be substantial (e.g., compared to establishing a Stewardship Site).

Option 2: Purchase credits from the open market

Biodiversity credits exist in an open market-based system whereby an owner of a Biodiversity Stewardship Site, who has generated a range of biodiversity credits, lists their credits in an online database for proponents with a credit obligation to interrogate and enter into price negotiations with relevant credit holders. As an open market, the price of credits is set by supply and demand factors as well as requirements for credits generated at a Biodiversity Stewardship Site to be sold for at least the minimum portion each credit contributes to the management costs of that site (Part A cost, further detailed below). Initial credit sales must all go to funding the management actions required to be undertaken at the Biodiversity Stewardship Site (the costing of which is termed the 'Total Fund Deposit' [TFD]), however once the TFD has been fully satisfied, any future credit sales are generally direct profit to the credit owner.

Potential benefits from procuring credits from the open market include a potential increase in offsetting options when applying the 'Like-for-Like' rules included in the BAM, and then further again with the 'Like for Like Variation Rules', as well as the ability to negotiate with sellers on price, potentially with multiple credit holders. Drawbacks include an ongoing general paucity of credits available on the market (which is particularly relevant to projects with large credit obligations), sellers setting a high price and being unwilling to negotiate, timeframes associated with negotiations, timeframes associated with procurement of a range of credit types (where required), timeframes to process sales, and additional credit 'transfer' and 'retirement' fees.

Option 3: Establish a Biodiversity Stewardship Site

Establishment of a Biodiversity Stewardship Site (or multiple sites) with the intention of generating credits to satisfy the project's offset obligation is considered likely to be the most suitable option available to Spark Renewables for the project. This is due to the expected quantum of offsets that will be required for the project, and the associated cost of securing those offsets through either the open credit market or via payment to the Fund. The suitability of this option is however dependent on securing land that is both suitable for the establishment of a Biodiversity Stewardship Site and supports PCTs/habitats considered Like-for-Like with those impacted by the project.

The major benefit of establishing a Biodiversity Stewardship Site to offset the project's impacts is the expected substantial reduction in the cost of offset security. The price of biodiversity credits on the open market (and those secured by the BCT via the Fund) is made up of two parts:

- Part A (compulsory) – the cost associated with implementing the required management actions at the Biodiversity Stewardship Site where the credits are generated (equivalent to the TFD); and
- Part B (optional) – the cost to the landholder associated with the establishment of the offset site (i.e., cost recovery, and lost opportunity costs), and most significantly, the landholder's profit margin.

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Under the situation where a proponent establishes a Biodiversity Stewardship Site to offset the impacts of their project, the Part B (optional) portion of the offset credits would generally be greatly reduced by excluding the profit margin, and any other non-essential cost recovery items. The price of the credits would therefore only comprise the Part A (compulsory) cost, or in other words the minimum dollar value required to generate the credits through on site protection and management of habitat. This exclusion (or reduction) of the Part B cost, generally results in substantial cost savings when compared to the price of credits on the open market, and/or the price paid to the Fund.

Drawbacks associated with the establishment of Biodiversity Stewardship Sites are associated with the large areas of land required to generate sufficient offset credits (generally between five to eight times the area of native vegetation impacted at the development site), sterilisation of the land for virtually all future uses other than in-perpetuity biodiversity conservation (some managed low-impact grazing may be allowable), and the ongoing requirement to manage the site to ensure the management actions, outlined in the Biodiversity Stewardship Site Management Plan, are implemented to the required standard.

One further drawback is the time required to establish a Biodiversity Stewardship Site and generate the credits required to offset a project's liability, and hence it is beneficial that Spark Renewables has commenced investigations into suitable sites, during the current EIS phase of the project.

11.3. Local offset feasibility

Assessments undertaken to date of offset suitability over the five above listed properties (the subject properties) are detailed below.

Background research

Desktop review of background information was undertaken to provide ecological context to the subject properties and items to consider during further assessment, including:

- BioNet Atlas of NSW Wildlife for BC Act listed threatened entities.
- Protected Matters Search Tool for EPBC Act matters of national environmental significance.
- Vegetation mapping including:
  - Riverina State Vegetation Type Mapping (SVTM) (DPIE 2016).
  - Biosis PCT mapping undertaken across the broader development site to date.
- Establishment of a Stewardship Site case for the project in the BAM Calculator and assessment of predicted threatened species.
- Research into factors influencing the boundaries of the potential Biodiversity Stewardship Sites such as areas to be excluded via review of Land and Property Information easements spatial layers, MinView searches, current cadastral databases, land zoning, and research into any existing offset obligations.

Field investigation

Field investigations of the subject properties were completed by two experienced Biosis ecologists, over five days (24-26 July and 01-02 August 2023)

- Rapid ground-validation of mapped vegetation to preliminary PCTs and broad scale mapping of ecological condition states.
- Determination of high-level expected management issues/actions required to be undertaken to generate the biodiversity credits if a Biodiversity Stewardship Site is established. Including assessment of any management issues considered substantial enough to preclude areas from being entered in a Biodiversity Stewardship Site.
- Collection of floristic plot data (BAM plots) used for calculation of credit generation potential.
- Assessment of areas of potential habitat for threatened species that could generate 'species credits', and/or confirmation of existing species records.

More detailed field investigations at two subject properties, sites two and four, have commenced in spring 2024.

Credit calculations and suitability assessment

Following completion of the field investigations, analysis of the data collected was undertaken to:

- Map and calculate the areas of vegetation zones.
- Calculate the estimated number of biodiversity credits generated by the subject properties through entry of vegetation zone areas and relevant BAM plot data into the online BAM Credit Calculator.
  - Where required, BAM plot data collected across the subject properties was supplemented with data collected during the preparation of this BDAR.
- Complete a suitability assessment, based on Offset Trading Group (OTG), to determine which areas of the subject properties would be best suited to generate credits that could be used to offset the impacts of the projects.

Results

Background research

Desktop review of background information found a range of suitable PCTs as being mapped across the subject properties and existing records of target species credit species, which have the potential to generate offset credits for the project. These items were ground validated with further detail provide below.

Desktop assessment into factors influencing the areas of each of the subject properties which can be entered into a Biodiversity Stewardship Site, such as the presence of utilities and assets and associated easements, mining leases, Crown Lands and other considerations such as existing conservation obligations, also found a range of items present across the subject properties. Such items generally require exclusion from a Biodiversity Stewardship Site, and as such coinciding areas of mapped vegetation and habitats cannot generate offset credits.

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Table 95 provides the details of the factors influencing the potential boundaries of future Biodiversity Stewardship Sites at each of the subject properties, and provides an estimated percentage reduction in total area available for biodiversity credit generation (compared to the full extent of mapped vegetation and habitats on each site).

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Table 95 Results of desktop research into factors influencing the Biodiversity Stewardship Site areas and boundaries

Biodiversity Stewardship site	Approx. area	Utilities from Dial Before You Dig searches	Mining leases	Crown lands	Other considerations	Percentage reduction in credit generation
Offset area one	4203 ha	• Essential Energy easement present within the site along southern boundary adjacent to North Boundary Road.	• None present.	• A number of Crown land road easements occur in a grid pattern through the site.	• Nil	• 5% reduction for utility asset maintenance corridors and Crown roads buffers.
Offset area two	2131 ha	• Essential Energy underground earth/wires, poles and (assumed) overhead powerlines along Pooginook Road along site's western boundary, crossing through north-western lots away from the roadway. • Telstra cabling along Pooginook Road, unlikely to occur within or influence the site.	• None present.	• A Crown land road easement occurs through the centre of the site running in an east/west direction.	• Nil	• 5% reduction for utility asset maintenance corridors and Crown roads buffers.
Offset area three	1119 ha	• Transgrid communication cable in/adjacent to Kidman way, unlikely to occur within or influence the site. • Essential Energy underground earth/wires, poles and (assumed) overhead powerlines along Cadell Road along site's western boundary and Kidman Way along the site's south-eastern boundary. • Telstra cabling along Mclennons Bore Road, unlikely to occur within or influence the site. • Telstra cabling along Kidman Way appears to occur within the site.	• None present.	• Crown lands road easements occur along the northern, western and southern boundaries of the site and encroach slightly into the site.	• Nil	• 5% reduction for utility asset maintenance corridors and Crown roads buffers.

Biodiversity Stewardship site	Approx. area	Utilities from Dial Before You Dig searches	Mining leases	Crown lands	Other considerations	Percentage reduction in credit generation
Offset area four	3365 ha	• Essential Energy underground earth/wires, poles and (assumed) overhead powerlines occur through the central portion of the site from Mabins Well Road in the southern portion of the site, and Carrathool Road along the site's western boundary. • Telstra cabling / infrastructure along Mabins Well Road and Carrathool Road may occur within the site. • Telstra cabling / infrastructure occurs within the central portion of site in Lots 22 and 28 DP756311, and Crown Land road easements.	• None present.	• A number of Crown land roads easements occur within the northern and southern portions of the site.	• A number of areas of Category 2 – Sensitive Regulated Land occur within the property assumed to represent historic and/or current conservation agreements or set-asides etc. these areas have been excluded from the potential BSA areas.	• 5% reduction for utility asset maintenance corridors and Crown roads buffers. • 633 ha485 excluded for assumed conservation areas.
Offset area five	967 ha	• Essential Energy poles and (assumed) overhead powerlines occur through the north-western potion of the site	• None present.	• Crown land road easements occur in the north and south of the site running in an east/west direction.	• Nil	• 5% reduction for utility asset maintenance corridors and Crown roads buffers.

Field investigation, Credit calculations and suitability assessment

Field investigations confirmed the presence of nine different PCTs across the five subject properties, details of which are provided in Table 96 below. Ecological condition was found to range from good to low and derived native grasslands.

Table 96 PCTs confirmed present within the subject properties

PCT	Offset Trading Group (OTG)	Offset area one	Offset area two	Offset area three	Offset area four	Offset area five
10 River Red Gum – Black Box woodland wetland	Inland Riverine Forests <50% cleared				X	
13 Black Box – Lignum woodland wetland	Inland Floodplain Woodlands ≥50% to 70% cleared	X	X	X		X
15 Black Box open woodland wetland with chenopod understorey	Inland Floodplain Woodlands ≥50% to <70% cleared			X		
16 Black Box grassy open woodland wetland	Inland Floodplain Woodlands ≥50% to <70% cleared		X	X		X
17 Lignum shrubland wetland	Inland Floodplain Shrublands ≥50% to <70% cleared	X	X	X	X	
26 Weeping Myall open woodland	Weeping Myall Woodland TEC	X	X	X	X	X
28 White Cypress Pine open woodland	Sandhill Pine Woodland TEC		X		X	
44 Forb-rich Speargrass – Windmill Grass – White Top grassland	Riverine Plain Grasslands ≥70% to <90% cleared					X
164 Cotton Bush open shrubland	Riverine Chenopod Shrublands <50% cleared				X	

Threatened species habitat was assessed and habitat was recorded for species expected to require offsets as a result of the project, with Silky Swainson-pea recorded on the area five property, as well as Southern Bell Frog on the area two property. Paired and juvenile Superb Parrots were also observed. Further assessment and targeted surveys would be required to determine the presence of the target threatened species across the subject properties.

Management actions that would be required to be undertaken following the establishment of a Biodiversity Stewardship Site across the subject properties were found to include fairly standard requirements such as; weed control, fence removal for fauna passage, fence installation/maintenance for stock exclusion, access track closures and maintenance, removal of dumped farm refuse and scrap building material, etc. None were found to be of significant concern in terms of preventing a BSA from being established over (portions of) the sites.

The offset credits that could potentially be generated at each property were assessed using BAM plot data collected across the subject properties, supplemented with relevant data collected from the BDAR. Table 97 provides the areas of each PCT and OTG recorded across the subject properties along with an estimate of the potential credits that could be generated (considering the exclusions detailed in Table 95). It should be noted that offset credit generation potential is considered an estimate only and further detailed assessment and collection of additional plot data is required to confirm the numbers presented herein. However, the data in Table 97 provides a good indication of the amount of offsets each property would be able to provide, which match those expected to be required by the project.

Table 97 Summary of OTGs and PCTs mapped and potential credit generation across the subject properties (including consideration of solar and wind credit requirements)

Type	Stage / Property	Inland Riverine Forests <50% (PCT 10)	Inland Floodplain Woodlands ≥50% to 70% (PCT 13, 15, 16)	Inland Floodplain Shrublands <50% (PCT 24, 160)	Inland Floodplain Shrublands ≥50% to <70% (PCT 17)	Riverine Plain Woodlands ≥90% (PCT 26 DNG)	Weeping Myall Woodland TEC (PCT 26 non-DNG)	Sandhill Pine Woodland TEC (PCT 28)	Natural Grasslands CEEC (PCT 44, 45, 46)	Riverine Chenopod Shrublands <50% (PCT 164)	Stage / Property total
BSA	Offset area one	0	86	0	43	15022	138	0	0	0	15289
BSA	Offset area two	0	2507	0	264	4304	1805	307	0	0	9188
BSA	Offset area three	0	1077	0	66	1160	3149	0	146	0	5598
BSA	Offset area four	119	0	0	373	6825	1766	564	0	259	9907
BSA	Offset area five	0	244	0	0	1520	1498	0	29	0	3289
BSA	**Totals**	**119**	**3914**	**0**	**747**	**28830**	**8356**	**871**	**174**	**259**	**43272**
Wind impacts	Stage 1 and Enabling	0	76	0	30	1276	3594	0	240	0	5216
Wind impacts	Stage 2	2	388	147	44	2198	8213	1405	4083	0	16480
Wind impacts	**Total**	**2**	**464**	**147**	**74**	**3475**	**11807**	**1405**	**4322**	**0**	**21696**

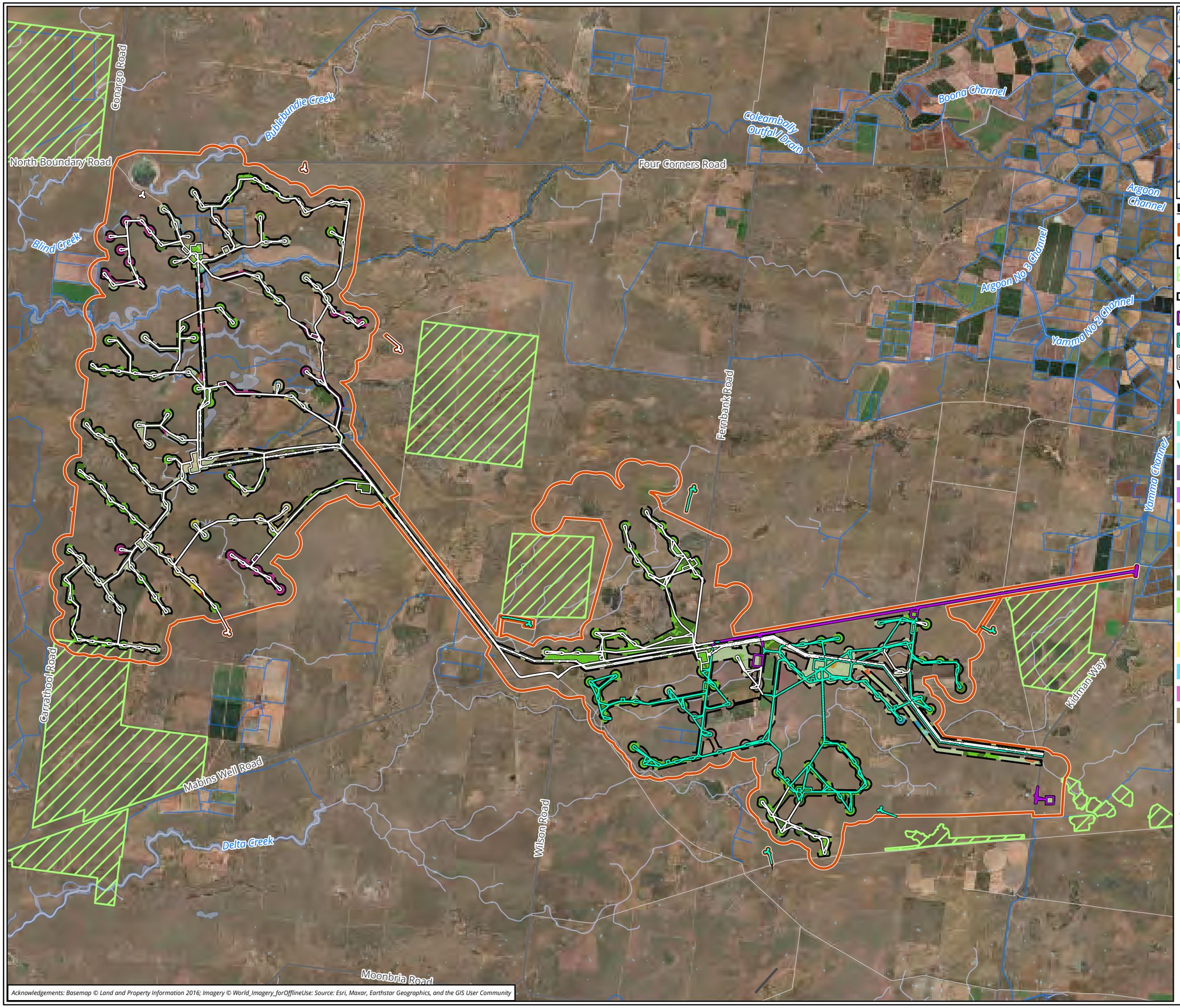
11.4. Offset staging plan

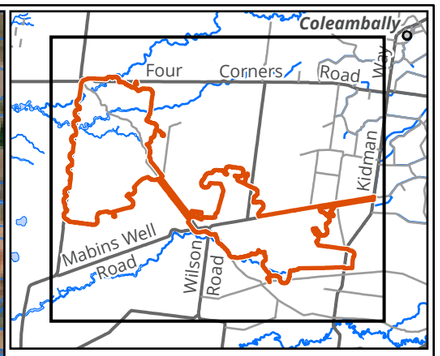
As outlined in Section 1.1.2, the project has been broken up into three stages to facilitate the development and staged retirement of the project's biodiversity credit liability. Prior to works commencing in each area, the biodiversity offset associated with that area will be secured. This is demonstrated in Table 97 above and Table 98 below.

Table 98 Summary of offset staging plan

Vegetation zone	Credit requirement	Enabling works	Stage 1	Stage 2
PCT 10_moderate	2	-	-	2
PCT 13_moderate	110	-	-	110
PCT 13_thinned	238	-	76	162
PCT 15_moderate	84	-	-	84
PCT 15_thinned	32	-	-	32
PCT 17_mod_good	28	-	12	16
PCT 17_moderate	46	-	18	28
PCT 26_DNG	3,475	191	1,085	2,198
PCT 26_intact	3,917	40	765	3,113
PCT 26_sparse	7,890	203	2,586	5,100
PCT 28_low	1,364	-	-	1,364
PCT 28_moderate	41	-	-	41
PCT 45_mod_good	91	-	91	-
PCT 45_Intersection	52	52	-	-
PCT 46_moderate	4,158	-	76	4,083
PCT 46_Intersection	21	21	-	-
PCT 160_mod_good	147	-	-	147
Total	**21,696**	**507**	**4,709**	**16,480**

Spark Renewables will confirm the offset staging plan with DPHI prior to the commencement of construction.





Legend

- Subject land
- Development corridor
- Indicative stewardship sites

Development footprint

- Early Works
- Stage 1
- Stage 2

Vegetation zone

- VZ1 - 10_Moderate
- VZ2 - 13_Moderate
- VZ3 - 13_Thinned
- VZ4 - 15_Moderate
- VZ5 - 15_Thinned
- VZ6 - 17_Mod_Good
- VZ7 - 17_Moderate
- VZ8 - 26_DNG
- VZ9 - 26_Intact
- VZ10 - 26_Sparse_Canopy
- VZ11 - 28_Low
- VZ12 - 28_Moderate
- VZ13 - 45_Mod_Good
- VZ15 - 46_Moderate
- VZ17 - 160_Mod_Good

Figure 23 Staging and stewardship site boundaries - Overview

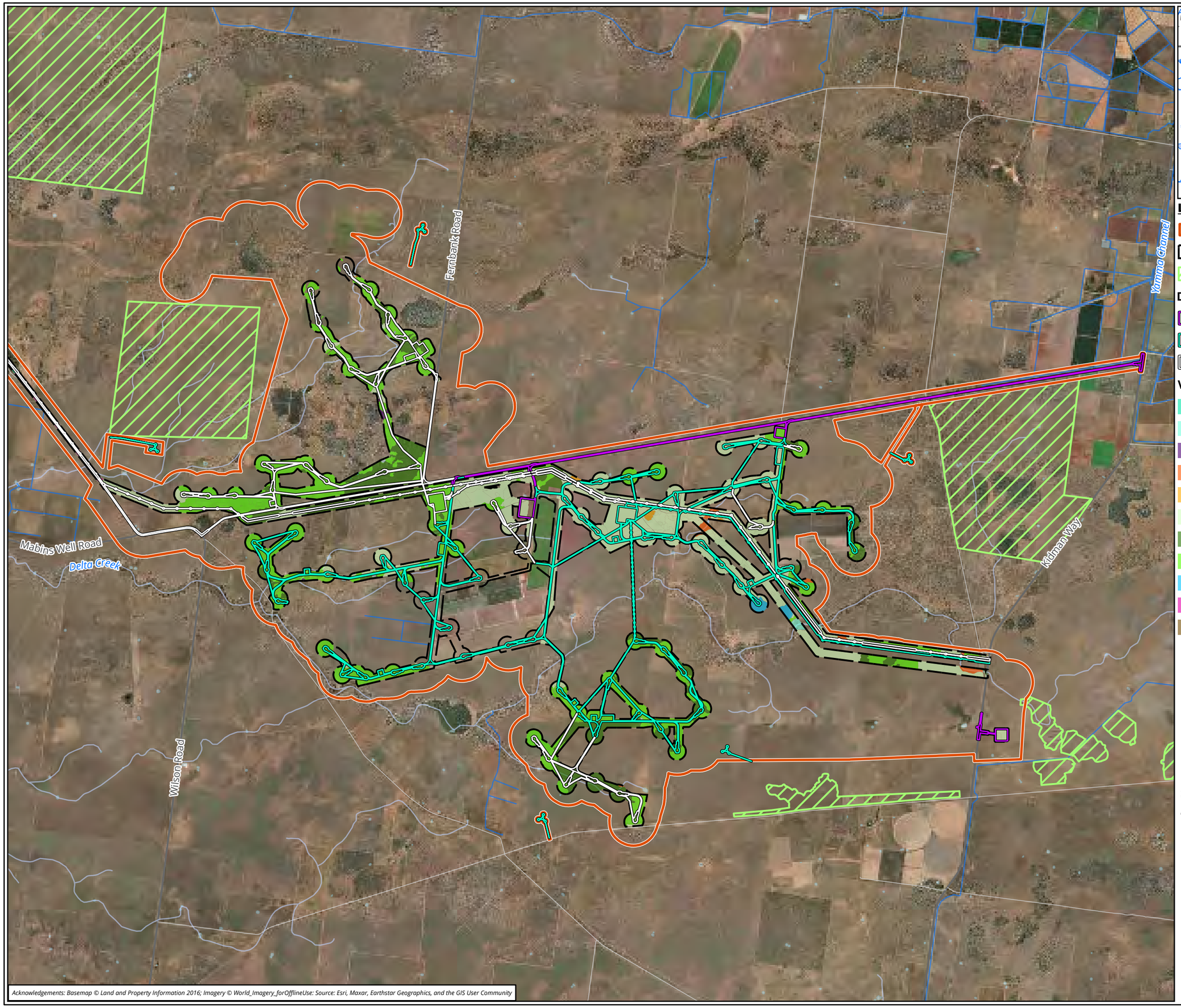
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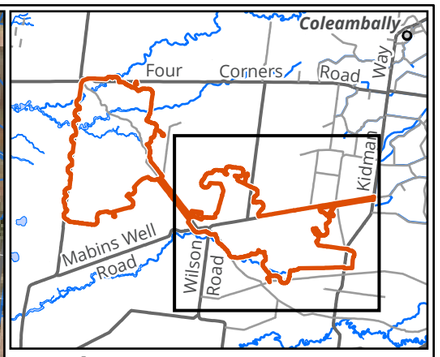
Kilometers
Scale: 1:130,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

N

biosis

Matter: 37263, Date: 08 April 2025,
GIS: JB, Checked by: MP, Last edited by: jbeckius
Location: P:\37200s\37263\Mapping\
37263_Dinawan_BDAR_Wind_F18-24.aprx
Layout: 37263_Wind_F23_Staging





Legend

- Subject land
- Development corridor
- Indicative stewardship sites

Development footprint

- Early Works
- Stage 1
- Stage 2

Vegetation zone

- VZ2 - 13_Moderate
- VZ3 - 13_Thinned
- VZ4 - 15_Moderate
- VZ6 - 17_Mod_Good
- VZ7 - 17_Moderate
- VZ8 - 26_DNG
- VZ9 - 26_Intact
- VZ10 - 26_Sparse_Canopy
- VZ13 - 45_Mod_Good
- VZ15 - 46_Moderate
- VZ17 - 160_Mod_Good

Figure 23 Staging and stewardship site boundaries - Eastern area

0 1 2 3

Kilometers
Scale: 1:80,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

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Matter: 37263, Date: 08 April 2025,
GIS: JB, Checked by: MP, Last edited by: jbeckius
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37263_Dinawan_BDAR_Wind_F18-24.aprx
Layout: 37263_Wind_F23_Staging

Acknowledgements: Basemap © Land and Property Information 2016; Imagery © World_Imagery_forOfflineUse: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community



Figure 23 Staging and stewardship site boundaries - Western area

Acknowledgements: Basemap © Land and Property Information 2016; Imagery © World_Imagery_forOfflineUse: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Matter: 37263, Date: 08 April 2025,
GIS: JB, Checked by: MP, Last edited by: jbeckius
Location: P:\37200s\37263\Mapping\
37263_Dinawan_BDAR_Wind_F18-24.aprx
Layout: 37263_Wind_F23_Staging

12. Assessment against EPBC Act and FM Act

12.1. Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's key piece of environmental legislation. The EPBC Act applies to developments and associated activities that have the potential to significantly impact on Matters of National Environmental Significance (MNES) protected under the Act. Under the EPBC Act, activities that have potential to result in significant impacts on MNES must be referred to the Commonwealth Minister for the Environment and Water for assessment.

On the 12 July 2023, a delegate of the Federal Minister for the Environment and Water, determined the Dinawan Wind Farm was a controlled action under section 75 of the EPBC Act with the following controlling provisions:

- Listed threatened species and communities.

Supplementary SEARs were issued following the controlled action declaration.

Table 99 Response to Submissions EPBC Bilateral Assessment Information

Biodiversity requirements	Relevant section where addressed
Attachment D BCS Bilateral Assessment information and data requirements	
1.1 Include descriptions and maps of the operational and construction footprints of the project that relate to MNES.	Figure 24 outlines all MNES related data alongside the development corridor and development footprint. Impacts specific to MNES are detailed and summarised within Section 12.1.
1.2 Include descriptions and maps of staging and timing of the action that may impact on MNES.	The project's proposed stage plan is outlined in Section 11.4.
1.3 Contain maps of the subject land boundary showing the final proposal and disturbance footprint with regards to MNES.	Figure 24 outlines all MNES related data alongside the development corridor and development footprint. Impacts specific to MNES are detailed and summarised within Section 12.1.
1.4 Be submitted with GIS shapefiles of all maps that relate to MNES.	All MNES related spatial data has been re-submitted with the amended BDAR.
2 Ensure that the 'Establishing the site context' of BAM 2020 (Section 3) have been fully met in the BDAR in relation to MNES.	All aspects of the site context relating to MNES were assessed (refer to Section 2), including but not limited to: • Mapped vegetation associated with EPBC Act listed TECs. • Wetlands of international importance (Ramsar wetlands) and wetlands listed under the Directory of Important Wetlands (DoIW). • Connectivity of habitat including to NPWS areas.

Biodiversity requirements	Relevant section where addressed
3.1 Demonstrate that field-based survey effort meets BCS survey guidelines and, where available, Commonwealth survey guidelines.	All survey efforts meet the BCS survey guidelines and can be reviewed in Section 4.3.1. All species were able to be surveyed in accordance with relevant BCS guidelines, no additional methodologies under the EPBC Act were required to meet survey effort under the bilateral agreement.
3.2 Demonstrate supporting databases (e.g. NSW BioNet Vegetation Classification, NSW BioNet Threatened Biodiversity Data Collection, NSW BioNet Atlas, Commonwealth Species Profile and Threats Database search results) have been accessed and used.	Supporting databases were used to inform the BDAR. A list of databases used is located within Section 1.5. Supporting databases were used in section 2.1.1 to assist with PCT presence. Databased were used in Section 3.1 to assist with PCT identification. In Appendix 2, species were assessed to determine previous known occurrence (if any) within 10km of the subject land.
3.3 Demonstrate published peer-reviewed literature has been accessed and used.	Peer reviewed literature has been accessed and used. A list of the literature used is presented in the References and throughout the BDAR.
3.4 Demonstrate local data has been accessed and used (if relevant).	No appropriate local benchmark data was used in the preparation of this BDAR.
3.5 Demonstrate all EPBC Act-listed threatened species and communities have been appropriately mapped in accordance with the relevant Commonwealth listing advice.	All EPBC Act listed threatened species and communities have been mapped in accordance with relevant commonwealth listing advice in Section 3 and 4.
3.4 Demonstrate important populations and critical habitat, as defined in Approved Listing Advice, Approved Conservation Advice and Recovery Action Plans, has been considered.	Important populations and critical habitat, as defined in Approved Listing Advice, Approved Conservation Advice and Recovery Action Plans has been considered with all relevant information found in Appendix 6 and summarised within Table 101.
3.6 Include a list of all EPBC Act listed threatened species and communities that occur on the subject land, or in the vicinity (including species that are 'ecosystem credits' in BAM).	All EPBC Act listed threatened species and communities occurring on the subject land can be found in Section 12.1.2, and summarised within Table 101.
3.7 Include a discussion, with data and analysis where any species and communities identified by the Department of Climate Change, Energy, the Environment and Water (DCCEEW) referral documents have been ruled out as occurring on or near the subject site.	Relevant information on species and communities identified by Commonwealth DCCEEW can be found in Section 12.1.
4.1 Demonstrate that all feasible alternatives and efforts to avoid and minimise impacts on EPBC Act listed threatened species and communities (including direct, indirect and prescribed impacts) have been made, including an analysis of alternative: **a) designs and engineering solutions.** **b) modes or technologies** **c) routes and locations of facilities** **d) sites within the subject site** **e) any other site constraints in determining the location and design of the proposal (such as bushfire protection requirements, flood planning levels, servicing constraints, etc).**	Section 7 of the BDAR outlines and demonstrates the extensive avoid and minimise steps undertaken as part of the project from the onset of the design phase, including but not limited to design and engineering steps, modes and technologies to be utilised and routes and locations of facilities. MNES have been considered from the outset of this assessment as high constraint biodiversity values requiring consideration in all avoidance and minimisation of impact decisions. Specific avoidance consideration for MNES is included in Table 101.

Biodiversity requirements	Relevant section where addressed
4.2 Discuss and justify all feasible measures to avoid, mitigate and/or manage impacts on EPBC Act listed threatened species and communities (including direct, indirect and prescribed impacts) including: **a) techniques, timing, frequency and responsibility.** **b) identify measures for which there is risk of failure.** **c) evaluate the risk and consequence of any residual impacts.** **d) any adaptive management strategy proposed to monitor and respond to impacts.**	Section 7 of the BDAR outlines and demonstrates the extensive avoid and minimise steps undertaken as part of the project from the onset of the design phase. Section 9 outlines all mitigation and management commitments to be undertaken as part of the project. Table 87 outlines and states all measures to mitigate and manage impacts including but not limited to techniques, timing, frequency and responsibility of actions, measures for where there is risk of failure, risk and consequence of any residual impacts and adaptive management strategies.
5.1 Identify the residual adverse impacts likely to occur to each EPBC Act listed threatened species and/or community after the proposed avoidance and mitigation measures are taken into account.	Table 101 outlines MNES entities at risk of impact.
5.2 Justify and provide evidence for the predicted level of impact, with reference to the Commonwealth's 'Significant Impact Guidelines 1.1 - Matters of National Environmental Significance'3 and DPIE's 'Guidance to Assist a Decision- Maker to Determine a Serious and Irreversible Impact'4	All MNES species at risk of impact by the project were assessed in accordance with the EPBC MNES Significant Impact Guidelines within Appendix 6.
5.3 Provide a summary table with the following information: **a) Name of EPBC Act listed entity.** **b) Nature & consequence of impact (direct/indirect).** **c) Duration of impact (e.g. construction, operation, life of project).** **d) Quantum of impact.** **e) Consequence of impact (local, state & national scales).** **f) Impacts requiring offsetting? (Significant or not).**	Table 101 outlines MNES species at risk of impact, including: a) Name of EPBC Act listed entity. b) Nature & consequence of impact (direct/indirect). c) Duration of impact (e.g. construction, operation, life of project). d) Quantum of impact. e) Consequence of impact (local, state & national scales). f) Impacts requiring offsetting? (Significant or not).
5.4 Provide data and justification where any EPBC Act-listed threatened species or communities to be considered in the BDAR are considered to be at low risk of impact during the assessment.	Table 101 includes detailed summaries of potential impacts to MNES species within the subject land, including outlining species at low risk of impact.
6.1 Identify any MNES that have not been offset using the BAM.	All MNES species with proposed impacts are listed as threatened under the BC Act and as such, will be offset under the bilateral agreement. Refer to Section 13.
6.2 Detail how impacts requiring offset correlate to the MNES impacts.	All MNES species with proposed impacts are listed as threatened under the BC Act and as such, will be offset under the bilateral agreement. Refer to Section 13.

Biodiversity requirements	Relevant section where addressed
6.3 Include details of the PCTs that need to be offsetting and the number and type of ecosystem credits required for impacts to MNES.	All MNES species with proposed impacts are listed as threatened under the BC Act and as such, will be offset under the bilateral agreement. Refer to Section 13.
6.4 Include details of threatened species that need to be offset and the number of species credits required for impacts to MNES.	All MNES species with proposed impacts are listed as threatened under the BC Act and as such, will be offset under the bilateral agreement. Refer to Section 13.
6.5 Demonstrate that the BAM has been correctly used (and BAM calculator) to identify the number and class of biodiversity credits that need to be offset to achieve a standard of 'no net loss' of biodiversity.	All MNES species with proposed impacts are listed as threatened under the BC Act and as such, will be offset under the bilateral agreement. Refer to Section 13.
6.6 Include any details of ecological rehabilitation and/or biodiversity conservation actions proposed for offsetting.	Detail surrounding the offset strategy for the project is outlined within Section 13.
6.7 Identify any other offsetting approach proposed, such as land-based offsets, retiring credits by payment into the Biodiversity Conservation Fund and/or through supplementary measures.	All MNES species with proposed impacts are listed as threatened under the BC Act and as such, will be offset under the bilateral agreement. Refer to Section 13.
6.8 Provide a summary table with the following: **a) Threatened species/communities listed under the EPBC Act.** **b) PCTs associated with the ecosystem credit species/ecological community (if applicable).** **c) Area of impact (ha).** **d) Credits required.** **e) Offsetting approach.** **f) Reference (EIS/BDAR).**	Detail surrounding the offset strategy for the project is outlined within Section 13.
7.1 Consider all relevant Commonwealth guidelines and policy statements that are appliable to the action and listed threatened species and/or communities, including but not limited to: **a) International environmental obligations.** **b) Recovery Plans.** **c) Approved Conservation Advice.** **d) Threat Abatement Plans.**	All commonwealth guidelines and policy statements applicable to MNES with the potential to be impacted were reviewed and referenced within Appendix 6.
7.2 Include an assessment for each EPBC Act listed threatened species and/or community, that has been adequately informed by applicable Commonwealth guidelines and/or policy statements. For example, the interaction between the proposed action and important populations or critical habitat identified in policy documents and/or the interaction between the	Table 101 includes detailed summaries of potential impact to MNES species within the subject land including but not limited to important populations and critical habitat.

Biodiversity requirements	Relevant section where addressed
proposed action and threatening processes or recommended conservation actions outlined in Commonwealth policies and plans.	

12.1.1. Project assessment against the EPBC Act

The project is being assessed under the bilateral agreement addressing the matters outlined in Schedule 4 of the Environment Protection and Biodiversity Conservation Regulation 2000 (EPBC Regulation). As such, an assessment of the likelihood of occurrence of nationally listed biota occurring in the impact area and determination of significant impact likely to result from the project has been undertaken (Appendix 2). An assessment of significant impacts under the EPBC Act in accordance with the Significant Impact Guidelines (CoA 2013) was undertaken for threatened MNES biota (Appendix 6). Assessments of significant impacts on threatened species and ecological communities presented here are limited to biota recorded or identified as having a medium or higher likelihood of occurrence in the impact area and that may be impacted by construction and/or operation of the project, as well as those referenced in Supplementary SEARs.

The controlled action decision specifies listed threatened species and ecological communities as controlling provisions. Impacts associated with World Heritage properties and National Heritage places are outside the scope of this assessment, and Ramsar wetlands are not considered as they are not assessed to be controlling provisions. MNES within the subject land are detailed within Table 100 below.

All MNES protected under the triggered controlling provisions are potentially relevant. The supplementary SEARs issued 22 August 2023 by Cth DCCEEW consider that there is likely to be a significant impact on the following species or communities:

- Plains Wanderer – Critically Endangered.
- Natural Grasslands of the Murray Valley Plains – Critically Endangered
- Weeping Myall Woodlands – Endangered.

Additional to this, the following species are identified as potentially being at risk of impact:

- Winged Peppercress *Lepidium monoplocoides* - Endangered
- Sand-hill Spider Orchid *Caladenia arenaria* – Endangered
- Turnip Copperburr *Sclerolaena napiformis* – Endangered
- Spear Grass *Austrostipa wakoolica* – Endangered
- Claypan Daisy *Brachyscome muelleroides* – Vulnerable
- Chariot Wheels *Maireana cheelii* – Vulnerable
- Slender Darling Pea *Swainsona murrayana* – Vulnerable
- Red Darling Pea *Swainsona plagiotropis* – Vulnerable
- Major Mitchell's Cockatoo (eastern) *Lophochroa leadbeateri leadbeateri* – Endangered
- Australasian Bittern *Botaurus poiciloptilus* – Endangered
- Australian Painted Snipe *Rostratula australis* – Endangered
- Superb Parrot *Polytelis swainsonii* – Vulnerable

- Southern Whiteface *Aphelocephala leucopsis* – Vulnerable
- Painted Honeyeater *Grantiella picta* – Vulnerable
- Diamond Firetail *Stagonopleura guttata* – Vulnerable
- Blue-winged Parrot *Neophema chrysostoma* – Vulnerable
- Corben's Long-eared Bat *Nyctophilus corbeni* – Vulnerable
- Southern Bell Frog *Litoria raniformis* – Vulnerable.

A list of biodiversity related MNES considered likely to be, or be at some risk of being, significantly impacted by the project is provided in Table 100, with detailed assessments included as Appendix 6. This assessment determined the MNES outlined below as having the potential for significant impact from the project:

- Plains Wanderer – Critically Endangered.
    - Significant impact likely.
- Superb Parrot – Vulnerable.
    - Significant impact possible.
- Natural Grasslands of the Murray Valley Plains – Critically Endangered
    - Significant impact likely.
- Weeping Myall Woodlands – Endangered.
    - Significant impact likely.

Assessments have been undertaken in accordance with the Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (CoA 2013) within Appendix 6. All relevant EPBC Act listed species and ecological communities, and listed migratory species considered herein are listed in Table 100 and Table 101, along with a summary of the evidence used to conclude whether a significant impact is likely or unlikely to occur as a result of the project.

12.1.2. MNES within the subject land

A summary of all MNES recorded, or considered to have the potential to occur, within the development footprint and development corridor is provided in Table 100.

Table 100 MNES within the subject land

Matter of NES	Project specifics	Potential for significant impact
Threatened species	The Controlled Action decision identified the proposed action (i.e. the project) as likely to have a significant impact on the following species: • Plains Wanderer The Controlled Action decision identified the following species as being at risk of impact: • Winged Peppercress • Sand-hill Spider Orchid • Turnip Copperburr • Spear Grass • Claypan Daisy • Chariot Wheels • Slender Darling Pea • Red Darling Pea • Major Mitchell's Cockatoo • Australasian Bittern • Australian Painted Snipe • Superb Parrot • Southern Whiteface • Painted Honeyeater • Diamond Firetail • Blue-winged Parrot • Corben's Long-eared Bat • White-throated Needletail Although not mentioned within the controlled action decision, Southern Bell Frog has also been included. 17 EPBC listed threatened species above are considered to have a known, potential or uncertain impact as a result of the project. Those entities are highlighted in bold above. All other potential threatened species are considered to have a low likelihood of occurrence due to limited or absent suitable habitats in the subject land.	The following species were determined to be potentially at risk of significant impact, and require assessment under the EPBC Act. • Plains Wanderer • Winged Peppercress • Turnip Copperburr • Chariot Wheels • Spear Grass • Claypan Daisy • Mossgiel Daisy • Slender Darling Pea • Red Darling Pea • Major Mitchell's Cockatoo • Australasian Bittern • Australian Painted Snipe • Superb Parrot • Southern Whiteface • Painted Honeyeater • Diamond Firetail • Southern Bell Frog • Corben's Long-eared Impacts to White-throated Needle tail and Blue-winged Parrot have been considered to be low or negligible, due to westerly distribution limits or vagrancy respectively. Impacts to Sand-hill Spider Orchid are considered negligible due to lack of suitable microhabitats and geographical limitations.
Threatened ecological communities	Direct and indirect impacts are considered to occur to two listed TECs: • Weeping Myall Woodland • Natural Grasslands of the Murray Valley Plains No other EPBC listed TECs occur within the subject land.	Of all entities assessed, the following are considered to have a significant impact resulting from the project: • Weeping Myall Woodland • Natural Grasslands of the Murray Valley Plains

Matter of NES	Project specifics	Potential for significant impact
Migratory species	The Controlled Action decision did not identify the proposed action as likely to have a significant impact on migratory species. Background searches identified the following migratory species as having potential to occur in the subject land: • *Actitis hypoleucos* • *Apus pacificus* • *Calidris acuminata* • *Calidris ferruginea* • *Calidris melanotos* • *Charadrius veredus* • *Gallinago hardwickii* • *Gelochelidon nilotica* • *Haliaeetus leucogaster* • *Hirundapus caudacutus* • *Hydroprogne caspia* • *Limosa limosa* • *Merops ornatus* • *Motacilla flava* • *Numenius madagascariensis* • *Legadis falcinellus* • *Tringa nebularia*	There is limited suitable habitat within the subject land for migratory shorebird species, particularly those that are largely associated with tidal mudflats or coastal beaches and estuaries. Migratory species that may occur in inland areas such as Latham's Snipe and Glossy Ibis, may occasionally utilise any natural drainage systems, depressional wetlands or farm dams in the subject land during suitable conditions. Impacts to these areas are likely to be minimal, with the project design largely avoiding any impacts to wetland habitats. Fork-tailed Swift were observed during BUS, and an assessment of this species has been undertaken. Despite collision risk associated with the project, all other migratory species are considered to be not significantly impacted.
World or National Heritage Places	No world heritage places or national heritage places were identified as occurring within the subject land or within 10 km of the subject land.	There are no national or world heritage places within or near the subject land. The project is unlikely to result in any direct or indirect impacts to national or world heritage.
Wetlands of international importance (Ramsar sites)	There are no Ramsar wetland areas within or near the subject land. The subject land is 200-300 kilometres upstream from the nearest Ramsar site at Hattah-Kulkyne Lakes (Ramsar site 16), 400-500 kilometres upstream from the Riverland (Ramsar site 29) and Banrock Station wetland complex (Ramsar site 63), and 500-600 kilometres upstream from the Coorong, and lakes Alexandrina and Albert wetland (Ramsar site 25).	The project is not expected to incur any significant impacts, or modifications to the natural drainage systems including watercourses and lake areas within the subject land or surrounding landscape.

Further detailed assessment of the potential presence of MNES within the subject land, avoidance efforts and assessment of potential impacts are included in Table 101, Section 12.1.3 to Section 12.1.7, Appendix 2 and Appendix 6.

Table 101 Detailed summary of MNES with potential for impact within the subject land

MNES	DCCEEW consideration	Important populations / Critical habitat	Updated likelihood of occurrence based on assessment	Potential impacts	Summary of MNES occurrence, avoidance efforts, potential impact (amended design)	SIC self-assessment undertaken / result (Appendix 6)
Weeping Myall woodlands	Likely to be significant impacted	As an Endangered Ecological Community, all occurrences are considered 'Important'.	Recorded within development footprint.	Yes - **Offsets for residual significant impacts required**	Most dominant vegetation community with the broader locality and development footprint, in three various condition zones. Although a large amount of intact Weeping Myall has been prioritised for avoidance, due to the removal of approximately 128.73 ha of Weeping Myall TEC that is known or likely to meet the criteria under the EPBC Act, in conjunction with cumulative impacts within the region, it is a considered a significant impact on the TEC.	Significant impact likely. on criteria 1 of SIC – Reduce the extent of an ecological community Detailed assessment provided in Appendix 6.
Natural Grasslands of the Murray Valley Plains	Likely to be significant impacted	As an Critically Endangered Ecological Community, all occurrences are considered 'Important'.	Recorded within development footprint.	Yes - **Offsets for residual significant impacts required**	Impacts to known areas of this community have been avoided where possible and restricted to smaller isolated patches or fringing areas of larger more connected patches. Total impacts associated with this TEC are approximately 76.87 ha. Potential areas of vegetation that will have patches commensurate with this TEC within the subject land equate to approximately 5,699 ha. It is estimated in the Riverina that approximately 61,000 ha remain in the region. Based on an impact area of 76.87 ha, the project has potential to remove approximately 1.4% and 0.13% of the predicted extent of this TEC within the subject land and broader region respectively. Although areas of this TEC have been avoided, and restricted to more linear impacts in nature, given the overall amount of impact and potential for cumulative impacts, it is likely that significant impacts would occur to this TEC.	Significant impact likely. Detailed assessment provided in Appendix 6.
Plains-Wanderer	Likely to be significant impacted	As a Critically Endangered listed species, all populations are considered 'Important Populations'. The national recovery plan for this species (DoE 2016) states habitat critical to the survival of this species includes: • Any regions where the species is likely to occur, and • Any newly discovered locations that extend the likely range of the species.	Known to occur. Important mapped habitat within subject land	Yes - **Offsets for residual significant impacts required**	The Plains Wanderer is known to occur throughout the broader locality historically, with the Riverina considered a strong hold for the species. Due to the dynamic nature of the grassland habitats and condition states therein, a key focus during project design was the avoidance of likely suitable habitat at a landscape scale. Specifically, due to the cryptic nature of this species and critically endangered listing, avoidance of suitable habitat and mapped important areas were incorporated early into project designs. This included avoiding and minimising impacts to areas of lower tussocky grasslands such as PCT 46, as well as areas of important mapped habitat and associated buffers. Approximately 2.38 ha of important mapped area will be impacted and offset, however 0.67 ha of this occurs across an existing formed public road and farm tracks. Approximately 645 ha within the subject land. Additionally, areas or PCT 46 (73 ha) total will be impacted that may provide habitat in future due to the dynamic nature of grassland communities in the Riverina. Site surveys were undertaken in November 2022 (impacted by flooding) as well as March 2023 and April 2023. Surveys were conducted via nocturnal transects as well as acoustic detection. One Plains Wanderer individual was incidentally recorded in October 2024 within PCT 46 fringing areas of PCT 26 DNG, and coincidently, in close proximity to important mapped areas. A 300m buffer no go area was applied and design amended to avoid impacts to this buffer and potential home range. Direct impacts equate to approximately 2.43% of potentially suitable habitat within the subject land and mapped import areas equate to 0.79%. Site surveys were undertaken in November 2022 (impacted by flooding) as well as March	Significant impact possible due to criteria 2 of SIC. Reduce the area of occupancy of the species Detailed assessment provided in Appendix 6.

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MNES	DCCEEW consideration	Important populations / Critical habitat	Updated likelihood of occurrence based on assessment	Potential impacts	Summary of MNES occurrence, avoidance efforts, potential impact (amended design)	SIC self-assessment undertaken / result (Appendix 6)
					2023 and April 2023. Surveys were conducted via nocturnal transects as well as acoustic detection.	
Brachyscome muelleroides	Low risk of significant impact	An important population is considered to occur at Morundah Station. Critical habitat not defined. Therefore considered areas necessary for long-term maintenance, genetic diversity and long term evolutionary development, reintroduction of populations or recovery of the species.	Surveyed. Unlikely to be present. Assumed present where survey coverage not adequate	Unlikely	Targeted surveys for *Brachyscome muelleroides* have been carried out throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024. This species has not been recorded despite flooding impeding some access however sufficient survey for the species was completed. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible (including within seasonally damp situations such as shallow depression sand around the margins of swamps, lagoons and claypans, on heavy grey cracking clays to lighter clay loam soils, in grassland and grassy woodland). This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. This species prefers seasonally moist grey gilgaied soils on the floodplains with PCTs such as PCT 45 and PCT 46, which occur within the subject land. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 35.62 ha. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely Detailed assessment provided in Appendix 6.
Brachyscome papillosa	Low risk of significant impact	Important populations not defined. Therefore considered key source populations either for breeding or dispersal, for maintaining genetic diversity, near the limit of the species range. Critical habitat not defined. Therefore considered areas necessary for long-term maintenance, genetic diversity and long term evolutionary development, reintroduction of populations or recovery of the species.	Surveyed. Unlikely to be present. Assumed present where survey coverage not adequate	Unlikely	Targeted surveys for *Brachyscome papillosa* have been carried out throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024. This species has not been recorded. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 44.42 ha. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely Detailed assessment provided in Appendix 6.

MNES	DCCEEW consideration	Important populations / Critical habitat	Updated likelihood of occurrence based on assessment	Potential impacts	Summary of MNES occurrence, avoidance efforts, potential impact (amended design)	SIC self-assessment undertaken / result (Appendix 6)
Lepidium monoplocoides	Low risk of significant impact	As an Endangered listed species, all populations are considered 'Important Populations'. Critical habitat not defined. Therefore considered areas necessary for long-term maintenance, genetic diversity and long term evolutionary development, reintroduction of populations or recovery of the species.	Surveyed. Unlikely to be present.	Unlikely	Targeted surveys for *Lepidium monoplocoides* have been carried out throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024. This species has not been recorded. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 212.44 ha in which microhabitats could occur. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures	Significant impact unlikely Detailed assessment provided in Appendix 6.
Sclerolaena napiformis	Low risk of significant impact	Seventeen important populations have been identified: 11 in Victoria and six in New South Wales. Five of which occur in the Jerilderie/Conargo locality, in the broad vicinity of the subject land. In NSW, the species occurs in Knotty Spear-Grass *Austrostipa nodosa* and Windmill Grass *Chloris truncata* tussock grasslands on grey to red-brown cracking clays and clay loams.	Assumed present where survey coverage not adequate	Unlikely	Targeted surveys for *Sclerolaena napiformis* have been carried out throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024. This species has not been recorded. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible (including within seasonally damp situations such as shallow depression sand around the margins of swamps, lagoons and claypans, on heavy grey cracking clays to lighter clay loam soils, in grassland and grassy woodland). This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. This species prefers grassland PCTs such as PCT 46, and derived areas of PCT 26 which occur within the subject land. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 238.97 ha. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely Detailed assessment provided in Appendix 6.

MNES	DCCEEW consideration	Important populations / Critical habitat	Updated likelihood of occurrence based on assessment	Potential impacts	Summary of MNES occurrence, avoidance efforts, potential impact (amended design)	SIC self-assessment undertaken / result (Appendix 6)
Austrostipa wakoolica	Low risk of significant impact	As an Endangered listed species, all populations are considered 'Important Populations'. Critical habitat not defined. Therefore considered areas necessary for long-term maintenance, genetic diversity and long term evolutionary development, reintroduction of populations or recovery of the species.	Surveyed. Unlikely to be present. Assumed present where survey coverage not adequate	Unlikely	*Austrostipa wakoolica* has not been surveyed adequately to date, due to flooding and access constraints in November 2022, 2023 and 2024, with 16.41 ha still currently assumed present. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This included known habitats such as lignum swamp in brown loam with box and mallee, creek banks in grey silty clay, mallee and lignum sandy loam flat, open cypress pine forest on low range in sandy soil and a low rock rise fenced-off from stock for about 18 months (DECCW, 2014). This species can be associated with PCT 17 and PCT 26 and has been assumed present in these zones. For PCT 26, this species has only been assumed in areas within this zone that are subject to more frequent periodic flooding for its habitat to maintain wet conditions. Avoidance has resulted in multiple revisions of the development footprint as demonstrated in Section 7. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 16.41 ha. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025. Regardless of the outcomes of the additional surveys, potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact considered unlikely Detailed assessment provided in Appendix 6.
Maireana cheelii	Low risk of significant impact	Important populations not defined. Therefore considered key source populations either for breeding or dispersal, for maintaining genetic diversity, near the limit of the species range. Critical habitat not defined. Therefore considered areas necessary for long-term maintenance, genetic diversity and long term evolutionary development, reintroduction of populations or recovery of the species.	Surveyed. Unlikely to be present. Assumed present where survey coverage not adequate	Unlikely	Targeted surveys for *Maireana cheelii* have been carried out throughout the development footprint in September 2022, 2023 and 2024, and November 2022, 2023 and 2024. This species has not been recorded. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 238.04 ha. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely Detailed assessment provided in Appendix 6.

MNES	DCCEEW consideration	Important populations / Critical habitat	Updated likelihood of occurrence based on assessment	Potential impacts	Summary of MNES occurrence, avoidance efforts, potential impact (amended design)	SIC self-assessment undertaken / result (Appendix 6)
Swainsona murrayana	Some risk of significant impact	Important populations not defined. Therefore considered key source populations either for breeding or dispersal, for maintaining genetic diversity, near the limit of the species range. Critical habitat not defined. Therefore considered areas necessary for long-term maintenance, genetic diversity and long term evolutionary development, reintroduction of populations or recovery of the species.	Recorded within development footprint.	Yes	This species has been identified during surveys in September 2022, 2023 and 2024. All records and suitable habitat were found to be in certain habitats of reduced grass cover, increase forb cover with species such as Bulbine lily. Large numbers of the species were recorded through the subject land, estimated to up to 1,334 individuals and 42 ha of optimal habitat, however numerous designs revisions have occurred to avoid and minimise impacts to larger patches to ensure a viable local population can be maintained. Impacts will occur to isolated individuals and small patches, totalling approximately 2.6 ha of known occurrence. Unlikely to be considered an important population. This represents approximately 6% of the local population recorded. Additionally this species is also impacted by the adjacent Dinawan Solar Farm, with a further 8 ha impacted. Spatial gaps still occur Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact considered unlikely Detailed assessment provided in Appendix 6.
Swainsona plagiotropis	Low risk of significant impact	Fourteen important populations have been defined in NSW, with 12 sub-populations comprising the Jerilderie meta-population, south of the subject land. Further unidentified important populations may exist, which would be defined as: • 'Stronghold' populations (greater than 1000 individuals) • Populations that, if lost, would cause a significant range contraction or loss of genetic diversity. • Populations subject to monitoring and conservation management. All habitat for this species should be considered important for the species' long-term survival	Surveyed. Unlikely to be present. Assumed present where survey coverage not adequate	Unlikely	Targeted surveys for *Swainsona plagiotropis* have been carried out throughout the development footprint in September 2022, 2023 and 2024 and this species has not been recorded. It was found to be flowering during surveys in September 2023 at a known reference population near Jerilderie. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 35.62 ha. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely Detailed assessment provided in Appendix 6.
Eastern Major Mitchell's Cockatoo	Low risk of significant impact	As an Endangered listed species, all populations are considered 'Important Populations'. Habitat critical to the survival of the eastern Pink cockatoo consist of: • Arid and semi-arid woodlands dominated by Mulga, mallee and box eucalypts, Slender Cypress Pine or Belah. • Known habitat containing suitable attributes, including potential habitat for the subspecies, especially where there are large mature trees with suitable hollows. • Surrounding matrix of these areas for the role of providing movement corridors for dispersal across the landscape.	Surveyed. Unlikely to be present for breeding	Unlikely	Not recorded during detailed BUS across two years, during targeted surveys nor incidentally.. Hollow bearing trees will be removed as part of the project, limited to nine. Turbine collision is possible, but overall risk is considered low. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. No known breeding site will be impacted. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely Detailed assessment provided in Appendix 6.

MNES	DCCEEW consideration	Important populations / Critical habitat	Updated likelihood of occurrence based on assessment	Potential impacts	Summary of MNES occurrence, avoidance efforts, potential impact (amended design)	SIC self-assessment undertaken / result (Appendix 6)
Australasian Bittern	Some risk of significant impact	As an Endangered listed species, all populations are considered 'Important Populations'. Any natural wetland habitat where the species is known or likely to occur (breeding or foraging habitat) within the indicative distribution map (Cth DCCEEW 2022a)	Transient only	Unlikely	There is no optimal habitat for the Australasian Bittern within the subject land, however this species is known to fly to and from breeding grounds in and around Leeton and Griffith in NSW, through to Victoria. It is unlikely that this species would occur within the subject land, other than rare transient use or during increased seasonal flooding events and only on a temporary basis. Potential flight heights for Australasian Bitterns can vary depending on several factors, including habitat type, weather conditions, and behavioural patterns. Generally, Bitterns are known to fly at relatively low altitudes, often skimming over wetland vegetation such as reeds and grasses. This low-level flight behaviour is believed to be an adaptation to their hunting strategy, as they primarily prey on small fish, frogs, and invertebrates found in shallow water within wetland habitats. Bitterns are likely to fly lower to minimise energy expenditure and maintain stability due to their bulky heavy set build. However, prolonged flights over open areas and open habitats may occur on occasion, and they may occasionally ascend to slightly higher altitudes, particularly during certain behaviours such as territorial displays, courtship flights, or nomadic movements. It is considered an unlikely event that Bitterns would fly within the RSA of this project, that being within 61-239m above ground level. This species has a low risk of being effected by macro avoidance of large areas of turbines. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP and BBAMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely Detailed assessment provided in Appendix 6.
Australian Painted Snipe	Low risk of significant impact	As an Endangered listed species, all populations are considered 'Important Populations'. Any natural wetland habitat where the species is known or likely to occur (especially with suitable breeding habitat) within the indicative distribution map. Any location outside the above area that may be periodically occupied by Australian Painted Snipe when wetland conditions are favourable. (Cth DCCEEW 2022b)	Transient only	Unlikely	There is no optimal habitat for the Australian Painted Snipe within the subject land, however this species is known to fly to and from optimal areas nomadically based on environmental conditions, influenced by factors such as habitat availability, water levels, and food resources as well as for breeding events between September and March. Swamps, and flooded grasslands may provide suitable habitat on the rare occasion during rare flooding events. Australian Painted Snipes typically fly at relatively low elevations, especially during their migration and foraging activities. They are not considered high-altitude migratory birds like some species of waterbirds and/or raptors. Instead, they tend to fly close to the ground, skimming over wetlands and vegetation as they move between feeding and breeding sites. Whilst not well known, and research on movements is currently underway, it is unlikely that Australian Painted Snipe would fly within the RSA of this project, that being within 61-239m above ground level. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP and BBAMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely Detailed assessment provided in Appendix 6.
Superb Parrot	Some risk of significant impact	The species is considered to comprise a single national population of an estimated 6500 mature individuals (Cth DCCEEW 2024t). The National Recovery Plan (DAWE 2021b) details critical habitat as:	Recorded within development footprint.	Yes - **Offsets for residual significant impacts required**	Recorded foraging onsite. No direct observational evidence of breeding was recorded within the subject land, however numerous paired individuals and juveniles were observed. Potential hollows were found to be preferentially in use by common species such as Blue Bonnets and Galahs. A number of annual flights (between 1 and 4) for the Superb Parrot are at risk of collision	Potential for significant impact based on reduced occupancy and collision risk. Recorded within RSA.

MNES	DCCEEW consideration	Important populations / Critical habitat	Updated likelihood of occurrence based on assessment	Potential impacts	Summary of MNES occurrence, avoidance efforts, potential impact (amended design)	SIC self-assessment undertaken / result (Appendix 6)
		• The two main distinct habitat types used for breeding: riverine forests in the Riverina, and box-gum woodlands in the tablelands and slopes of VIC, SW, ACT. • Any known breeding colonies with a 10 km buffer zone where there is contiguous habitat.			with turbines as well as the potential, albeit low likelihood, of macro avoidance of habitat within the subject land. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP and BBAMP, pre-clearance surveys, adaptive management and unexpected finds procedures. x	Detailed assessment provided in Appendix 6.
Southern Whiteface	Low risk of significant impact	Important populations not defined. Therefore considered key source populations either for breeding or dispersal, for maintaining genetic diversity, near the limit of the species range. Habitat critical to the survival of the Southern Whiteface includes areas of: • Relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both. • Habitat with low tree densities and an herbaceous understory litter cover which provides essential foraging habitat. • Living and dead trees with hollows and crevices which are essential for roosting and nesting. (Cth DCCEEW 2023d)	Recorded within development footprint.	Yes	Recorded foraging onsite frequently in all major habitats within the development corridor. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely Not at risk of collision Detailed assessment provided in Appendix 6.
Painted Honeyeater	Low risk of significant impact	The species is considered to comprise a single national population of fewer than 10,000 mature individuals (DAWE 2021a) The National Recovery Plan for the Painted Honeyeater lists critical habitat as: • Known or likely breeding habitat in Weeping Myall, Brigalow *Acacia harpophylla* woodlands, box-gum woodlands and box-ironbark forests on the inland slopes of the Great Dividing Range in New South Wales, Victoria and southern Queensland. • All preferred foraging species within known and likely foraging habitat particularly mistletoes of the genus *Amyema* growing on forest and woodland eucalypts and acacias. (DAWE 2021a).	Recorded adjacent to development footprint	Yes	Recorded foraging adjacent to the previous development corridor in high condition Weeping Myall vegetation that has been avoided. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. Direct impacts to 116.79 ha of intact Weeping Myall areas containing mature woody vegetation are predicted; however, 679 ha will be retained within the development corridor and an additional estimated 7,149 ha within the subject land will also be retained. Movement through the landscape will not be impeded by the project. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely Not at risk of collision Detailed assessment provided in Appendix 6.
Diamond Firetail	Low risk of significant impact	Important populations not defined. Therefore considered key source populations either for breeding or dispersal, for maintaining genetic diversity, near the limit of the species range. Habitat critical to the survival of the diamond firetail includes areas of: • Eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats. • Low tree density, few large logs, and little litter cover but high grass cover for foraging, roosting and breeding. • Drooping she-oak (Allocasuarina verticillata) within the Mt Lofty Ranges. (Cth DCCEEW 2024p)	Recorded within development footprint.	Yes	Recorded foraging onsite and likely to use majority of habitats within the development corridor. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures	Significant impact unlikely Not at risk of collision Detailed assessment provided in Appendix 6.

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MNES	DCCEEW consideration	Important populations / Critical habitat	Updated likelihood of occurrence based on assessment	Potential impacts	Summary of MNES occurrence, avoidance efforts, potential impact (amended design)	SIC self-assessment undertaken / result (Appendix 6)
Blue-winged Parrot	Low risk of significant impact	No important populations have been defined for the species. The species can be considered to comprise a single national population of an estimated 10,000 mature individuals (DCCEEW 2023) Critical habitat is described as: • Foraging and staging habitats found from coastal, sub-coastal and inland areas, right through to semi-arid zones including: grasslands, grassy woodlands and semi-arid chenopod shrubland with native and introduced grasses, herbs and shrubs. • Wetlands both near the coast and in semi-arid zones used for foraging and staging. • Eucalypt forests and woodlands within the breeding range in Tasmania, coastal south-eastern South Australia and southern Victoria. • Live and dead trees and stumps with suitable hollows within the breeding range. (DCCEEW 2023).	Surveyed. Not recorded, and unlikely to be present	Unlikely	Not recorded during detailed BBUS surveys across two years, targeted surveys or incidentally. Breeding noted as typically occurring in Tasmania, coastal south-eastern Australia and southern Victoria. With single national population, and no more than a rare or vagrant occurrence within the subject land, there is no potential for a Significant Impact as a result of the project. Turbine collision is possible, but overall risk is considered low. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures	Significant impact unlikely to "Important population" (single national population) of the Vulnerable listed species. Species not at risk from collision impacts.
Southern Bell Frog	Some risk of significant impact	Any viable population is considered to be an important population. A viable population is one which is not isolated from other populations or water bodies, such that it has the opportunity to interact with other nearby populations or has the ability to establish new populations when water bodies fill and become available (DEWHA 2009b). Populations from the north and west of the species' range occur in swamps dominated by River Red Gum, Lignum and Typha, and Black Box / Lignum / Nitre Goosefoot, and will also occur in irrigated rice crops. Critical features of these habitat types appear to be that they are large, continuous areas containing both permanent and ephemeral waterbodies that undergo regular flooding, and are surrounded by areas containing suitable refugia in the form of ground debris, vegetation cover and cracking soils (DSE 2012).	Recorded within development footprint.	Yes	This species was observed opportunistically and repeatedly during habitat surveys, as well as again in February and March 2023, and January 2024 during targeted habitat surveys. Records occurred following above average rainfall and flooding conditions that likely washed individuals from a stronghold area in the Coleambally irrigation areas to the north, via flooding events in Delta Creek and Coleambally outfall drain. For majority of the time, the only areas that provide more permanent, yet still suboptimal habitat, are within the irrigation channel and grasslands adjacent to. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Direct impacts will be limited, with most impacts associated to adjacent buffers and dispersal habitat up to 82 ha. It was noted that where more permanent water was found and *Gambusia holbrooki* were present, Southern Bell Frog was not recorded or observed to be present. Where more permanent water was found, such as irrigation channels and farm dams, and where *Gambusia holbrooki* was not present, mature individuals, immature individuals and tadpoles were observed. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures as well generation of additional credits for indirect impacts to residual transient habitats as prescribed by the BAM.	Significant impact unlikely Detailed assessment provided in Appendix 6.
Coben long-eared Bat	Low risk of significant impact	Important populations not defined. Therefore considered key source populations either for breeding or dispersal, for maintaining genetic diversity, near the limit of the species range. Critical habitat not defined. Therefore considered areas necessary for long-term maintenance, genetic diversity and long term evolutionary development, reintroduction of populations or recovery of the species.	Recorded within development footprint.	Unlikely	Corben's long-eared bats can vary depending on factors such as time of night (more frequent movement between dusk and 10pm), weather conditions, and individual behaviour. These bats often fly at low levels, particularly when foraging for insects. They may fly just a few meters above the ground or forest canopy with good vegetative structure., where their prey is more abundant. Unlikely to fly within RSA. Flying at lower heights allows them to more effectively detect and capture flying insects using echolocation. Habitat for this species are intact riverine woodland	Significant impact unlikely Detailed assessment provided in Appendix 6.

MNES	DCCEEW consideration	Important populations / Critical habitat	Updated likelihood of occurrence based on assessment	Potential impacts	Summary of MNES occurrence, avoidance efforts, potential impact (amended design)	SIC self-assessment undertaken / result (Appendix 6)
					communities and White Cypress Pine communities, where impacts have been minimised. The removal of nine hollow bearing tress, in a locality with a high abundance of small and medium hollows, is not likely to affect this species. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP and BBAMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	
Glossy Ibis	Low risk of significant impact	Important populations not defined. Therefore considered habitat that supports an ecologically significant proportion of the population/species, habitat of critical importance to particular life-cycle stages, or at the limit of the species range. Critical habitat is not defined for Migratory species.	Recorded within subject land (BUS control point only)	Yes	Preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation (Cth DCCEEW 2024q). Australian breeding locations are limited to a number of areas including the Murray Darling Basin in northern New South Wales, western Riverina of NSW/Victoria, wider south-east South Australia, Channel Country of Queensland and South Australia and the lower Ord/Keep Rivers of Western Australia and the Northern Territory (Cth DCCEEW 2024q). Dams within the subject land are not considered likely to support breeding habitat or foraging habitat for this species. Glossy Ibis was recorded on just one occasion during any targeted avian surveys, BUS or incidental surveys within the subject land despite periods of above average rainfall and flooding events increasing the quantity and availability of water within the subject land and surrounding landscape. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP and BBAMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely
Caspian Tern	Low risk of significant impact	The total global population of the Caspian Tern is estimated to be 240 000–420, 000 birds (BirdLife International 2024c). Critical habitat is not defined for Migratory species.	Not recorded within subject land	Unlikely	Within Australia this species typically occurs along coastlines of south Australia, Western Australia and coastlines of western West Australia. In NSW the species is widespread east of the Great Divide, mainly in coastal regions, and also in the Riverina and Lower and Upper Western Regions, with occasional records elsewhere. Occurrence of this species is also present in northern QLD, some areas of coastal QLD, coastal VIC and Tasmania. Globally this species is also found in North America, Africa and Eurasia (Cwth DCCEEW 2024) Within Australia, this species occurs in sheltered coastal embayment's including harbours, lagoons, inlets, bays, estuaries and river deltas. Areas with muddy or sandy margins are preferred. This species also occurs on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks. (Cwth DCCEEW 2024). This species breeds in Australia, utilising low islands, cays, spits, banks, ridges, beaches of sand or shell, terrestrial wetlands and stony or rocky inlets. Nests are constructed in the open, or in low sparse vegetation consisting of a scraped hollow in the ground lined with vegetation, small stones, feathers or shells. Breeding has also been recorded from the Menindee Lakes, north of the Riverina (Cwth DCCEEW 2024)	No potential for significant impact

MNES	DCCEEW consideration	Important populations / Critical habitat	Updated likelihood of occurrence based on assessment	Potential impacts	Summary of MNES occurrence, avoidance efforts, potential impact (amended design)	SIC self-assessment undertaken / result (Appendix 6)
					Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP and BBAMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	
Fork Tailed Swift	Low risk of significant impact	Important populations not defined. Therefore considered habitat that supports an ecologically significant proportion of the population/species, habitat of critical importance to particular life-cycle stages, or at the limit of the species range. Critical habitat is not defined for Migratory species.	Recorded within development footprint.	Yes	This species was recorded once, during BUS surveys in March 2024 only, despite two years of survey. The Fork-tailed Swift is almost exclusively aerial, flying from less than 1 m to at least 300 m above ground and probably much higher. Mostly occur over inland plains but sometimes above foothills or in coastal areas. Fork-tailed Swift undertake extensive migrations, traveling thousands of kms from their breeding grounds to their wintering areas. Their movements are influenced by factors such as food availability, weather patterns, and breeding cycles. Turbine collision is possible, but overall risk is considered low. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP and BBAMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely
White-throated Needletail	Low risk of significant impact	Important populations not defined. Therefore considered habitat that supports an ecologically significant proportion of the population/species, habitat of critical importance to particular life-cycle stages, or at the limit of the species range. Critical habitat is not defined for Migratory species.	Surveyed. Unlikely to be present	Unlikely	Not recorded during detailed BUS surveys across two years. Foraging in Australia occurs until January – April, where birds begin migration back to breeding grounds in Asia and Siberia. The subject land is considered to be at its southern and westerly distribution This species is almost entirely aerial, foraging from 1m to 1000m above the ground, they occur over most habitat types, with a preference towards wooded areas. Roosting occurs in in forest/woodland in dense canopy or hollow, with indications of aerial roosting also occurring. Turbine collision is possible, but overall risk is considered low in this region. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP and BBAMP, pre-clearance surveys, adaptive management and unexpected finds procedures.	Significant impact unlikely

12.1.3. Survey effort for MNES entities

Habitat assessments to determine microhabitats for threatened species across the development corridor and subject land have been completed. Suitable foraging and breeding habitat was identified for a number of species within the development corridor and subject land. Targeted surveys included the following:

- Targeted flora surveys.
- Targeted nocturnal bird surveys.
- Diurnal bird surveys (Bird Utilisation Surveys):
- Two years survey effort covering summer/autumn/winter/spring.
- Microchiroptera bat survey (Bat Utilisation Survey).

Vegetation surveys comprising mapping of vegetation communities and collection of floristic plot data were also completed to determine the presence of TECs listed as MNES under the EPBC Act.

Section 4, provides details of survey method and effort, justification for survey methods employed, timing of surveys, experience of personnel undertaking the surveys and the result of the surveys.

The following MNES listed species were identified during the survey effort:

- Painted Honeyeater.
- Diamond Firetail.
- Southern Whiteface.
- Superb Parrot.
- Southern Bell Frog.
- Corben's Long-eared Bat (precautionary from call analysis based on species group identification).
- Fork-tailed Swift.
- *Swainsona murrayana*.

12.1.4. Avoidance of impacts to MNES

Avoidance and minimisation of impacts to biodiversity values have been undertaken throughout the development and design of the project from initial desktop-based constraints information, followed by design workshops and updates based on a number of rounds of collection of ground-validated data. Section 7 and Table 101 provide detailed information of efforts undertaken to minimise impacts to MNES which have been considered throughout the assessment as high constraint biodiversity values.

12.1.5. MNES potentially impacted by the project

The likelihood of occurrence of MNES within the development corridor and subsequent potential impacts were assessed through desktop and field-based assessments. Species were determined to be at risk of significant impact and were subject to assessment under the EPBC Act Significant Impact Guidelines (DoE 2013):

Likelihood of occurrence tables are addressed with BAM candidate species in Appendix 2. Significant Impact Criteria assessments for MNES are provided in Appendix 6. This assessment determined the species outlined below as having the potential for significant impact from the project:

- Plains Wanderer – Critically Endangered.
    - Significant impact.
- Superb Parrot – Vulnerable.
    - Significant impact.
- Natural Grasslands of the Murray Valley Plains – Critically Endangered
    - Significant impact.
- Weeping Myall Woodlands – Endangered.
    - Significant impact.

Species such as the Australasian Bittern that may traverse through the landscape during nomadic movement may be impacted by barrier effects and macro avoidance of large areas of turbines, however this impact is not considered to be significant or substantial.

12.1.6. Mitigation to MNES

Ongoing avoidance, minimisation and mitigation of impacts to biodiversity values will be undertaken through detailed design, construction and operation of the project. Table 87 in Section 9 provides detailed information on mitigation measures and commitment to ensure impacts to MNES continue to be minimised during future project stages with such measures including (but are not limited to) the following:

- Development of adaptive management plans, including a BMP and final BBAMP, that provide clear mitigation and management measures required to benefit MNES, and to ensure unexpected or indirect impacts are prevented from occurring, or if unforeseen impacts do occur these are realised early, arrested, prevented from reoccurring, and if significant enough additional offsets are secured.
- Impact minimisation and mitigation strategies to prevent collision with and electrocution from overhead powerlines by MNES will be employed.
- Ongoing pest control to prevent an increase in predator populations will be implemented, this will be particularly important for the local Plains-wanderer population.
- Rehabilitation of areas subject to temporary impacts only to allow for the maintenance of forage and shelter opportunities for mobile fauna, and to allow for the maintenance of habitats that potentially support threatened flora species recorded within the disturbance footprint.
- Operational impacts minimisation measure such as fauna friendly fencing, ongoing weed control, reduced construction speed limits and vehicle strike procedures will all benefit MNES recorded or considered likely to occur within the subject land.

12.1.7. Residual Impacts to MNES

Following all efforts to avoid and minimise impacts to MNES (and biodiversity values generally) the project is expected to result in the following unavoidable residual impacts shown in Table 102.

Table 102 MNES within the subject land

Residual impact	MNES impacted	Impact to MNES	Rationale
Significant residual impacts to MNES	• Weeping Myall Woodlands	• Direct impacts to 128.73 ha of TEC (or 15% of occurrence within the development corridor).	• The development corridor contains a total of 873.53 ha of Weeping Myall Woodlands, of which 128.73 ha (or 15%) will be directly impacted. An approximate amount of 6,649 ha occurs within the broader subject land, but it is uncertain how much of this would meet the requirements of the EPBC listing. • Impacts to over 125 ha of the TEC is considered a substantial reduction, and likely to be a significant impact under the EPBC Act.
	• Natural Grasslands of the Murray Valley Plains	• Direct impacts to 76.87 ha of TEC.	• Direct impacts to 76.87 ha of TEC, which equates to the loss of 0.13% of remaining TEC in the locality, and 1.4% of the assessed community within the subject land are considered a significant impacts due to the project resulting in a reduction in the extent of a critically endangered community, as well as the potential for cumulative impacts.
	• Plains Wanderer	• The project is expected to impact upon approximately 2.38 ha of Mapped Important Areas of habitat, with an additional 73 ha of potential dynamic grassland habitat when additional Biosis mapped habitat (PCT 46) is considered. • Impacts are to habitat considered critical to the survival of the species, to the extent that there is some potential for the species to decline.	• Approximately 645 ha of Mapped Important Areas of habitat occur within the subject land, with other areas of potential habitat mapped by Biosis within the development corridor comprising a further 326 ha. • The project is likely to adversely affect habitat critical to the survival of the species, reduce the area of occupancy of a population, and has some potential to impact the species' habitat to the extent that the species is likely to decline.
	• Superb Parrot	• The project would result in direct impacts of 134.10 ha of PCTs 10, 13, 15, 17 and 26 (intact). However this vegetation is not considered suitable breeding habitat for Superb Parrot, or habitat critical to the survival of the species. • Nine hollow bearing trees may be impacted	• Superb Parrot has the potential to be significantly impacted, as the project may lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population. This results from removal of habitat and risk of collisions.

Residual impact	MNES impacted	Impact to MNES	Rationale
			• It is considered unlikely the Superb Parrot utilises habitat for breeding within the subject land, and move towards more significant major permanent waterways for breeding where suitable hollows are abundant. • The project may isolate or decrease the availability or quality of habitat to the extent the species declines, and may interfere will the recovery of the species.
Removal of native vegetation providing habitat to MNES and/or potential impacts from turbine collision and barrier effect	• Australasian Bittern • Australian Painted Snipe	• Significant impact unlikely. • Impacts to suboptimal habitat comprising farm dams, and freshwater Lignum wetlands and shrublands within PCT 24, PCT 17, PCT 13 and PCT 15. • Collision risk and barrier effect considered Low Risk for Australasian Bittern, and Negligible (collision) and Low (barrier effect) for Australian Painted Snipe.	• The project will not lead to the long term decrease of a population, reduce the areas of occupancy or fragment an existing population, or disrupt the breeding cycle of a population, or species as a whole. • The project will not adversely modify the species habitat or introduce invasive species/diseases or interfere will the recovery of the species. • Potential collision risk can be effectively mitigated through implementation of the BBAMP.
	• Fork tailed swift • White-throated Needletail	• Significant impact unlikely. • As the project is a wind farm development, this may alter the airspace above the project, therefore these species may be at risk of blade strike, or avoidance of potential habitats currently present once the wind farm becomes operational. • Collision risk and barrier effect considered Low Risk for Fork-tailed Swift (i.e. At-risk), and Negligible for White-throated Needletail.	• Numerous individuals of Fork-tailed Swift across were encountered incidentally enroute between BBUS surveys in March 2024. White-throated Needletail has not been recorded within the subject land. • The project is unlikely to substantially modify, destroy or isolate an area of important habitat, or result in an invasive species becoming established in an area of important. • Nor will the project seriously disrupt the lifecycle of an ecologically significant proportion of the population the species. • Potential collision risk can be effectively mitigated through implementation of the BBAMP.
	• Blue-winged Parrot • Major Mitchell's Cockatoo	• Significant impact unlikely.	• Neither species recorded during 24 months of BUS., targeted birds surveys nor incidentally.

Residual impact	MNES impacted	Impact to MNES	Rationale
		• Impacts to foraging and potential breeding habitat is represented woodland communities such as PCT's 13, 15, 26 and 45, supporting tree hollows. • Collision risk and barrier effect considered Negligible for both species.	• Known records occur in the broader locality, which is taken into account for impact likelihood, however are considered to occur on the rare occasion or less frequently then habitats 30-50 km to the west, and Hay Plain, indicated by replicated seasonal surveys across 24 months • The project will not lead to the long term decrease of a population, reduce the areas of occupancy or fragment an existing population. • Nor will it disrupt the breeding cycle of a population, or species as a whole, adversely modify the species habitat, introduce invasive species/diseases, or interfere will the recovery of the species. • Potential collision risk can be effectively mitigated through implementation of the BBAMP.
Removal of native vegetation providing habitat to MNES	• Winged Peppercress • Turnip Copperburr • Spear Grass • Claypan Daisy • Mossgiel Daisy • Chariot Wheels • Slender Darling Pea • Red Darling Pea	• Impacts to flora species habitat range from as little as 2.4 ha where sufficient targeted surveys have been able to be completed (and avoidance has been implemented) within the development corridor, to as large as 238 ha, where presence has needed to be assumed on the basis of ongoing updates to the project layout.	• Only Slender Darling Pea has been recorded within the subject land and subject to high levels of avoidance of optimal habitat and species clusters • Four of the five Vulnerable listed species have been assessed as not comprising an Important Population. • Chariot Wheel has been assessed as an Important Population, on the basis of assumed presence in under-surveyed areas, however impact have been concluded not to be significant. • It is considered highly unlikely these species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025.
	• Southern Bell Frog	• Direct impacts are limited, with most impacts associated to adjacent buffers and dispersal habitat up to 82 ha. • Impacted PCTs within the subject land include PCTs 10, 13, 15, 17, 28, and 45, however suitable habitat is likely to	• The project will not lead to the long term decrease of a population, reduce the areas of occupancy or fragment an existing population. • Nor will it disrupt the breeding cycle of a population, or species as a whole, adversely modify the species habitat,

Residual impact	MNES impacted	Impact to MNES	Rationale
		constitute PCTs 13, 15, and 17 that comprise wetland vegetation.	introduce invasive species/diseases, or interfere will the recovery of the species. • Potential indirect impacts can be effectively mitigated through implementation of the BMP.
	• Diamond Firetail • Southern Whiteface • Painted Honeyeater • Corben's Long-eared Bat	• Species have been recorded within the subject land and are likely to use majority of habitats within the development corridor. • Painted Honeyeater is more associated with areas of intact Weeping Myall Woodland and Corben's Long-eared Bat with wooded area generally. • Direct impacts are to quite large areas (in terms of hectares) however the species' potential habitats within the broader subject land are commensurately large.	• All considered at a Negligible risk from turbine collisions and barrier effect, with only Painted Honeyeater having the potential to fly within RSA. • None of these species have been assessed as an Important Population. • The project will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population. • Nor will it disrupt the breeding cycle of an important population, the local population or species as a whole, adversely modify the species habitat or introduce invasive species/diseases, or interfere will the recovery of the species.

Residual impact	MNES impacted	Impact to MNES	Rationale
Indirect impacts	• All MNES recorded or considered likely to occur within the subject land	The project has the potential to result in residual indirect impacts to MNES, associated with the potential impacts listed below. Various impacts are more likely to occur to different MNES and the severity of potential impacts will also range between MNES. However, in indirect impacts are unlikely to be substantial or significant due to avoidance and minimisation measures undertaken to date, and commitments to ongoing mitigation during future project stages. Potential indirect impacts to MNES include: • Inadvertent impacts on adjacent habitat or vegetation • Reduced viability of adjacent habitat due to edge effects • Reduced viability of adjacent habitat due to noise, dust or light spill • Transport of weeds and pathogens from the site to adjacent vegetation • Trampling of threatened flora species • Increase in predators and pest animal populations • Vehicle strikes • Fragmentation of movement corridors • Collision (powerline strike), electrocution, and exposure to electrical and magnetic fields due to installation of powerlines	• Throughout the current life of the project, the design has considered avoidance and minimisation of all MNES. Avoid and minimise steps have been undertaken from the onset, including within the initial constraints assessment, early EPBC Act referral, consultation and completion of multiple redesign to minimise impacts. The project design has considered potential impacts to MNES entities. • Consequences of indirect impacts are considered localised.

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12.1.8. Offsetting of residual impacts to MNES

Impacts to MNES as a result of the project have been determined to be significant for two listed threatened species, and two threatened ecological communities, in accordance with Significant Impact Guidelines 1.1 - Matters of National Environmental Significance (DoE 2013) (refer Appendix 6). Offsetting in accordance with the EPBC Act Environmental Offsets Policy (CoA 2012) and the EPBC Act is not specifically required. Reducing impacts to these species and communities will be the focus of further detailed design.

Impacts to all MNES, including those assessed as unlikely to be significantly impacted by the project, will be offset in accordance with the NSW BOS through generation of either Ecosystem Credits or Species Credits via direct establishment of Biodiversity Stewardship Sites to generate biodiversity credits to offset the project's impacts, through securing biodiversity credits from the open market, or from payment to the Biodiversity Conservation Fund. Further information of the project biodiversity offset strategy is provided in Section 11.

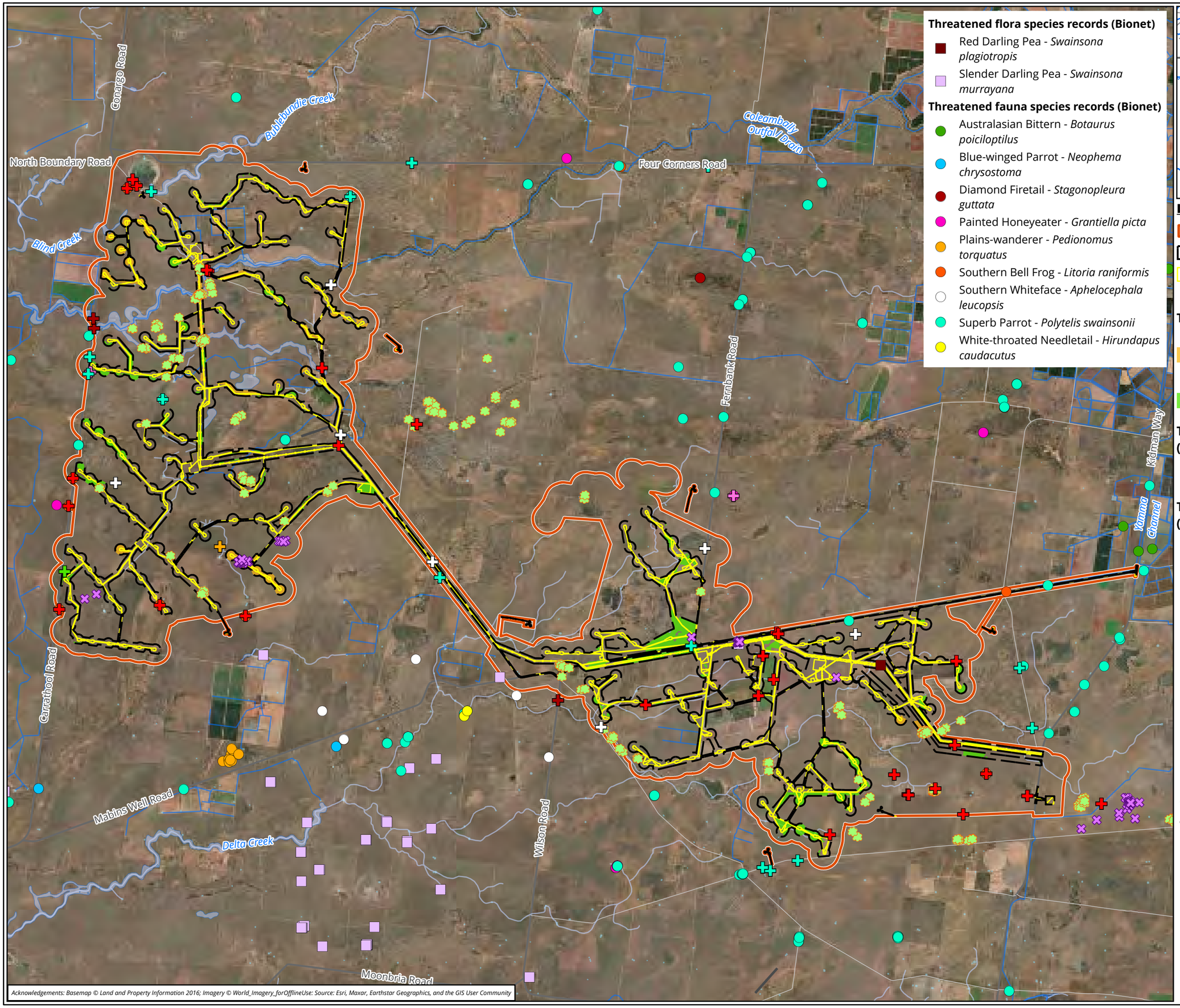
The project is committed to providing additional offsets, over and above those required by the NSW BOS and EPBC Act Environmental Offsets Policy to benefit significantly impacted communities and species through means such as providing additional funding for habitat management, predator exclusion and pest control. These are likely to be contained within stewardship sites currently under assessment for the project. The quantum of additional offset contributions, specific measures to be funded, and relevant mechanisms will be detailed in the project's final designs Biodiversity Offset Strategy, to be developed post-approval.

Table 103 Potential residual offsets for MNES

Residual impact	MNES impacted	Residual offsets
Significant residual impacts to MNES	• Weeping Myall Woodlands	• Up to a total credit obligation that would include suitable MNES areas of 11,807 credits, including 3,917 PCT 26 Intact credits and 7,890 PCT 26 sparse credits • Enabling works/Stage 1 credit obligation that would include suitable MNES areas of 3,594 credits • Stage 2 credit obligation that would include suitable MNES areas of 8,213 credits
	• Natural Grasslands of the Murray Valley Plains	• Up to a total credit obligation that would include suitable MNES areas of 4,322 credits. • Enabling works/Stage 1 credit obligation that would include suitable MNES areas of 240 credits, • Stage 2 credit obligation that would include suitable MNES areas of 4,083 credits.
	• Plains Wanderer	• Up to a total credit obligation of 125 credits, resultant from direct impacts to important mapped polygons for Plains Wanderer. • Up to a total credit obligation of 3,459 credits that will include suitable grassland habitats managed for Plains Wanderer and Natural Grasslands of the Murray Valley Plains • Enabling works/Stage 1 credit obligation of 193 credits of suitable broad natural grassland communities • Stage 2 credit obligation that would include suitable MNES areas of 125 credits for direct impacts to mapped important areas and 3,266 credits of suitable broad natural grassland communities.
	• Superb Parrot	• Up to a total credit obligation that would include suitable MNES areas of 987 credits and that contain hollow bearing trees

Residual impact	MNES impacted	Residual offsets
		• Enabling works/Stage 1 credit obligation that would include suitable MNES areas of 125 credits. • Stage 2 credit obligation that would include suitable MNES areas of 867 credits.
Removal of native vegetation providing habitat to MNES and/or potential impacts from turbine collision and barrier effect	• Australasian Bittern • Australian Painted Snipe	• No direct impacts or significant impacts are expected to occur for these species, and residual offsets are not required.
	• Fork tailed swift • White-throated Needletail	• No direct impacts or significant impacts are expected to occur for these species, and residual offsets are not required. • Measures stipulated within the BBAMP as a result of annual reporting may result in the generation of credits as a result of prescribed impacts (should a collision occur of these species) based of an approved method stated within the final BBAMP
	• Blue-winged Parrot • Major Mitchell's Cockatoo	• No significant impacts are expected to occur for these species, and specific residual offsets are not required. • Measures stipulated within the BBAMP as a result of annual reporting may result in the generation of credits as a result of prescribed impacts (should a collision occur of these species) based of an approved method stated within the final BBAMP • Impacts to foraging habitat is represented in woodland and grassland communities such as PCT's 10, 13, 15, 26 (intact and sparse) supporting tree hollows and PCT 45, and may generate up to 9,303 credits
Removal of native vegetation providing habitat to MNES	• Winged Peppercress • Turnip Copperburr • Spear Grass • Claypan Daisy • Mossgiel Daisy • Chariot Wheels • Slender Darling Pea • Red Darling Pea	• Winged Peppercress – 3,985 credits from assumed presence • Turnip Copperburr - 5,286 credits from assumed presence • Spear Grass - 322 credits from assumed presence • Claypan Daisy – 2,428 credits from assumed presence • Mossgiel Daisy – 1,930 credits from assumed presence • Chariot Wheels – 5,241 credits from assumed presence • Slender Darling Pea – 9,121 credits from known impacts and assumed presence • Red Darling Pea – 8,054 credits from assumed presence **All are highly likely to come down in credit liabilities to zero, with exception of *Swainsona murrayana*, upon completion of all remaining survey requirements**
	• Southern Bell Frog	• Direct impacts are limited, with most impacts associated to adjacent buffers and dispersal habitat up to 82 ha, resulting in credit obligation of 1,956 credits
	• Diamond Firetail • Southern Whiteface	• No significant impacts are expected to occur for these species, and specific residual offsets are not required. • Measures stipulated within the BBAMP as a result of annual reporting may result in the generation of credits as a result of prescribed impacts

Residual impact	MNES impacted	Residual offsets
	• Painted Honeyeater • Corben's Long-eared Bat	(should a unlikely collision occur of these species) based of an approved method stated within the final BBAMP • Painted Honeyeater is more associated with areas of intact Weeping Myall Woodland and Corben's Long-eared Bat with wooded area generally, with associated ecosystems habitat credits of 8,855 credits, (including 2,938 PCT 26 Intact credits and 5,917 PCT 26 sparse credits) and 1,387 (PCTs 10, 13, 15 and 28) respectively • Diamond Firetail and Southern Whiteface use a variety of habitats with an approximate ecosystem credit obligation of 9,734 credits will contain suitable habitat for these species.
Indirect impacts Prescribed Impacts	• All MNES recorded or considered likely to occur within the subject land	• No direct offsets are associated with indirect impacts however substantial mitigation stated within a BMP will ensure indirect are considered negligible • Measures stipulated within the BBAMP as a result of annual reporting may result in the generation of credits as a result of prescribed impacts (should a unlikely collision occur of these species) based of an approved method stated within the final BBAMP

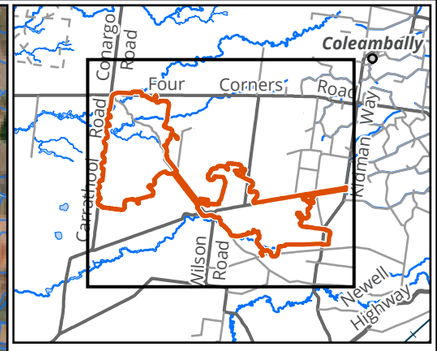


Threatened flora species records (Bionet)

- Red Darling Pea - *Swainsona plagiotropis*
- Slender Darling Pea - *Swainsona murrayana*

Threatened fauna species records (Bionet)

- Australasian Bittern - *Botaurus poiciloptilus*
- Blue-winged Parrot - *Neophema chrysostoma*
- Diamond Firetail - *Stagonopleura guttata*
- Painted Honeyeater - *Grantiella picta*
- Plains-wanderer - *Pedionomus torquatus*
- Southern Bell Frog - *Litoria raniformis*
- Southern Whiteface - *Aphelocephala leucopsis*
- Superb Parrot - *Polytelis swainsonii*
- White-throated Needletail - *Hirundapus caudacutus*



Legend

- Subject land
- Development corridor
- Development footprint
- Hollow-bearing tree

Threatened ecological communities

- Natural Grasslands of the Murray Valley Plains (potential) (CEEC, EPBC Act)
- Weeping Myall Woodlands (EEC, EPBC Act)

Threatened flora species records (Biosis)

- Slender Darling-pea - *Swainsona murrayana*

Threatened fauna species records (Biosis)

- Diamond Firetail - *Stagonopleura guttata*
- Fork-tailed Swift - *Apus pacificus*
- Painted Honeyeater - *Grantiella picta*
- Plains-wanderer - *Pedionomus torquatus*
- Southern Bell Frog - *Litoria raniformis*
- Southern Whiteface - *Aphelocephala leucopsis*
- Superb Parrot - *Polytelis swainsonii*

Figure 24 Matters of national environmental significance - Overview

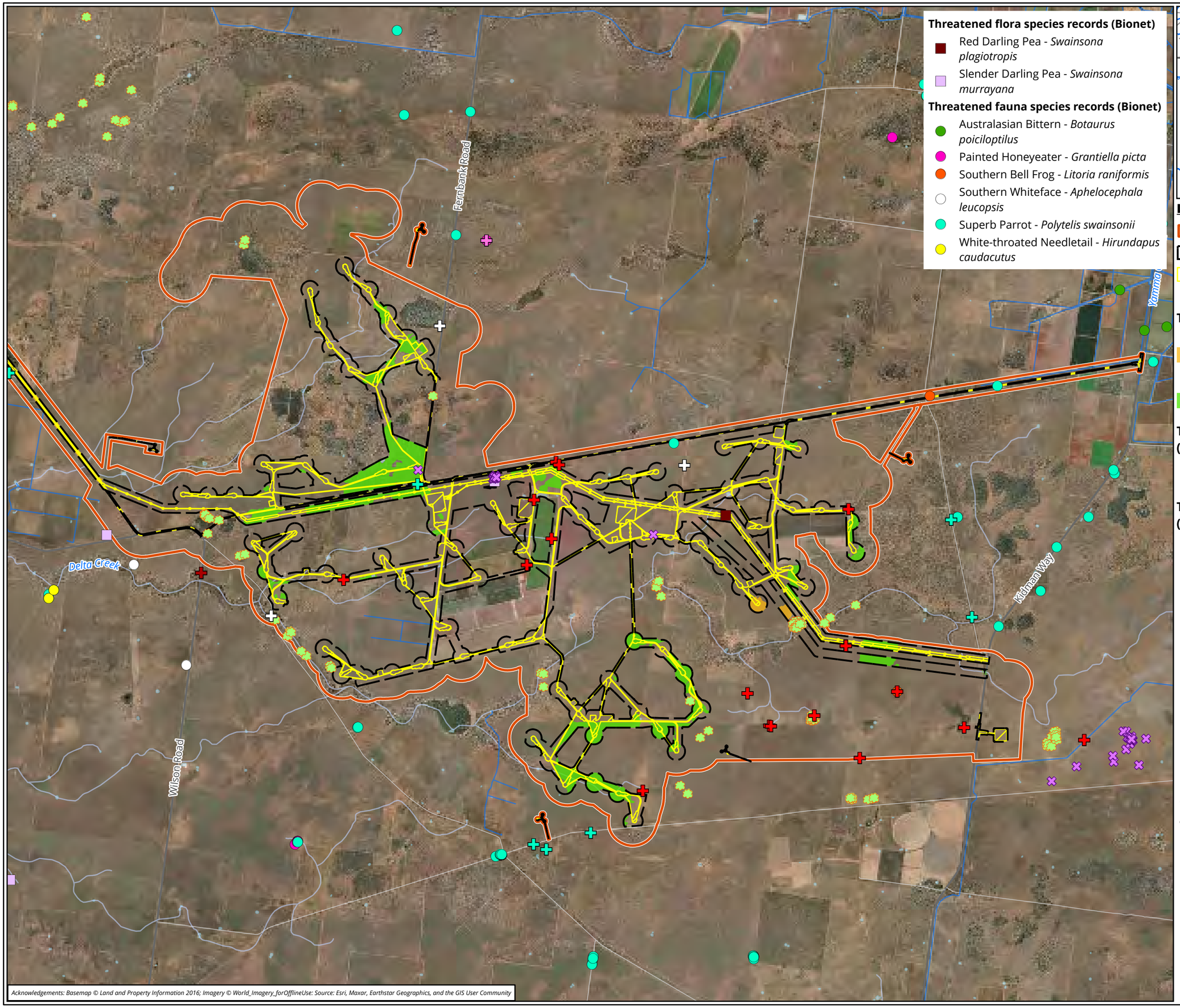
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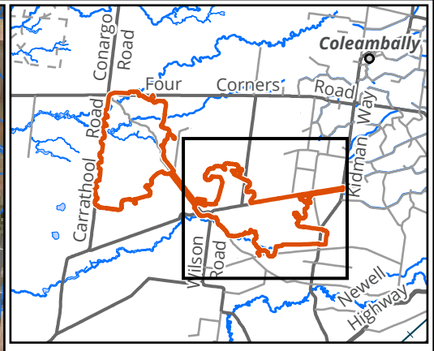
Kilometers
Scale: 1:130,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

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biosis

Matter: 37263, Date: 08 April 2025,
GIS: JB, Checked by: MP, Last edited by: jbeckius
Location: P:\37200s\37263\Mapping\
37263_Dinawan_BDAR_Wind_F18-24.aprx
Layout: 37263_Wind_F24_MNES





Legend

- Subject land
- Development corridor
- Development footprint
- Hollow-bearing tree

Threatened ecological communities

- Natural Grasslands of the Murray Valley Plains (potential) (CEEC, EPBC Act)
- Weeping Myall Woodlands (EEC, EPBC Act)

Threatened flora species records (Biosis)

- Slender Darling-pea - *Swainsona murrayana*

Threatened fauna species records (Biosis)

- Diamond Firetail - *Stagonopleura guttata*
- Painted Honeyeater - *Grantiella picta*
- Southern Bell Frog - *Litoria raniformis*
- Southern Whiteface - *Aphelocephala leucopsis*
- Superb Parrot - *Polytelis swainsonii*

Figure 24 Matters of national environmental significance - Eastern area

0 1 2 3

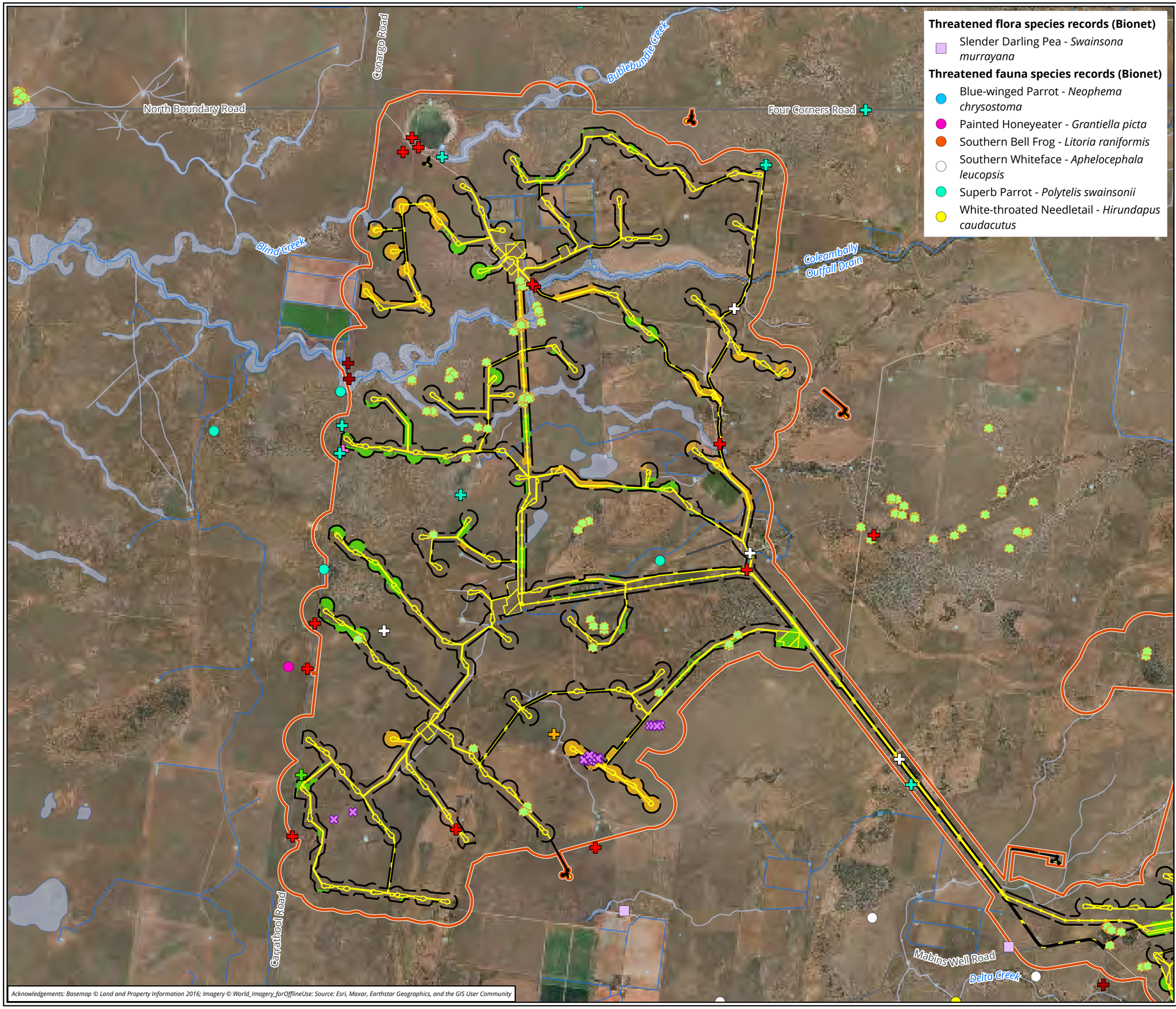
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Scale: 1:80,000 @ A3

Coordinate System: GDA2020 MGA Zone 55

biosis

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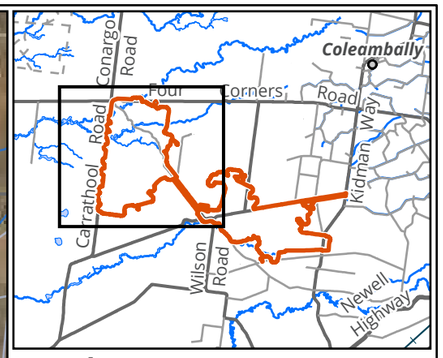


Threatened flora species records (Bionet)

- Slender Darling Pea - *Swainsona murrayana*

Threatened fauna species records (Bionet)

- Blue-winged Parrot - *Neophema chrysostoma*
- Painted Honeyeater - *Grantiella picta*
- Southern Bell Frog - *Litoria raniformis*
- Southern Whiteface - *Aphelocephala leucopsis*
- Superb Parrot - *Polytelis swainsonii*
- White-throated Needletail - *Hirundapus caudacutus*



Legend

- Subject land
- Development corridor
- Development footprint
- Hollow-bearing tree

Threatened ecological communities

- Natural Grasslands of the Murray Valley Plains (potential) (CEEC, EPBC Act)
- Weeping Myall Woodlands (EEC, EPBC Act)

Threatened flora species records (Biosis)

- Slender Darling-pea - *Swainsona murrayana*

Threatened fauna species records (Biosis)

- Diamond Firetail - *Stagonopleura guttata*
- Fork-tailed Swift - *Apus pacificus*
- Painted Honeyeater - *Grantiella picta*
- Plains-wanderer - *Pedionomus torquatus*
- Southern Bell Frog - *Litoria raniformis*
- Southern Whiteface - *Aphelocephala leucopsis*
- Superb Parrot - *Polytelis swainsonii*

Figure 24 Matters of national environmental significance - Western area

0 1 2 3

Kilometers
Scale: 1:80,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

N

biosis

Matter: 37263, Date: 08 April 2025,
GIS: JB, Checked by: MP, Last edited by: jbeckius
Location: P:\37200s\37263\Mapping\
37263_Dinawan_BDAR_Wind_F18-24.aprx
Layout: 37263_Wind_F24_MNES

12.2. Fisheries Management Act 1994

The FM Act provides for the protection and conservation of aquatic species and their habitat throughout NSW. Impacts to threatened species, populations and communities, and critical habitats listed under the FM Act must be assessed through an Assessment of Significance process.

Predicted habitat for threatened aquatic species such as the Flathead Galaxias or Silver Perch is mapped on the DPI spatial data portal within the subject land and within sections of the Coleambally Outfall Drain. These species are also identified as part of Delta Creek, however this creek will not be directly impacted. The Coleambally Outfall Drain are identified as Poor Freshwater Fish Community habitat within the subject land and on the NSW DPI Freshwater Fish Community map (DPI 2023). The area of indicative habitat for this species within the subject land is located within a modified earthen channel, the Coleambally Outfall Drain, which is used to supply water for irrigation (NSW Agriculture 2003). Water pooling and minor flow were observed during surveys within the subject land, however water quality was observed to be in poor condition. The habitat within the Coleambally Outfall Drain consists of a two-three meter wide, highly modified earthen channel, and at best, one to two meter in depth. This channel may be used as transitional habitat between areas of suitable breeding and foraging areas, however it is considered highly unlikely to support breeding of these species during low or high flows. No records of threatened aquatic species have been recorded within 10 kilometres of the subject land on the BioNet Atlas of NSW, however two species were predicted by the Protected Matters Search Tool (PMST).

Numerous ephemeral watercourses associated are located within the subject land and dissected by the development corridor. No instream woody debris is proposed to be removed and therefore a permit under Part 7 of the FM Act is not required. NSW DPI is required to assess all projects that involve structures that span the full width of a waterway (including pipe crossings) or modifies the velocity or quantity of water. Crossing locations within the Coleambally Outfall Drain are located where existing structures occur currently. Consideration of appropriate riparian buffer distances for the purpose of key fish habitat conservation, as well as best practise guidance on minimising impacts to fish passage and general aquatic wildlife as a result of temporary and permanent waterway crossings will be undertaken. Mitigation measures will be implemented to ensure impacts within the subject land do not result in indirect impacts to waterways in the broader locality. As the waterways within the subject land do not support significant aquatic ecological communities, fish passage is unlikely to be impacted by the project.

12.3. Biosecurity Act 2015

The *Biosecurity Act 2015* provides for the identification, classification and control of priority weeds with the purpose of determining if a biosecurity risk is likely to occur. A biosecurity risk is defined as the risk of a biosecurity impact occurring, which for weeds includes the introduction, presence, spread or increase of a pest into or within NSW or any part of the State. A pest plant has the potential to; harm or reduce biodiversity or out-compete other organisms for resources, including food, water, nutrients, habitat and sunlight.

Two priority weeds for the Murray LLS Region have been recorded in the subject land and are African Boxthorn *Lycium ferocissimum* and Bathurst Burr *Xanthium spinosum*. Both have a General Biosecurity Duty under the Act.

13. Biodiversity credit report

Offsetting through establishment of Biodiversity Stewardship Sites, the transfer and retirement of biodiversity credits, and/or paying into the BCT Offset Fund, is required for the project. Biodiversity credit reports provided on the following pages.

BAM Credit Summary Report

Proposal Details

Assessment Id
00034895/BAAS17051/25/00055370

Proposal Name
Dinawan Wind_DevFoot

BAM data last updated *
05/08/2025

Assessor Name
Mitchell Palmer

Report Created
14/08/2025

BAM Data version *
Current classification (live - default) (82)

Assessor Number
BAAS17051

BAM Case Status
Finalised

Date Finalised
14/08/2025

Assessment Revision
5

BOS entry trigger

Assessment Type
Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)												
2	13_Moderate	Not a TEC	70.6	70.6	3.6	PCT Cleared - 57%	High Sensitivity to Gain			1.75		110

3	13_Thinned	Not a TEC	69.2	69.2	7.9	PCT Cleared - 57%	High Sensitivity to Gain			1.75		238
											Subtotal	**348**
Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)												
4	15_Moderate	Not a TEC	75.7	75.7	2.5	PCT Cleared - 50%	High Sensitivity to Gain			1.75		84
5	15_Thinned	Not a TEC	67.1	67.1	1.1	PCT Cleared - 50%	High Sensitivity to Gain			1.75		32
											Subtotal	**116**
Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion												
14	46_Moderate	Natural Grasslands of the Murray Valley Plains	90.6	90.6	73.4	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Critically Endangered	2.50		4158

17	46_Intersection	Natural Grasslands of the Murray Valley Plains	100	100.0	0.34	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Critically Endangered	2.50		21
											Subtotal	**4179**
Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)												
6	17_Mod_Good	Not a TEC	84.2	84.2	0.76	PCT Cleared - 63%	High Sensitivity to Gain			1.75		28
7	17_Moderate	Not a TEC	83.5	83.5	1.3	PCT Cleared - 63%	High Sensitivity to Gain			1.75		46
											Subtotal	**74**
Nitre Goosefoot shrubland wetland on clays of the inland floodplains												
15	160_Mod_Good	Not a TEC	79	79.0	5	PCT Cleared - 28%	High Sensitivity to Gain			1.50		147
											Subtotal	**147**

Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion												
13	45_Mod_Good	Natural Grasslands of the Murray Valley Plains	65.1	65.1	2.2	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Critically Endangered	2.50		91
16	45_Intersection	Natural Grasslands of the Murray Valley Plains	100	100.0	0.83	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Critically Endangered	2.50		52
											Subtotal	**143**
River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)												
1	10_Moderate	Not a TEC	29.2	29.2	0.19	PCT Cleared - 43%	High Sensitivity to Gain			1.50		2
											Subtotal	**2**

Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion												
8	26_DNG	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	20.3	20.3	342.4	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		3475
9	26_Intact	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	67.1	67.1	116.8	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		3917

10	26_Sparse	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	46.2	46.2	341.4	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		7890
											Subtotal	**15282**
White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone												
11	28_Low	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	57.1	57.1	47.8	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		1364

12	28_Moderate	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	73.8	73.8	1.1	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		41
											Subtotal	**1405**
											Total	**21696**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Austrostipa wakoolica / A spear-grass (Flora)									
17_Mod_Good	84.2	84.2	0.06	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	3
17_Moderate	83.5	83.5	1.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	51

26_Intact	67.1	67.1	0.35	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	12
26_Sparse	46.2	46.2	8.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	189
26_DNG	20.3	20.3	6.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	67
								Subtotal	**322**
Brachyscome muelleroides / Claypan Daisy (Flora)									
45_Mod_Good	65.1	65.1	0.05	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	True	2
46_Moderate	90.6	90.6	34.4	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	True	2338
45_Intersection	100.0	100.0	0.83	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	True	62

46_Intersection	100.0	100.0	0.34	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	True	26
								Subtotal	**2428**
Brachyscome papillosa / Mossgiel Daisy (Flora)									
13_Moderate	70.6	70.6	2.9	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	104
13_Thinned	69.2	69.2	3.7	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	128
15_Moderate	75.7	75.7	1.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	42
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	36
45_Mod_Good	65.1	65.1	0.05	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	2

46_Moderate	90.6	90.6	34.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1559
45_Intersection	100.0	100.0	0.83	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	42
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	17
								Subtotal	**1930**
Hemiaspis damelii / Grey Snake (Fauna)									
10_Moderate	29.2	29.2	0.19	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	3
13_Moderate	70.6	70.6	3.6	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	126
13_Thinned	69.2	69.2	7.9	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	272

15_Moderate	75.7	75.7	2.5	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	96
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	37
17_Mod_Good	84.2	84.2	0.76	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	32
17_Moderate	83.5	83.5	1.3	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	53
160_Mod_Good	79.0	79.0	5	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	196
								Subtotal	**815**

Lepidium monoplocoides / Winged Peppercress (Flora)									
10_Moderate	29.2	29.2	0.14	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	2
13_Moderate	70.6	70.6	2.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	104
13_Thinned	69.2	69.2	3.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	121
15_Moderate	75.7	75.7	1.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	56
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	37

26_Intact	67.1	67.1	23.3	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	780
26_Sparse	46.2	46.2	81.7	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	1888
26_DNG	20.3	20.3	98.3	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	997
								Subtotal	**3985**
Leptorhynchos orientalis / Lanky Buttons (Flora)									
26_Intact	67.1	67.1	23.3	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	780
26_Sparse	46.2	46.2	81.7	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	1888

45_Mod_Good	65.1	65.1	0.05	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	2
46_Moderate	90.6	90.6	34.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	1559
26_DNG	20.3	20.3	98.3	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	997
45_Intersection	100.0	100.0	0.83	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	42
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	17
								Subtotal	**5285**

Litoria raniformis / Southern Bell Frog (Fauna)									
13_Moderate	70.6	70.6	0.55	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	19
13_Thinned	69.2	69.2	2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	69
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	36
17_Mod_Good	84.2	84.2	0.49	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	21
26_Intact	67.1	67.1	8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	268

26_Sparse	46.2	46.2	29.7	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	687
28_Low	57.1	57.1	0.77	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	22
46_Moderate	90.6	90.6	9.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	432
160_Mod_Good	79.0	79.0	1.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	58
26_DNG	20.3	20.3	28.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	285
45_Intersection	100.0	100.0	0.64	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	32

46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	17
								Subtotal	**1946**
Maireana cheelii / Chariot Wheels (Flora)									
26_Intact	67.1	67.1	23.3	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	780
26_Sparse	46.2	46.2	81.7	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1888
46_Moderate	90.6	90.6	34.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1559
26_DNG	20.3	20.3	98.3	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	997
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	17
								Subtotal	**5241**

Myotis macropus / Southern Myotis (Fauna)									
13_Moderate	70.6	70.6	0.55	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	19
13_Thinned	69.2	69.2	1.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	64
								Subtotal	**83**
Pedionomus torquatus / Plains-wanderer (Fauna)									
13_Moderate	70.6	70.6	0.01	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	1
13_Thinned	69.2	69.2	0.1	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	5
17_Moderate	83.5	83.5	0.02	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	1

26_Sparse	46.2	46.2	0.85	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	29
46_Moderate	90.6	90.6	1.3	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	88
26_DNG	20.3	20.3	0.08	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	1
								Subtotal	**125**
Pilularia novae-hollandiae / Austral Pillwort (Flora)									
13_Moderate	70.6	70.6	3.2	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	114

13_Thinned	69.2	69.2	4.1	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	141
15_Moderate	75.7	75.7	1.5	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	56
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	37
26_Intact	67.1	67.1	0.35	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	12
26_Sparse	46.2	46.2	8.2	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	189
45_Mod_Good	65.1	65.1	0.27	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	9

46_Moderate	90.6	90.6	46.1	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	2089
26_DNG	20.3	20.3	6.5	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	66
45_Intersection	100.0	100.0	0.83	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	42
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	17
								Subtotal	**2772**
Polytelis swainsonii / Superb Parrot (Fauna)									
10_Moderate	29.2	29.2	0.19	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	3

13_Moderate	70.6	70.6	3.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	126
13_Thinned	69.2	69.2	7.9	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	272
15_Moderate	75.7	75.7	2.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	96
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	37
17_Moderate	83.5	83.5	0.21	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	9
26_Intact	67.1	67.1	1.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	52
26_Sparse	46.2	46.2	7.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	174

28_Low	57.1	57.1	0.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	3
28_Moderate	73.8	73.8	0.04	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	1
45_Mod_Good	65.1	65.1	0.15	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	5
46_Moderate	90.6	90.6	2.7	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	124
160_Mod_Good	79.0	79.0	0.01	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	1
26_DNG	20.3	20.3	8.4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	85
								Subtotal	**988**

Sclerolaena napiformis / Turnip Copperburr (Flora)									
26_Intact	67.1	67.1	23.3	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	780
26_Sparse	46.2	46.2	81.7	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	1888
46_Moderate	90.6	90.6	34.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	1559
26_DNG	20.3	20.3	98.3	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	997
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	17
								Subtotal	**5241**

Swainsona murrayana / Slender Darling Pea (Flora)									
15_Moderate	75.7	75.7	2.2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	82
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	36
26_Intact	67.1	67.1	49.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1647
26_Sparse	46.2	46.2	120.7	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	2789
28_Low	57.1	57.1	29.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	832
28_Moderate	73.8	73.8	0.44	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	16
45_Mod_Good	65.1	65.1	0.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	3

46_Moderate	90.6	90.6	49.2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	2227
26_DNG	20.3	20.3	140.9	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1430
45_Intersection	100.0	100.0	0.83	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	42
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	17
								Subtotal	**9121**
Swainsona plagiotropis / Red Darling Pea (Flora)									
26_Intact	67.1	67.1	49.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1646
26_Sparse	46.2	46.2	120.6	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	2788

45_Mod_Good	65.1	65.1	0.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	3
46_Moderate	90.6	90.6	47.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	2133
26_DNG	20.3	20.3	140.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1425
45_Intersection	100.0	100.0	0.83	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	42
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	17
								Subtotal	**8054**
Swainsona sericea / Silky Swainson-pea (Flora)									
15_Moderate	75.7	75.7	2.2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	82

15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	36
26_Intact	67.1	67.1	49.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	1647
26_Sparse	46.2	46.2	120.7	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	2789
28_Low	57.1	57.1	29.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	832
28_Moderate	73.8	73.8	0.44	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	16
45_Mod_Good	65.1	65.1	0.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	3
46_Moderate	90.6	90.6	49.2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	2227

26_DNG	20.3	20.3	140.9	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	1430
45_Intersection	100.0	100.0	0.83	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	42
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	17
								Subtotal	**9121**

BAM Credit Summary Report

Proposal Details

Assessment Id
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Proposal Name
Din Wind_ enabling works

BAM data last updated *
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Assessor Name
Mitchell Palmer

Report Created
11/08/2025

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Assessor Number
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BAM Case Status
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Assessment Revision
4

BOS entry trigger

Assessment Type
Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion												
5	46_Intersection	Natural Grasslands of the Murray Valley Plains	100	100.0	0.34	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Critically Endangered	2.50		21
											Subtotal	**21**
Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion												
4	45_Intersection	Natural Grasslands of the Murray Valley Plains	100	100.0	0.83	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Critically Endangered	2.50		52
											Subtotal	**52**

Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion												
1	26_DNG	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	20.3	20.3	18.8	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		191
2	26_Intact	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	67.1	67.1	1.2	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		40

3	26_Sparse	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	46.2	46.2	8.8	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		203
											Subtotal	**434**
											Total	**507**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Austrostipa wakoolica / A spear-grass (Flora)									
26_DNG	20.3	20.3	1.3	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	13

26_Sparse	46.2	46.2	0.81	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	19
								Subtotal	**32**
Brachyscome muelleroides / Claypan Daisy (Flora)									
45_Intersection	100.0	100.0	0.83	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	True	62
46_Intersection	100.0	100.0	0.34	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	True	26
								Subtotal	**88**
Brachyscome papillosa / Mossgiel Daisy (Flora)									
45_Intersection	100.0	100.0	0.83	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	42
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	17
								Subtotal	**59**

Lepidium monoplocoides / Winged Peppercress (Flora)									
26_DNG	20.3	20.3	1.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	19
26_Intact	67.1	67.1	0.13	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	4
26_Sparse	46.2	46.2	2.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	56
								Subtotal	**79**
Leptorhynchos orientalis / Lanky Buttons (Flora)									
26_DNG	20.3	20.3	1.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	19
26_Intact	67.1	67.1	0.13	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	4

26_Sparse	46.2	46.2	2.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	56
45_Intersection	100.0	100.0	0.83	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	42
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	17
								Subtotal	**138**
Litoria raniformis / Southern Bell Frog (Fauna)									
26_DNG	20.3	20.3	4.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	43
45_Intersection	100.0	100.0	0.64	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	32

46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	17
								Subtotal	**92**
Maireana cheelii / Chariot Wheels (Flora)									
26_DNG	20.3	20.3	1.9	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	19
26_Intact	67.1	67.1	0.13	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	4
26_Sparse	46.2	46.2	2.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	56
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	17
								Subtotal	**96**

Pilularia novae-hollandiae / Austral Pillwort (Flora)									
26_DNG	20.3	20.3	1.3	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	13
26_Intact	67.1	67.1	0.81	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	27
45_Intersection	100.0	100.0	0.83	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	42
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	17
								Subtotal	**99**
Sclerolaena napiformis / Turnip Copperburr (Flora)									
26_DNG	20.3	20.3	1.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	19

26_Intact	67.1	67.1	0.13	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	4
26_Sparse	46.2	46.2	2.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	56
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	17
								Subtotal	**96**
Swainsona murrayana / Slender Darling Pea (Flora)									
26_DNG	20.3	20.3	4.8	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	49
26_Intact	67.1	67.1	0.31	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	10
26_Sparse	46.2	46.2	3.3	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	77

45_Intersection	100.0	100.0	0.83	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	42
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	17
								Subtotal	**195**
Swainsona plagiotropis / Red Darling Pea (Flora)									
26_DNG	20.3	20.3	4.8	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	49
26_Intact	67.1	67.1	0.31	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	10
26_Sparse	46.2	46.2	3.3	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	77
45_Intersection	100.0	100.0	0.83	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	42

46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	17
								Subtotal	**195**
Swainsona sericea / Silky Swainson-pea (Flora)									
26_DNG	20.3	20.3	4.8	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	49
26_Intact	67.1	67.1	0.31	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	10
26_Sparse	46.2	46.2	3.3	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	77
45_Intersection	100.0	100.0	0.83	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	42
46_Intersection	100.0	100.0	0.34	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	17
								Subtotal	**195**

BAM Credit Summary Report

Proposal Details

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Proposal Name
Dinawan Wind Farm - Stage 1

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Assessor Name
Mitchell Palmer

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Assessment Type
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* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)												
1	13_Thinned	Not a TEC	69.2	69.2	2.5	PCT Cleared - 57%	High Sensitivity to Gain			1.75		76
											Subtotal	**76**
Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion												
8	46_Moderate	Natural Grasslands of the Murray Valley Plains	90.6	90.6	1.3	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Critically Endangered	2.50		76
											Subtotal	**76**
Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)												
2	17_Mod_Good	Not a TEC	84.2	84.2	0.32	PCT Cleared - 63%	High Sensitivity to Gain			1.75		12
3	17_Moderate	Not a TEC	83.5	83.5	0.5	PCT Cleared - 63%	High Sensitivity to Gain			1.75		18
											Subtotal	**30**

Plains Grass grassland on alluvial mainly clay soils in the Riverina Bioregion and NSW South Western Slopes Bioregion												
7	45_Mod_Good	Natural Grasslands of the Murray Valley Plains	65.1	65.1	2.2	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Critically Endangered	2.50		91
											Subtotal	**91**
Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion												
4	26_DNG	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	20.3	20.3	107	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		1085

5	26_Intact	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	67.1	67.1	22.8	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		765
6	26_Sparse	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	46.2	46.2	111.9	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		2586
											Subtotal	**4436**
											Total	**4709**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Austrostipa wakoolica / A spear-grass (Flora)									
17_Mod_Good	84.2	84.2	0.02	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	1
17_Moderate	83.5	83.5	0.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	21
26_DNG	20.3	20.3	1.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	11
26_Intact	67.1	67.1	0.16	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	5

26_Sparse	46.2	46.2	6.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	152
								Subtotal	**190**
Brachyscome muelleroides / Claypan Daisy (Flora)									
45_Mod_Good	65.1	65.1	0.05	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	True	2
46_Moderate	90.6	90.6	0.86	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	True	58
								Subtotal	**60**
Brachyscome papillosa / Mossgiel Daisy (Flora)									
13_Thinned	69.2	69.2	0.22	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	8
45_Mod_Good	65.1	65.1	0.05	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	2

46_Moderate	90.6	90.6	0.86	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	39
								Subtotal	**49**
Hemiaspis damelii / Grey Snake (Fauna)									
13_Thinned	69.2	69.2	2.5	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	87
17_Mod_Good	84.2	84.2	0.32	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	13
17_Moderate	83.5	83.5	0.5	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	21
								Subtotal	**121**
Lepidium monoplocoides / Winged Peppercress (Flora)									
13_Thinned	69.2	69.2	0.22	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	8

26_DNG	20.3	20.3	19.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	197
26_Intact	67.1	67.1	4.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	155
26_Sparse	46.2	46.2	19.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	450
								Subtotal	**810**
Leptorhynchos orientalis / Lanky Buttons (Flora)									
26_DNG	20.3	20.3	19.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	197
26_Intact	67.1	67.1	4.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	155

26_Sparse	46.2	46.2	19.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	450
45_Mod_Good	65.1	65.1	0.05	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	2
46_Moderate	90.6	90.6	0.86	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	39
								Subtotal	**843**
Litoria raniformis / Southern Bell Frog (Fauna)									
17_Mod_Good	84.2	84.2	0.23	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	10
26_DNG	20.3	20.3	10.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	106

26_Intact	67.1	67.1	2.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	79
26_Sparse	46.2	46.2	15.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	351
								Subtotal	**546**
Maireana cheelii / Chariot Wheels (Flora)									
26_DNG	20.3	20.3	19.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	197
26_Intact	67.1	67.1	4.6	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	155
26_Sparse	46.2	46.2	19.5	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	450
46_Moderate	90.6	90.6	0.86	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	39
								Subtotal	**841**

Pilularia novae-hollandiae / Austral Pillwort (Flora)									
13_Thinned	69.2	69.2	0.26	Geographic Distribution	Ecology or response to management is poorly known	Endangered	Not Listed	False	9
26_DNG	20.3	20.3	1.1	Geographic Distribution	Ecology or response to management is poorly known	Endangered	Not Listed	False	11
26_Intact	67.1	67.1	0.16	Geographic Distribution	Ecology or response to management is poorly known	Endangered	Not Listed	False	5
26_Sparse	46.2	46.2	6.6	Geographic Distribution	Ecology or response to management is poorly known	Endangered	Not Listed	False	152
45_Mod_Good	65.1	65.1	0.27	Geographic Distribution	Ecology or response to management is poorly known	Endangered	Not Listed	False	9

46_Moderate	90.6	90.6	0.86	Geographic Distribution	Ecology or response to management is poorly known	Endangered	Not Listed	False	39
								Subtotal	**225**
Polytelis swainsonii / Superb Parrot (Fauna)									
13_Thinned	69.2	69.2	2.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	87
26_DNG	20.3	20.3	1.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	11
45_Mod_Good	65.1	65.1	0.15	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	5
26_Sparse	46.2	46.2	0.95	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	22
								Subtotal	**125**

Sclerolaena napiformis / Turnip Copperburr (Flora)									
26_DNG	20.3	20.3	19.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	197
26_Intact	67.1	67.1	4.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	155
26_Sparse	46.2	46.2	19.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	450
46_Moderate	90.6	90.6	0.86	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	39
								Subtotal	**841**
Swainsona murrayana / Slender Darling Pea (Flora)									
26_DNG	20.3	20.3	21.6	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	219

45_Mod_Good	65.1	65.1	0.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	3
46_Moderate	90.6	90.6	0.86	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	39
26_Intact	67.1	67.1	7.3	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	244
26_Sparse	46.2	46.2	28.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	655
								Subtotal	**1160**
Swainsona plagiotropis / Red Darling Pea (Flora)									
26_DNG	20.3	20.3	21.2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	215
26_Intact	67.1	67.1	7.2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	243

26_Sparse	46.2	46.2	28.3	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	655
45_Mod_Good	65.1	65.1	0.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	3
46_Moderate	90.6	90.6	0.86	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	39
								Subtotal	**1155**
Swainsona sericea / Silky Swainson-pea (Flora)									
26_DNG	20.3	20.3	21.6	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	219
45_Mod_Good	65.1	65.1	0.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	3
46_Moderate	90.6	90.6	0.86	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	39

26_Intact	67.1	67.1	7.3	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	244
26_Sparse	46.2	46.2	28.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	655
								Subtotal	**1160**

BAM Credit Summary Report

Proposal Details

Assessment Id
00034895/BAAS17051/25/00055369

Proposal Name
Dinawan wind - Stage 2

BAM data last updated *
05/08/2025

Assessor Name
Mitchell Palmer

Report Created
14/08/2025

BAM Data version *
Current classification (live - default) (82)

Assessor Number
BAAS17051

BAM Case Status
Finalised

Date Finalised
14/08/2025

Assessment Revision
4

BOS entry trigger

Assessment Type
Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)												
2	13_Moderate	Not a TEC	70.6	70.6	3.6	PCT Cleared - 57%	High Sensitivity to Gain			1.75		110

3	13_Thinned	Not a TEC	69.2	69.2	5.4	PCT Cleared - 57%	High Sensitivity to Gain			1.75		162
											Subtotal	**272**
Black Box open woodland wetland with chenopod understorey mainly on the outer floodplains in south-western NSW (mainly Riverina Bioregion and Murray Darling Depression Bioregion)												
4	15_Moderate	Not a TEC	75.7	75.7	2.5	PCT Cleared - 50%	High Sensitivity to Gain			1.75		84
5	15_Thinned	Not a TEC	67.1	67.1	1.1	PCT Cleared - 50%	High Sensitivity to Gain			1.75		32
											Subtotal	**116**
Curly Windmill Grass - speargrass - wallaby grass grassland on alluvial clay and loam on the Hay Plain, Riverina Bioregion												
13	46_Moderate	Natural Grasslands of the Murray Valley Plains	90.6	90.6	72.1	Environment Protection and Conservation Act listing status	High Sensitivity to Gain	Not Listed	Critically Endangered	2.50		4083
											Subtotal	**4083**

Lignum shrubland wetland of the semi-arid (warm) plains (mainly Riverina Bioregion and Murray Darling Depression Bioregion)												
6	17_Mod_Good	Not a TEC	84.2	84.2	0.43	PCT Cleared - 63%	High Sensitivity to Gain			1.75		16
7	17_Moderate	Not a TEC	83.5	83.5	0.77	PCT Cleared - 63%	High Sensitivity to Gain			1.75		28
											Subtotal	**44**
Nitre Goosefoot shrubland wetland on clays of the inland floodplains												
14	160_Mod_Good	Not a TEC	79	79.0	5	PCT Cleared - 28%	High Sensitivity to Gain			1.50		147
											Subtotal	**147**
River Red Gum - Black Box woodland wetland of the semi-arid (warm) climatic zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)												
1	10_Moderate	Not a TEC	29.2	29.2	0.19	PCT Cleared - 43%	High Sensitivity to Gain			1.50		2
											Subtotal	**2**

Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion												
8	26_DNG	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	20.3	20.3	216.6	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		2198
9	26_Intact	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	67.1	67.1	92.8	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		3113

10	26_Sparse	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	46.2	46.2	220.7	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		5100
											Subtotal	**10411**
White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone												
11	28_Low	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	57.1	57.1	47.8	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		1364

12	28_Moderate	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	73.8	73.8	1.1	Biodiversity Conservation Act listing status	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		41
											Subtotal	**1405**
											Total	**16480**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Austrostipa wakoolica / A spear-grass (Flora)									
17_Mod_Good	84.2	84.2	0.04	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	2
17_Moderate	83.5	83.5	0.72	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	30

26_DNG	20.3	20.3	4.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	41
26_Intact	67.1	67.1	0.19	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	6
26_Sparse	46.2	46.2	0.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	18
								Subtotal	**97**
Brachyscome muelleroides / Claypan Daisy (Flora)									
46_Moderate	90.6	90.6	33.6	Geographic Distribution	Ability to colonise improved habitat	Vulnerable	Vulnerable	True	2279
								Subtotal	**2279**
Brachyscome papillosa / Mossgiel Daisy (Flora)									
13_Moderate	70.6	70.6	2.9	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	104

13_Thinned	69.2	69.2	3.5	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	120
15_Moderate	75.7	75.7	1.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	42
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	36
46_Moderate	90.6	90.6	33.6	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1520
								Subtotal	**1822**
Hemiaspis damelii / Grey Snake (Fauna)									
10_Moderate	29.2	29.2	0.19	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	3
13_Moderate	70.6	70.6	3.6	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	126

13_Thinned	69.2	69.2	5.4	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	185
15_Moderate	75.7	75.7	2.5	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	96
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	37
17_Mod_Good	84.2	84.2	0.43	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	18
17_Moderate	83.5	83.5	0.77	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	32
160_Mod_Good	79.0	79.0	5	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Endangered	False	196

								Subtotal	**693**
Lepidium monoplocoides / Winged Peppercress (Flora)									
10_Moderate	29.2	29.2	0.14	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	2
13_Moderate	70.6	70.6	2.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	104
13_Thinned	69.2	69.2	3.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	120
15_Moderate	75.7	75.7	1.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	42
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	36

26_DNG	20.3	20.3	76.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	781
26_Intact	67.1	67.1	18.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	620
26_Sparse	46.2	46.2	59.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	1383
								Subtotal	**3088**
Leptorhynchos orientalis / Lanky Buttons (Flora)									
26_DNG	20.3	20.3	76.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	781
26_Intact	67.1	67.1	18.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	620

26_Sparse	46.2	46.2	59.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	1383
46_Moderate	90.6	90.6	33.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	1520
								Subtotal	**4304**
Litoria raniformis / Southern Bell Frog (Fauna)									
13_Moderate	70.6	70.6	0.55	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	19
13_Thinned	69.2	69.2	2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	69
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	36

17_Mod_Good	84.2	84.2	0.26	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	11
26_DNG	20.3	20.3	13.4	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	137
26_Intact	67.1	67.1	5.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	188
26_Sparse	46.2	46.2	14.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	336
28_Low	57.1	57.1	0.77	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	22
46_Moderate	90.6	90.6	9.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	432

160_Mod_Good	79.0	79.0	1.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Vulnerable	False	58
								Subtotal	**1308**
Maireana cheelii / Chariot Wheels (Flora)									
26_DNG	20.3	20.3	76.9	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	781
26_Intact	67.1	67.1	18.5	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	620
26_Sparse	46.2	46.2	59.8	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1383
46_Moderate	90.6	90.6	33.6	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1520
								Subtotal	**4304**

Myotis macropus / Southern Myotis (Fauna)									
13_Moderate	70.6	70.6	0.55	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	19
13_Thinned	69.2	69.2	1.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	64
								Subtotal	**83**
Pedionomus torquatus / Plains-wanderer (Fauna)									
13_Moderate	70.6	70.6	0.01	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	1
13_Thinned	69.2	69.2	0.1	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	5
17_Moderate	83.5	83.5	0.02	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	1

26_DNG	20.3	20.3	0.08	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	1
26_Sparse	46.2	46.2	0.85	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	29
46_Moderate	90.6	90.6	1.3	Environment Protection and Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Critically Endangered	True	88
								Subtotal	**125**
Pilularia novae-hollandiae / Austral Pillwort (Flora)									
13_Moderate	70.6	70.6	3.2	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	114

13_Thinned	69.2	69.2	3.8	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	132
15_Moderate	75.7	75.7	1.5	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	56
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	37
26_DNG	20.3	20.3	4.1	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	41
26_Intact	67.1	67.1	0.19	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	6
26_Sparse	46.2	46.2	0.8	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	18

46_Moderate	90.6	90.6	45.3	Biodiversity Conservation Act listing status	Ecology or response to management is poorly known	Endangered	Not Listed	False	2050
								Subtotal	**2454**
Polytelis swainsonii / Superb Parrot (Fauna)									
10_Moderate	29.2	29.2	0.19	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	3
13_Moderate	70.6	70.6	3.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	126
13_Thinned	69.2	69.2	5.4	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	185
15_Moderate	75.7	75.7	2.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	96
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	37

17_Moderate	83.5	83.5	0.21	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	9
26_DNG	20.3	20.3	7.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	74
26_Intact	67.1	67.1	1.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	52
26_Sparse	46.2	46.2	6.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	152
28_Low	57.1	57.1	0.1	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	3
28_Moderate	73.8	73.8	0.04	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	1
46_Moderate	90.6	90.6	2.7	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	124

160_Mod_Good	79.0	79.0	0.01	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	1
								Subtotal	**863**
Sclerolaena napiformis / Turnip Copperburr (Flora)									
26_DNG	20.3	20.3	76.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	781
26_Intact	67.1	67.1	18.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	620
26_Sparse	46.2	46.2	59.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	1383
46_Moderate	90.6	90.6	33.6	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	1520
								Subtotal	**4304**

Swainsona murrayana / Slender Darling Pea (Flora)									
15_Moderate	75.7	75.7	2.2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	82
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	36
26_DNG	20.3	20.3	114.5	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1162
26_Intact	67.1	67.1	41.5	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1393
26_Sparse	46.2	46.2	89	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	2057
28_Low	57.1	57.1	29.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	832
28_Moderate	73.8	73.8	0.44	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	16

46_Moderate	90.6	90.6	48.3	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	2188
								Subtotal	**7766**
Swainsona plagiotropis / Red Darling Pea (Flora)									
26_DNG	20.3	20.3	114.5	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1162
26_Intact	67.1	67.1	41.5	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	1393
26_Sparse	46.2	46.2	89	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	2057
46_Moderate	90.6	90.6	46.4	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Vulnerable	False	2103
								Subtotal	**6715**

Swainsona sericea / Silky Swainson-pea (Flora)									
15_Moderate	75.7	75.7	2.2	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	82
15_Thinned	67.1	67.1	1.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	36
26_DNG	20.3	20.3	114.5	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	1162
26_Intact	67.1	67.1	41.5	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	1393
26_Sparse	46.2	46.2	89	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	2057
28_Low	57.1	57.1	29.1	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	832
28_Moderate	73.8	73.8	0.44	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	16

46_Moderate	90.6	90.6	48.3	Biodiversity Conservation Act listing status	Ability to colonise improved habitat	Vulnerable	Not Listed	False	2188
								Subtotal	**7766**

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00034895/BAAS17051/24/00047205	Dinawan wind - Scattered Stage 1	05/08/2025
Assessor Name	**Report Created**	**BAM Data version ***
Mitchell Palmer	11/08/2025	Current classification (live - default) (82)
Assessor Number	**BAM Case Status**	**Date Finalised**
BAAS17051	Finalised	11/08/2025
Assessment Revision	**BOS entry trigger**	**Assessment Type**
5	Major Project	Scattered Trees

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Scattered Trees Credit Requirement

Class	Contains hollows	Number of trees	Ecosystem credits
13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)			
3	True	2.0	2
			2
26-Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion			
2	False	2.0	1
			1
			3

Species credits for threatened species

Nil

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00034895/BAAS17051/25/00055371	Dinawan wind - Scattered stage 2	05/08/2025
Assessor Name	**Report Created**	**BAM Data version ***
Mitchell Palmer	11/08/2025	Current classification (live - default) (82)
Assessor Number	**BAM Case Status**	**Date Finalised**
BAAS17051	Finalised	11/08/2025
Assessment Revision	**BOS entry trigger**	**Assessment Type**
2	Major Project	Scattered Trees

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Scattered Trees Credit Requirement

Class	Contains hollows	Number of trees	Ecosystem credits
13-Black Box - Lignum woodland wetland of the inner floodplains in the semi-arid (warm) climate zone (mainly Riverina Bioregion and Murray Darling Depression Bioregion)			
2	False	1.0	1
			1
26-Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion			
2	False	11.0	6
			6
			7

Species credits for threatened species

The scattered tree module is not applicable. This species much be assessed using chapter 5 of the BAM and BAM-C development module

Lathamus discolor
Swift Parrot

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APPENDICES

Appendix 1. Survey methods

Appendix 1.1. Nomenclature

The flora taxonomy (classification) used in this report follows the most recent Flora of NSW (Harden 1992, Harden 1993, Harden 2000, Harden 2002). All doubtful species names were verified with the online Australian Plant Name Index (Australian National Botanic Gardens & Australian National Herbarium 2007). Flora species, including threatened species and introduced flora species, are referred to by both their common and then scientific names when first mentioned. Subsequent references to flora species cite the common names only, unless there is no common name, for which scientific name will be used. Common names, where available, have been included in threatened species tables and the complete flora list in Section 4 and Appendix 3.

Names of vertebrates follow the Census of Australian Vertebrates (CAVs) maintained by the Cth DCCEEW (DSEWPaC 2009). In the body of this report vertebrates are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only.

Appendix 1.2. Permits and licences

The flora and fauna assessment was conducted under the terms of Biosis' Scientific Licence issued by NSW DCCEEW (SL100758, expiry date 30 June 2024). The BAM Assessment and quality review of the BDAR was carried out by Accredited Assessor/s Mitchell Palmer (BAAS17051) and Callan Wharfe (BAAS18138).

Appendix 1.3. Limitations

As discussed throughout this BDAR in Section 3 and Section 4, field surveys were undertaken in accordance with the BAM (DPIE 2020a) as far as practicable for a project of this size. Ecological surveys provide a sampling of flora and fauna at a given time and season. Factors influencing detectability of species during survey include species dormancy, seasonal conditions, ephemeral status of waterbodies, and migration and breeding behaviours of some fauna. Above average rainfall events in 2022, and substantial flooding of low lying areas throughout the subject land hindered field surveys and access in September and October 2022 , however the largest impacts due to flooding occurred in November 2022. In many cases, these factors do not present a significant limitation to assessing the overall biodiversity values of a site. Second and third season surveys in spring 2023 and spring 2024 will complete the required surveys under the BAM for the project. Gaps in flora survey do occur and will be completed in spring 2024.

Surveys undertaken, combined with habitat assessments and desktop analysis are considered sufficient to reach the conclusions herein regarding this and all other species' likelihood of occurrence within the subject land.

Database searches, and associated conclusions on the likelihood of species to occur within the assessment area, are reliant upon external data sources and information managed by third parties.

Appendix 2. BAM Candidate species and EPBC assessment

Table A 1: Threatened flora species habitat assessment

Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Amphibromus fluitans **River Swamp Wallaby-grass**	VU	VU	No	Inhabits both natural and man-made water-bodies, including swamps, lagoons, billabongs and dams, most of which are permanent, and not ephemeral waterbodies	Low	No	Excluded – Geographical limitations	Low	The closest record of River Swamp-Wallaby Grass occurs over 80 kilometres away and is over 20 years old. Suitable habitat is broadly associated with PCT 10, 17, 24 and 160.
Austrostipa wakoolica **A spear-grass**	EN	EN	Yes	Densely tufted perennial grass restricted to the Murray River tributaries of central-western and south-western NSW. Grows on floodplains, on the edges of lignum swamp, creek banks and lignum sandy-loam flats in a variety of communities including Western Slopes Dry Sclerophyll Forests, Floodplain Transition Woodlands, Riverine Plain Woodlands and Western Peneplain Woodlands. Grows in a variety of soils including silty clays and sandy loams.	Medium	Yes	Included – Survey undertaken	Low	The subject land is within Spear Grass predicted distribution only. The closest record occurs over 40km from the subject land. Suitable habitat is broadly represented by Lignum swamp and depressions on floodplains within PCT 10, 17, 24, 26 and 28. Small areas of assumed presence have been undertaken due to a shortfall and gaps in targeted surveys, but surveys to date have not shown any indication of presence within the development corridor. More surveys to be undertaken in Spring 2025.

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Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Brachyscome muelleroides **Claypan Daisy**	VU	VU	Yes	Annual herb distributed throughout the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Found growing in damp areas, depressions, claypan margins, and lagoon margins in Riverine Plain Grasslands and Inland Floodplain Swamps. Grows in muds derived from heavy clay.	Medium	Yes	Included – Survey undertaken	Low	Claypan Daisy occurs over 40km from the subject land. Suitable habitat is broadly represented by grasslands comprising PCT 46 and 45. Areas have been assumed present have been undertaken due to a shortfall and gaps in targeted surveys, but surveys to date have not shown any indication of presence within the development corridor. More surveys to be undertaken in Spring 2025.
Brachyscome papillosa **Mossgiel Daisy**	VU	VU	Yes	Multistemmed perennial herb endemic to NSW, primarily distributed throughout the Riverina bioregion with one site occurring in the South Western Slopes. Grows on Saltbush plains in a variety of communities including Aeolian Chenopod Shrublands, Inland Floodplain Shrublands, Riverine Plain Grasslands and Inland Saline Lakes. Grows in clay soils.	Medium	Yes	Included – Survey undertaken	Low	Mossgiel Daisy occurs over 25km from the subject land, with the most recent record from over 20 years ago. Suitable habitat is broadly represented by shrubland and grassland comprising PCTs 13, 15, 24, 45, 46 and 160. This species was not detected during targeted surveys. Areas have been assumed present have been undertaken due to a shortfall and gaps in targeted surveys, but surveys to date have not shown any indication of presence within the development corridor. More surveys to be undertaken in Spring 2025.
Caladenia arenaria **Sand-hill Spider Orchid**	EN	EN	No	Small orchid, found in the Riverina between Urana and Narranderra. Grows in	Low	No	Excluded – No suitable microhabitat	Negligible	Sand-hill Spider Orchid occurs over 30km east from the subject land Suitable habitat is broadly

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Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				woodland and on sandhills associated with White Cypress Pine *Callitris glaucophylla* in Floodplain Transition Woodlands and Riverine Sandhill Woodlands. Grows in sandy soils.					represented by shrubland and pine communities PCT 28, however not known known to occur east of Jerilderie as a geographical limitation
Convolvulus tedmoorei **Bindweed**		EN	Yes	Perennial herb restricted to four areas, two on the Murrumbidgee and Darling Rivers, one on the road to Wilcannia east of Broken Hill and one from Menindee Road near Scarsdale. Found on floodplains in a variety of communities including Riverine Chenopod Shrublands, Inland Floodplain Shrublands, Semi-arid Floodplain Grasslands and Inland Saline Lakes. Grows in grey clay soils.	Low	Yes	Included – Survey undertaken	Low	Bindweed occurs over 20km from the subject land, with the most recent record from over 50 years ago. Suitable habitat is broadly represented by shrubland and grassland with grey soils comprising PCTs 17, 24, 26, 45, 46 and 160.
Cullen parvum **Small Scurf-pea**		EN	No	Small shrub recorded from two locations, once in 1884 in Wagga Wagga and the other in 1967 in Jinderra near Albury. Found in grassland or understorey in areas that experience between –50 - 700mm of rainfall per year such as Inland Riverine Forests, Riverine Plain Grasslands,	Low	No	Excluded – No suitable microhabitat	Low	Small Scurf-pea occurs over 20km from the subject land, with the most recent record from over 50 years ago. Suitable habitat is broadly represented by shrubland and grassland.

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Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Floodplain Transition Woodlands and Western Slopes Grassy Woodlands.					
***Diuris* sp. (Oaklands, D.L. Jones 5380)** **Oaklands Diuris**		EN	No	Terrestrial orchid restricted to the Oaklands-Urana region of southern NSW. Grows amongst grasses and forbs in association with White Cypress Pine Callitris glaucophylla in Floodplain Transition Woodlands and Riverine Sandhill Woodlands. Grows in sandy loam soils.	Low	No	Excluded – No suitable microhabitat	Low	The habitat for Oaklands Diuris is not present within the subject land. The species is not associated with any PCT's present within the subject land.
Diuris tricolor **Pine Donkey Orchid**		VU	No	Terrestrial orchid with a sporadic distribution ranging from south of Narrandera stretching northwards through central western NSW towards the QLD border. Grows amongst grasses, sometimes in disturbed areas in a variety of communities including Pilliga Outwash Dry Sclerophyll Forests, Southern Tablelands Grassy Woodlands, North-west Alluvial Sand Woodlands and Floodplain Transition Woodlands. Grows on sand and red earth soils.	Low	No	Excluded – No suitable microhabitat	Low	Habitat for Diuris Tricolor is not present within the subject land. The species is not associated with any PCT's present within the subject land.

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Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Eucalyptus leucoxylon subsp. Pruinosa **Yellow Gum**		VU	Yes	Small to medium-sized tree restricted to several small areas between Barham and Euston. In New South Wales, it occurs at the bases of sandy rises and on loamy clay flats on the floodplains of the Murray River and its tributaries in the Riverina Bioregion	Low	Yes	Included – Survey undertaken	Low	No records of Yellow Gum occur within 25km of the subject land. This species has habitat broadly associated with PCT's 13 and 15, however was not detected during the field investigation or targeted surveys.
Lepidium aschersonii **Spiny Peppercress**	VU	VU	No	Erect perennial herb occurring in the marginal central-western slopes and north-western plains regions of NSW (and potentially the south western plains). Found on ridges of gilgai clays dominated by Brigalow, Belah, Buloke and Grey Box. In the south has been recorded growing in Bull Mallee. Often the understorey is dominated by introduced plants. The species grows as a component of the ground flora, in grey loamy clays.	Low	No	Excluded – No suitable microhabitat	Low	No records of Spiny-Peppercress occur within 25 km of the subject land. No suitable microhabitat is considered present in the subject land.
Lepidium monoplocoides **Winged Peppercress**	EN	EN	Yes	Erect, annual herb with populations sparsely scattered throughout a widespread distribution spanning the semi-arid western plains. Historical records are numerous	Medium	Yes	Included – Survey undertaken	Low	Winged Peppercress has been recorded over 25km from the subject land. Suitable habitat is available within patches of PCTs 10, 13, 15, 17, 24, 26, 28, 45, 46 and 160. Areas have been assumed present have been

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Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				although recent records are confined to two collections from Broken Hill, in 1915 and 1950. Grows in areas receiving between 300 mm to 500 mm annual rainfall on periodically inundated and waterlogged habitats in a variety of communities including Inland Floodplain Shrublands, Floodplain Transition Woodlands, Inland Saline Lakes, Sand Plain Mallee Woodlands and Western Peneplain Woodlands. Grows on waterlogged grey-brown clays					undertaken due to a shortfall and gaps in targeted surveys, but surveys to date have not shown any indication of presence within the development corridor. More surveys to be undertaken in Spring 2025.
Leptorhynchos orientalis **Lanky Buttons**		EN	Yes	Erect, annual forb confined to several Hay Plain and southern Riverina locations including Willanthry east of Hillston, Zara-Wanganella via Hay, McKinley Road south-west of Hillst'n, 'Moru"dah" west of Buckinbong State Forest and Cowl Cowl Station near Hillston. Grows in woodlands and sometimes on the margins of swamps in a variety of communities including Inland Floodplain Shrublands, Inland Floodplain Swamps, Riverine	High	Yes	Included – Survey undertaken	Medium	Lanky buttons has been recorded over 25km from the subject land. Suitable habitat is available within shrublands, grasslands and woodland communities represented by PCTs 24, 26, 46 and 45. No individuals were observed during targeted surveys. Areas have been assumed present have been undertaken due to a shortfall and gaps in targeted surveys, but surveys to date have not shown any indication of presence within the development corridor. More surveys to be undertaken in Spring 2025.

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Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Plain Grasslands, Floodplain Transition Woodlands and Riverine Plain Woodlands. Grows on red clay to clay loam soils.					
Maireana cheelii **Chariot Wheels**	VU	VU	Yes	Small perennial forb restricted to the southern Riverina region of NSW between Deniliquin and Hay. Grows in shallow depressions, on eroded or scalded surfaces or on the edge of windswept claypans in association with Bladder Saltbush Atriplex vesicaria in a variety of communities including Riverine Chenopod Shrublands, Riverine Plain Grasslands, Gibber Transition Shrublands, North-west Floodplain Woodlands, and Inland Saline Lakes. Grows on heavy grey clays, brown to red-brown clay-loams, or hard cracking red clay soils.	Medium	Yes	Included – Survey undertaken	Low	Chariot Wheels has been recorded approximately 20km from the subject land. Suitable habitat is broadly available within woodland and grassland PCT's 13, 15, 26 and 46. No individuals were observed during targeted surveys. Areas have been assumed present have been undertaken due to a shortfall and gaps in targeted surveys, but surveys to date have not shown any indication of presence within the development corridor. More surveys to be undertaken in Spring 2025.
Pilularia novae-hollandiae **Austral Pillwort**		EN	Yes	Semi-aquatic fern with the only extant populations located at Lake Cowal and Oolambeyan National Park. Historical distribution ranged from Sydney, Khancoban, The Riverina near Albury and	Medium	Yes	Included – Survey undertaken	Low	Austral Pilwort has been recorded 18km from the subject land. Suitable habitat is available within depressions and gilgai's within shrubland, fringing woodland and grassland PCT's 10, 13, 15, 24, 26, 46 and 45. No individuals were observed

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Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				Urana. Grows in seasonally dry depressions, drainage lines, margins of marshes, shallow swamps and waterways in a variety of communities including Inland Riverine Forests, Inland Floodplain Swamps, Southern Tableland Dry Sclerophyll Forests, Coastal Floodplain Wetlands, Coastal Swamp Forests, Coastal Freshwater Lagoons. Grows in mud amongst grasses and sedges.					during the targeted surveys to date. Areas have been assumed present have been undertaken due to a shortfall and gaps in targeted surveys, but surveys to date have not shown any indication of presence within the development corridor. More surveys to be undertaken in Spring 2025.
Sclerolaena napiformis **Turnip Copperburr**	EN	EN	Yes	Small subshrub known from a few populations in the southern Riverina between Jerilderie and Moama primarily in Travelling Stock Routes and Road Reserves and also in north-central Victoria. Found growing on level plains in remnant grassland habitats including those subject to grazing in Riverine Plain Grasslands and Riverine Plain Woodlands. Grows in clay loam soils.	Medium	Yes	Included – Survey undertaken Not recorded during surveys	Low	Turnip Copperburr has been recorded 19km from the subject land. This species is primarily found on the Hay Plain, which occurs anecdotally west of Oolambeyan National park on the flat scalded plains towards Balranald. Broadly associated with PCTs 26 and 46. No individuals were observed during targeted surveys. Areas have been assumed present have been undertaken due to a shortfall and gaps in targeted surveys, but surveys to date have not shown any indication of presence within the development corridor. More surveys to be undertaken in Spring 2025.

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Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Swainsona murrayana **Slender Darling Pea**	VU	VU	Yes	Small sparsely downy forb distributed between Jerilderie and Deniliquin areas of the southern Riverine Plain as far north as Willandra National Park, near Broken Hill and between Dubbo and Mudgee. Found growing on level plains, floodplains and depressions in a variety of communities including Riverine Chenopod Shrublands, Semi-arid Floodplain Shrublands, Western Slopes Grasslands, Brigalow Clay Plain Woodlands, Riverine Plain Woodlands and Inland Saline Lakes. Grows in heavy clay based soils ranging from grey, red and brown cracking clays to red-brown earths and loams.	High	Yes	Included – Survey undertaken Recorded during surveys	High	Slender Darling Pea has been recorded within the subject land, with suitable habitat represented by shrubland, grassland and woodland PCTs 10, 13, 15, 17, 24, 26, 28, 46 and 45. Refinements to the development footprint have avoided significant populations of this species identified within the subject land.
Swainsona plagiotropis **Red Darling Pea**	VU	VU	Yes	Small prostrate forb sparsely distributed between Jerilderie and the Louth-Bourke area with a disjunct population occurring in the north-western plains from Buttabone Stud Park ~35 kilometres west of Warren. Found growing on roadsides, rail reserves, stock routes, grasslands and in table	Medium	Yes	Included – Survey undertaken	Low	This species is primarily found on the Hay Plain, which occurs anecdotally west of Oolambeyan National park on the flat scalded plains towards Balranald, but also known to occur within the Jerilderie Nature Reserve. No individuals were observed during targeted surveys. Broad habitat is associated with PCTs 26, 45 and 46. Surveys to date have not shown any

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Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
				drains in Riverine Plain Grasslands, Riverine Chenopod Shrublands, Semi-arid Floodplain Grasslands and Riverine Plain Woodlands. Grows in heavy red-brown clay-loam soils.					indication of presence within the development corridor. Areas have been assumed present have been undertaken due to a shortfall and gaps in targeted surveys, but surveys to date have not shown any indication of presence within the development corridor. More surveys to be undertaken in Spring 2025.
Swainsona sericea **Silky Swainson-pea**		VU	Yes	Small prostrate or erect perennial herb with a distribution spanning from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains with an additional outlying population in the far north-west of NSW. Found growing in a variety of communities including Natural Temperate Grasslands, Snow Gum Eucalyptus pauciflora Woodlands on the Monaro, Box-Gum Woodland, New England Dry Sclerophyll Forests, North-west Slopes Dry Sclerophyll Woodlands, North-west Plain Shrublands, Western Slopes Grasslands, Floodplain Transition Woodlands and Subalpine Woodlands.	High	Yes	Included – Survey undertaken Recorded during surveys	High	Silky Swainsona-pea has been recorded bordering the subject land in isolated patches. Suitable habitat is broadly available within woodland and grassland PCTs 10, 13, 15, 17, 24, 26, 28, 46 and 45. Refinements to the development footprint have avoided significant populations of this species identified within the subject land.

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Species	Status		BAM predicted SCS	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC							
Solanum karsense **Menindee Nightshade**	VU	VU	Yes	Forb restricted to the far south-western plains, extending up the Darling River to the Menindee and Wilcannia districts. Grows in occasionally flooded depressions with heavy soil, including level river floodplains of grey clay with Black Box and Old Man Saltbush, and open treeless plains with solonized brown soils. Habitats are generally lake beds or floodplains of heavy grey clays with a highly self-mulching surface. Also found on sandy floodplains and ridges and in calcareous soils, red sands, red-brown earths and loamy soils	Low	Yes	Excluded – Geographical limitations	Negligible	Menindee Nightshade does not occur within 25km of the subject land. This species is primarily found west of Maude, and therefore has been excluded from the assessment.

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Table A 2: Threatened fauna species habitat assessment

Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
Birds											
Actitis hypoleucos **Common Sandpiper**			No	Migratory	PMST, BioNet	In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines (Higgins 1999).	Low	No	BUS survey undertaken - vagrant	Negligible	No records of Common Sandpiper occur within 50km of the subject land. Suitable habitat may include grassland and riparian woodland, however, the subject land is unlikely to provide habitat frequented by the species, with only few populations known west of the Great Dividing Range. Low risk of collision due to vagrancy.
Anthochaera phrygia **Regent Honeyeater**	CR	CR	No		PMST, BioNet	Regent Honeyeaters are semi-nomadic, occurring in temperate eucalypt woodlands and open forests. Most records are from box-ironbark eucalypt forest associations and wet lowland coastal forests. Nectar and fruit from mistletoes are also eaten.	Low	No	Excluded – no microhabitat or important mapped areas	Negligible	No records of Regent honeyeater occur within 50km of the subject land. The subject land is not mapped as an important area for the species and does not

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						This species usually nest in tall mature eucalypts and sheoaks.					contain suitable habitat, as it is not associated with any PCTs that occur within the subject land.
Aphelocephala leucopsis **Southern Whiteface**	Vu		No	No	PMST	Dry open forests and woodland and inland scrubs of mallee, mulga and saltbush are the preferred habitat of Southern Whiteface, especially areas with fallen timber or dead trees and stumps.	Known	No	Included – Survey undertaken	Low	Southern Whiteface has been recorded within and adjacent to the subject land Suitable habitat is available in woodland, scattered trees and open farmland associated with PCT's 13, 15, and 26. Preferred intact habitat has been avoided. Minor impacts to fringing vegetation.
Apus pacificus **Fork-tailed Swift**			No	Migratory	PMST, BioNet	In Australia, they mostly occur over inland plains but sometimes above foothills or in coastal areas. They often occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh.	Known	No	Included – BUS survey undertaken	Medium	Fork tailed swift has been recorded within the subject land. Suitable habitat may include open farmland and riparian woodland. Collisions are possible to due flight behaviour

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						They are also found at treeless grassland and sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. The sometimes occur above rainforests, wet sclerophyll forest or open forest or plantations of pines (Higgins 1999).					
Ardeotis australis **Australian Bustard**		EN	Yes		BioNet	This species appears to be confined to areas where the upper vegetation canopy cover is less than 10% or under 2m high (NPWS 1996). Mainly occurs in open woodland, low shrubland, farmland and roost in tree or on a high vantage point on the ground (Blakers et al. 1984, NPWS 1996). This species does not build nest, eggs are laid on open bare ground beside grass or tussock (NPWS 1996).	Medium	Yes	Included – Survey undertaken	Low	Australian Bustard has been recorded approximately 17km from the subject land with the most recent record from over 15 years ago. Suitable habitat for the species is available within the subject land, represented by open farmland and shrubland and grassland communities consistent with PCT's 10, 15, 13, 17, 24, 26, 28, 45, 46 and 160
Botaurus poiciloptilus **Australasian Bittern**	EN	EN	No		PMST, BioNet	The Australasian Bittern is distributed across south-eastern Australia. Often found in terrestrial and estuarine wetlands, generally where there is permanent water with tall, dense vegetation	Low	No	BUS survey undertaken	Low	Australian Bittern has not been recorded within the subject land. Suitable habitat is present, represented by Lignum woodland

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						including Typha spp. and Eleocharis spp.. Typically this bird forages at night on frogs, fish and invertebrates, and remains inconspicuous during the day. The breeding season extends from October to January with nests being built amongst dense vegetation on a flattened platform of reeds.					and wetland PCT 13 and 24. Known to move through the site during migration. Collision risk low, but consequence high.
Burhinus grallarius **Bush Stone-curlew**		EN	Yes		BioNet	The Bush Stone-curlew is found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. Only in northern Australia is it still common however and in the south-east it is either rare or extinct throughout its former range. Occurs in lightly timbered open forest and woodland, or partly cleared farmland with remnants of woodland, with a ground cover of short sparse grass and few or no shrubs where fallen branches and leaf litter are present.	Low	Yes	Included – Survey undertaken	Low	Bush Stone-Curlew has been recorded approximately 19km from the subject land with the most recent record from over 10 years ago. Suitable habitat for the species is available within the subject land, represented by partially cleared farmland and thinned woodland communities consistent with PCT's 10, 13, 17, 24, 26, 28, 45, 46 and 160.
Calidris acuminata			No	Migratory	PMST, BioNet	In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands,	Low	No	BUS survey undertaken	Negligible	Sharp-tailed Sandpiper has been recorded approximately 16km

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC									
Sharp-tailed Sandpiper						with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They also occur in saltworks and sewage farms. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry. They use intertidal mudflats in sheltered bays, inlets, estuaries or seashores, and also swamps and creeks lined with mangroves. They tend to occupy coastal mudflats mainly after ephemeral terrestrial wetlands have dried out, moving back during the wet season. They may be attracted to mats of algae and water weed either floating or washed up around terrestrial wetlands, and coastal areas with much beachcast seaweed. Sometimes they occur on rocky shores and rarely on exposed reefs (Higgins & Davies 1996).					from the subject land. Suitable habitat within the subject land may include wetland communities and flooded paddocks.
Calidris ferruginea **Curlew Sandpiper**	CR	EN	No	Migratory	PMST, BioNet	Inhabits sheltered intertidal mudflats. Also non-tidal swamps,	Low	No	BUS survey undertaken	Low	Curlew Sandpiper has not been recorded within 50km of the subject land. No

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						lagoons and lakes near the coast. Infrequently recorded inland.					suitable habitat is available within the subject land, such as intertidal flats, and the species is not associated with any PCTs within the subject land.
Calidris melanotos **Pectoral Sandpiper**			No	Migratory	PMST, BioNet	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands. The species is usually found in coastal or near coastal habitat but occasionally found further inland. It prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation, such as grass or samphire. The species has also been recorded in swamp overgrown with lignum. They forage in shallow water or soft mud at the edge of wetlands (Higgins & Davies 1996).	Low	No	BUS survey undertaken	Negligible	Pectoral Sandpiper has not been recorded within 50km of the subject land. Habitat within the subject land is not suitable, given the distance from the coast.
Calyptorhynchus Latham	VU	VU	No		PMST, BioNet	Inhabits forest with low nutrients, characteristically with key Allocasuarina species. Tends to	Low	No	BUS survey undertaken	Low	Glossy Black-Cockatoo has been recorded approximately 40km

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
Glossy Black-Cockatoo						prefer drier forest types. Often confined to remnant patches in hills and gullies. Breed in hollows stumps or limbs, either living or dead.					from the subject land. Habitat within the subject land is unsuitable, as it does not contain forest communities with Allocasuarina species, and the species is not associated with any PCT's within the subject land.
Charadrius veredus **Oriental Plover**			No	Migratory	BioNet	Immediately after arriving in non-breeding grounds in northern Australia, Oriental Plovers spend a few weeks in coastal habitats such as estuarine mudflats and sandbanks, on sandy or rocky ocean beaches or nearby reefs, or in near-coastal grasslands, before dispersing further inland (Bigg 1981; Bransbury 1985; Crawford 1972; Murlis et al. 1988; Serventy & Whittell 1976; Storr 1977, 1980, 1984b). Thereafter they usually inhabit flat, open, semi-arid or arid grasslands, where the grass is short and sparse, and interspersed with hard, bare ground, such as claypans, dry paddocks, playing fields, lawns and cattle camps At the onset of the Wet Season, some may move into lightly wooded	Low	No	BUS survey undertaken	Negligible	Oriental Plover has been recorded approximately 38km from the subject land, with the most recent record from over 15 years ago. Suitable habitat may include open farmland and grassland communities within the subject land.

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						grasslands (Storr 1977). Some remain in estuarine and littoral environments, and a few are occasionally recorded around terrestrial wetlands or flooded paddocks (Boekel 1980; Close 1982; McCrie 1984). Vagrants in southern Australia have been recorded in saltmarsh (Park 1983; Patterson 1983; Pedler 1982).					
Falco hypoleucos **Grey Falcon**	VU	VU	No		PMST, BioNet	Found over open country and wooded lands of tropical and temperate Australia. Mainly found on sandy and stony plains of inland drainage systems with lightly timbered acacia scrub.	Low	No	BUS survey undertaken	Low	Grey Falcon has been recorded approximately 13km from the subject land with the most recent record from over 10 years ago. Suitable habitat for the species is available within the subject land, represented by open farmland and acacia woodland communities and within PCT's 13, 15, 16, 17, 26, 46 and 45.
Gallinago hardwickii **Latham's Snipe**			No	Migratory	PMST, BioNet	In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level (Chapman 1969; Naarding 1981). They usually inhabit open,	Medium	No	BUS survey undertaken	Low	Latham's Snipe has been recorded approximately 13km from the subject land. Suitable habitat is

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies) (Frith et. al. 1977; Naarding 1983; Weston 2006, pers. comm.). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity (Frith et al. 1977; Naarding 1983).					represented by wetland communities within the subject land.
Gelochelidon nilotica **Gull-billed Tern**			No	Migratory	BioNet	Gull-billed Terns are found in freshwater swamps, brackish and salt lakes, beaches and estuarine mudflats, floodwaters, sewage farms, irrigated croplands and grasslands. They are only rarely found over the ocean	Known	No	BUS survey undertaken	Negligible	Gull-billed Tern has been recorded approximately 35km from the subject land. Suitable habitat may be present within wetland communities and in grasslands during periods of inundation.
Grantiella picta **Painted Honeyeater**	VU	VU	No		PMST, BioNet	Found mainly in dry open woodlands and forests, where it is strongly associated with mistletoe. Often found on plains with scattered eucalypts and remnant trees on farmlands.	Known	No	BUS survey undertaken	High	Painted Honeyeater has previously been recorded within the subject land in 2019 and recorded within surveys for the wind farm. Suitable habitat is available in woodland, scattered trees and open farmland

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
											associated with PCT's 13, 15, and 26 with appropriate levels of mistletoe
Haliaeetus leucogaster **White-bellied Sea-Eagle**		VU	Yes		BioNet	A migratory species that is generally sedentary in Australia, although immature individuals and some adults are dispersive. Found in terrestrial and coastal wetlands; favouring deep freshwater swamps, lakes and reservoirs; shallow coastal lagoons and saltmarshes. It hunts over open terrestrial habitats. Feeds on birds, reptiles, fish, mammals, crustaceans and carrion. Roosts and makes nest in trees.	Low	Yes	BUS survey undertaken	Low	White-bellied Sea-Eagle has been recorded approximately 16km from the subject land. Terrestrial and shallow aquatic foraging habitat are available within PCTs10, 13, and 15. Aquatic foraging resources are likely favourable during wetter periods, where freshwater wetlands become inundated.
Hemiaspis damelii ***Grey Snake***	EN	EN	Yes		PMST	Floodplains and ephemeral wetlands associated with heavy clay soils are key habitat features for the Grey Snake. In NSW, the Grey Snake's habitat includes the margins of ephemeral wetlands within River Red Gum (Eucalyptus camaldulensis) and Black Box (E. largiflorens) vegetation communities and Tangled Lignum (Duma florulenta) swamp. The Grey Snake has not been sighted in dry phase wetlands, suggesting	Low	Yes	No - Assumed present	Low	Associated with PCT 10, 13,15 and 17. Unlikely to be present within the subject land, with known records and more optimal habitat west of Maude

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						its detectability and activity patterns may be related to wetland inundation regimes and suitable weather conditions					
Hieraaetus morphnoides **Little Eagle**		VU	Yes		Bionet	The Little Eagle is most abundant in lightly timbered areas with open areas nearby providing an abundance of prey species. It has often been recorded foraging in grasslands, crops, treeless dune fields, and recently logged areas. The Little Eagle nests in tall living trees within farmland, woodland and forests.	Medium	Yes	BUS survey undertaken	Medium	Little Eagle has previously been recorded within the subject land in 2020. Suitable habitat is available within open and sparsely vegetated and intact woodlands within PCTs 13, 15, 17, 26, 46 and 45.
Hirundapus caudacutus **White-throated Needletail**	VU		No	Migratory	PMST, Bionet	Almost exclusively an aerial species, occur over most types of habitat, they are probably recorded most often above wooded areas, including open forest.	Medium	No	BUS survey undertaken	Negligible	White-throated Needletail has not been recorded within the subject land. Generally, only comes to ground in adverse weather in western NSW. Subject land is fringing on the most westerly distribution.
Hydroprogne caspia **Caspian Tern**			No	Migratory		Generally found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred, however known to frequent inland	Low	No	BUS survey undertaken	Low	Caspian Tern has been recorded approximately 34 km from the subject land over 15 years ago. No suitable habitat occurs

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						areas and wetlands during periods of inundation.					within the subject land, given the distance from the coast.
Lathamus discolor **Swift Parrot**	CR	EN	No		PMST, Bionet	The Swift Parrot occurs in woodlands and forests of NSW from May to August, where it feeds on eucalypt nectar, pollen and associated insects. The Swift Parrot is dependent on flowering resources across a wide range of habitats in its wintering grounds in NSW. Favoured feed trees include winter flowering species such as Swamp Mahogany Eucalyptus robusta, Spotted Gum Corymbia maculata, Red Bloodwood C. gummifera, Mugga Ironbark E. sideroxylon, and White Box E. albens. Commonly used lerp infested trees include Grey Box E. microcarpa, Grey Box E. moluccana and Blackbutt E. pilularis. This species is migratory, breeding in Tasmania and also nomadic, moving about in response to changing food availability.	Low	No	BUS survey undertaken Excluded – no important mapped habitat	Negligible	Swift Parrot has been recorded approximately 25km from the subject land. No suitable habitat occurs within the subject land, with a low floristic diversity of flowering trees and shrubs across the PCTs present. The subject land does not contain any important areas mapped for the species, and the species is not associated with any PCT's within the subject land.
Leipoa ocellata **Malleefowl**	VU	EN	No	Migratory	PMST, Bionet	The malleefowl occurs in tall, dense mallee with a mean annual rainfall of 300 to 450mm (NPWS 1996). This species prefers areas	Low	No	Excluded – No habitat	Negligible	Malleefowl has been recorded approximately 19km from the subject land

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						with a light sandy to sandy loam soil, a dense but discontinuous canopy cover, dense and variable herb layer and open ground for easy of movement (NPWS 1996).					with the most recent record from over 20 years ago. The species is not associated with any PCT's present within the subject land and no suitable habitat it present, given there is no tall, densely vegetation Mallee vegetation.
Limosa limosa **Black-tailed Godwit**		VU	No	Migratory	Bionet	In Australia the Black-tailed Godwit has a primarily coastal habitat environment. The species is commonly found in sheltered bays, estuaries and lagoons with large intertidal mudflats or sandflats, or spits and banks of mud, sand or shell-grit; occasionally recorded on rocky coasts or coral islets. The use of habitat often depends on the stage of the tide. It is also found in shallow and sparsely vegetated, near-coastal, wetlands; such as saltmarsh, saltflats, river pools, swamps, lagoons and floodplains. There are a few inland records, around shallow, freshwater and saline lakes, swamps, dams and bore-overflows. They also use	Low	No	BUS survey undertaken	Low	Black-tailed Godwit has been recorded approximately 46km from the subject land over 20 years ago. The subject land is unlikely to provide suitable habitat for this species given the distance from coastal areas, and that very few records occur inland.

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						lagoons in sewage farms and saltworks (Higgins & Davies 1996).					
Lophochroa leadbeateri **Major Mitchell's Cockatoo**	EN	VU	Yes		Bionet	Found mainly in semi-arid and arid regions, in dry woodlands, particularly mallee - casuarina assemblages. They breed in the hollows of large trees, often near watercourse.	Medium	Yes	BUS survey undertaken	Low	Major Mitchells Cockatoo has been recorded approximately 13km from the subject land. Foraging and breeding habitat is represented by large hollows and woodland communities within PCT's 10, 13, 15, 17, 24, 26, 28, 45, and 46. At risk of collisions due to flocking nature.
Lophoictinia isura **Square-tailed Kite**		VU	Yes		Bionet	Typically inhabits coastal forested and wooded lands of tropical and temperate Australia. In NSW it is often associated with ridge and gully forests dominated by Eucalyptus longifolia, Corymbia maculata, E. elata, or E. smithii. Individuals appear to occupy large hunting ranges of more than 100 km2. They require large living trees for breeding, particularly near water with surrounding woodland /forest close by for foraging habitat. Nest sites are generally located along or near	Low	Yes	BUS survey undertaken	Low	Square-tailed Kite has been recorded approximately 36km from the subject land over 10 years ago. Suitable habitat is represented by large Eucalypts, open farmland, woodland, shrubland and grassland communities within PCT's 13, 15, 26 and 45.

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						watercourses, in a tree fork or on large horizontal limbs.					
Merops ornatus **Rainbow Bee-eater**			No	Migratory	Bionet	The Rainbow Bee-eater occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation (Higgins 1999). It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water (Badman 1979; Boekel 1976; Fry 1984; Roberts 1979; Storr 1984a, 1984b, 1985a). It also occurs in inland and coastal sand dune systems, and in mangroves in northern Australia, and has been recorded in various other habitat types including heathland, sedgeland, vine forest and vine thicket, and on beaches (Higgins 1999).	Known	No	BUS survey undertaken	Medium	Rainbow Bee-eater has previously been recorded within the subject land. Suitable habitat is represented by woodland and shrubland communities and areas of open farmland.
Motacilla flava **Yellow Wagtail**			No	Migratory	PMST, Bionet	Prefers damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs	Low	No	Excluded - vagrant	Negligible	Yellow Wagtail has not been recorded within 50km of the subject land.

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
Neophema chrysostoma **Blue-winged Parrot**	VU	VU	No		PMST	Favour grasslands and grassy woodlands. They are often found near wetlands both near the coast and in semi-arid zones.	Low	No	BUS survey undertaken Vagrant	Low	Woodland habitat is broadly available within PCTs 13, 15 and 26 however the subject land does Blue-winged Parrots are in Tasmania and Victoria, particularly in southern Victoria and the midlands and eastern areas of Tasmania. Sparser populations are found in western New South Wales. Considered a vagrant species in NSW
Ninox connivens **Barking Owl**		VU	Yes		Bionet	Generally found in open forests, woodlands, swamp woodlands, farmlands and dense scrub. Can also be found in the foothills and timber along watercourses in otherwise open country. Territories are typically 2000 ha in NSW habitats. Hunts small arboreal mammals or birds and terrestrial mammals when tree hollows are absent.	Medium	Yes	Hollow bearing tree survey undertaken	Low	Suitable habitat available in large hollows, open farmland, dense shrubland and woodland within PCTs 10, 13, 15 and 26
Numenius madagascariensis **Eastern Curlew**	CR		No	Migratory	PMST, Bionet	Occurs in sheltered coasts, especially estuaries, embayments, harbours, inlets and coastal	Low	No	Excluded - vagrant	Negligible	Eastern Curlew has not been recorded within 50km of the subject

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						lagoons with large intertidal mudflats or sandflats often with beds of seagrass.					land. No suitable habitat is available within the subject land, such as coastal estuaries, inlets or embayment's, and the species is not associated with any PCTs within the subject land.
Pedionomus torquatus **Plains-wanderer**	CR	EN	Yes		PMST, Bionet	Plains-wanderers live in semi-arid, lowland native grasslands that typically occur on hard red-brown soils. Habitat structure appears to be more important than plant species composition. Preferred habitat typically comprises 50% bare ground, 10% fallen litter, and 40% herbs, forbs and grasses. They have been recorded in some agricultural land including unimproved pasture, and cropping on long rotation.	High	Yes	Included – Survey undertaken. Mapped important habitat	Medium	Plains-wanderer has previously been recorded within the subject land. Not recorded in surveys undertaken. Important areas of Plains wanderer are mapped within the northern section of the subject land. Suitable habitat is present within grassland represented by PCT 46.
Pezoporus occidentalis **Night Parrot**	EN	EX	No	Migratory	PMST, Bionet	The Night Parrot is known to occur within Spinifex grasslands in stony or sandy areas and samphire and chenopod associations on floodplains, salt lakes and clay pans. Suitable habitat is characterized by the presence of	Negligible	No	Excluded	Negligible	Night Parrot is extinct in NSW. No records occur within 50km of the subject land.

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						large and dense clumps of Spinifex, and it may prefer mature spinifex that is long and unburnt. The Night Parrot builds its nest which consists of a few small sticks at the end of a 'tunnel' that is formed in a Spinifex tussock or a small bush. Up to four white eggs are laid in this nest. Some unconfirmed reports have claimed that the Night Parrot may nest or roost in caves, and one unverified source claimed that it may also excavate burrows in sandy soils.					
Plegadis falcinellus **Glossy Ibis**			No	Migratory	Bionet	The Glossy Ibis' preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. The species is occasionally found in coastal locations such as estuaries, deltas, saltmarshes and coastal lagoons	Low	No	BUS survey undertaken	Low	Glossy Ibis has been recorded approximately 6km from the subject land. Suitable habitat occurs within the subject land in wetland communities on floodplains.
Polytelis anthopeplus monarchoides		VU	Yes		Bionet	The species nests within River Red Gum forests along the Murray, Wakool and lower Murrumbidgee Rivers, and possibly the Darling River downstream of Pooncarie. Typical nest trees are large, mature	Low	Yes	BUS survey undertaken Excluded – Geographical limitations	Negligible	Regent Parrot (eastern subspecies) has not been recorded within 50km of the subject land. Woodland habitat is broadly available

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
Regent Parrot (eastern subspecies)						healthy trees with many spouts (though dead trees are used) and are usually located close to a watercourse. Principal foraging habitat is mallee woodlands, though foraging also occurs in riverine forests and woodlands. Mallee woodland within 20 kilometres of nesting sites is critical foraging habitat for breeding birds. They may utilise cereal crops and will feed on spilt grain. Is claimed to be a pest in almond orchards. Birds move between the riverine nesting habitat and foraging sites along corridors of natural vegetation. Outside the breeding season birds may move away from the riverine plain, with birds observed in mallee over 60 kilometres from the river. However, there are very few records in NSW away from the Murray River during the non-breeding season and it has been speculated that most birds may join non-breeding flocks in Victoria.					within PCTs 13 and 15 however the subject land does not contain Mallee woodland or located near the Murray River.
Polytelis swainsonii **Superb Parrot**	VU	VU	Yes		PMST, Bionet	Found mainly in open, tall riparian River Red Gum forest or woodland. Often found in farmland including grazing land with patches of remnant	Known	Yes	BUS survey undertaken	High	Superb Parrot has previously been recorded within the subject land and was recorded during the

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						vegetation. Forages primarily in grassy box woodland, feeding in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants.					field investigation. Suitable habitat is present within grazing land, and native woodland and grassland vegetation within PCTs 10, 13, 15, 26 and 45. At risk of collisions.
Rostratula australis **Australian Painted Snipe**	EN	EN	No		Bionet	Usually found in shallow inland wetlands including farm dams, lakes, rice crops, swamps and waterlogged grassland. They prefer freshwater wetlands, but have been recorded in brackish waters. Forages on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.	Low	No	BUS survey undertaken	Low	Australian Painted Snipe has been recorded approximately 25km from the subject land over 15 years ago. Suitable habitat is broadly available within farm dams, and freshwater Lignum wetlands and shrublands within PCTs 13 and 17.
Stagonopleua guttata **Diamond Firetail**	VU	VU	No		Bionet PMST	Diamond firetails occur in eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats, including farmland and grassland with scattered trees. They prefer areas with relatively low tree	Known	No	BUS survey undertaken	Low	Diamond Firetail has been recorded within and adjacent to the subject land. Suitable habitat is available in woodland, scattered trees and open farmland associated with PCT's 13, 15, and

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						density, few large logs, and little litter cover but high grass cover					26. Preferred intact habitat has been avoided. Minor impacts to fringing vegetation.
Tringa nebularia **Common Greenshank**			No	Migratory	Bionet	The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. The edges of the wetlands used are generally of mud or clay, occasionally of sand, and may be bare or with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live	Low	No	BUS survey undertaken	Low	Common Greenshank has been recorded approximately 5km from the subject land. Suitable habitat occurs within the subject land in wetland communities.

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						trees. It was once recorded with Black-winged Stilts (Himantopus himantopus) in pasture, but are generally not found in dry grassland (Higgins & Davies 1996).					
Tyto novaehollandiae **Masked Owl**		VU	Yes		Bionet	The Masked Owl is found in range of wooded habitats that provide tall or dense mature trees with hollows suitable for nesting and roosting. It is mostly seen in open forests and woodlands adjacent to cleared lands. Prey includes hollow-dependent arboreal marsupials and terrestrial mammals.	Medium	Yes	Hollow bearing tree survey undertaken	Low	Masked Owl has been recorded approximately 24km from the subject land over 20 years ago. Suitable habitat is available within woodland in PCTs 10, 13, 15 and 26 and large hollows.
Mammals											
Phascolarctos cinereus **Koala**	VU	VU	Yes		PMST, Bionet	In NSW the Koala mainly occurs on the central and north coasts with some populations in the western region. Koalas feed almost exclusively on eucalypt foliage, and their preferences vary regionally. Primary feed trees include *Eucalyptus camaldulensis* within the Riverina. They are solitary with varying home ranges.	Low	Yes	Excluded – Limited habitat in subject land	Low	Koala has been recorded approximately 14km from the subject land. Suitable habitat is broadly available within woodland communities 10 13, and 15. The subject land contains sporadic occurrences and low condition patches of preferred Koala feed tree species *Eucalyptus*

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
											camaldulensis in suboptimal condition. Restricted to major waterways.
Myotis macropus **Southern Myotis**		VU	Yes			Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, wharves, bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface. Rarely found more than 100 km inland, except along major river systems	Low – potential increased activity during flooding events	Yes	BUS survey undertaken	Low	At edge of known distribution, but may occur during more optimal flooding events within associated Black Box dominated communities, and where more permanent water occurs, such as the Coleambally outfall drain. May occur rarely or as a vagrant during flood events more broadly when water inundation occurs in normally highly ephemeral areas.
Nyctophilus corbeni **Corben's Long-eared Bat**	VU	VU	No		PMST, Bionet	Restricted to the Murray-Darling basin and western slopes. Found in a range of habitats including tall Eucalypt forests, mallee, open savanna and Black Box woodland, preferring habitats with a distinct canopy and cluttered, dense understorey. Roost in tree hollows	Medium	No	Included – Survey undertaken. Recorded as species group.	Low	Corbens Long-eared Bat has not been recorded within 50km of the subject land. May be found in PCT 10, 13, 15 and 28.

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
						and fissures and under exfoliating bark.					
Pteropus poliocephalus **Grey-headed Flying Fox**	VU		No	Nomadic	PMST	Occur in various habitat from 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.	Low	No	Excluded – Geographical limitations and lack of habitat	Low	Grey-headed Flying Fox has not been recorded within 50km of the subject land. The subject does not contain suitable habitat for the species, which is not associated with any PCT's within the subject land.
Frogs											
Crinia sloanei **Sloane's Froglet**	EN	VU	No		PMST, Bionet	Sloane's Froglet is a cryptic species, usually found only after rain. This species has a widely scattered distribution throughout the floodplains of the Murray-Darling Basin in NSW and has been recorded mostly in the Darling Riverine Plains, NSW South Western Slopes, and the Riverina bioregions. It is typically associated with periodically inundated grassland, woodland and disturbed areas.	Low	No	Excluded - vagrant	Low	Sloane's Froglet has been recorded approximately 25km from the subject land over 20 years ago. While the subject land contains periodically inundated grasslands, the species is not associated with any PCT's within the subject land.

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EPBC	BC									
Litoria raniformis **Southern Bell Frog**	VU	EN	Yes		PMST, Bionet	In NSW, the species is known to exist only in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. Usually found in or around permanent or ephemeral swamps or billabongs with an abundance of bulrushes and other emergent vegetation along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. Outside the breeding season animals disperse away from the water and take shelter beneath ground debris such as fallen timber and bark, rocks, grass clumps and in deep soil cracks.	Known	Yes	Included – Survey undertaken	High	Southern Bell Frog has previously been recorded within the subject land and was observed during the field investigation. Suitable habitat is present within swamp and wetland within PCTs 10, 13, 15, 17, 24 and fringing areas within PCT 26 and PCT 45. This species was also identified within Coleambally irrigation channel, outfall drain and numerous farm dams.
Fish											
Bidyanus bidyanus **Silver Perch**	CE		No		PMST	Only one remaining secure and self sustaining population occurs in NSW in the central Murray River downstream of Yarrawonga weir, as well as several anabranches and tributaries. Very limited potential within the subject land	Low	No	Excluded – No habitat	Low	No records of Silver perch occur within 50km of the subject land. There is mapped habitat for Silver Perch within the subject land as part of the Coleambally Outfall Drain and comprising

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
											Delta Creek outside of the subject land.
Galaxias rostratus **Flathead Galaxias**	CR		No		PMST	Flathead Galaxias are found in still or slow moving water bodies such as wetlands and lowland streams. The species has been recorded forming shoals. They have been associated with a range of habitats including rock and sandy bottoms and aquatic vegetation. Flathead Galaxias spawn in spring and lay slightly adhesive demersal eggs.	Low	No	Excluded – No habitat	Low	No records of Flathead Galaxias occur within 50km of the subject land. There is mapped habitat for Flathead Galaxias within the subject land as part of the Coleambally Outfall Drain and comprising Delta Creek outside of the subject land.
Maccullochella peelii **Murray Cod**	VU		No		PMST	The Murray Cods natural distribution extends throughout the Murray-Darling basin ranging west of the divide from south east Queensland, through NSW into Victoria and South Australia. It is found in the waterways of the Murray–Darling Basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers, billabongs and large deep holes. Murray Cod is entirely a freshwater species and will not tolerate high salinity levels.	Low	No	Excluded – No habitat	Low	No records of Murray Cod occur within 50km of the subject land. No mapped habitat occurs within the subject land. Habitat is not likely suitable within the subject land, given the absence of rocky streams, rivers and deep holes.

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Species	Status		BAM predicted SCS	Migratory	Other Sources	Habitat Description	Potential occurrence in subject land	BAM Candidate species	Survey required/ undertaken	Potential for impact	Conclusion and rationale
	EP BC	BC									
Macquaria australasica **Macquarie Perch**	EN		No		PMST	Macquarie Perch are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments. Macquarie perch are found in both river and lake habitats, especially the upper reaches of rivers and their tributaries	Low	No	Excluded – No habitat	Low	No records of Macquarie Perch occur within 50km of the subject land. No mapped habitat occurs within the subject land. Habitat is not likely suitable within the subject land, given the absence of rivers and lakes.
Maccullochella macquariensis **Trout Cod**	EN		No		PMST	The Trout Cod is endemic to the southern Murray-Darling river system, including the Murrumbidgee and Murray Rivers, and the Macquarie River in central NSW. Trout Cod are often found in faster flowing water with rocky and gravel bottoms, but can also be found in some slower flowing, lowland rivers. Large woody snags are very important for the species as they provide complex habitats for each stage of the species' life cycle.	Low	No	Excluded – No habitat	Low	No records of Trout Cod occur within 50km of the subject land. No mapped habitat occurs within the subject land. Habitat is not likely suitable within the subject land, given the absence of rivers, or fast flowing water with gravel bottoms and large woody snags.

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Appendix 3. Flora

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Appendix 3.1. BAM plot field data

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plot	pct	area	patchsize	conditionclass	zone	easting	northing	bearing	compTree	compShrub	compGrass	compForbs	compFerns	compOther
W_904	10	4.25	100	Moderate	55	358641	6125949	10	1	5	4	5	0	0
W_906	10	4.25	100	Moderate	55	357292	6127374	60	1	5	3	3	1	0
RTS_W1	13	16.61	100	Moderate	55	358665	6137923	222	2	4	5	7	0	1
W_604	13	16.61	100	Moderate	55	371952	6122967	215	1	2	6	1	1	0
W_606	13	16.61	100	Moderate	55	372749	6129433	152	2	5	4	8	1	1
RTS_505	13	29.78	100	Thinned	55	357175	6134013	240	1	7	4	1	0	0
W_601	13	29.78	100	Thinned	55	385396	6120782	150	2	5	7	7	0	0
W_608	13	29.78	100	Thinned	55	363033	6134151	119	2	2	9	3	1	0
W_815	13	29.78	100	Thinned	55	358442	6137002	13	1	5	5	8	1	0
RTS_502	15	33.13	100	Moderate	55	375898	6125550	230	1	9	1	2	0	0
W_01	15	33.13	100	Moderate	55	377145	6125847	91	1	8	7	13	1	0
W_500	15	33.13	100	Moderate	55	364398	6130438	241	2	5	7	9	1	0
W_504	15	33.13	100	Moderate	55	363072	6131346	105	1	7	6	5	1	1
RTS_W2	15	6.39	100	Thinned	55	357698	6134582	10	1	11	4	9	1	0
W_813	15	6.39	100	Thinned	55	358537	6135349	128	1	8	5	6	1	0
W_814	15	6.39	100	Thinned	55	357519	6136326	193	1	8	5	9	1	0
RTS_W7	17	23.9	100	Mod_Good	55	385645	6121711	92	1	5	6	7	1	0
RTS_W8	17	23.9	100	Mod_Good	55	383488	6123274	305	0	3	4	9	1	0
S_12	17	23.9	100	Mod_Good	55	382321	6116931	134	0	2	5	1	1	0
W_603	17	23.9	100	Mod_Good	55	383325	6123014	240	0	3	10	8	1	0
RTS_W5	17	11.16	100	Moderate	55	376956	6124617	100	0	3	3	9	1	0
RTS_W6	17	11.16	100	Moderate	55	363068	6137033	348	0	4	4	7	0	0
S_52	17	11.16	100	Moderate	55	382089	6116925	80	0	3	10	7	2	0
W_02	26	2177.64	100	DNG	55	382792	6123688	86	0	2	10	11	0	0
W_03	26	2177.64	100	DNG	55	383677	6124944	234	0	2	7	7	0	1
W_07	26	2177.64	100	DNG	55	377941	6123936	82	0	5	9	9	0	0
W_12	26	2177.64	100	DNG	55	357202	6129073	254	0	5	9	10	0	0
W_13	26	2177.64	100	DNG	55	354830	6126327	92	0	7	8	8	0	0
W_14	26	2177.64	100	DNG	55	360882	6137355	15	0	1	8	12	0	0

plot	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to9	funTreeStem10to19	funTreeStem20to29
W_904	15.0	1.8	5.7	2.6	0.0	0.0	1	0	30.0	3.0	0	0	0
W_906	10.0	31.2	13.1	0.7	0.1	0.0	1	2	24.0	20.0	0	0	0
RTS_W1	20.2	10.7	28.1	0.8	0.0	0.1	0	1	31.0	7.5	1	1	1
W_604	25.0	52.0	1.6	0.1	1.0	0.0	4	1	0.0	5.0	1	1	0
W_606	30.1	75.3	11.6	0.9	0.1	0.1	4	1	18.0	0.0	1	0	1
RTS_505	3.0	4.9	9.3	2.0	0.0	0.0	1	1	25.0	0.0	0	0	0
W_601	15.1	19.9	23.2	3.7	0.0	0.0	2	4	20.0	2.0	0	1	1
W_608	40.1	5.4	11.4	0.3	3.0	0.0	6	0	25.0	15.0	0	1	1
W_815	30.0	18.2	15.2	0.9	0.1	0.0	1	3	10.2	10.0	1	1	1
RTS_502	10.0	6.3	0.1	0.8	0.0	0.0	1	4	33.0	2.0	1	1	1
W_01	20.0	9.3	9.6	2.0	0.1	0.0	3	3	15.0	5.0	0	0	0
W_500	21.0	10.6	23.3	4.9	0.1	0.0	2	2	5.6	3.0	0	0	0
W_504	25.0	42.0	4.0	2.5	0.2	0.1	2	3	12.4	6.0	0	0	0
RTS_W2	3.0	20.4	42.1	14.7	8.0	0.0	0	1	21.4	11.0	0	0	0
W_813	25.0	12.3	10.3	2.5	0.1	0.0	0	2	11.2	7.0	0	0	1
W_814	25.0	55.0	2.8	1.0	0.2	0.0	1	4	17.0	8.0	1	1	1
RTS_W7	0.1	9.0	8.8	1.0	0.1	0.0	0	0	26.0	19.0	0	0	0
RTS_W8	0.0	22.1	55.2	0.9	0.1	0.0	0	0	25.0	0.0	0	0	0
S_12	0.0	30.1	45.3	5.0	10.0	0.0	0	0	12.0	0.0	0	0	0
W_603	0.0	5.6	57.7	1.6	2.0	0.0	0	0	5.0	0.0	0	0	0
RTS_W5	0.0	25.3	45.0	1.0	0.1	0.0	0	0	38.0	0.0	0	0	0
RTS_W6	0.0	17.2	45.2	1.2	0.0	0.0	0	0	58.0	0.0	0	0	0
S_52	0.0	1.4	50.4	3.7	3.5	0.0	0	0	7.0	3.0	0	0	0
W_02	0.0	0.3	52.9	1.3	0.0	0.0	0	0	29.0	0.0	0	0	0
W_03	0.0	0.2	31.3	1.9	0.0	0.1	0	0	27.0	0.0	0	0	0
W_07	0.0	2.7	40.3	1.4	0.0	0.0	0	0	16.0	0.0	0	0	0
W_12	0.0	4.9	34.2	1.2	0.0	0.0	0	0	15.4	0.0	0	0	0
W_13	0.0	1.3	22.5	0.8	0.0	0.0	0	0	10.8	0.0	0	0	0
W_14	0.0	0.1	51.5	1.3	0.0	0.0	0	0	7.0	0.0	0	0	0

plot	funTreeStem30to49	funTreeStem50to79	funTreeRegen	funHighThreatExotic
W_904	1	0	0	1.1
W_906	1	1	0	0.0
RTS_W1	1	0	1	0.0
W_604	1	1	0	0.0
W_606	1	1	0	0.2
RTS_505	0	1	0	0.2
W_601	1	0	0	0.4
W_608	1	1	0	0.0
W_815	1	0	0	0.1
RTS_502	1	1	1	0.1
W_01	0	1	0	0.0
W_500	0	1	0	0.0
W_504	0	1	1	0.2
RTS_W2	1	0	1	0.0
W_813	0	0	0	0.2
W_814	1	0	1	0.1
RTS_W7	0	0	0	0.4
RTS_W8	0	0	0	0.1
S_12	0	0	0	0.0
W_603	0	0	0	0.1
RTS_W5	0	0	0	0.0
RTS_W6	0	0	0	0.0
S_52	0	0	0	0.0
W_02	0	0	0	0.1
W_03	0	0	0	0.0
W_07	0	0	0	0.0
W_12	0	0	0	0.0
W_13	0	0	0	0.0
W_14	0	0	0	0.0

plot	pct	area	patchsize	conditionclass	zone	easting	northing	bearing	compTree	compShrub	compGrass	compForbs	compFerns	compOther
W_602	26	2177.64	100	DNG	55	382581	6122713	236	0	4	7	8	0	1
W_609	26	2177.64	100	DNG	55	360890	6138928	240	2	6	7	9	1	0
W_614	26	2177.64	100	DNG	55	358436	6140312	220	0	3	6	10	0	0
W_808	26	2177.64	100	DNG	55	354212	6132146	300	0	6	4	6	0	0
RTS_W10	26	795.43	100	Intact	55	376484	6124277	325	1	7	6	14	0	0
RTS_W11	26	795.43	100	Intact	55	376407	6123989	25	1	8	7	18	0	0
RTS_W12	26	795.43	100	Intact	55	364612	6129842	265	1	9	3	11	0	1
W_06	26	795.43	100	Intact	55	374939	6123472	339	1	5	7	11	0	0
W_08	26	795.43	100	Intact	55	364826	6129827	310	1	7	7	9	0	0
W_503	26	795.43	100	Intact	55	359711	6131089	135	1	4	6	13	0	0
W_610	26	795.43	100	Intact	55	357609	6138306	159	1	5	7	9	0	0
W_613	26	795.43	100	Intact	55	359861	6141538	220	1	7	6	6	0	0
W_802	26	795.43	100	Intact	55	385346	6124837	129	1	5	7	5	0	0
W_807	26	795.43	100	Intact	55	354259	6132250	121	2	11	6	2	0	0
W_819	26	795.43	100	Intact	55	380767	6117092	212	1	2	9	10	0	1
S_25	26	1961.78	100	Sparse	55	381485	6116262	168	1	2	8	8	1	0
S_16	26	1961.78	100	Sparse	55	381857	6116299	324	1	2	8	10	1	0
S_29	26	1961.78	100	Sparse	55	382086	6118783	116	2	3	11	5	1	1
S_35	26	1961.78	100	Sparse	55	382282	6119129	336	2	2	9	10	0	1
W_04	26	1961.78	100	Sparse	55	381838	6124623	338	1	4	4	5	2	1
W_10	26	1961.78	100	Sparse	55	358338	6128447	261	1	4	6	10	1	0
W_818	26	1961.78	100	Sparse	55	364001	6140584	290	2	7	5	5	1	0
W_820	26	1961.78	100	Sparse	55	381860	6117367	260	1	2	7	4	0	1
RTS_504	26	1961.78	100	Sparse	55	358412	6133493	110	1	7	4	4	0	0
RTS_W13	28	240.65	100	Low	55	362400	6140230	270	1	2	2	6	0	0
RTS_W15	28	240.65	100	Low	55	361071	6128407	12	1	4	4	3	0	0
W_811	28	240.65	100	Low	55	361561	6129140	103	1	7	4	7	0	0
W_812	28	240.65	100	Low	55	360051	6129613	40	1	5	6	7	0	1
W_903	28	240.65	100	Low	55	358130	6130641	230	1	1	3	4	0	0

plot	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to9	funTreeStem10to19	funTreeStem20to29
W_602	0.0	3.4	75.5	1.2	0.0	0.1	0	0	7.0	0.0	0	0	0
W_609	0.6	2.1	67.7	1.3	0.1	0.0	0	0	4.4	0.0	1	0	0
W_614	0.0	20.3	85.0	1.2	0.0	0.0	0	0	13.0	0.0	0	0	0
W_808	0.0	0.6	24.0	5.5	0.0	0.0	0	0	4.0	0.0	0	0	0
RTS_W10	15.0	14.4	25.4	2.1	0.0	0.0	2	0	27.0	2.0	0	0	1
RTS_W11	15.0	8.5	28.1	2.7	0.0	0.0	2	0	44.0	3.5	0	1	0
RTS_W12	7.0	16.5	15.0	6.0	0.0	0.1	0	0	41.0	11.0	0	1	1
W_06	15.0	16.3	32.2	2.3	0.0	0.0	1	0	10.0	0.0	0	1	1
W_08	10.0	10.4	42.1	2.0	0.0	0.0	0	0	14.0	4.0	0	1	1
W_503	40.0	1.4	33.2	1.3	0.0	0.0	4	0	45.4	2.0	1	1	1
W_610	10.0	31.3	39.6	2.9	0.0	0.0	0	0	29.0	3.0	1	1	1
W_613	15.0	16.5	8.4	1.3	0.0	0.0	0	0	4.0	0.0	1	1	0
W_802	10.0	4.3	26.8	0.7	0.0	0.0	0	0	70.0	10.0	0	0	1
W_807	15.0	6.8	16.5	0.3	0.0	0.0	0	0	5.6	20.0	1	1	1
W_819	20.0	2.1	26.4	1.1	0.0	0.1	0	0	21.6	2.0	1	1	0
S_25	10.0	0.2	12.8	1.0	0.3	0.0	0	0	17.0	20.0	1	1	1
S_16	0.2	0.2	16.2	1.6	0.1	0.0	0	0	5.0	0.0	1	0	0
S_29	1.1	0.5	47.8	1.5	0.1	0.1	0	0	0.0	0.0	1	0	0
S_35	0.3	0.3	64.9	1.8	0.0	0.1	0	0	18.0	0.0	1	0	0
W_04	3.0	0.5	68.0	0.5	0.2	0.1	0	0	51.0	0.0	1	1	1
W_10	7.0	4.1	58.5	1.0	1.0	0.0	0	0	20.0	0.0	0	1	1
W_818	6.1	3.9	13.1	0.9	0.1	0.0	1	0	9.0	12.0	1	0	0
W_820	0.5	0.7	10.3	0.4	0.0	0.1	0	0	3.8	3.0	0	0	0
RTS_504	2.0	4.9	32.0	0.9	0.0	0.0	0	0	51.0	8.0	0	0	0
RTS_W13	3.0	0.6	2.5	2.9	0.0	0.0	1	0	52.0	6.5	0	0	0
RTS_W15	15.0	0.5	6.3	3.6	0.0	0.0	3	0	51.0	22.0	0	0	0
W_811	7.0	2.9	15.0	1.7	0.0	0.0	1	0	14.0	3.0	0	0	0
W_812	15.0	0.6	5.6	0.8	0.0	0.1	2	1	12.0	2.0	0	0	0
W_903	0.1	0.1	31.5	0.9	0.0	0.0	0	0	10.0	0.0	0	0	1

plot	funTreeStem30to49	funTreeStem50to79	funTreeRegen	funHighThreatExotic
W_602	0	0	0	0.1
W_609	0	0	1	0.1
W_614	0	0	0	0.0
W_808	0	0	0	0.3
RTS_W10	1	0	0	0.1
RTS_W11	1	0	0	1.0
RTS_W12	0	0	0	0.0
W_06	0	1	0	0.0
W_08	0	0	0	0.0
W_503	0	1	0	0.5
W_610	0	0	1	0.1
W_613	0	0	0	0.6
W_802	0	0	0	0.0
W_807	0	0	0	3.0
W_819	0	0	1	0.1
S_25	0	0	1	0.2
S_16	0	0	1	0.1
S_29	0	0	0	0.0
S_35	0	0	1	0.0
W_04	0	0	0	0.0
W_10	0	0	0	0.1
W_818	0	0	1	0.0
W_820	0	0	1	0.0
RTS_504	0	0	1	0.3
RTS_W13	1	0	0	3.5
RTS_W15	1	1	0	1.0
W_811	1	0	0	0.3
W_812	0	1	0	0.5
W_903	0	0	0	0.4

plot	pct	area	patchsize	conditionclass	zone	easting	northing	bearing	compTree	compShrub	compGrass	compForbs	compFerns	compOther
W_905	28	240.65	100	Low	55	357938	6126527	260	0	3	4	6	0	0
RTS_W14	28	22.54	100	Moderate	55	361662	6133071	285	1	6	3	1	0	0
W_11	28	22.54	100	Moderate	55	358200	6128607	235	1	3	4	5	0	0
W_501	28	22.54	100	Moderate	55	358269	6126133	97	2	0	2	6	0	0
W_502	28	22.54	100	Moderate	55	359489	6131722	330	1	0	3	5	0	0
RTS_500	45	22.79	100	Mod_Good	55	384490	6121127	80	0	1	4	2	0	0
RTS_501	45	22.79	100	Mod_Good	55	385122	6121094	120	0	1	6	5	0	1
RTS_503	45	22.79	100	Mod_Good	55	361387	6133711	0	0	6	7	4	0	0
W_801	45	22.79	100	Mod_Good	55	384624	6121230	121	0	1	6	3	1	1
RTS_W16	46	399.65	100	Moderate	55	360952	6126507	95	1	4	5	10	1	0
RTS_W9	46	399.65	100	Moderate	55	359680	6127257	320	0	5	7	14	0	1
W_15	46	399.65	100	Moderate	55	358977	6137590	156	0	1	8	9	0	0
W_505	46	399.65	100	Moderate	55	362283	6135803	121	0	4	4	7	0	0
W_611	46	399.65	100	Moderate	55	354916	6137799	20	0	4	4	8	0	0
W_612	46	399.65	100	Moderate	55	355104	6139187	171	0	6	5	4	0	0
W_805	46	399.65	100	Moderate	55	377210	6124624	19	0	2	8	6	0	0
W_806	46	399.65	100	Moderate	55	377024	6124547	225	0	0	0	0	0	0
W_816	46	399.65	100	Moderate	55	356478	6139471	286	0	3	7	7	0	0
W_817	46	399.65	100	Moderate	55	362855	6137350	32	0	5	11	6	1	0
RTS_W3	160	27.7	100	Mod_Good	55	359338	6124833	155	0	3	3	6	1	1
RTS_W4	160	27.7	100	Mod_Good	55	358258	6133914	6	0	3	5	7	1	1
W_902	160	27.7	100	Mod_Good	55	355131	6139356	270	0	3	4	4	1	0
W_901	160	27.7	100	Mod_Good	55	355957	6139996	320	0	3	5	3	1	0

plot	strucTree	strucShrub	strucGrass	strucForbs	strucFerns	strucOther	funLargeTrees	funHollowtrees	funLitterCover	funLenFallenLogs	funTreeStem5to9	funTreeStem10to19	funTreeStem20to29
W_905	0.0	1.2	9.2	12.9	0.0	0.0	0	0	16.0	0.0	0	0	0
RTS_W14	15.0	3.9	5.7	0.1	0.0	0.0	2	1	43.0	6.0	0	0	0
W_11	15.0	1.3	2.2	0.5	0.0	0.0	2	2	60.0	0.0	0	0	0
W_501	14.0	0.0	26.0	0.8	0.0	0.0	4	2	24.6	6.0	0	0	0
W_502	15.0	0.0	2.2	6.1	0.0	0.0	5	1	33.0	6.0	0	0	0
RTS_500	0.0	0.1	45.0	0.8	0.0	0.0	0	0	23.0	0.0	0	0	0
RTS_501	0.0	0.1	48.4	0.6	0.0	0.1	0	0	35.0	4.0	0	0	0
RTS_503	0.0	1.6	40.2	0.4	0.0	0.0	0	0	37.0	0.0	0	0	0
W_801	0.0	0.3	55.1	0.3	0.1	0.1	0	0	40.0	0.0	0	0	0
RTS_W16	0.1	7.3	63.1	5.2	0.1	0.0	0	0	18.0	0.5	0	0	0
RTS_W9	0.0	12.7	38.2	14.1	0.0	0.1	0	0	33.0	0.0	0	0	0
W_15	0.0	0.1	51.3	1.1	0.0	0.0	0	0	5.0	0.0	0	0	0
W_505	0.0	2.7	72.0	1.1	0.0	0.0	0	0	9.2	0.0	0	0	0
W_611	0.0	1.3	70.2	1.0	0.0	0.0	0	0	35.0	0.0	0	0	0
W_612	0.0	11.7	50.1	0.8	0.0	0.0	0	0	33.0	0.0	0	0	0
W_805	0.0	1.4	37.1	0.6	0.0	0.0	0	0	15.0	0.0	0	0	0
W_806	0.0	0.0	0.0	0.0	0.0	0.0	0	0	22.0	0.0	0	0	0
W_816	0.0	7.3	47.0	0.7	0.0	0.0	0	0	15.0	0.0	0	0	0
W_817	0.0	3.7	61.8	1.8	0.1	0.0	0	0	9.0	0.0	0	0	0
RTS_W3	0.0	25.2	6.1	5.1	2.0	0.5	0	0	22.0	0.0	0	0	0
RTS_W4	0.0	25.1	32.2	1.1	4.0	0.1	0	0	16.0	0.0	0	0	0
W_902	0.0	17.1	53.1	0.4	0.1	0.0	0	0	2.0	0.0	0	0	0
W_901	0.0	5.2	25.7	0.3	0.1	0.0	0	0	1.0	0.0	0	0	0

plot	funTreeStem30to49	funTreeStem50to79	funTreeRegen	funHighThreatExotic
W_905	0	0	0	0.0
RTS_W14	1	0	0	0.0
W_11	0	1	0	0.0
W_501	0	1	0	0.0
W_502	0	1	0	0.0
RTS_500	0	0	0	0.0
RTS_501	0	0	0	0.1
RTS_503	0	0	0	0.0
W_801	0	0	0	0.0
RTS_W16	0	0	0	0.0
RTS_W9	0	0	0	0.0
W_15	0	0	0	0.0
W_505	0	0	0	0.0
W_611	0	0	0	0.1
W_612	0	0	0	0.1
W_805	0	0	0	0.0
W_806	0	0	0	0.0
W_816	0	0	0	0.0
W_817	0	0	0	0.1
RTS_W3	0	0	0	0.0
RTS_W4	0	0	0	0.0
W_902	0	0	0	0.0
W_901	0	0	0	0.0

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/12/2024	Dinawan solar farm rts		Moderate	ZR ML			
Zone 55	Datum GDA94	Plot ID	DEH_RTSW1.20241202	Plot dimensions	50x20	Orientation of middle	222	
Easting 358665	Northing 6137924	IBRA region	Riverina	Photo #				
Plant Community Type		13				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	0
	Grasses etc.	0
	Forbs	0
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	0
	Grasses etc.	0
	Forbs	0
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	4
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	7.5
No. trees with hollows	1

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	25	20	15	20	75
Average of the 5 subplots	31				

Notes	Standing water prezent

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flst	Soil Surface Texture	Clsy
Soil Colour	Black	Site Drainage	Poor	Distance to nearest water	50m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	R	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/12/2024	Dinawan solar farm rts December	DEH_RTSW1.20241202	ZR ML

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	10/03/2025	Dinawan wind		DNG	AB NL			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_500	Plot dimensions	50x20	Orientation of middle	80	
Easting 384490	Northing 6121128	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: No	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	1
	Grasses etc.	4
	Forbs	2
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	0.1
	Grasses etc.	45
	Forbs	0.8
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	30	30	15	15	25
Average of the 5 subplots	23				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clayey silt
Soil Colour	Light greyish brown	Site Drainage	Flat	Distance to nearest water	Greater than 1km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	10/03/2025	Dinawan wind	DEH_RTS_500	AB NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa nodosa	N	8	800	
	Avena spp.	E	0.1	20	
GG	Enteropogon acicularis	N	4	400	
	Lolium rigidum	E	1	100	
GG	Rytidosperma caespitosum	N	3	400	
SG	Sclerolaena muricata var.	N	0.1	3	
FG	Sida corrugata	N	0.2	80	
FG	Sida cunninghamii	N	0.6	100	
GG	Walwhalleya proluta	N	30	1000	

BAM Plot Data Sheet								Site Sheet no: 1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	10/03/2025	Dinawan wind		Other	AB NL			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_501	Plot dimensions	50x20	Orientation of middle	120	
Easting 385122	Northing 6121094	IBRA region	Riverina	Photo #				
Plant Community Type		45				EEC: No	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	1
	Grasses etc.	6
	Forbs	5
	Ferns	0
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	0.1
	Grasses etc.	48.4
	Forbs	0.6
	Ferns	0
	Other	0.1
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	4
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	45	35	40	40
Average of the 5 subplots	35				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Slighty sandy & clayey silt
Soil Colour	Light brown	Site Drainage	Flat	Distance to nearest water	Greater than 1km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	10/03/2025	Dinawan wind	DEH_RTS_501	AB NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa aristiglumis	N	15	700	
GG	Austrostipa nodosa	N	8	700	
OG	Convolvulus angustissimus	N	0.1	1	
GG	Enteropogon acicularis	N	5	300	
FG	Euphorbia drummondii	N	0.1	1	
FG	Maireana enchylaenoides	N	0.1	1	
GG	Rytidosperma setaceum	N	0.3	40	
SG	Sclerolaena muricata var.	N	0.1	1	
FG	Sida corrugata	N	0.1	20	
FG	Sida cunninghamii	N	0.2	90	
FG	Solanum esuriale	N	0.1	20	
GG	Sporobolus caroli	N	0.1	1	
GG	Walwhalleya proluta	N	20	2000	
	Xanthium spinosum	HTE	0.1	10	

BAM Plot Data Sheet								Site Sheet no: 1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	10/03/2025	Dinawan wind		Moderate	AB NL			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_502	Plot dimensions	50x20	Orientation of middle	230	
Easting 375899	Northing 6125551	IBRA region	Riverina	Photo #				
Plant Community Type		13				EEC: No	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	9
	Grasses etc.	1
	Forbs	2
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	10
	Shrubs	6.3
	Grasses etc.	0.1
	Forbs	0.8
	Ferns	0
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	1
30 - 49 cm	5
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	2
No. trees with hollows	4

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	40	75	30	15	5
Average of the 5 subplots	33				

Notes	Charcoal patch with small burnt log pieces in centre of plot (SW side).

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Sandy & slightly clayey silt
Soil Colour	Light greyish brown	Site Drainage	Depression	Distance to nearest water	Greater than 1km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	10/03/2025	Dinawan wind	DEH_RTS_502	AB NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex leptocarpa	N	0.5	100	
SG	Atriplex semibaccata	N	0.2	80	
SG	Chenopodium nitrariaceum	N	0.1	1	
SG	Duma florulenta	N	5	20	
FG	Einadia nutans	N	0.3	100	
SG	Enchylaena tomentosa	N	0.1	1	
TG	Eucalyptus largiflorens	N	10	5	
	Lycium ferocissimum	HTE	0.1	1	
SG	Maireana decalvans	N	0.1	1	
FG	Maireana pentagona	N	0.5	100	
SG	Rhagodia spinescens	N	0.1	1	
GG	Rytidosperma caespitosum	N	0.1	20	
SG	Sclerolaena muricata var.	N	0.1	5	
SG	Sclerolaena stelligera	N	0.1	1	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	09/03/2025	Dinawan wind		Other	AB NL			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_503	Plot dimensions	50x20	Orientation of middle	0	
Easting 361387	Northing 6133712	IBRA region	Riverina	Photo #				
Plant Community Type		45				EEC: No	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	6
	Grasses etc.	7
	Forbs	4
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	1.6
	Grasses etc.	40.2
	Forbs	0.4
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	40	30	25	50	40
Average of the 5 subplots	37				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Sandy clay
Soil Colour	Light brown	Site Drainage	Flat	Distance to nearest water	Greater than 1km3

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	09/03/2025	Dinawan wind	DEH_RTS_503	AB NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera nana	N	0.1	1	
SG	Atriplex semibaccata	N	0.3	20	
GG	Austrostipa aristiglumis	N	20	800	
GG	Austrostipa bigeniculata	N	7	300	
GG	Austrostipa nodosa	N	2	200	
	Avena spp.	E	0.1	1	
	Echium plantagineum	E	0.1	1	
GG	Enteropogon acicularis	N	10	700	
FG	Euphorbia drummondii	N	0.1	1	
SG	Maireana aphylla	N	0.5	5	
SG	Maireana humillima	N	0.1	20	
	Medicago polymorpha	E	0.3	200	
FG	Ptilotus spp.	N	0.1	1	
GG	Rytidosperma setaceum	N	0.1	1	
SG	Salsola tragus	N	0.1	5	
SG	Sclerolaena diacantha	N	0.1	20	
SG	Sclerolaena muricata var.	N	0.5	5	
FG	Solanum esuriale	N	0.1	1	
GG	Sporobolus caroli	N	0.1	1	
GG	Walwhalleya proluta	N	1	80	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	10/03/2025	Dinawan wind		Other	AB NL			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_504	Plot dimensions	50x20	Orientation of middle	110	
Easting 358412	Northing 6133493	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: No	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	7
	Grasses etc.	4
	Forbs	4
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	2
	Shrubs	4.9
	Grasses etc.	32
	Forbs	0.9
	Ferns	0
	Other	0
High Threat Weed cover		0.3

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	1
Length of logs (m)	8
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	50	55	40	60	50
Average of the 5 subplots	51				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Sandy clay
Soil Colour	Reddish brown	Site Drainage	Flat	Distance to nearest water	Greater than 1km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	10/03/2025	Dinawan wind	DEH_RTS_504	AB NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	2	8	
SG	Atriplex semibaccata	N	1	50	
GG	Austrostipa bigeniculata	N	10	1000	
GG	Austrostipa scabra	N	10	1000	
FG	Einadia nutans	N	0.1	1	
GG	Enteropogon acicularis	N	7	500	
FG	Leiocarpa spp.	N	0.6	20	
SG	Maireana aphylla	N	3	20	
SG	Maireana humillima	N	0.1	20	
	Medicago polymorpha	E	3	300	
FG	Ptilotus spp.	N	0.1	1	
SG	Rhagodia spinescens	N	0.5	1	
GG	Rytidosperma caespitosum	N	5	500	
SG	Salsola tragus	N	0.1	20	
SG	Sclerolaena diacantha	N	0.1	20	
SG	Sclerolaena muricata var.	N	0.1	1	
FG	Solanum esuriale	N	0.1	1	
	Xanthium spinosum	HTE	0.3	1	

BAM Plot Data Sheet								Site Sheet no: 1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	10/03/2025	Dinawan wind		Other	AB NL			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_505	Plot dimensions	50x20	Orientation of middle	240	
Easting 357175	Northing 6134014	IBRA region	Riverina	Photo #				
Plant Community Type		13				EEC: No	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	7
	Grasses etc.	4
	Forbs	1
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	3
	Shrubs	4.9
	Grasses etc.	9.3
	Forbs	2
	Ferns	0
	Other	0
High Threat Weed cover		0.2

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	1
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	1

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	30	25	40	25	5
Average of the 5 subplots	25				

Notes	Small patch of charcoal on NW outer edge of plot containing small burnt logs.

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Silty clay
Soil Colour	Greyish brown	Site Drainage	Black box depression	Distance to nearest water	Dam approx 500m E

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	10/03/2025	Dinawan wind	DEH_RTS_505	AB NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex semibaccata	N	3	300	
GG	Austrostipa nodosa	N	2	200	
SG	Chenopodium nitrariaceum	N	0.5	5	
FG	Einadia nutans	N	2	70	
SG	Enchylaena tomentosa	N	0.1	1	
GG	Enteropogon acicularis	N	6	300	
TG	Eucalyptus largiflorens	N	3	1	
	Lycium ferocissimum	HTE	0.1	1	
SG	Maireana aphylla	N	0.1	1	
	Marrubium vulgare	E	0.1	1	
	Medicago polymorpha	E	0.1	50	
SG	Rhagodia spinescens	N	0.1	1	
GG	Rytidosperma caespitosum	N	1	100	
SG	Salsola tragus	N	0.1	1	
SG	Sclerolaena muricata var.	N	1	20	
GG	Walwhalleya proluta	N	0.3	20	
	Xanthium spinosum	HTE	0.1	3	

BAM Plot Data Sheet								Site Sheet no: 1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/12/2024	Dinawan Solar Farm RTS		High	ZR ML			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W 10.20241203	Plot dimensions	50x20	Orientation of middle	325	
Easting 376485	Northing 6124277	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: Weeping myall	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	7
	Grasses etc.	6
	Forbs	14
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	15
	Shrubs	14.4
	Grasses etc.	25.4
	Forbs	2.1
	Ferns	0
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	2
20 - 29cm	1
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	2
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	45	15	35	15	25
Average of the 5 subplots	27				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Red	Site Drainage	Good	Distance to nearest water	Over 500m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/12/2024	Dinawan Solar Farm RTS December	DEH_RTS_W10.20241203	ZR ML

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	15	2	
FG	Alternanthera nodiflora	N	0.1	10	
SG	Atriplex semibaccata	N	2	100	
GG	Austrostipa scabra	N	5	200	
FG	Calocephalus sonderi	N	0.1	20	
FG	Calotis scabiosifolia var.	N	0.5	100	
	Echium plantagineum	E	0.2	30	
FG	Einadia nutans	N	0.2	20	
GG	Enteropogon acicularis	N	10	200	
FG	Euphorbia drummondii	N	0.1	5	
FG	Leiocarpa panaetioides	N	0.1	1	
	Lolium rigidum	E	0.1	10	
	Lycium ferocissimum	HTE	0.1	1	
SG	Maireana aphylla	N	5	20	
FG	Maireana enchylaenoides	N	0.1	10	
FG	Maireana pentagona	N	0.2	50	
	Medicago minima	E	0.5	100	
FG	Oxalis perennans	N	0.1	5	
FG	Ptilotus semilanatus	N	0.1	3	
SG	Rhagodia spinescens	N	5	20	
GG	Rytidosperma duttonianum	N	0.1	5	
GG	Rytidosperma setaceum	N	10	300	
SG	Salsola tragus	N	1	70	
SG	Sclerolaena brachyptera	N	0.2	20	
SG	Sclerolaena diacantha	N	1	100	
SG	Sclerolaena muricata var.	N	0.2	10	
FG	Sida corrugata	N	0.1	5	
FG	Sida cunninghamii	N	0.1	5	
FG	Solanum esuriale	N	0.2	50	
GG	Sporobolus caroli	N	0.1	2	
FG	Vittadinia spp.	N	0.1	5	
	Vulpia spp.	E	0.1	10	
GG	Walwhalleya proluta	N	0.2	5	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/12/2024	DINAWAN SOLAR FARM		High	ZR ML			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W 11.2024120 3	Plot dimensions	50x20	Orientation of middle	25	
Easting 376408	Northing 6123990	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: Weeping myall	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	8
	Grasses etc.	7
	Forbs	18
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	15
	Shrubs	8.5
	Grasses etc.	28.1
	Forbs	2.7
	Ferns	0
	Other	0
High Threat Weed cover		1

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	2
20 - 29cm	0
10 - 19 cm	1
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	3.5
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	50	40	70	30	30
Average of the 5 subplots	44				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Red	Site Drainage	Good	Distance to nearest water	Over 550m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/12/2024	DINAWAN SOLAR FARM RTS DECEMBER	DEH_RTS_W11.20241203	ZR ML

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	15	1	
FG	Alternanthera nodiflora	N	0.1	5	
FG	Asperula conferta	N	0.1	5	
SG	Atriplex semibaccata	N	0.5	50	
GG	Austrostipa bigeniculata	N	2	30	
GG	Austrostipa nitida	N	0.2	5	
GG	Austrostipa scabra	N	0.2	20	
FG	Bulbine semibarbata	N	0.1	10	
FG	Calocephalus sonderi	N	0.1	2	
FG	Calotis scabiosifolia var.	N	0.1	5	
	Cucumis myriocarpus subsp.		0.1	5	
FG	Einadia nutans	N	0.2	30	
SG	Enchylaena tomentosa	N	0.2	30	
GG	Enteropogon acicularis	N	20	300	
FG	Euphorbia drummondii	N	0.1	5	
FG	Goodenia gracilis	N	0.1	10	
FG	Goodenia spp.	N	0.1	5	
	Lycium ferocissimum	HTE	1	2	
SG	Maireana aphylla	N	5	20	
FG	Maireana enchylaenoides	N	0.1	5	
FG	Maireana pentagona	N	0.1	10	
	Medicago minima	E	0.5	300	
FG	Oxalis perennans	N	0.1	5	
FG	Ptilotus semilanatus	N	0.5	30	
SG	Rhagodia spinescens	N	2	20	
GG	Rytidosperma duttonianum	N	0.2	10	
GG	Rytidosperma setaceum	N	5	200	
SG	Salsola tragus	N	0.1	5	
SG	Sclerolaena brachyptera	N	0.1	10	
SG	Sclerolaena diacantha	N	0.1	5	
SG	Sclerolaena muricata var.	N	0.5	10	
FG	Sida corrugata	N	0.1	10	
FG	Sida cunninghamii	N	0.1	10	
FG	Solanum esuriale	N	0.5	200	
FG	Swainsona procumbens	N	0.1	2	
FG	Vittadinia spp.	N	0.1	5	
GG	Walwhalleya proluta	N	0.5	10	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/12/2024	Dinawan Solar Farm RTS		Moderate	ZR ML			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W 12.2024120 2	Plot dimensions	50x20	Orientation of middle	265	
Easting 364613	Northing 6129843	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: Weeping myall woodland	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	9
	Grasses etc.	3
	Forbs	11
	Ferns	0
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	7
	Shrubs	16.5
	Grasses etc.	15
	Forbs	6
	Ferns	0
	Other	0.1
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	11
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	40	40	50	30	45
Average of the 5 subplots	41				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Brown red	Site Drainage	Good	Distance to nearest water	1 km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/12/2024	Dinawan Solar Farm RTS December	DEH_RTS_W12.20241202	ZR ML

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	7	3	
FG	Alternanthera nodiflora	N	0.1	1	
OG	Amyema quandang var.	N	0.1	1	
SG	Atriplex leptocarpa	N	0.1	5	
SG	Atriplex semibaccata	N	0.7	30	
GG	Austrostipa scabra	N	2	60	
FG	Bulbine semibarbata	N	0.1	3	
FG	Centipeda cunninghamii	N	0.1	1	
	Cucumis myriocarpus subsp.		0.1	1	
FG	Einadia nutans	N	0.1	2	
SG	Enchylaena tomentosa	N	0.5	20	
GG	Enteropogon acicularis	N	3	70	
	Lolium rigidum	E	0.5	50	
SG	Maireana aphylla	N	2	10	
FG	Maireana enchylaenoides	N	0.1	1	
FG	Maireana pentagona	N	5	200	
	Medicago truncatula	E	0.1	5	
FG	Oxalis perennans	N	0.1	5	
FG	Ptilotus semilanatus	N	0.1	1	
SG	Rhagodia spinescens	N	10	20	
GG	Rytidosperma caespitosum	N	10	500	
SG	Salsola tragus	N	2	200	
SG	Sclerolaena brachyptera	N	1	30	
SG	Sclerolaena diacantha	N	0.1	5	
SG	Sclerolaena stelligera	N	0.1	1	
FG	Sida corrugata	N	0.1	5	
FG	Solanum esuriale	N	0.1	5	
FG	Vittadinia spp.	N	0.1	5	

BAM Plot Data Sheet					Site Sheet no:1 of 2		
		Survey Name		Veg Zone ID	Recorders		
Date	02/12/2024	Dinawan Wind Farm RTS		Low	ML ZR		
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W 13.20241202	Plot dimensions	50x20	Orientation of middle	270
Easting 362401	Northing 6140231	IBRA region	Riverina	Photo #			
Plant Community Type		28				EEC: Sandhill pine	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	2
	Grasses etc.	2
	Forbs	6
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	3
	Shrubs	0.6
	Grasses etc.	2.5
	Forbs	2.9
	Ferns	0
	Other	0
High Threat Weed cover		3.5

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	1
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	6.5
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	35	60	70	40	55
Average of the 5 subplots	52				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Sandy loam
Soil Colour	Red	Site Drainage	Well drained	Distance to nearest water	1km plus

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	3	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/12/2024	Dinawan Wind Farm RTS December 2024	DEH_RTS_W13.20241202	ML ZR

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa scabra	N	0.5	30	
FG	Boerhavia dominii	N	1	50	
TG	Callitris glaucophylla	N	3	1	
	Chenopodium album	E	0.1	1	
	Cucumis myriocarpus subsp.		0.1	5	
FG	Dysphania pumilio	N	0.2	20	
	Echium plantagineum	E	0.2	30	
GG	Enteropogon acicularis	N	2	20	
	Heliotropium europaeum	E	0.2	50	
	Hordeum spp.	E	30	1000	
	Lycium ferocissimum	HTE	3	4	
	Malva parviflora	E	0.1	5	
	Marrubium vulgare	E	10	40	
FG	Portulaca oleracea	N	0.5	20	
	Proboscidea louisianica	E	1	10	
SG	Rhagodia spinescens	N	0.5	5	
SG	Salsola tragus	N	0.1	1	
	Schismus barbatus	E	1	50	
FG	Sida corrugata	N	0.1	10	
	Sisymbrium erysimoides	E	0.1	2	
FG	Solanum esuriale	N	1	100	
	Tribulus terrestris	E	2	50	
	Trifolium arvense	E	1	100	
FG	Vittadinia cuneata	N	0.1	5	
	Vulpia myuros	E	0.2	100	
	Xanthium spinosum	HTE	0.5	30	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/12/2024	Dinawan Solar Farm RTS		Moderate	ZR ML			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W 14.2024120 2	Plot dimensions	50x20	Orientation of middle	285	
Easting 361662	Northing 6133071	IBRA region	Riverina	Photo #				
Plant Community Type		28				EEC: Sandhill pine	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	6
	Grasses etc.	3
	Forbs	1
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	15
	Shrubs	3.9
	Grasses etc.	5.7
	Forbs	0.1
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	2
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	6
No. trees with hollows	1

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	40	55	65	15	40
Average of the 5 subplots	43				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Slight downhill	Soil Surface Texture	Sandy
Soil Colour	Red brown	Site Drainage	Good	Distance to nearest water	1 km plus

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	2		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/12/2024	Dinawan Solar Farm RTS December	DEH_RTS_W14.20241202	ZR ML

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex semibaccata	N	0.1	3	
GG	Austrostipa nitida	N	5	100	
TG	Callitris glaucophylla	N	15	2	
	Chenopodium album	E	0.1	2	
SG	Dodonaea viscosa subsp.	N	0.5	10	
	Echium plantagineum	E	2	100	
FG	Einadia nutans	N	0.1	5	
SG	Enchylaena tomentosa	N	0.2	10	
GG	Enteropogon acicularis	N	0.2	20	
	Hordeum spp.	E	30	1000	
SG	Maireana brevifolia	N	0.1	1	
	Malva parviflora	E	2	50	
GG	Paspalidium constrictum	N	0.5	20	
SG	Rhagodia spinescens	N	2	9	
SG	Salsola tragus	N	1	50	
	Schismus barbatus	E	2	1000	
	Sisymbrium erysimoides	E	0.5	40	
	Tribulus terrestris	E	0.2	20	
	Trifolium arvense	E	1	100	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/12/2024	Dinawan Solar farm rts		Moderate	ZR ML			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W 15.20241202	Plot dimensions	50x20	Orientation of middle	12	
Easting 361072	Northing 6128407	IBRA region	Riverina	Photo #				
Plant Community Type		28				EEC: Sandhill pine	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	4
	Grasses etc.	4
	Forbs	3
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	15
	Shrubs	0.5
	Grasses etc.	6.3
	Forbs	3.6
	Ferns	0
	Other	0
High Threat Weed cover		1

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	2
30 - 49 cm	1
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	22
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	60	40	45	40	70
Average of the 5 subplots	51				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flst	Soil Surface Texture	Sandy loam
Soil Colour	Red brown	Site Drainage	Good	Distance to nearest water	1 km plus

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	3	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/12/2024	Dinawan Solar farm rts December	DEH_RTS_W15.20241202	ZR ML

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex semibaccata	N	0.1	2	
GG	Austrostipa nitida	N	0.2	10	
	Avena spp.	E	0.5	50	
FG	Boerhavia dominii	N	3	60	
TG	Callitris glaucophylla	N	15	2	
	Chenopodium album	E	0.1	2	
	Echium plantagineum	E	0.1	2	
FG	Einadia nutans	N	0.1	2	
SG	Enchylaena tomentosa	N	0.1	1	
GG	Enteropogon acicularis	N	3	30	
	Hordeum spp.	E	30	1000	
	Lepidium africanum	E	1	20	
	Lycium ferocissimum	HTE	1	5	
SG	Maireana brevifolia	N	0.2	1	
	Malva parviflora	E	0.5	20	
GG	Paspalidium constrictum	N	3	50	
SG	Rhagodia spinescens	N	0.1	1	
GG	Rytidosperma caespitosum	N	0.1	2	
FG	Sida corrugata	N	0.5	50	
	Sisymbrium erysimoides	E	5	100	
	Trifolium arvense	E	0.1	10	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	19/12/2024	Dinawan Windfarm RTS		Moderate	ZR NL			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W16	Plot dimensions	50x20	Orientation of middle	95	
Easting 360952	Northing 6126508	IBRA region	Riverina	Photo #				
Plant Community Type		46				EEC: Unsure	Confidence L	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	4
	Grasses etc.	5
	Forbs	10
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0.1
	Shrubs	7.3
	Grasses etc.	63.1
	Forbs	5.2
	Ferns	0.1
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0.5
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	20	15	15	20
Average of the 5 subplots	18				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Grey brown	Site Drainage	No drainage line present	Distance to nearest water	500m+

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	2		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	19/12/2024	Dinawan Windfarm RTS Dec 2024	DEH_RTS_W16	ZR NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	0.1	1	
FG	Alternanthera nodiflora	N	0.2	50	
SG	Atriplex semibaccata	N	0.1	1	
	Avena spp.	E	1	100	
FG	Calocephalus sonderi	N	0.1	20	
FG	Calotis scabiosifolia	N	1	20	
FG	Eclipta platyglossa	N	0.1	1	
FG	Einadia nutans	N	0.2	8	
SG	Enchylaena tomentosa	N	0.1	1	
GG	Enteropogon acicularis	N	20	3000	
FG	Euphorbia drummondii	N	0.5	100	
GG	Juncus spp.	N	0.1	1	
FG	Leiocarpa brevicompta	N	1	10	
	Lolium rigidum	E	10	600	
SG	Maireana aphylla	N	7	70	
EG	Marsilea drummondii	N	0.1	1	
	Medicago minima	E	2	100	
	Medicago polymorpha	E	2	200	
GG	Rytidosperma caespitosum	N	15	1000	
GG	Rytidosperma setaceum	N	3	300	
SG	Sclerolaena muricata var.	N	0.1	1	
FG	Sida cunninghamii	N	1	200	
FG	Solanum esuriale	N	1	100	
	Sonchus oleraceus	E	0.1	1	
FG	Teucrium racemosum	N	0.1	1	
GG	Walwhalleya proluta	N	25	2000	

BAM Plot Data Sheet							
		Survey Name		Veg Zone ID	Site Sheet no:1 of 2 Recorders		
Date	18/12/2024	Dinawan Wind Farm RTS		Other	ZR NL		
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W2	Plot dimensions	50x20	Orientation of middle	1
Easting 357698	Northing 6134582	IBRA region	Riverina	Photo #			
Plant Community Type		15				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	11
	Grasses etc.	4
	Forbs	9
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	3
	Shrubs	20.4
	Grasses etc.	42.1
	Forbs	14.7
	Ferns	8
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	3
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	1
Length of logs (m)	11
No. trees with hollows	1

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	20	2	50	20
Average of the 5 subplots	21.4				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	Black box creek ,ine running east through west	Distance to nearest water	500m +

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		

Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	18/12/2024	Dinawan Wind Farm RTS Dec 2024	DEH_RTS_W2	ZR NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.1	1	
SG	Atriplex leptocarpa	N	2	50	
SG	Atriplex semibaccata	N	1	50	
FG	Boerhavia dominii	N	0.1	1	
FG	Boerhavia repleta	N	0.1	10	
GG	Carex inversa	N	0.1	1	
SG	Chenopodium nitrariaceum	N	3	20	
SG	Duma florulenta	N	10	80	
FG	Einadia nutans	N	10	200	
GG	Enteropogon acicularis	N	30	1000	
TG	Eucalyptus largiflorens	N	3	3	
FG	Euphorbia drummondii	N	0.2	40	
SG	Maireana decalvans	N	1	60	
EG	Marsilea drummondii	N	8	400	
FG	Minuria integerrima	N	0.1	10	
SG	Rhagodia spinescens	N	0.1	1	
FG	Rumex brownii	N	0.1	1	
GG	Rytidosperma caespitosum	N	2	200	
SG	Sclerolaena diacantha	N	2	200	
SG	Sclerolaena muricata var.	N	1	10	
SG	Sclerolaena muricata var.	N	0.1	1	
SG	Sclerolaena spp.	N	0.1	1	
SG	Sclerolaena stelligera	N	0.1	1	
FG	Sida cunninghamii	N	2	100	
FG	Solanum esuriale	N	2	40	
	Sonchus oleraceus	E	0.1	1	
GG	Walwhalleya proluta	N	10	1000	

BAM Plot Data Sheet							
		Survey Name		Veg Zone ID	Site Sheet no: 1 of 2 Recorders		
Date	19/12/2024	Dinawan Windfarm RTS		Other	ZR NL		
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W3	Plot dimensions	50x20	Orientation of middle	155
Easting 359339	Northing 6124834	IBRA region	Riverina	Photo #			
Plant Community Type		160				EEC: No	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	3
	Forbs	6
	Ferns	1
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	25.2
	Grasses etc.	6.1
	Forbs	5.1
	Ferns	2
	Other	0.5
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	50	20	15	15	10
Average of the 5 subplots	22				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	Slight depression no drainage line present	Distance to nearest water	500m +

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		

Weediness	2		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	19/12/2024	Dinawan Windfarm RTS Dec 2024	DEH_RTS_W3	ZR NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex semibaccata	N	0.2	4	
	Avena spp.	E	0.1	1	
FG	Calotis scabiosifolia	N	3	200	
SG	Chenopodium nitrariaceum	N	15	50	
OG	Convolvulus angustissimus	N	0.5	100	
SG	Duma florulenta	N	10	50	
GG	Enteropogon acicularis	N	2	100	
FG	Euphorbia drummondii	N	0.5	100	
FG	Goodenia pusilliflora	N	0.5	100	
	Lolium rigidum	E	15	1000	
EG	Marsilea drummondii	N	2	200	
	Medicago minima	E	1	100	
FG	Oxalis perennans	N	0.5	100	
GG	Rytidosperma duttonianum	N	0.1	1	
FG	Sida corrugata	N	0.5	100	
	Sonchus oleraceus	E	0.5	20	
FG	Teucrium racemosum	N	0.1	1	
	Vulpia bromoides	E	3	300	
GG	Walwhalleya proluta	N	4	100	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	19/12/2024	Dinawan Windfarm RTS		Other	ZR NL			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W4	Plot dimensions	50x20	Orientation of middle	6	
Easting 358259	Northing 6133914	IBRA region	Riverina	Photo #				
Plant Community Type		160				EEC: No	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	5
	Forbs	7
	Ferns	1
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	25.1
	Grasses etc.	32.2
	Forbs	1.1
	Ferns	4
	Other	0.1
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	10	15	20	20
Average of the 5 subplots	16				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flatclay	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	Slight depression within landscape	Distance to nearest water	500m +

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	2		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	19/12/2024	Dinawan Windfarm RTS Dec 2024	DEH_RTS_W4	ZR NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.1	1	
	Avena spp.	E	1	100	
FG	Calotis scabiosifolia	N	0.2	20	
SG	Chenopodium nitrariaceum	N	15	100	
OG	Convolvulus angustissimus	N	0.1	1	
SG	Duma florulenta	N	10	100	
GG	Eleocharis acuta	N	2	20	
GG	Enteropogon acicularis	N	15	300	
FG	Euphorbia drummondii	N	0.4	100	
GG	Juncus spp.	N	0.1	1	
	Lolium rigidum	E	25	1000	
EG	Marsilea drummondii	N	4	400	
FG	Oxalis perennans	N	0.1	1	
GG	Rytidosperma caespitosum	N	0.1	1	
SG	Sclerolaena muricata	N	0.1	1	
FG	Sida cunninghamii	N	0.1	1	
FG	Solanum esuriale	N	0.1	1	
	Sonchus oleraceus	E	0.1	1	
FG	Vittadinia cuneata	N	0.1	1	
GG	Walwhalleya proluta	N	15	400	

BAM Plot Data Sheet								Site Sheet no: 1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/12/2024	Dinawan Solar Farm RTS		Moderate	ZR M			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W 5.20241203	Plot dimensions	50x20	Orientation of middle	100	
Easting 376957	Northing 6124618	IBRA region	Riverina	Photo #				
Plant Community Type		17				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	3
	Forbs	9
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	25.3
	Grasses etc.	45
	Forbs	1
	Ferns	0.1
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	60	40	15	20	55
Average of the 5 subplots	38				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Black	Site Drainage	Poor	Distance to nearest water	Over 500m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	2	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/12/2024	Dinawan Solar Farm RTS December	DEH_RTS_W5.20241203	ZR M

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Calotis scabiosifolia var.	N	0.2	50	
SG	Duma florulenta	N	25	20	
FG	Eclipta platyglossa	N	0.1	2	
FG	Einadia nutans	N	0.1	5	
SG	Enchylaena tomentosa	N	0.1	2	
GG	Enteropogon acicularis	N	10	100	
FG	Euphorbia drummondii	N	0.1	5	
FG	Goodenia gracilis	N	0.1	20	
	Lactuca serriola	E	0.1	1	
	Lolium rigidum	E	5	1000	
EG	Marsilea drummondii	N	0.1	20	
	Medicago minima	E	0.2	100	
FG	Oxalis perennans	N	0.1	10	
GG	Rytidosperma duttonianum	N	25	300	
SG	Sclerolaena muricata var.	N	0.2	5	
FG	Sida cunninghamii	N	0.1	5	
	Sonchus oleraceus	E	0.1	5	
FG	Swainsona procumbens	N	0.1	1	
FG	Vittadinia spp.	N	0.1	5	
	Vulpia myuros	E	0.1	10	
GG	Walwhalleya proluta	N	10	200	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/12/2024	Dinawan solar farm RTS		Moderate	ML ZR			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W 6.20241202	Plot dimensions	50x20	Orientation of middle	348	
Easting 363068	Northing 6137034	IBRA region	Darling Riverine Plains	Photo #				
Plant Community Type		17				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	4
	Grasses etc.	4
	Forbs	7
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	17.2
	Grasses etc.	45.2
	Forbs	1.2
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	60	40	40	70	80
Average of the 5 subplots	58				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	Poor	Distance to nearest water	<1km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	3	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	2	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/12/2024	Dinawan solar farm RTS December	DEH_RTS_W6.20241202	ML ZR

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Asperula conferta	N	0.2	30	
SG	Atriplex semibaccata	N	0.1	3	
	Avena barbata	E	0.2	10	
FG	Bulbine semibarbata	N	0.1	1	
FG	Calotis scabiosifolia var.	N	0.1	5	
SG	Duma florulenta	N	15	20	
SG	Enchylaena tomentosa	N	0.1	2	
GG	Enteropogon acicularis	N	0.1	2	
FG	Leiocarpa leptolepis	N	0.1	1	
	Lolium rigidum	E	10	5000	
	Medicago minima	E	1	100	
GG	Rytidosperma caespitosum	N	0.1	2	
GG	Rytidosperma duttonianum	N	5	100	
SG	Sclerolaena muricata var.	N	2	10	
FG	Sida corrugata	N	0.1	5	
FG	Solanum esuriale	N	0.5	30	
	Sonchus oleraceus	E	0.1	1	
FG	Teucrium racemosum	N	0.1	2	
GG	Walwhalleya proluta	N	40	300	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	19/12/2024	Dinawan Windfarm RTS		Other	ZR NL			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W7	Plot dimensions	50x20	Orientation of middle	92	
Easting 385646	Northing 6121712	IBRA region	Riverina	Photo #				
Plant Community Type		17				EEC: No	Confidence L	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	5
	Grasses etc.	6
	Forbs	7
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0.1
	Shrubs	9
	Grasses etc.	8.8
	Forbs	1
	Ferns	0.1
	Other	0
High Threat Weed cover		0.4

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	19
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	35	20	20	30	25
Average of the 5 subplots	26				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	No drainage line present	Distance to nearest water	500m +

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	19/12/2024	Dinawan Windfarm RTS Dec 2024	DEH_RTS_W7	ZR NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	0.1	1	
FG	Alternanthera spp.	N	0.1	1	
SG	Atriplex semibaccata	N	0.1	1	
FG	Calotis scabiosifolia	N	0.1	1	
	Cirsium vulgare	E	0.1	1	
SG	Duma florulenta	N	8	40	
GG	Eleocharis pallens	N	0.5	100	
GG	Enteropogon acicularis	N	2	50	
FG	Euphorbia drummondii	N	0.4	50	
FG	Goodenia fascicularis	N	0.1	1	
	Heliotropium europaeum	E	0.2	50	
GG	Juncus spp.	N	0.1	1	
	Lolium rigidum	E	1	100	
SG	Maireana decalvans	N	0.5	7	
EG	Marsilea drummondii	N	0.1	50	
	Medicago polymorpha	E	1	80	
GG	Rytidosperma setaceum	N	0.2	50	
SG	Sclerolaena muricata var.	N	0.3	5	
SG	Sclerolaena muricata var.	N	0.1	1	
FG	Sida corrugata	N	0.1	1	
FG	Sida cunninghamii	N	0.1	1	
	Sonchus oleraceus	E	0.2	5	
GG	Tripogon loliiformis	N	1	100	
FG	Vittadinia gracilis	N	0.1	1	
GG	Walwhalleya proluta	N	5	50	
	Xanthium spinosum	HTE	0.4	50	

BAM Plot Data Sheet								Site Sheet no: 1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/12/2024	Dinawan Solar Farm RTS		Moderate	ZR ML			
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W 8.20241203	Plot dimensions	50x20	Orientation of middle	305	
Easting 383488	Northing 6123275	IBRA region	Riverina	Photo #				
Plant Community Type		17				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	4
	Forbs	9
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	22.1
	Grasses etc.	55.2
	Forbs	0.9
	Ferns	0.1
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	250
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	40	40	10	20
Average of the 5 subplots	25				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Grey brown	Site Drainage	Good	Distance to nearest water	Over 500m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	2	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/12/2024	Dinawan Solar Farm RTS December	DEH_RTS_W8.20241203	ZR ML

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera nodiflora	N	0.1	1	
FG	Asperula conferta	N	0.1	5	
SG	Atriplex semibaccata	N	0.1	5	
	Avena spp.	E	0.1	10	
FG	Boerhavia dominii	N	0.1	5	
GG	Carex inversa	N	0.1	5	
	Cirsium vulgare	E	0.5	20	
SG	Duma florulenta	N	20	40	
FG	Einadia nutans	N	0.1	10	
GG	Eleocharis pallens	N	5	200	
FG	Erodium crinitum	N	0.1	1	
FG	Euchiton involucratus	N	0.1	1	
FG	Euphorbia drummondii	N	0.1	5	
	Hordeum spp.	E	0.5	200	
GG	Juncus subsecundus	N	0.1	1	
	Lolium rigidum	E	0.1	20	
	Malva parviflora	E	0.1	5	
EG	Marsilea drummondii	N	0.1	5	
	Medicago polymorpha	E	0.2	100	
FG	Oxalis perennans	N	0.1	20	
SG	Sclerolaena muricata var.	N	2	40	
FG	Solanum esuriale	N	0.1	10	
GG	Walwhalleya proluta	N	50	300	
	Xanthium spinosum	HTE	0.1	5	

BAM Plot Data Sheet							
		Survey Name		Veg Zone ID	Recorders		
Date	19/12/2024	Dinawan Windfarm RTS		DNG	ZR NL		
Zone 55	Datum GDA94	Plot ID	DEH_RTS_W9	Plot dimensions	50x20	Orientation of middle	320
Easting 359680	Northing 6127258	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	5
	Grasses etc.	7
	Forbs	14
	Ferns	0
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	12.7
	Grasses etc.	38.2
	Forbs	14.1
	Ferns	0
	Other	0.1
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	25	40	30	50
Average of the 5 subplots	33				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	Flat no drainahe line present	Distance to nearest water	500m+

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	19/12/2024	Dinawan Windfarm RTS Dec 2024	DEH_RTS_W9	ZR NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera nodiflora	N	0.1	10	
SG	Atriplex semibaccata	N	0.1	1	
GG	Austrostipa nodosa	N	4	400	
GG	Austrostipa scabra	N	0.1	10	
	Avena spp.	E	1	100	
FG	Calotis scabiosifolia	N	0.1	1	
OG	Convolvulus angustissimus	N	0.1	1	
GG	Enteropogon acicularis	N	25	600	
FG	Eriochlamys squamata	N	0.1	1	
FG	Euphorbia drummondii	N	0.1	20	
FG	Goodenia fascicularis	N	0.5	100	
FG	Goodenia pusilliflora	N	1	100	
GG	Juncus spp.	N	0.1	1	
	Lolium rigidum	E	7	600	
SG	Maireana aphylla	N	9	50	
FG	Maireana ciliata	N	3	300	
SG	Maireana humillima	N	3	400	
FG	Maireana pentagona	N	2	200	
	Medicago minima	E	4	600	
FG	Oxalis perennans	N	0.1	1	
GG	Rytidosperma caespitosum	N	4	400	
GG	Rytidosperma setaceum	N	4	400	
SG	Salsola tragus	N	0.1	1	
SG	Sclerolaena muricata var.	N	0.5	4	
FG	Sida corrugata	N	1	100	
FG	Sida cunninghamii	N	3	200	
FG	Solanum esuriale	N	2	200	
GG	Sporobolus caroli	N	1	60	
FG	Teucrium racemosum	N	1	100	
FG	Vittadinia cuneata	N	0.1	1	
	Vulpia myuros	E	2	200	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	03/02/2023	Dinewan		Moderate	JRS STC		
Zone 55	Datum GDA94	Plot ID	DEH_S_11	Plot dimensions	50x20	Orientation of middle	308
Easting 389911	Northing 6119366	IBRA region	Riverina	Photo #			
Plant Community Type		17				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	2
	Grasses etc.	8
	Forbs	1
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	11
	Grasses etc.	78.2
	Forbs	0.1
	Ferns	10
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	0	0	5	5	5
Average of the 5 subplots	3				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Orange brown	Site Drainage	Poor	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	03/02/2023	Dinewan	DEH_S_11	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa aristiglumis	N	1		
SG	Duma florulenta	N	10	30	
GG	Eleocharis acuta	N	60	5000	
GG	Eleocharis pallens	N	5	400	
GG	Enteropogon acicularis	N	2	80	
GG	Juncus filicaulis	N	0.1	10	
GG	Juncus subsecundus	N	0.1	20	
EG	Marsilea drummondii	N	10	400	
FG	Rumex tenax	N	0.1	5	
GG	Rytidosperma duttonianum	N	8	300	
SG	Sclerolaena muricata	N	1	70	
GG	Walwhalleya proluta	N	2	100	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/02/2023	Dinewan		Moderate	JRS STC			
Zone 55	Datum GDA94	Plot ID	DEH_S_12	Plot dimensions	50x20	Orientation of middle	134	
Easting 382321	Northing 6116931	IBRA region	New England Tablelands	Photo #				
Plant Community Type		17				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	2
	Grasses etc.	5
	Forbs	1
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	30.1
	Grasses etc.	45.3
	Forbs	5
	Ferns	10
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	30	10	5	10	5
Average of the 5 subplots	12				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay sand
Soil Colour	Dark brown	Site Drainage	Poor	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	2	R	Chewed plants, sheep scat
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/02/2023	Dinewan	DEH_S_12	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Duma florulenta	N	30	50	
GG	Eleocharis acuta	N	40	1000	
GG	Eleocharis pallens	N	5	200	
GG	Juncus filicaulis	N	0.1	5	
GG	Juncus subsecundus	N	0.1	10	
EG	Marsilea drummondii	N	10	500	
FG	Persicaria prostrata	N	5	600	
GG	Rytidosperma duttonianum	N	0.1	5	
SG	Sclerolaena muricata	N	0.1	3	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/02/2023	Solar Farm		Moderate	JRS STC			
Zone 55	Datum GDA94	Plot ID	DEH_S_13	Plot dimensions	50x20	Orientation of middle	90	
Easting 384803	Northing 6117845	IBRA region	Riverina	Photo #				
Plant Community Type		17				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	6
	Forbs	6
	Ferns	2
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	10.4
	Grasses etc.	74.2
	Forbs	1
	Ferns	3.5
	Other	0
High Threat Weed cover		0.2

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	5	0	0	0
Average of the 5 subplots	2				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay very hard
Soil Colour	Grey brown	Site Drainage	Low	Distance to nearest water	0m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	1	NR	
Fire damage			
Storm damage			
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/02/2023	Solar Farm	DEH_S_13	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.5	60	
SG	Atriplex semibaccata	N	0.3	1	
GG	Austrostipa bigeniculata	N	0.1	1	
SG	Duma florulenta	N	10	50	
FG	Eclipta platyglossa	N	0.1	1	
GG	Eleocharis acuta	N	65	3000	
GG	Eleocharis pallens	N	1	100	
GG	Enteropogon acicularis	N	3	300	
FG	Goodenia pusilliflora	N	0.1	5	
EG	Marsilea costulifera	N	0.5	20	
EG	Marsilea drummondii	N	3	400	
FG	Persicaria prostrata	N	0.1	5	
	Romulea rosea var. australis	HTE	0.1	3	
FG	Rumex tenax	N	0.1	5	
GG	Rytidosperma duttonianum	N	0.1	1	
SG	Sclerolaena muricata	N	0.1	3	
FG	Triglochin spp.	N	0.1	5	
GG	Walwhalleya proluta	N	5	500	
	Xanthium spinosum	HTE	0.1	1	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	02/02/2023	Dinewan		Moderate	JRS STC		
Zone 55	Datum GDA94	Plot ID	DEH_S_14	Plot dimensions	50x20	Orientation of middle	37
Easting 386897	Northing 6118372	IBRA region	Riverina	Photo #			
Plant Community Type		17				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	1
	Grasses etc.	7
	Forbs	2
	Ferns	2
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	30
	Grasses etc.	67.8
	Forbs	0.2
	Ferns	5.5
	Other	0.1
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	0	15	20	0
Average of the 5 subplots	8				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Brown	Site Drainage	Poor	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	1	R	
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/02/2023	Dinewan	DEH_S_14	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
OG	Convolvulus angustissimus	N	0.1	2	
SG	Duma florulenta	N	30	100	
GG	Eleocharis acuta	N	60	5000	
GG	Eleocharis pallens	N	5	500	
GG	Enteropogon acicularis	N	0.2	200	
FG	Goodenia fascicularis	N	0.1	2	
FG	Goodenia pusilliflora	N	0.1	1	
GG	Juncus flavidus	N	0.1	10	
GG	Juncus subsecundus	N	2	400	
EG	Marsilea costulifera	N	0.5	200	
EG	Marsilea drummondii	N	5	500	
GG	Rytidosperma duttonianum	N	0.1	20	
GG	Walwhalleya proluta	N	0.4	300	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	02/02/2023	Solar Farm		Moderate	JRS STC		
Zone 55	Datum GDA94	Plot ID	DEH_S_15	Plot dimensions	50x20	Orientation of middle	60
Easting 386997	Northing 6118459	IBRA region	Riverina	Photo #			
Plant Community Type		17				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	4
	Grasses etc.	8
	Forbs	6
	Ferns	2
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0.1
	Shrubs	35.6
	Grasses etc.	36.8
	Forbs	0.6
	Ferns	1.3
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	0	0	5	10
Average of the 5 subplots	7				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay very hard
Soil Colour	Greyish brown	Site Drainage	Low	Distance to nearest water	0m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	2	R	
Fire damage			
Storm damage			
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/02/2023	Solar Farm	DEH_S_15	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	0.1	1	
FG	Alternanthera denticulata	N	0.1	20	
SG	Atriplex nummularia	N	0.3	1	
SG	Atriplex semibaccata	N	0.2	10	
GG	Austrostipa scabra	N	0.1	1	
SG	Duma florulenta	N	35	50	
FG	Eclipta platyglossa	N	0.1	5	
GG	Eleocharis acuta	N	30	3000	
GG	Eleocharis pallens	N	5	300	
GG	Enteropogon acicularis	N	0.3	60	
FG	Euphorbia drummondii	N	0.1	1	
FG	Goodenia pusilliflora	N	0.1	20	
GG	Juncus spp.	N	0.2	20	
GG	Juncus subsecundus	N	0.1	5	
EG	Marsilea costulifera	N	0.3	50	
EG	Marsilea drummondii	N	1	200	
FG	Rumex tenax	N	0.1	5	
GG	Rytidosperma duttonianum	N	0.1	1	
SG	Sclerolaena muricata	N	0.1	5	
FG	Wahlenbergia fluminalis	N	0.1	1	
GG	Walwhalleya proluta	N	1	40	
	Xanthium spinosum	HTE	0.1	1	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	21/11/2022	Dinawan		Sparse	NL JRS		
Zone 55	Datum GDA94	Plot ID	DEH_S_16	Plot dimensions	50x20	Orientation of middle	324
Easting 381857	Northing 6116299	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: No	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	2
	Grasses etc.	8
	Forbs	10
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0.2
	Shrubs	0.2
	Grasses etc.	16.2
	Forbs	1.6
	Ferns	0.1
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	10	0	10	5	0
Average of the 5 subplots	5				

Notes	NL; NL; NL; NL

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	Flat	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	21/11/2022	Dinawan	DEH_S_16	NL JRS

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	0.2	1	
FG	Alternanthera denticulata	N	0.2	400	
	Arctotheca calendula	E	0.1	20	
FG	Asperula conferta	N	0.2	400	
GG	Austrostipa bigeniculata	N	0.1	5	
GG	Carex inversa	N	0.2	30	
FG	Centipeda cunninghamii	N	0.3	200	
GG	Chloris truncata	N	0.5	50	
	Echium plantagineum	E	0.1	5	
GG	Eleocharis acuta	N	10	900	
GG	Enteropogon acicularis	N	0.1	10	
FG	Goodenia pusilliflora	N	0.1	20	
	Hordeum spp.	E	0.1	1	
GG	Isolepis cernua	N	0.3	80	
	Lactuca serriola	E	0.1	1	
FG	Limosella curdieana	N	0.1	10	
	Lolium rigidum	E	50	3000	
SG	Maireana humillima	N	0.1	1	
EG	Marsilea drummondii	N	0.1	50	
	Medicago polymorpha	E	0.3	30	
FG	Oxalis perennans	N	0.1	20	
FG	Rhodanthe corymbiflora	N	0.1	1	
FG	Rumex tenax	N	0.2	30	
GG	Rytidosperma duttonianum	N	1	20	
SG	Sclerolaena divaricata	N	0.1	10	
FG	Sida corrugata	N	0.2	50	
FG	Solanum esuriale	N	0.1	2	
	Sonchus oleraceus	E	0.1	8	
GG	Walwhalleya proluta	N	4	40	
	Xanthium strumarium	HTE	0.1	1	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	23/11/2022	Dinewan		DNG	NL JRS		
Zone 55	Datum GDA94	Plot ID	DEH_S_20	Plot dimensions	50x20	Orientation of middle	273
Easting 389354	Northing 6118060	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	10
	Forbs	7
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	1.2
	Grasses etc.	62.9
	Forbs	0.8
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	10	20	0	5	15
Average of the 5 subplots	10				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Light brown	Site Drainage	Moderate with some wet patches	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	1	R	
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	23/11/2022	Dinewan	DEH_S_20	NL JRS

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.1	10	
GG	Austrostipa aristiglumis	N	5	400	
GG	Austrostipa bigeniculata	N	8	500	
	Avena spp.	E	7	500	
GG	Bothriochloa macra	N	0.2	40	
GG	Chloris truncata	N	3	200	
GG	Eleocharis acuta	N	0.1	50	
GG	Enteropogon acicularis	N	4	200	
	Euphorbia prostrata	E	0.1	3	
FG	Goodenia pusilliflora	N	0.1	6	
	Hordeum spp.	E	0.1	3	
	Lolium rigidum	E	15	1000	
SG	Maireana humillima	N	0.1	10	
FG	Maireana pentagona	N	0.1	20	
	Medicago polymorpha	E	5	200	
FG	Oxalis perennans	N	0.2	100	
	Rumex crispus	E	0.1	10	
FG	Rumex tenax	N	0.1	10	
GG	Rytidosperma duttonianum	N	0.5	50	
GG	Rytidosperma setaceum	N	0.1	50	
SG	Sclerolaena diacantha	N	0.1	5	
SG	Sclerolaena muricata	N	1	50	
FG	Sida corrugata	N	0.1	10	
	Sonchus oleraceus	E	0.2	50	
GG	Sporobolus caroli	N	2	200	
FG	Vittadinia cuneata	N	0.1	10	
GG	Walwhalleya proluta	N	40	2000	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	21/11/2022	Dinawan 26 intact		Intact	JRS NL		
Zone 55	Datum GDA94	Plot ID	DEH_S_24	Plot dimensions	50x20	Orientation of middle	290
Easting 382492	Northing 6119225	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	7
	Grasses etc.	5
	Forbs	6
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	5
	Shrubs	3.4
	Grasses etc.	18.2
	Forbs	0.9
	Ferns	0
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	1
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	1
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	0	0	0	2
Average of the 5 subplots	1.4				

Notes	Nl; Nl; Nl; Nl

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Silty clay
Soil Colour	Orange	Site Drainage	Poor	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion	1		Patches of slight erosion
Firewood/CWD removal			
Grazing (identify native/livestock	1		
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	21/11/2022	Dinawan 26 intact	DEH_S_24	JRS NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	5	1	
SG	Atriplex leptocarpa	N	1	30	
SG	Atriplex semibaccata	N	0.4	20	
GG	Austrostipa bigeniculata	N	7	100	
GG	Austrostipa scabra	N	9	300	
GG	Chloris truncata	N	0.1	9	
FG	Chrysocephalum apiculatum	N	0.1	1	
GG	Enteropogon acicularis	N	0.1	10	
	Euphorbia prostrata	E	0.1	1	
FG	Goodenia pusilliflora	N	0.1	10	
	Hordeum spp.	E	0.1	10	
	Lactuca serriola	E	0.1	2	
	Lolium rigidum	E	0.1	50	
	Lycium ferocissimum	HTE	0.1	2	
SG	Maireana aphylla	N	0.2	2	
SG	Maireana humillima	N	0.3	20	
	Medicago polymorpha	E	0.5	200	
	Medicago truncatula	E	2	60	
FG	Oxalis perennans	N	0.1	10	
FG	Ptilotus semilanatus	N	0.2	50	
SG	Rhagodia spinescens	N	0.1	10	
FG	Rhodanthe corymbiflora	N	0.1	5	
GG	Rytidosperma duttonianum	N	2	100	
SG	Sclerolaena diacantha	N	0.4	5	
SG	Sclerolaena divaricata	N	1	10	
	Sonchus oleraceus	E	0.1	10	
FG	Vittadinia cuneata	N	0.3	20	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	21/11/2022	Dinawan 26 intact		Intact	NL			
Zone 55	Datum GDA94	Plot ID	DEH_S_25	Plot dimensions	50x20	Orientation of middle	168	
Easting 381485	Northing 6116262	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: No	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	2
	Grasses etc.	8
	Forbs	8
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	10
	Shrubs	0.2
	Grasses etc.	12.8
	Forbs	1
	Ferns	0.3
	Other	0
High Threat Weed cover		0.2

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	20
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	15	20	10	20
Average of the 5 subplots	17				

Notes	NL; NL; NL; NL

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay loam
Soil Colour	Brown	Site Drainage	Flat	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	21/11/2022	Dinawan 26 intact	DEH_S_25	NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	10	10	
FG	Alternanthera denticulata	N	0.1	10	
GG	Austrostipa bigeniculata	N	0.1	10	
	Avena spp.	E	0.2	60	
GG	Bothriochloa macra	N	0.1	10	
GG	Carex inversa	N	0.1	20	
GG	Chloris truncata	N	0.5	90	
FG	Chrysocephalum apiculatum	N	0.1	10	
	Echium plantagineum	E	0.1	10	
GG	Eleocharis acuta	N	1	20	
GG	Enteropogon acicularis	N	5	50	
FG	Goodenia pusilliflora	N	0.1	30	
	Lolium rigidum	E	0.1	10	
	Lycium ferocissimum	HTE	0.1	2	
EG	Marsilea drummondii	N	0.3	200	
FG	Rumex tenax	N	0.1	10	
GG	Rytidosperma setaceum	N	1	500	
SG	Sclerolaena diacantha	N	0.1	1	
SG	Sclerolaena muricata	N	0.1	20	
FG	Sida corrugata	N	0.3	60	
FG	Solanum esuriale	N	0.1	10	
	Sonchus oleraceus	E	0.1	10	
FG	Swainsona procumbens	N	0.1	1	
	Trifolium repens	E	0.1	50	
FG	Vittadinia cuneata	N	0.1	10	
GG	Walwhalleya proluta	N	5	2000	
	Xanthium spinosum	HTE	0.1	1	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	21/11/2022	37263		Sparse	JRS NL		
Zone 55	Datum GDA94	Plot ID	DEH_S_29	Plot dimensions	50x20	Orientation of middle	116
Easting 382087	Northing 6118783	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: None	Confidence M

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	3
	Grasses etc.	11
	Forbs	5
	Ferns	1
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	1.1
	Shrubs	0.5
	Grasses etc.	47.8
	Forbs	1.5
	Ferns	0.1
	Other	0.1
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	1
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	0	0	0	0	0
Average of the 5 subplots	0				

Notes	NL; NL; NL; NL

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flodplain, no slope	Soil Surface Texture	Clay
Soil Colour	Light brown	Site Drainage	Extremely poor, plot inundated	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	21/11/2022	37263	DEH_S_29	JRS NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia oswaldii	N	0.1	1	
TG	Acacia pendula	N	1	2	
FG	Alternanthera denticulata	N	0.2	50	
	Arctotheca calendula	E	0.1	1	
FG	Asperula conferta	N	0.1	50	
SG	Atriplex semibaccata	N	0.1	5	
GG	Austrostipa bigeniculata	N	0.5	50	
GG	Bothriochloa macra	N	1	200	
FG	Centipeda cunninghamii	N	0.1	1	
GG	Chloris truncata	N	0.5	100	
OG	Convolvulus angustissimus	N	0.1	2	
	Echium plantagineum	E	0.1	1	
GG	Eleocharis acuta	N	20	3000	
GG	Eleocharis pallens	N	5	1000	
GG	Enteropogon acicularis	N	0.5	50	
FG	Goodenia pusilliflora	N	1	500	
GG	Isolepis cernua	N	0.1	10	
GG	Juncus subsecundus	N	4	1000	
	Lolium rigidum	E	0.3	50	
EG	Marsilea drummondii	N	0.1	50	
	Medicago truncatula	E	0.1	40	
	Oxalis pes-caprae	E	0.2	80	
FG	Rumex tenax	N	0.1	10	
GG	Rytidosperma duttonianum	N	15	2000	
SG	Sclerolaena diacantha	N	0.2	20	
SG	Sclerolaena divaricata	N	0.2	20	
	Sonchus oleraceus	E	0.1	6	
GG	Sporobolus caroli	N	0.2	50	
GG	Walwhalleya proluta	N	1	100	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	14/02/2023	Dinewan		Low	MGP KK		
Zone 55	Datum GDA94	Plot ID	DEH_S_31	Plot dimensions	50x20	Orientation of middle	286
Easting 383902	Northing 6118765	IBRA region	Riverina	Photo #			
Plant Community Type		17				EEC: Yes	Confidence M

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	2
	Grasses etc.	8
	Forbs	0
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	8.3
	Grasses etc.	49.8
	Forbs	0
	Ferns	0.2
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	45	60	50	30	70
Average of the 5 subplots	51				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	2	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	2	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	14/02/2023	Dinewan	DEH_S_31	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa aristiglumis	N	0.1	2	
SG	Duma florulenta	N	8		
GG	Eleocharis pallens	N	20		
GG	Enteropogon acicularis	N	2		
GG	Juncus spp.	N	0.1	20	
	Lolium rigidum	E	2		
EG	Marsilea drummondii	N	0.2	200	
GG	Rytidosperma duttonianum	N	2		
GG	Rytidosperma spp.	N	0.5	50	
SG	Sclerolaena muricata var.	N	0.3	10	
GG	Sporobolus caroli	N	0.1	10	
GG	Walwhalleya proluta	N	25		

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	21/11/2022	Dinawan 26 intact		Sparse	NL JRS			
Zone 55	Datum GDA94	Plot ID	DEH_S_35	Plot dimensions	50x20	Orientation of middle	336	
Easting 382282	Northing 6119129	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: No	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	2
	Grasses etc.	9
	Forbs	10
	Ferns	0
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	0.3
	Shrubs	0.3
	Grasses etc.	64.9
	Forbs	1.8
	Ferns	0
	Other	0.1
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	75	10	0	0
Average of the 5 subplots	18				

Notes	NL; NL; NL; NL

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Brown	Site Drainage	Flat	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	21/11/2022	Dinawan 26 intact	DEH_S_35	NL JRS

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia oswaldii	N	0.2	3	
TG	Acacia pendula	N	0.1	3	
FG	Asperula conferta	N	0.2	200	
GG	Austrostipa bigeniculata	N	60	2000	
GG	Austrostipa scabra subsp. falcata	N	0.5	30	
	Avena spp.	E	0.1	10	
GG	Carex inversa	N	0.1	10	
GG	Chloris truncata	N	0.4	200	
FG	Chrysocephalum apiculatum	N	0.1	10	
	Cirsium vulgare	E	0.1	10	
OG	Convolvulus angustissimus	N	0.1	1	
GG	Enteropogon acicularis	N	0.3	100	
FG	Erodium crinitum	N	0.1	10	
	Hordeum spp.	E	0.1	10	
	Hypochaeris glabra	E	0.1	1	
GG	Juncus subsecundus	N	0.1	10	
	Lactuca serriola	E	0.1	1	
	Lolium rigidum	E	0.1	10	
SG	Maireana humillima	N	0.1	20	
	Malva parviflora	E	0.1	10	
	Medicago polymorpha	E	2	200	
GG	Microlaena stipoides	N	0.2		
FG	Oxalis perennans	N	0.3	300	
	Plantago lanceolata	E	0.1	20	
FG	Ptilotus semilanatus	N	0.2	50	
FG	Rhodanthe corymbiflora	N	0.1	1	
FG	Rumex tenax	N	0.1	3	
GG	Rytidosperma setaceum	N	0.3	60	
SG	Sclerolaena diacantha	N	0.2	20	
FG	Sida corrugata	N	0.1	5	
FG	Solanum esuriale	N	0.3	10	
	Sonchus oleraceus	E	0.1	20	
	Taraxacum officinale	E	0.1	10	
FG	Vittadinia cuneata	N	0.3	40	
GG	Walwhalleya proluta	N	3	200	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/02/2023	Dinewan		Mod_Good	JRS STC			
Zone 55	Datum GDA94	Plot ID	DEH_S_43	Plot dimensions	50x20	Orientation of middle	201	
Easting 384746	Northing 6118250	IBRA region	Riverina	Photo #				
Plant Community Type		45				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	5
	Grasses etc.	9
	Forbs	14
	Ferns	1
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	1.4
	Grasses etc.	90.2
	Forbs	1.4
	Ferns	0.1
	Other	0.1
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	15	5	20	30
Average of the 5 subplots	15				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Dark brown	Site Drainage	Moderate	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	1	R	
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/02/2023	Dinewan	DEH_S_43	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.1	10	
GG	Austrostipa aristiglumis	N	20	1000	
GG	Austrostipa bigeniculata	N	10	200	
GG	Austrostipa scabra	N	5	200	
FG	Calotis cuneifolia	N	0.1	1	
GG	Chloris truncata	N	0.1	20	
FG	Chrysocephalum apiculatum	N	0.1	2	
FG	Chrysocephalum semipapposum	N	0.1	1	
OG	Convolvulus angustissimus	N	0.1	8	
FG	Cotula australis	N	0.1	1	
SG	Duma florulenta	N	0.1	2	
SG	Enchylaena tomentosa	N	0.1	10	
GG	Enteropogon acicularis	N	20	500	
FG	Euphorbia drummondii	N	0.1	5	
FG	Goodenia fascicularis	N	0.1	2	
	Heliotropium europaeum	E	0.1	5	
GG	Juncus subsecundus	N	0.1	2	
	Lolium perenne	E	0.1	20	
SG	Maireana aphylla	N	0.1	2	
FG	Maireana pentagona	N	0.1	2	
EG	Marsilea drummondii	N	0.1	4	
FG	Oxalis perennans	N	0.1	10	
FG	Ptilotus nobilis	N	0.1	2	
GG	Rytidosperma caespitosum	N	10	300	
GG	Rytidosperma setaceum	N	10	400	
SG	Sclerolaena birchii	N	0.1	1	
SG	Sclerolaena muricata	N	1	30	
FG	Sida corrugata	N	0.1	20	
FG	Solanum esuriale	N	0.1	3	
FG	Teucrium racemosum	N	0.1	2	
FG	Vittadinia cuneata	N	0.1	20	
GG	Walwhalleya proluta	N	15	400	
	Xanthium spinosum	HTE	0.1	1	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	22/11/2022	Dinawan		Mod_Good	JRS NL			
Zone 55	Datum GDA94	Plot ID	DEH_S_44	Plot dimensions	50x20	Orientation of middle	120	
Easting 387465	Northing 6118622	IBRA region	Riverina	Photo #				
Plant Community Type		45				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	6
	Grasses etc.	13
	Forbs	11
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	0.6
	Grasses etc.	48.2
	Forbs	8
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	0	5	5	0	5
Average of the 5 subplots	3				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Fkat	Soil Surface Texture	Clay
Soil Colour	Light browm/orange	Site Drainage	Moderate - mostly drt ground with few wet patches	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	22/11/2022	Dinawan	DEH_S_44	JRS NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Arctotheca calendula	E	0.2	50	
SG	Atriplex leptocarpa	N	0.1	5	
SG	Atriplex semibaccata	N	0.1	5	
GG	Austrostipa aristiglumis	N	10	1000	
GG	Austrostipa bigeniculata	N	20	2000	
GG	Austrostipa nodosa	N	4	300	
GG	Austrostipa scabra	N	7	200	
	Avena spp.	E	0.5	40	
GG	Bothriochloa macra	N	2	50	
FG	Brachyscome lineariloba	N	0.3	60	
GG	Carpha nivicola	N	0.1	6	
GG	Chloris truncata	N	2	300	
FG	Chrysocephalum apiculatum	N	3	200	
	Echium plantagineum	E	0.1	1	
GG	Enteropogon acicularis	N	0.2	20	
FG	Erodium crinitum	N	0.1	10	
	Euphorbia prostrata	E	0.1	10	
FG	Goodenia pusilliflora	N	0.1	5	
	Hordeum spp.	E	0.3	40	
FG	Hypericum spp.	N	0.1	5	
GG	Isolepis cernua	N	0.1	2	
GG	Juncus subsecundus	N	0.1	5	
	Lolium rigidum	E	5	300	
SG	Maireana excavata	N	0.1	10	
SG	Maireana humillima	N	0.1	20	
	Medicago polymorpha	E	3	50	
	Medicago truncatula	E	4	200	
FG	Oxalis perennans	N	2	200	
	Oxalis pes-caprae	E	0.1	10	
FG	Ptilotus semilanatus	N	0.1	20	
FG	Rhodanthe corymbiflora	N	0.1	6	
GG	Rytidosperma caespitosum	N	0.2	50	
GG	Rytidosperma setaceum	N	0.5	100	
SG	Sclerolaena divaricata	N	0.1	10	
SG	Sclerolaena muricata	N	0.1	5	
FG	Sida corrugata	N	2	200	
FG	Solanum esuriale	N	0.1	10	
	Sonchus oleraceus	E	0.1	3	
FG	Vittadinia cuneata	N	0.1	20	
GG	Walwhalleya proluta	N	2	50	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	02/02/2023	Solar Farm		Moderate	JRS STC			
Zone 55	Datum GDA94	Plot ID	DEH_S_52	Plot dimensions	50x20	Orientation of middle	80	
Easting 382090	Northing 6116926	IBRA region	Riverina	Photo #				
Plant Community Type		17				EEC: None	Confidence M	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	10
	Forbs	7
	Ferns	2
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	1.4
	Grasses etc.	50.4
	Forbs	3.7
	Ferns	3.5
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	3
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	0	5	15	5	10
Average of the 5 subplots	7				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Grey light brown	Site Drainage	Low	Distance to nearest water	0m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	3	R	Sheep grazing - fresh scat
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	02/02/2023	Solar Farm	DEH_S_52	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex semibaccata	N	0.1	2	
GG	Austrostipa bigeniculata	N	0.2	10	
GG	Austrostipa scabra	N	0.1	2	
GG	Cynodon dactylon	N	0.5	10	
SG	Duma florulenta	N	1	5	
FG	Eclipta platyglossa	N	0.1	2	
GG	Eleocharis acuta	N	20	2000	
GG	Eleocharis pallens	N	0.5	200	
GG	Enteropogon acicularis	N	25	2000	
FG	Euphorbia drummondii	N	0.1	10	
GG	Juncus subsecundus	N	0.1	2	
EG	Marsilea costulifera	N	0.5	10	
EG	Marsilea drummondii	N	3	300	
FG	Oxalis perennans	N	0.1	2	
FG	Persicaria prostrata	N	3	200	
FG	Rumex tenax	N	0.2	10	
GG	Rytidosperma duttonianum	N	0.5	20	
SG	Sclerolaena muricata	N	0.3	10	
FG	Sida corrugata	N	0.1	2	
FG	Solanum esuriale	N	0.1	2	
GG	Sporobolus caroli	N	0.5	30	
GG	Walwhalleya proluta	N	3	300	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	22/11/2022	Dinawan		Moderate	MP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_01	Plot dimensions	50x20	Orientation of middle	91	
Easting 377146	Northing 6125847	IBRA region	Riverina	Photo #				
Plant Community Type		15				EEC: No	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	8
	Grasses etc.	7
	Forbs	13
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	20
	Shrubs	9.3
	Grasses etc.	9.6
	Forbs	2
	Ferns	0.1
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	3
50 - 79 cm	0
30 - 49 cm	1
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	5
No. trees with hollows	3

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	20	5	10	25
Average of the 5 subplots	15				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1		
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	2	R	Patersons curse, milk thistle
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	22/11/2022	Dinawan	DEH_W_01	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.5	20	
SG	Atriplex semibaccata	N	0.5	50	
GG	Austrostipa scabra	N	7		
	Avena fatua	E	0.1	20	
FG	Boerhavia dominii	N	0.2	20	
FG	Bulbine bulbosa	N	0.1	3	
GG	Chloris truncata	N	0.1	20	
	Chondrilla juncea	E	0.1	1	
FG	Chrysocephalum apiculatum	N	0.1	2	
FG	Craspedia spp.	N	0.1	2	
FG	Crassula colorata	N	0.1	100	
SG	Dissocarpus paradoxus	N	0.2	5	
FG	Dysphania pumilio	N	0.2	20	
	Echium vulgare	E	0.1	1	
FG	Einadia nutans	N	0.2	20	
SG	Enchylaena tomentosa	N	1		
GG	Enteropogon acicularis	N	2		
TG	Eucalyptus largiflorens	N	20		
FG	Euphorbia drummondii	N	0.1	50	
FG	Goodenia fascicularis	N	0.1	5	
	Hordeum leporinum	E	20		
	Lamarckia aurea	E	0.1	10	
	Lolium rigidum	E	1		
SG	Lycium australe	N	1		
SG	Maireana decalvans	N	0.6	30	
EG	Marsilea drummondii	N	0.1	30	
	Medicago polymorpha	E	1		
FG	Oxalis perennans	N	0.1	50	
SG	Rhagodia spinescens	N	2		
FG	Rumex tenax	N	0.1	2	
GG	Rytidosperma caespitosum	N	0.2	20	
GG	Rytidosperma setaceum	N	0.1	10	
SG	Salsola tragus	N	1		
SG	Sclerolaena muricata var.	N	3		
FG	Sida corrugata	N	0.1	20	
	Sonchus oleraceus	E	0.2	10	
GG	Sporobolus caroli	N	0.1	20	
GG	Walwhalleya proluta	N	0.1	20	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	22/11/2022	Dinawan		DNG	MP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_02	Plot dimensions	50x20	Orientation of middle	86	
Easting 382792	Northing 6123689	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	2
	Grasses etc.	10
	Forbs	11
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	0.3
	Grasses etc.	52.9
	Forbs	1.3
	Ferns	0
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	40	15	20	25	45
Average of the 5 subplots	29				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	R	
Cultivation (inc. pasture)	0		
Soil erosion	1	R	
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	Sheep grazing
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	22/11/2022	Dinawan	DEH_W_02	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.1	10	
	Arctotheca calendula	E	0.1	20	
GG	Austrostipa aristiglumis	N	2		
FG	Calotis scabiosifolia	N	0.1	20	
FG	Chrysocephalum apiculatum	N	0.1	20	
GG	Cyperus gracilis	N	0.1	50	
SG	Dissocarpus paradoxus	N	0.1	5	
GG	Eleocharis pallens	N	0.1	20	
GG	Enteropogon acicularis	N	5		
FG	Euphorbia drummondii	N	0.1	50	
FG	Goodenia fascicularis	N	0.1	50	
FG	Goodenia gracilis	N	0.1	10	
GG	Juncus spp.	N	0.2	20	
	Lolium rigidum	E	20		
FG	Oxalis perennans	N	0.1	100	
FG	Ptilotus semilanatus	N	0.2	30	
FG	Rhodanthe corymbiflora	N	0.1	20	
GG	Rytidosperma caespitosum	N	30		
GG	Rytidosperma duttonianum	N	0.5	30	
GG	Rytidosperma setaceum	N	2		
SG	Sclerolaena muricata	N	0.2	5	
FG	Sida corrugata	N	0.2	100	
GG	Sporobolus caroli	N	10		
FG	Vittadinia hispidula	N	0.1	5	
GG	Walwhalleya proluta	N	3		
	Xanthium spinosum	HTE	0.1	3	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	22/11/2022	Dinawan		DNG	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_03	Plot dimensions	50x20	Orientation of middle	234
Easting 383678	Northing 6124945	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	2
	Grasses etc.	7
	Forbs	7
	Ferns	0
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	0.2
	Grasses etc.	31.3
	Forbs	1.9
	Ferns	0
	Other	0.1
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	50	35	15	20	15
Average of the 5 subplots	27				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	1	NR	
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	2	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	22/11/2022	Dinawan	DEH_W_03	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Arctotheca calendula	E	0.1	20	
GG	Austrostipa aristiglumis	N	20		
GG	Austrostipa nodosa	N	0.3	20	
	Avena fatua	E	5		
GG	Chloris truncata	N	0.5	30	
FG	Chrysocephalum apiculatum	N	0.1	20	
OG	Convolvulus spp.	N	0.1	10	
GG	Enteropogon acicularis	N	0.3	50	
FG	Erodium spp.	N	0.1	10	
	Hordeum leporinum	E	5		
	Lolium rigidum	E	20		
SG	Maireana excavata	N	0.1	10	
	Medicago polymorpha	E	15		
FG	Oxalis perennans	N	0.5	200	
FG	Ptilotus semilanatus	N	0.5	20	
FG	Rhodanthe corymbiflora	N	0.5	50	
GG	Rytidosperma caespitosum	N	5		
SG	Sclerolaena muricata var.	N	0.1	2	
FG	Solanum esuriale	N	0.1	2	
	Sonchus oleraceus	E	0.1	10	
GG	Sporobolus caroli	N	5		
FG	Vittadinia cuneata	N	0.1	10	
GG	Walwhalleya proluta	N	0.2	10	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	22/11/2022	Dinawan		Sparse	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_04	Plot dimensions	50x20	Orientation of middle	338
Easting 381838	Northing 6124623	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	4
	Grasses etc.	4
	Forbs	5
	Ferns	2
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	3
	Shrubs	0.5
	Grasses etc.	68
	Forbs	0.5
	Ferns	0.2
	Other	0.1
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	60	65	30	60	40
Average of the 5 subplots	51				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	0		
Fire damage	0		
Storm damage	0		
Weediness	2	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	22/11/2022	Dinawan	DEH_W_04	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	3		
	Arctotheca calendula	E	0.1	10	
GG	Austrostipa aristiglumis	N	50		
	Avena fatua	E	15		
EG	Cheilanthes sieberi	N	0.1	3	
OG	Convolvulus spp.	N	0.1		
SG	Dissocarpus paradoxus	N	0.1	3	
	Echium spp.	E	0.1	5	
SG	Enchylaena tomentosa	N	0.1	1	
FG	Goodenia fascicularis	N	0.1	6	
SG	Maireana excavata	N	0.1	8	
EG	Marsilea drummondii	N	0.1	10	
	Medicago polymorpha	E	15		
FG	Oxalis perennans	N	0.1	50	
SG	Rhagodia spinescens	N	0.2	2	
FG	Rhodanthe corymbiflora	N	0.1	1	
GG	Rytidosperma caespitosum	N	5		
FG	Sida corrugata	N	0.1	20	
	Sonchus oleraceus	E	0.1	10	
GG	Sporobolus caroli	N	3		
FG	Vittadinia cuneata	N	0.1	20	
GG	Walwhalleya proluta	N	10		

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	22/11/2022	Dinawan		Moderate	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_05	Plot dimensions	50x20	Orientation of middle	125
Easting 374997	Northing 6122509	IBRA region	Riverina	Photo #			
Plant Community Type		24				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	2
	Grasses etc.	9
	Forbs	3
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	0.7
	Grasses etc.	73.6
	Forbs	0.3
	Ferns	0.1
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	10	2	5	1	2
Average of the 5 subplots	4				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	1	R	
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	22/11/2022	Dinawan	DEH_W_05	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa aristiglumis	N	1		
FG	Brachyscome lineariloba	N	0.1	1	
GG	Chloris truncata	N	1		
SG	Duma florulenta	N	0.5	2	
GG	Eleocharis acuta	N	40		
GG	Eleocharis pallens	N	5		
GG	Eragrostis australasica	N	25		
GG	Eragrostis parviflora	N	0.5	40	
GG	Juncus flavidus	N	0.1	2	
GG	Lachnagrostis filiformis	N	0.5	30	
EG	Marsilea drummondii	N	0.1	100	
FG	Rumex tenax	N	0.1	20	
GG	Rytidosperma duttonianum	N	0.5	20	
SG	Sclerolaena muricata	N	0.2	8	
FG	Teucrium racemosum	N	0.1	20	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	22/11/2022	Dinawan		Intact	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_06	Plot dimensions	50x20	Orientation of middle	339
Easting 374940	Northing 6123472	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	5
	Grasses etc.	7
	Forbs	11
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	15
	Shrubs	16.3
	Grasses etc.	32.2
	Forbs	2.3
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	1
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	15	5	15	10
Average of the 5 subplots	10				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Grey brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	22/11/2022	Dinawan	DEH_W_06	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	15		
SG	Atriplex semibaccata	N	10		
GG	Austrostipa aristiglumis	N	10		
GG	Austrostipa nodosa	N	0.1	5	
GG	Austrostipa scabra	N	1		
FG	Calotis scabiosifolia	N	0.1	10	
GG	Carex inversa	N	0.1	10	
FG	Einadia nutans	N	0.1	40	
SG	Enchylaena tomentosa	N	0.2	10	
GG	Enteropogon acicularis	N	1		
FG	Goodenia gracilis	N	0.1	1	
FG	Lepidium pseudohyssopifolium	N	0.1	5	
	Lolium rigidum	E	15		
SG	Maireana aphylla	N	3		
	Medicago polymorpha	E	15		
FG	Oxalis perennans	N	0.1	100	
FG	Ptilotus semilanatus	N	0.5	20	
SG	Rhagodia spinescens	N	3		
FG	Rhodanthe corymbiflora	N	0.1	10	
FG	Roepera glauca	N	0.8	20	
GG	Rytidosperma caespitosum	N	15		
GG	Rytidosperma setaceum	N	5		
SG	Salsola tragus	N	0.1	3	
FG	Solanum esuriale	N	0.1	20	
FG	Vittadinia cuneata	N	0.1	5	
FG	Vittadinia hispidula	N	0.2	20	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	22/11/2022	Dinawan		DNG	MP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_07	Plot dimensions	50x20	Orientation of middle	82	
Easting 377942	Northing 6123936	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: Yes	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	5
	Grasses etc.	9
	Forbs	9
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	2.7
	Grasses etc.	40.3
	Forbs	1.4
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	25	20	5	15
Average of the 5 subplots	16				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	22/11/2022	Dinawan	DEH_W_07	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex semibaccata	N	0.1	1	
GG	Austrostipa aristiglumis	N	5		
GG	Austrostipa bigeniculata	N	15		
GG	Austrostipa scabra	N	0.3	50	
	Avena fatua	E	0.1	10	
FG	Calotis scabiosifolia	N	0.3	100	
GG	Chloris truncata	N	0.5	50	
FG	Chrysocephalum apiculatum	N	0.1	5	
SG	Dissocarpus paradoxus	N	0.8	50	
GG	Enteropogon acicularis	N	1		
FG	Goodenia fascicularis	N	0.1	20	
FG	Goodenia gracilis	N	0.3	200	
	Hordeum leporinum	E	0.1	10	
FG	Leucochrysum molle	N	0.2	100	
	Lolium rigidum	E	25		
SG	Maireana aphylla	N	0.4	2	
SG	Maireana humillima	N	0.4	50	
	Medicago polymorpha	E	10		
FG	Oxalis perennans	N	0.1	100	
FG	Rhodanthe corymbiflora	N	0.1	10	
GG	Rytidosperma caespitosum	N	10		
GG	Rytidosperma setaceum	N	0.5	20	
SG	Salsola tragus	N	1		
FG	Sida corrugata	N	0.1	20	
GG	Sporobolus caroli	N	3		
FG	Swainsona procumbens	N	0.1	1	
GG	Walwhalleya proluta	N	5		

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	23/11/2022	Dinawan		Intact	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_08	Plot dimensions	50x20	Orientation of middle	310
Easting 364827	Northing 6129828	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	7
	Grasses etc.	7
	Forbs	9
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	10
	Shrubs	10.4
	Grasses etc.	42.1
	Forbs	2
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	4
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	10	15	15	10	20
Average of the 5 subplots	14				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	23/11/2022	Dinawan	DEH_W_08	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	10		
SG	Atriplex leptocarpa	N	1		
SG	Atriplex semibaccata	N	0.1	2	
GG	Austrostipa aristiglumis	N	15		
GG	Austrostipa nodosa	N	3		
GG	Austrostipa scabra	N	5		
	Avena fatua	E	0.1	20	
GG	Chloris truncata	N	0.1	20	
FG	Chrysocephalum apiculatum	N	0.1	20	
GG	Enteropogon acicularis	N	4		
FG	Goodenia pusilliflora	N	0.1	20	
	Hordeum leporinum	E	1		
FG	Leucochrysum molle	N	0.1	10	
	Lolium rigidum	E	25		
SG	Maireana aphylla	N	5		
SG	Maireana excavata	N	0.1	10	
FG	Maireana pentagona	N	1		
	Medicago polymorpha	E	25		
FG	Oxalis perennans	N	0.1	100	
FG	Ptilotus semilanatus	N	0.2	20	
SG	Rhagodia spinescens	N	4	1	
FG	Rhodanthe corymbiflora	N	0.1	50	
GG	Rytidosperma caespitosum	N	5		
GG	Rytidosperma setaceum	N	10		
SG	Salsola tragus	N	0.1	5	
SG	Sclerolaena diacantha	N	0.1	2	
FG	Solanum esuriale	N	0.1	3	
	Sonchus oleraceus	E	0.1	5	
FG	Vittadinia cuneata	N	0.2	50	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	23/11/2022	Dinawan		Moderate	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_09	Plot dimensions	50x20	Orientation of middle	358
Easting 366258	Northing 6131584	IBRA region	Riverina	Photo #			
Plant Community Type		28				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	2
	Grasses etc.	6
	Forbs	7
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	16
	Shrubs	4.1
	Grasses etc.	44.9
	Forbs	5.6
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	3
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	2

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	55	60	50	65	70
Average of the 5 subplots	60				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	3	Soil Surface Texture	Sandy clay
Soil Colour	Red brown	Site Drainage	3	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	23/11/2022	Dinawan	DEH_W_09	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Aira caryophyllea	E	1		
TG	Allocasuarina luehmannii	N	1	1	
	Arctotheca calendula	E	0.1	5	
GG	Austrostipa scabra	N	40		
	Brassica spp.	E	0.1	5	
TG	Callitris glaucophylla	N	15		
FG	Crassula colorata	N	0.1	5	
	Echium spp.	E	0.3	10	
GG	Enteropogon acicularis	N	0.5	20	
GG	Eragrostis lacunaria	N	3		
GG	Eragrostis leptostachya	N	0.2	20	
GG	Eragrostis setifolia	N	1		
FG	Erodium spp.	N	0.1	20	
SG	Hakea leucoptera	N	4		
	Hordeum leporinum	E	10		
	Lolium rigidum	E	20		
SG	Maireana trichoptera	N	0.1	1	
FG	Malva spp.	N	5		
GG	Paspalidium constrictum	N	0.2	10	
FG	Sida corrugata	N	0.1	5	
	Solanum nigrum	E	0.1	3	
	Sonchus oleraceus	E	0.1	3	
	Trifolium arvense	E	25		
FG	Urtica spp.	N	0.1	3	
FG	Vittadinia cuneata	N	0.1	5	
FG	Wahlenbergia stricta	N	0.1	2	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	23/11/2022	Dinawan		Sparse	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_10	Plot dimensions	50x20	Orientation of middle	261
Easting 358338	Northing 6128448	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	4
	Grasses etc.	6
	Forbs	10
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	7
	Shrubs	4.1
	Grasses etc.	58.5
	Forbs	1
	Ferns	1
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	15	45	15	20
Average of the 5 subplots	20				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	23/11/2022	Dinawan	DEH_W_10	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	7		
	Arctotheca calendula	E	0.1	20	
SG	Atriplex leptocarpa	N	1	10	
	Avena fatua	E	0.1	10	
FG	Bulbine semibarbata	N	0.1	2	
FG	Calotis scabiosifolia	N	0.1	2	
GG	Carex inversa	N	0.1	20	
FG	Cotula australis	N	0.1	20	
	Echium spp.	E	0.1	3	
GG	Eleocharis pallens	N	15		
GG	Enteropogon acicularis	N	40		
FG	Goodenia pusilliflora	N	0.1	20	
	Hordeum leporinum	E	3		
GG	Isolepis spp.	N	0.1	10	
	Juncus articulatus	HTE	0.1	20	
	Lolium rigidum	E	30		
EG	Marsilea drummondii	N	1		
FG	Oxalis perennans	N	0.1	50	
FG	Pycnosorus spp.	N	0.1	10	
SG	Rhagodia spinescens	N	2		
FG	Rumex tenax	N	0.1	10	
GG	Rytidosperma caespitosum	N	3		
GG	Rytidosperma duttonianum	N	0.3	20	
SG	Sclerolaena muricata	N	1		
SG	Sclerolaena stelligera	N	0.1	5	
FG	Solanum esuriale	N	0.1	2	
FG	Swainsona procumbens	N	0.1	20	
FG	Teucrium racemosum	N	0.1	5	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	23/11/2022	Dinawan		Moderate	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_11	Plot dimensions	50x20	Orientation of middle	235
Easting 358201	Northing 6128608	IBRA region	Riverina	Photo #			
Plant Community Type		28				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	3
	Grasses etc.	4
	Forbs	5
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	15
	Shrubs	1.3
	Grasses etc.	2.2
	Forbs	0.5
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	2
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	2

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	55	65	50	50	80
Average of the 5 subplots	60				

Notes	A lot of dead grass

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	2	Soil Surface Texture	Sandy clay
Soil Colour	Red brown	Site Drainage	2	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1		
Fire damage	0		
Storm damage	0		
Weediness	2	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	23/11/2022	Dinawan	DEH_W_11	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa scabra	N	1		
	Avena fatua	E	0.1	5	
	Brassica spp.	E	0.5	20	
TG	Callitris glaucophylla	N	15		
	Echium spp.	E	1		
FG	Einadia trigonos	N	0.1	2	
GG	Enteropogon acicularis	N	0.1	5	
GG	Eragrostis lacunaria	N	0.1	10	
FG	Erodium spp.	N	0.1	50	
	Hordeum leporinum	E	20		
	Lolium rigidum	E	10		
	Malva parviflora	E	0.3	50	
	Marrubium vulgare	E	3		
	Medicago polymorpha	E	3		
GG	Paspalidium constrictum	N	1		
	Phalaris paradoxa	E	0.1	2	
SG	Rhagodia spinescens	N	0.7	5	
FG	Rhodanthe corymbiflora	N	0.1	5	
SG	Sclerolaena birchii	N	0.1	2	
SG	Sclerolaena muricata	N	0.5	10	
FG	Sida corrugata	N	0.1	20	
	Trifolium arvense	E	30		
FG	Zaleya galericulata	N	0.1	1	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	23/11/2022	Dinawan		DNG	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_12	Plot dimensions	50x20	Orientation of middle	254
Easting 357203	Northing 6129074	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	5
	Grasses etc.	9
	Forbs	10
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	4.9
	Grasses etc.	34.2
	Forbs	1.2
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	10	15	30	17	5
Average of the 5 subplots	15.4				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	23/11/2022	Dinawan	DEH_W_12	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Arctotheca calendula	E	0.1	20	
SG	Atriplex leptocarpa	N	0.4	50	
SG	Atriplex semibaccata	N	0.1	5	
GG	Austrostipa aristiglumis	N	7		
GG	Austrostipa nodosa	N	5		
GG	Austrostipa scabra	N	10		
	Avena fatua	E	0.3	50	
FG	Calotis scabiosifolia	N	0.1	30	
GG	Chloris truncata	N	1		
GG	Enteropogon acicularis	N	5		
	Hordeum leporinum	E	1		
FG	Leucochrysum molle	N	0.1	2	
	Lolium rigidum	E	15		
SG	Maireana aphylla	N	4		
SG	Maireana excavata	N	0.1	20	
FG	Maireana pentagona	N	0.3	50	
FG	Oxalis perennans	N	0.1	50	
FG	Ptilotus semilanatus	N	0.1	2	
FG	Rhodanthe corymbiflora	N	0.1	50	
GG	Rytidosperma caespitosum	N	2		
GG	Rytidosperma setaceum	N	0.2	20	
SG	Sclerolaena muricata	N	0.3	7	
FG	Sida trichopoda	N	0.1	20	
FG	Solanum esuriale	N	0.1	20	
GG	Sporobolus caroli	N	1		
FG	Thysanotus baueri	N	0.1	2	
FG	Vittadinia cuneata	N	0.1	20	
GG	Walwhalleya proluta	N	3		

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	23/11/2022	DEH_W_13		DNG	MP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_13	Plot dimensions	50x20	Orientation of middle	92	
Easting 354831	Northing 6126327	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	7
	Grasses etc.	8
	Forbs	8
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	1.3
	Grasses etc.	22.5
	Forbs	0.8
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	15	18	6	10
Average of the 5 subplots	10.8				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	23/11/2022	DEH_W_13	DEH_W_13	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex leptocarpa	N	0.1	4	
SG	Atriplex semibaccata	N	0.1	5	
GG	Austrostipa nodosa	N	0.1	10	
GG	Austrostipa scabra	N	1		
	Avena fatua	E	7		
GG	Chloris truncata	N	0.2	20	
FG	Chrysocephalum apiculatum	N	0.1	10	
FG	Einadia nutans	N	0.1	5	
SG	Enchylaena tomentosa	N	0.1	1	
GG	Enteropogon acicularis	N	5		
	Lolium rigidum	E	15		
SG	Maireana aphylla	N	0.5	5	
FG	Maireana pentagona	N	0.1	50	
	Medicago polymorpha	E	5		
FG	Oxalis perennans	N	0.1	50	
FG	Rhodanthe corymbiflora	N	0.1	20	
GG	Rytidosperma caespitosum	N	10		
GG	Rytidosperma setaceum	N	1		
SG	Salsola tragus	N	0.1	10	
SG	Sclerolaena divaricata	N	0.1	1	
SG	Sclerolaena muricata	N	0.3	10	
FG	Senecio spp.	N	0.1	1	
FG	Solanum esuriale	N	0.1	20	
GG	Sporobolus caroli	N	0.2	20	
FG	Vittadinia cuneata	N	0.1	10	
GG	Walwhalleya proluta	N	5		

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	24/11/2022	DEH_W_14		DNG	MP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_14	Plot dimensions	50x20	Orientation of middle	15	
Easting 360882	Northing 6137355	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: Yes	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	1
	Grasses etc.	8
	Forbs	12
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	0.1
	Grasses etc.	51.5
	Forbs	1.3
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	5	10	5	10
Average of the 5 subplots	7				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	24/11/2022	DEH_W_14	DEH_W_14	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa aristiglumis	N	5		
GG	Austrostipa nodosa	N	0.1	2	
GG	Austrostipa scabra	N	25		
FG	Calotis scabiosifolia	N	0.1	2	
FG	Chrysocephalum apiculatum	N	0.1	10	
GG	Enteropogon acicularis	N	3	30	
FG	Goodenia pusilliflora	N	0.1	20	
	Lolium rigidum	E	5		
FG	Maireana enchylaenoides	N	0.1	1	
FG	Maireana pentagona	N	0.1	20	
	Medicago polymorpha	E	2		
FG	Plantago gaudichaudii	N	0.1		
FG	Ptilotus semilanatus	N	0.2		
FG	Rhodanthe corymbiflora	N	0.1	20	
GG	Rytidosperma caespitosum	N	3		
GG	Rytidosperma setaceum	N	0.3	20	
SG	Sclerolaena muricata	N	0.1	2	
FG	Sida corrugata	N	0.1	20	
FG	Sida trichopoda	N	0.1	5	
FG	Solanum esuriale	N	0.1	20	
	Sonchus oleraceus	E	0.1	10	
GG	Sporobolus caroli	N	0.1	10	
FG	Vittadinia cuneata	N	0.1	10	
GG	Walwhalleya proluta	N	15		

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	24/11/2022	DEH_W_15		Moderate	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_15	Plot dimensions	50x20	Orientation of middle	156
Easting 358977	Northing 6137591	IBRA region	Riverina	Photo #			
Plant Community Type		46				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	1
	Grasses etc.	8
	Forbs	9
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	0.1
	Grasses etc.	51.3
	Forbs	1.1
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	3	5	2	5	10
Average of the 5 subplots	5				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	24/11/2022	DEH_W_15	DEH_W_15	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Aristida behriana	N	0.1	2	
GG	Austrostipa nodosa	N	5		
GG	Austrostipa scabra	N	20		
FG	Calostemma purpureum	N	0.1	6	
GG	Chloris truncata	N	0.1	10	
FG	Crassula colorata	N	0.1	20	
GG	Enteropogon acicularis	N	15		
FG	Goodenia pusilliflora	N	0.1	100	
FG	Leucochrysum molle	N	0.2	100	
	Lolium rigidum	E	10		
SG	Lycium australe	N	0.1	1	
FG	Maireana pentagona	N	0.1	100	
	Medicago polymorpha	E	3		
FG	Ptilotus semilanatus	N	0.1	20	
FG	Rhodanthe corymbiflora	N	0.1	20	
GG	Rytidosperma caespitosum	N	1		
FG	Solanum esuriale	N	0.1	1	
	Sonchus oleraceus	E	0.1	5	
GG	Sporobolus caroli	N	0.1	10	
FG	Vittadinia cuneata	N	0.2	40	
GG	Walwhalleya proluta	N	10		

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	23/11/2022	Dinawan		Moderate	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_500	Plot dimensions	50x20	Orientation of middle	241
Easting 364398	Northing 6130438	IBRA region	Riverina	Photo #			
Plant Community Type		15				EEC: No	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	5
	Grasses etc.	7
	Forbs	9
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	21
	Shrubs	10.6
	Grasses etc.	23.3
	Forbs	4.9
	Ferns	0.1
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	2
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	3
No. trees with hollows	2

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	2	4	2	15	5
Average of the 5 subplots	5.6				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	2	Soil Surface Texture	Clay loam
Soil Colour	Brown grey	Site Drainage	2	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	23/11/2022	Dinawan	DEH_W_500	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia oswaldii	N	1	1	
SG	Atriplex leptocarpa	N	0.5	20	
SG	Atriplex semibaccata	N	1	5	
GG	Austrostipa aristiglumis	N	0.2	5	
GG	Austrostipa scabra	N	10		
	Brassica spp.	E	0.1	5	
FG	Calotis scabiosifolia	N	0.1	20	
FG	Chrysocephalum apiculatum	N	0.1	5	
FG	Einadia nutans	N	0.2	50	
GG	Enteropogon acicularis	N	5		
GG	Eragrostis setifolia	N	2		
TG	Eucalyptus largiflorens	N	20		
FG	Goodenia pusilliflora	N	0.1	20	
	Hordeum leporinum	E	2		
	Lolium rigidum	E	15		
FG	Maireana pentagona	N	4		
EG	Marsilea drummondii	N	0.1	200	
	Medicago polymorpha	E	5		
FG	Oxalis perennans	N	0.1	100	
SG	Rhagodia spinescens	N	7		
GG	Rytidosperma caespitosum	N	2		
SG	Sclerolaena diacantha	N	0.1	10	
SG	Sclerolaena muricata	N	2		
FG	Sida corrugata	N	0.1	30	
FG	Solanum esuriale	N	0.1	20	
	Sonchus oleraceus	E	0.1	10	
GG	Sporobolus caroli	N	0.1	5	
FG	Vittadinia cuneata	N	0.1	10	
GG	Walwhalleya proluta	N	4		

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	23/11/2022	Dinawan		Moderate	MP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_501	Plot dimensions	50x20	Orientation of middle	97	
Easting 358270	Northing 6126133	IBRA region	Riverina	Photo #				
Plant Community Type		28				EEC: Yes	Confidence M	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	0
	Grasses etc.	2
	Forbs	6
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	14
	Shrubs	0
	Grasses etc.	26
	Forbs	0.8
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	4
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	6
No. trees with hollows	2

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	45	15	18	25
Average of the 5 subplots	24.6				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Sandy clay
Soil Colour	Light brown	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	23/11/2022	Dinawan	DEH_W_501	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Anthosachne scabra	N	1		
	Brassica spp.	E	0.2	2	
TG	Callitris glaucophylla	N	10		
FG	Chrysocephalum semipapposum	N	0.1	1	
	Conyza spp.	E	0.1	2	
	Echium spp.	E	0.2	10	
TG	Eucalyptus camaldulensis	N	4		
FG	Euphorbia drummondii	N	0.1	3	
FG	Heliotropium spp.	N	0.1	50	
	Hordeum leporinum	E	5		
	Lolium rigidum	E	25		
FG	Malva spp.	N	0.3	20	
	Marrubium vulgare	E	0.7	7	
	Medicago polymorpha	E	1		
FG	Oxalis perennans	N	0.1	20	
GG	Paspalidium constrictum	N	25		
FG	Sida corrugata	N	0.1	5	
	Solanum nigrum	E	0.1	2	
	Sonchus oleraceus	E	0.1	3	
	Trifolium arvense	E	40		

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	24/11/2022	DEH_W_502		Moderate	MP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_502	Plot dimensions	50x20	Orientation of middle	330	
Easting 359490	Northing 6131723	IBRA region	Riverina	Photo #				
Plant Community Type		28				EEC: Yes	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	0
	Grasses etc.	3
	Forbs	5
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	15
	Shrubs	0
	Grasses etc.	2.2
	Forbs	6.1
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	5
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	6
No. trees with hollows	1

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	15	60	55	15
Average of the 5 subplots	33				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	2	Soil Surface Texture	Sandy clay
Soil Colour	Orange brown	Site Drainage	2	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	2	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	24/11/2022	DEH_W_502	DEH_W_502	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Amaranthus spp.	N	0.1	1	
GG	Austrostipa scabra subsp. scabra	N	2		
	Brassica spp.	E	0.2	20	
TG	Callitris glaucophylla	N	15		
	Conyza spp.	E	0.1	4	
	Cucumis myriocarpus subsp.	E	0.1	1	
	Echium spp.	E	0.2	4	
GG	Eragrostis setifolia	N	0.1	10	
FG	Erodium spp.	N	0.7	100	
FG	Euchiton spp.	N	0.1	10	
	Hordeum leporinum	E	10		
	Hypochaeris glabra	E	0.1	3	
	Lolium rigidum	E	25		
FG	Malva spp.	N	0.2	20	
	Marrubium vulgare	E	0.2	10	
GG	Rytidosperma caespitosum	N	0.1	10	
	Sonchus oleraceus	E	0.1	4	
	Trifolium arvense	E	20		
FG	Urtica incisa	N	5		
	Vulpia myuros	E	1		

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	24/11/2022	Dinawan		Intact	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_503	Plot dimensions	50x20	Orientation of middle	135
Easting 359712	Northing 6131090	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	4
	Grasses etc.	6
	Forbs	13
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	40
	Shrubs	1.4
	Grasses etc.	33.2
	Forbs	1.3
	Ferns	0
	Other	0
High Threat Weed cover		0.5

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	4
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	0
Length of logs (m)	2
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	10	2	60	75	80
Average of the 5 subplots	45.4				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	24/11/2022	Dinawan	DEH_W_503	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	40		
FG	Alternanthera denticulata	N	0.1	10	
SG	Atriplex leptocarpa	N	0.2	10	
SG	Atriplex semibaccata	N	0.1	1	
GG	Austrostipa bigeniculata	N	0.1	10	
GG	Austrostipa scabra	N	1		
FG	Cotula australis	N	0.1	100	
FG	Einadia nutans	N	0.1	10	
GG	Enteropogon acicularis	N	1		
FG	Goodenia gracilis	N	0.1	20	
GG	Juncus spp.	N	0.1	20	
	Lamarckia aurea	E	0.1	10	
FG	Lepidium pseudohyssopifolium	N	0.1	2	
	Lolium rigidum	E	2		
	Lycium ferocissimum	HTE	0.5	2	
FG	Maireana enchylaenoides	N	0.1	5	
FG	Maireana pentagona	N	0.1	5	
	Medicago polymorpha	E	1		
FG	Oxalis perennans	N	0.1	50	
FG	Rhodanthe corymbiflora	N	0.1	20	
FG	Rumex tenax	N	0.1	5	
GG	Rytidosperma caespitosum	N	30		
GG	Rytidosperma setaceum	N	1		
SG	Salsola tragus subsp. tragus	N	0.1	5	
SG	Sclerolaena muricata	N	1		
FG	Sida corrugata	N	0.1	5	
	Sonchus oleraceus	E	0.1	10	
FG	Tricoryne elatior	N	0.1	5	
FG	Vittadinia cuneata	N	0.1	10	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	24/11/2022	Dinawan		Moderate	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_504	Plot dimensions	50x20	Orientation of middle	105
Easting 363073	Northing 6131346	IBRA region	Riverina	Photo #			
Plant Community Type		15				EEC: No	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	7
	Grasses etc.	6
	Forbs	5
	Ferns	1
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	25
	Shrubs	42
	Grasses etc.	4
	Forbs	2.5
	Ferns	0.2
	Other	0.1
High Threat Weed cover		0.2

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	2
50 - 79 cm	0
30 - 49 cm	1
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	1
Length of logs (m)	6
No. trees with hollows	3

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	35	10	2	5	10
Average of the 5 subplots	12.4				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Clay
Soil Colour	Brown	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	24/11/2022	Dinawan	DEH_W_504	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex leptocarpa	N	10		
SG	Atriplex semibaccata	N	3		
GG	Austrostipa scabra	N	0.2	20	
OG	Convolvulus spp.	N	0.1	5	
GG	Cyperus difformis	N	0.2	40	
SG	Duma florulenta	N	1		
FG	Einadia nutans	N	2		
GG	Eleocharis pallens	N	0.4	30	
GG	Enteropogon acicularis	N	3		
TG	Eucalyptus largiflorens	N	25		
	Hordeum leporinum	E	1	50	
GG	Juncus spp.	N	0.1	10	
	Lolium rigidum	E	5		
	Lycium ferocissimum	HTE	0.2	4	
SG	Maireana decalvans	N	8		
SG	Maireana spp.	N			
EG	Marsilea drummondii	N	0.2	100	
	Medicago polymorpha	E	0.3	50	
FG	Oxalis perennans	N	0.1	100	
FG	Persicaria prostrata	N	0.2	30	
SG	Rhagodia spinescens	N	5		
FG	Rumex tenax	N	0.1	10	
GG	Rytidosperma spp.	N	0.1	4	
SG	Sclerolaena muricata	N	15		
FG	Sida corrugata	N	0.1	10	
	Trifolium spp.	E	0.5	50	
	Vulpia myuros	E	0.5	100	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	24/11/2022	DEH_W_505		Moderate	MP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_505	Plot dimensions	50x20	Orientation of middle	121
Easting 362283	Northing 6135803	IBRA region	Riverina	Photo #			
Plant Community Type		46				EEC: Yes	Confidence M

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	4
	Grasses etc.	4
	Forbs	7
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	2.7
	Grasses etc.	72
	Forbs	1.1
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	5	10	6	5
Average of the 5 subplots	9.2				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	24/11/2022	DEH_W_505	DEH_W_505	MP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
	Avena fatua	E	0.5	100	
FG	Calotis scabiosifolia	N	0.1	20	
FG	Chrysocephalum apiculatum	N	0.3	50	
SG	Duma florulenta	N	0.3	2	
GG	Enteropogon acicularis	N	10		
	Lolium rigidum	E	15		
SG	Maireana aphylla	N	2		
FG	Maireana pentagona	N	0.2	50	
	Medicago polymorpha	E	0.5	100	
FG	Oxalis perennans	N	0.1	100	
GG	Rytidosperma caespitosum	N	1		
SG	Sclerolaena divaricata	N	0.3	4	
SG	Sclerolaena muricata	N	0.1	2	
FG	Sida corrugata	N	0.2	20	
FG	Sida trichopoda	N	0.1	5	
GG	Sporobolus caroli	N	1		
FG	Vittadinia cuneata	N	0.1	5	
GG	Walwhalleya proluta	N	60		

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	31/01/2023	Dinawan		Thinned	JRS STC		
Zone 55	Datum GDA94	Plot ID	DEH_W_601	Plot dimensions	50x20	Orientation of middle	150
Easting 385396	Northing 6120782	IBRA region	Riverina	Photo #			
Plant Community Type		13				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	5
	Grasses etc.	7
	Forbs	7
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	15.1
	Shrubs	19.9
	Grasses etc.	23.2
	Forbs	3.7
	Ferns	0
	Other	0
High Threat Weed cover		0.4

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	2
30 - 49 cm	1
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	2
No. trees with hollows	4

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	10	30	5	20	35
Average of the 5 subplots	20				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Grey brown	Site Drainage	Waterlogged	Distance to nearest water	Within 50m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	31/01/2023	Dinawan	DEH_W_601	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia oswaldii	N	0.1	1	
SG	Atriplex semibaccata	N	4	300	
GG	Austrostipa bigeniculata	N	0.5	30	
GG	Austrostipa scabra	N	5	200	
FG	Boerhavia dominii	N	0.1	1	
GG	Chloris truncata	N	0.1	5	
FG	Einadia nutans	N	3	300	
SG	Enchylaena tomentosa	N	0.3	20	
GG	Enteropogon acicularis	N	15	1000	
FG	Erodium crinitum	N	0.1	5	
TG	Eucalyptus largiflorens	N	15	20	
	Hordeum spp.	E	1	80	
	Lactuca serriola	E	0.1	5	
	Lepidium africanum	E	0.1	1	
	Lycium ferocissimum	HTE	0.3	10	
FG	Maireana pentagona	N	0.2	20	
	Modiola caroliniana	E	0.1	1	
GG	Rytidosperma duttonianum	N	2	200	
SG	Salsola tragus	N	0.1	1	
SG	Sclerolaena birchii	N	0.5	1	
SG	Sclerolaena muricata	N	15	100	
FG	Sida corrugata	N	0.1	10	
FG	Solanum esuriale	N	0.1	2	
	Solanum nigrum	E	0.1	10	
	Sonchus oleraceus	E	0.1	5	
GG	Sporobolus caroli	N	0.1	5	
FG	Vittadinia cuneata	N	0.1	5	
GG	Walwhalleya proluta	N	0.5	30	
	Xanthium spinosum	HTE	0.1	5	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	31/01/2023	Dinawan		DNG	JRS STC		
Zone 55	Datum GDA94	Plot ID	DEH_W_602	Plot dimensions	50x20	Orientation of middle	236
Easting 382582	Northing 6122714	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	4
	Grasses etc.	7
	Forbs	8
	Ferns	0
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	3.4
	Grasses etc.	75.5
	Forbs	1.2
	Ferns	0
	Other	0.1
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	5	20	5	0
Average of the 5 subplots	7				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Orange brown	Site Drainage	Moderate	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	31/01/2023	Dinawan	DEH_W_602	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa aristiglumis	N	0.2	10	
GG	Austrostipa nodosa	N	5	300	
	Avena fatua	E	0.5	200	
GG	Chloris truncata	N	0.2	50	
OG	Convolvulus angustissimus	N	0.1	2	
FG	Einadia nutans	N	0.1	5	
SG	Enchylaena tomentosa	N	0.1	2	
GG	Enteropogon acicularis	N	5	500	
FG	Erodium crinitum	N	0.1	5	
FG	Euphorbia drummondii	N	0.1	5	
	Heliotropium europaeum	E	0.1	1	
GG	Juncus subsecundus	N	0.1	2	
SG	Maireana decalvans	N	0.1	2	
SG	Maireana excavata	N	0.2	30	
FG	Maireana pentagona	N	0.5	80	
GG	Rytidosperma caespitosum	N	50	1000	
SG	Sclerolaena muricata	N	3	40	
FG	Sida corrugata	N	0.1	5	
FG	Sigesbeckia australiensis	N	0.1	5	
FG	Solanum esuriale	N	0.1	2	
GG	Sporobolus caroli	N	15	600	
FG	Vittadinia cuneata	N	0.1	6	
	Xanthium spinosum	HTE	0.1	1	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	31/01/2023	Dinawan		Mod_Good	JRS STC			
Zone 55	Datum GDA94	Plot ID	DEH_W_603	Plot dimensions	50x20	Orientation of middle	240	
Easting 383326	Northing 6123015	IBRA region	Riverina	Photo #				
Plant Community Type		17				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	10
	Forbs	8
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	5.6
	Grasses etc.	57.7
	Forbs	1.6
	Ferns	2
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	0	15	0	5
Average of the 5 subplots	5				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	Waterlogged	Distance to nearest water	0m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	31/01/2023	Dinawan	DEH_W_603	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.1	5	
SG	Atriplex semibaccata	N	0.1	1	
GG	Austrostipa aristiglumis	N	0.1	5	
GG	Austrostipa scabra	N	0.1		
	Avena spp.	E	0.1	5	
SG	Duma florulenta	N	5	30	
FG	Eclipta platyglossa	N	0.1	5	
GG	Eleocharis acuta	N	20	2000	
GG	Eleocharis pallens	N	0.1	2	
GG	Enteropogon acicularis	N	2	500	
FG	Erodium crinitum	N	0.1	1	
FG	Goodenia pusilliflora	N	0.3	80	
GG	Juncus subsecundus	N	5	100	
GG	Juncus usitatus	N	0.1	5	
EG	Marsilea drummondii	N	2	200	
FG	Oxalis perennans	N	0.1	5	
FG	Rumex tenax	N	0.3	30	
GG	Rytidosperma duttonianum	N	15	500	
SG	Sclerolaena muricata	N	0.5	10	
	Sida rhombifolia	E	0.1	1	
FG	Solanum esuriale	N	0.1	1	
GG	Sporobolus caroli	N	0.3	10	
FG	Triglochin spp.	N	0.5	60	
GG	Walwhalleya proluta	N	15	1000	
	Xanthium spinosum	HTE	0.1	5	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	31/01/2023	Dinawan		Moderate	JRS STC			
Zone 55	Datum GDA94	Plot ID	DEH_W_604	Plot dimensions	50x20	Orientation of middle	215	
Easting 371953	Northing 6122968	IBRA region	Riverina	Photo #				
Plant Community Type		13				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	2
	Grasses etc.	6
	Forbs	1
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	25
	Shrubs	52
	Grasses etc.	1.6
	Forbs	0.1
	Ferns	1
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	1
50 - 79 cm	3
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	0
Length of logs (m)	5
No. trees with hollows	1

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	0	0	0	0	0
Average of the 5 subplots	0				

Notes	Whole plot approx 30cm underwater

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Brown	Site Drainage	Poor - site inundated	Distance to nearest water	Site underwater

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	31/01/2023	Dinawan	DEH_W_604	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Chenopodium nitrariaceum	N	50	500	
SG	Duma florulenta	N	2	40	
GG	Eleocharis acuta	N	0.1	10	
GG	Enteropogon acicularis	N	0.1	20	
GG	Eragrostis australasica	N	0.1	5	
TG	Eucalyptus largiflorens	N	25	6	
GG	Lachnagrostis filiformis	N	0.2	30	
EG	Marsilea drummondii	N	1	1000	
GG	Paspalidium jubiflorum	N	0.1	10	
FG	Rumex tenax	N	0.1	3	
GG	Walwhalleya proluta	N	1		

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	31/01/2023	Dinawan		Low	JRS STC			
Zone 55	Datum GDA94	Plot ID	DEH_W_605	Plot dimensions	50x20	Orientation of middle	40	
Easting 371327	Northing 6129444	IBRA region	Riverina	Photo #				
Plant Community Type		28				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	4
	Grasses etc.	3
	Forbs	6
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	5
	Shrubs	0.5
	Grasses etc.	7.2
	Forbs	5.4
	Ferns	0
	Other	0
High Threat Weed cover		0.6

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	1
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	60	25	20	70	20
Average of the 5 subplots	39				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0-5	Soil Surface Texture	Sandy
Soil Colour	Orange	Site Drainage	Moderate	Distance to nearest water	1.2km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	2	R	
Fire damage			
Storm damage			
Weediness	3	R	Echium, White horehound, Bathurst Burr, Lycium
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	31/01/2023	Dinawan	DEH_W_605	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Atriplex lindleyi	N	0.1	2	
SG	Atriplex semibaccata	N	0.1	10	
GG	Austrostipa scabra	N	7	200	
TG	Callitris glaucophylla	N	5	1	
	Conyza bonariensis	E	0.1	5	
	Echium plantagineum	E	0.1	5	
FG	Einadia nutans	N	0.1	2	
SG	Enchylaena tomentosa	N	0.2	4	
FG	Erodium crinitum	N	1	200	
	Heliotropium europaeum	E	0.2	20	
	Hordeum spp.	E	0.1	5	
	Lycium ferocissimum	HTE	0.1	2	
	Marrubium vulgare	E	0.3	30	
GG	Rytidosperma duttonianum	N	0.1	5	
SG	Salsola tragus	N	0.1	5	
SG	Sclerolaena muricata	N	0.1	10	
FG	Sida corrugata	N	4	200	
FG	Solanum esuriale	N	0.1	1	
	Solanum nigrum	E	0.4	50	
	Sonchus oleraceus	E	0.1	1	
FG	Vittadinia cuneata	N	0.1	5	
GG	Walwhalleya proluta	N	0.1		
	Xanthium spinosum	HTE	0.5	90	

BAM Plot Data Sheet								Site Sheet no: 1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	31/01/2023	Dinawan		Moderate	JRS STC			
Zone 55	Datum GDA94	Plot ID	DEH_W_606	Plot dimensions	50x20	Orientation of middle	152	
Easting 372750	Northing 6129433	IBRA region	Riverina	Photo #				
Plant Community Type		13				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	5
	Grasses etc.	4
	Forbs	8
	Ferns	1
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	30.1
	Shrubs	75.3
	Grasses etc.	11.6
	Forbs	0.9
	Ferns	0.1
	Other	0.1
High Threat Weed cover		0.2

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	1
50 - 79 cm	3
30 - 49 cm	1
20 - 29cm	1
10 - 19 cm	0
5 - 9 cm	1
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	1

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	25	35	15	10
Average of the 5 subplots	18				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay silt
Soil Colour	Light brown	Site Drainage	Good	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	31/01/2023	Dinawan	DEH_W_606	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia oswaldii	N	0.1	2	
FG	Alternanthera denticulata	N	0.2	50	
SG	Atriplex semibaccata	N	25	100	
GG	Austrostipa scabra	N	0.5	200	
FG	Brachyscome ciliaris	N	0.1	5	
FG	Calotis scabiosifolia	N	0.1	1	
OG	Convolvulus angustissimus	N	0.1	4	
	Cynosurus echinatus	E	0.1	2	
FG	Dysphania pumilio	N	0.1	2	
FG	Einadia nutans	N	0.1	30	
SG	Enchylaena tomentosa	N	0.1	5	
GG	Enteropogon acicularis	N	0.1	20	
FG	Erodium crinitum	N	0.1	2	
TG	Eucalyptus largiflorens	N	30	4	
FG	Euphorbia drummondii	N	0.1	5	
	Hordeum spp.	E	0.1	10	
	Lycium ferocissimum	HTE	0.1	1	
EG	Marsilea drummondii	N	0.1	2	
GG	Rytidosperma caespitosum	N	5	300	
SG	Salsola tragus	N	0.1	2	
SG	Sclerolaena muricata	N	50	300	
SG	Sclerolaena tricuspis	N	0.1	4	
FG	Vittadinia cuneata	N	0.1	10	
GG	Walwhalleya proluta	N	6	600	
	Xanthium spinosum	HTE	0.1	2	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	31/01/2023	Dinawan		Intact	JRS STC			
Zone 55	Datum GDA94	Plot ID	DEH_W_607	Plot dimensions	50x20	Orientation of middle	215	
Easting 373462	Northing 6129894	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	5
	Grasses etc.	5
	Forbs	10
	Ferns	0
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	4.1
	Shrubs	1.2
	Grasses etc.	66
	Forbs	1.1
	Ferns	0
	Other	0.1
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	40	25	0	0
Average of the 5 subplots	14				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0-5	Soil Surface Texture	Sand-clay
Soil Colour	Orange brown	Site Drainage	High	Distance to nearest water	3km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	31/01/2023	Dinawan	DEH_W_607	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia oswaldii	N	0.1	1	
TG	Acacia pendula	N	4	5	
SG	Atriplex semibaccata	N	0.3	20	
GG	Austrostipa bigeniculata	N	15	1000	
GG	Austrostipa scabra	N	25	2000	
OG	Convolvulus angustissimus	N	0.1	1	
	Echium plantagineum	E	0.1	1	
FG	Einadia nutans	N	0.2	20	
SG	Enchylaena tomentosa	N	0.1	5	
GG	Enteropogon acicularis	N	1	40	
FG	Erodium crinitum	N	0.1	5	
FG	Euphorbia drummondii	N	0.1	5	
FG	Goodenia pusilliflora	N	0.1	1	
FG	Maireana pentagona	N	0.1	5	
FG	Oxalis perennans	N	0.1	1	
FG	Ptilotus erubescens	N	0.1	1	
GG	Rytidosperma duttonianum	N	20	3000	
SG	Salsola tragus	N	0.2	20	
SG	Sclerolaena diacantha	N	0.5	20	
SG	Sclerolaena muricata	N	0.1	5	
FG	Sida corrugata	N	0.1	20	
FG	Solanum esuriale	N	0.1	1	
	Sonchus oleraceus	E	0.1	5	
FG	Vittadinia cuneata	N	0.1	5	
GG	Walwhalleya proluta	N	5	300	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	01/02/2023	DEH_W_608		Thinned	JRS STC			
Zone 55	Datum GDA94	Plot ID	DEH_W_608	Plot dimensions	50x20	Orientation of middle	119	
Easting 363033	Northing 6134151	IBRA region	Riverina	Photo #				
Plant Community Type		13				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	2
	Grasses etc.	9
	Forbs	3
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	40.1
	Shrubs	5.4
	Grasses etc.	11.4
	Forbs	0.3
	Ferns	3
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	2
50 - 79 cm	4
30 - 49 cm	1
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	15
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	60	15	40	5	5
Average of the 5 subplots	25				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Sandy silt
Soil Colour	Light brown	Site Drainage	Moderate	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	01/02/2023	DEH_W_608	DEH_W_608	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia oswaldii	N	0.1	1	
FG	Alternanthera nana	N	0.1	5	
GG	Austrostipa nodosa	N	0.1	5	
SG	Duma florulenta	N	5	30	
FG	Eclipta platyglossa	N	0.1	2	
GG	Eleocharis acuta	N	10	400	
GG	Enteropogon acicularis	N	0.1	20	
TG	Eucalyptus largiflorens	N	40	5	
GG	Juncus flavidus	N	0.5	60	
GG	Juncus subsecundus	N	0.2	70	
EG	Marsilea drummondii	N	3	300	
GG	Paspalidium jubiflorum	N	0.2	50	
FG	Rumex tenax	N	0.1	2	
GG	Rytidosperma caespitosum	N	0.1	20	
SG	Sclerolaena muricata	N	0.4	20	
GG	Sporobolus caroli	N	0.1	5	
GG	Walwhalleya proluta	N	0.1	40	

BAM Plot Data Sheet							
		Survey Name		Veg Zone ID	Site Sheet no:1 of 2 Recorders		
Date	01/02/2023	Dinawan		DNG	JRS STC		
Zone 55	Datum GDA94	Plot ID	DEH_W_609	Plot dimensions	50x20	Orientation of middle	240
Easting 360890	Northing 6138929	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	6
	Grasses etc.	7
	Forbs	9
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0.6
	Shrubs	2.1
	Grasses etc.	67.7
	Forbs	1.3
	Ferns	0.1
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	10	2	5	0
Average of the 5 subplots	4.4				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0-5	Soil Surface Texture	Sandy clay
Soil Colour	Orange	Site Drainage	High	Distance to nearest water	1km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	2	R	
Fire damage			
Storm damage			
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	01/02/2023	Dinawan	DEH_W_609	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia oswaldii	N	0.5	10	
TG	Acacia pendula	N	0.1	1	
FG	Alternanthera denticulata	N	0.1	2	
SG	Atriplex semibaccata	N	0.5	20	
GG	Austrostipa scabra	N	0.5	50	
GG	Carex inversa	N	0.1	2	
FG	Chrysocephalum apiculatum	N	0.3	10	
SG	Dissocarpus paradoxus	N	0.2	10	
SG	Enchylaena tomentosa	N	0.5	20	
GG	Enteropogon acicularis	N	60	3000	
FG	Euphorbia drummondii	N	0.1	3	
GG	Juncus usitatus	N	0.1	2	
FG	Leucochrysum molle	N	0.1	2	
FG	Maireana pentagona	N	0.3	30	
EG	Marsilea drummondii	N	0.1	10	
FG	Ptilotus semilanatus	N	0.1	1	
	Romulea rosea var. australis	HTE	0.1	10	
GG	Rytidosperma caespitosum	N	3	300	
SG	Salsola tragus	N	0.1	3	
SG	Sclerolaena diacantha	N	0.3	20	
SG	Sclerolaena muricata	N	0.5	20	
FG	Sida corrugata	N	0.1	10	
FG	Solanum esuriale	N	0.1	10	
	Sonchus oleraceus	E	0.1	1	
GG	Sporobolus caroli	N	3	300	
FG	Vittadinia cuneata	N	0.1	1	
GG	Walwhalleya proluta	N	1	100	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	01/02/2023	Dinawan		Intact	JRS STC		
Zone 55	Datum GDA94	Plot ID	DEH_W_610	Plot dimensions	50x20	Orientation of middle	159
Easting 357610	Northing 6138307	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	5
	Grasses etc.	7
	Forbs	9
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	10
	Shrubs	31.3
	Grasses etc.	39.6
	Forbs	2.9
	Ferns	0
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	3
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	80	15	5	40	5
Average of the 5 subplots	29				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Sandy clay
Soil Colour	Brown orange	Site Drainage	Moderate	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	01/02/2023	Dinawan	DEH_W_610	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	10	8	
GG	Austrostipa nodosa	N	20	500	
FG	Calotis cuneifolia	N	0.1	1	
FG	Eclipta platyglossa	N	0.1	1	
FG	Einadia nutans	N	2	100	
SG	Enchylaena tomentosa	N	1	50	
GG	Enteropogon acicularis	N	1	200	
FG	Euphorbia drummondii	N	0.1	5	
FG	Goodenia fascicularis	N	0.1	20	
	Lycium ferocissimum	HTE	0.1	1	
SG	Maireana aphylla	N	20	300	
SG	Maireana excavata	N	0.1	2	
FG	Maireana pentagona	N	0.1	1	
FG	Oxalis perennans	N	0.1	2	
GG	Panicum spp.	N	0.1	1	
GG	Rytidosperma caespitosum	N	15	300	
GG	Rytidosperma spp.	N	2	100	
SG	Salsola tragus	N	0.2	40	
SG	Sclerolaena muricata	N	10	80	
FG	Sida corrugata	N	0.1	4	
FG	Solanum esuriale	N	0.2	50	
GG	Sporobolus caroli	N	1	500	
GG	Walwhalleya proluta	N	0.5	400	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	01/02/2023	Dinawan		Moderate	JRS STC			
Zone 55	Datum GDA94	Plot ID	DEH_W_611	Plot dimensions	50x20	Orientation of middle	20	
Easting 354916	Northing 6137799	IBRA region	Riverina	Photo #				
Plant Community Type		46				EEC: None	Confidence M	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	4
	Grasses etc.	4
	Forbs	8
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	1.3
	Grasses etc.	70.2
	Forbs	1
	Ferns	0
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	50	30	50	25	20
Average of the 5 subplots	35				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0-5	Soil Surface Texture	Clay
Soil Colour	Grey brown	Site Drainage	Moderate	Distance to nearest water	1.5

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness	2	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	01/02/2023	Dinawan	DEH_W_611	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa bigeniculata	N	0.1	1	
FG	Chrysocephalum apiculatum	N	0.1	5	
	Cirsium vulgare	E	0.1	5	
	Cucumis myriocarpus subsp.	E	0.2	10	
	Echium plantagineum	E	0.1	5	
GG	Enteropogon acicularis	N	5	500	
FG	Erodium crinitum	N	0.3	30	
FG	Euphorbia drummondii	N	0.1	10	
	Heliotropium europaeum	E	0.1	10	
	Lactuca serriola	E	0.1	5	
SG	Maireana aphylla	N	0.1	5	
	Marrubium vulgare	E	0.1	1	
FG	Oxalis perennans	N	0.1	10	
FG	Ptilotus semilanatus	N	0.1	5	
SG	Salsola tragus	N	0.1	1	
SG	Sclerolaena diacantha	N	0.1	5	
SG	Sclerolaena muricata	N	1	40	
FG	Sida corrugata	N	0.1	5	
FG	Solanum esuriale	N	0.1	10	
	Sonchus oleraceus	E	0.1	5	
GG	Sporobolus caroli	N	0.1	1	
FG	Vittadinia cuneata	N	0.1	5	
GG	Walwhalleya proluta	N	65	3000	
	Xanthium spinosum	HTE	0.1	10	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	01/02/2023	Dinawan		Moderate	JRS STC		
Zone 55	Datum GDA94	Plot ID	DEH_W_612	Plot dimensions	50x20	Orientation of middle	171
Easting 355105	Northing 6139188	IBRA region	Riverina	Photo #			
Plant Community Type		46				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	6
	Grasses etc.	5
	Forbs	4
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	11.7
	Grasses etc.	50.1
	Forbs	0.8
	Ferns	0
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	40	15	10	30	70
Average of the 5 subplots	33				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay
Soil Colour	Orange brown	Site Drainage	Good	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	01/02/2023	Dinawan	DEH_W_612	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex semibaccata	N	5	100	
GG	Austrostipa nodosa	N	0.1	10	
	Avena fatua	E	0.1	5	
FG	Calotis cuneifolia	N	0.5	80	
FG	Chrysocephalum apiculatum	N	0.1	2	
SG	Dissocarpus paradoxus	N	0.1	1	
SG	Enchylaena tomentosa	N	0.5	60	
GG	Enteropogon acicularis	N	10	400	
	Lycium ferocissimum	HTE	0.1	1	
SG	Maireana aphylla	N	5	30	
GG	Rytidosperma caespitosum	N	20	600	
SG	Salsola tragus	N	0.1	4	
SG	Sclerolaena muricata	N	1	40	
FG	Sida corrugata	N	0.1	3	
FG	Solanum esuriale	N	0.1	2	
GG	Sporobolus caroli	N	5	200	
GG	Walwhalleya proluta	N	15	600	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	01/02/2023	Dinawan		Intact	JRS STC		
Zone 55	Datum GDA94	Plot ID	DEH_W_613	Plot dimensions	50x20	Orientation of middle	220
Easting 359862	Northing 6141538	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: None	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	7
	Grasses etc.	6
	Forbs	6
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	15
	Shrubs	16.5
	Grasses etc.	8.4
	Forbs	1.3
	Ferns	0
	Other	0
High Threat Weed cover		0.6

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	0	0	5	10
Average of the 5 subplots	4				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0-5	Soil Surface Texture	Clay
Soil Colour	Light brown	Site Drainage	High	Distance to nearest water	800m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	01/02/2023	Dinawan	DEH_W_613	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	15	20	
SG	Atriplex semibaccata	N	2	40	
GG	Austrostipa nodosa	N	0.2	10	
GG	Austrostipa scabra	N	0.1	5	
SG	Chenopodium desertorum	N	5	60	
FG	Chrysocephalum apiculatum	N	0.5	20	
	Echium plantagineum	E	0.1	5	
FG	Einadia nutans	N	0.2	10	
SG	Enchylaena tomentosa	N	0.5	50	
GG	Enteropogon acicularis	N	0.1	1	
FG	Euphorbia drummondii	N	0.1	5	
	Lycium ferocissimum	HTE	0.5	1	
SG	Maireana aphylla	N	8	90	
FG	Maireana pentagona	N	0.3	50	
GG	Rytidosperma caespitosum	N	2	200	
GG	Rytidosperma spp.	N	1	100	
SG	Salsola tragus	N	0.4	80	
SG	Sclerolaena diacantha	N	0.1	5	
SG	Sclerolaena muricata	N	0.5	30	
FG	Sida corrugata	N	0.1	5	
FG	Solanum esuriale	N	0.1	1	
GG	Walwhalleya proluta	N	5	100	
	Xanthium spinosum	HTE	0.1	1	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	01/02/2023	Dinawan		Other	JRS STC			
Zone 55	Datum GDA94	Plot ID	DEH_W_614	Plot dimensions	50x20	Orientation of middle	220	
Easting 358437	Northing 6140312	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: None	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	6
	Forbs	10
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	20.3
	Grasses etc.	85
	Forbs	1.2
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	20	0	0	30
Average of the 5 subplots	13				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Clay silt
Soil Colour	Light brown	Site Drainage	Moderate	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock			
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	01/02/2023	Dinawan	DEH_W_614	JRS STC

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex semibaccata	N	0.2	10	
GG	Austrostipa scabra	N	5	200	
	Avena fatua	E	0.1	10	
FG	Calotis cuneifolia	N	0.1	5	
FG	Calotis scabiosifolia	N	0.1	2	
FG	Chrysocephalum apiculatum	N	0.2	50	
FG	Einadia nutans	N	0.1	2	
GG	Enteropogon acicularis	N	30	1000	
FG	Euphorbia drummondii	N	0.1	5	
FG	Goodenia fascicularis	N	0.1	4	
SG	Maireana aphylla	N	20	80	
FG	Maireana pentagona	N	0.2	30	
FG	Rhodanthe corymbiflora	N	0.1	1	
GG	Rytidosperma caespitosum	N	25	800	
GG	Rytidosperma spp.	N	10	200	
SG	Salsola tragus	N	0.1	5	
FG	Sida corrugata	N	0.1	10	
FG	Solanum esuriale	N	0.1	1	
GG	Sporobolus caroli	N	5	200	
GG	Walwhalleya proluta	N	10	300	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	14/02/2023	Dinewan		Mod_Good	MGP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_801	Plot dimensions	50x20	Orientation of middle	121
Easting 384625	Northing 6121230	IBRA region	Riverina	Photo #			
Plant Community Type		45				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	1
	Grasses etc.	6
	Forbs	3
	Ferns	1
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	0.3
	Grasses etc.	55.1
	Forbs	0.3
	Ferns	0.1
	Other	0.1
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	55	40	45	35	25
Average of the 5 subplots	40				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	14/02/2023	Dinewan	DEH_W_801	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa aristiglumis	N	25		
	Avena fatua	E	0.1	10	
FG	Calotis scabiosifolia	N	0.1	3	
OG	Convolvulus spp.	N	0.1	20	
GG	Enteropogon acicularis	N	3		
	Lolium rigidum	E	5		
EG	Marsilea drummondii	N	0.1	20	
GG	Rytidosperma duttonianum	N	1		
GG	Rytidosperma setaceum	N	0.1	10	
SG	Sclerolaena muricata var.	N	0.3	10	
FG	Sida trichopoda	N	0.1	30	
FG	Solanum esuriale	N	0.1	20	
GG	Sporobolus caroli	N	1		
GG	Walwhalleya proluta	N	25		

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	14/02/2023	Dinawan		Intact	MGP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_802	Plot dimensions	50x20	Orientation of middle	129
Easting 385346	Northing 6124837	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	5
	Grasses etc.	7
	Forbs	5
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	10
	Shrubs	4.3
	Grasses etc.	26.8
	Forbs	0.7
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	1
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	10
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	85	80	90	35	60
Average of the 5 subplots	70				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	4	Soil Surface Texture	Clay loam
Soil Colour	Grey brown	Site Drainage	4	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	14/02/2023	Dinawan	DEH_W_802	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	10		
FG	Alternanthera denticulata	N	0.1	5	
SG	Atriplex leptocarpa	N	3		
GG	Austrostipa aristiglumis	N	15		
GG	Austrostipa nodosa	N	0.5	30	
GG	Austrostipa scabra	N	0.1	10	
GG	Chloris truncata	N	0.1	10	
	Lolium rigidum	E	4		
SG	Maireana decalvans	N	0.6	30	
SG	Maireana spp.	N	0.1	10	
GG	Rytidosperma setaceum	N	0.1	10	
SG	Salsola tragus	N	0.2	10	
SG	Sclerolaena muricata var.	N	0.4	20	
FG	Sida corrugata	N	0.1	30	
FG	Solanum esuriale	N	0.2	60	
GG	Sporobolus caroli	N	1		
FG	Teucrium racemosum	N	0.1	20	
FG	Vittadinia cuneata	N	0.2	20	
GG	Walwhalleya proluta	N	10		

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	14/02/2023	Dinawan		Intact	Mgp and kk		
Zone 55	Datum GDA94	Plot ID	DEH_W_803	Plot dimensions	50x20	Orientation of middle	12
Easting 378265	Northing 6129337	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Weeping myall	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	7
	Grasses etc.	9
	Forbs	9
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	20
	Shrubs	3.8
	Grasses etc.	31.5
	Forbs	1
	Ferns	0.1
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	22
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	15	10	15	5
Average of the 5 subplots	12				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Red brown loam
Soil Colour	Red to brown little gilgai	Site Drainage	Nil	Distance to nearest water	Unk

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	1		
Fire damage			
Storm damage			
Weediness			
Other			Old small powerline

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	14/02/2023	Dinawan	DEH_W_803	Mgp and kk

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	20	10	Canopy
FG	Alternanthera denticulata	N	0.1	10	Ground
SG	Atriplex leptocarpa	N	1	10	Ground
GG	Austrostipa aristiglumis	N	25	200	Ground
GG	Austrostipa nodosa	N	1	100	Ground
GG	Austrostipa scabra	N	0.2	20	
SG	Chenopodium nitrariaceum	N	0.1	1	Ground
GG	Chloris truncata	N	0.2	30	Ground
FG	Einadia nutans	N	0.1	1	Ground
SG	Enchylaena tomentosa	N	0.1	1	Ground
GG	Enteropogon acicularis	N	1	50	Ground
GG	Juncus spp.	N	0.1	30	
FG	Lepidium spp.	N	0.1	10	
FG	Leptorhynchos squamatus	N	0.1	1	Ground
	Lycium ferocissimum	HTE	0.1	1	Mid Storey
SG	Maireana decalvans	N	1	20	Ground
EG	Marsilea drummondii	N	0.1	30	Ground
FG	Oxalis perennans	N	0.1	20	Ground
SG	Rhagodia spinescens	N	0.1	1	
GG	Rytidosperma duttonianum	N	1	10	
SG	Salsola tragus	N	1	30	Ground
SG	Sclerolaena muricata	N	0.5	10	Ground
FG	Sida corrugata	N	0.1	5	Ground
FG	Solanum esuriale	N	0.1	10	Ground
GG	Sporobolus caroli	N	2	50	Ground
FG	Teucrium racemosum	N	0.2	20	
FG	Vittadinia cuneata	N	0.1	5	Ground
GG	Walwhalleya proluta	N	1	200	Ground

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	15/02/2023	Dinawan		Moderate	MGP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_804	Plot dimensions	50x20	Orientation of middle	80	
Easting 378143	Northing 6128999	IBRA region	Riverina	Photo #				
Plant Community Type		28				EEC: Yes	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	6
	Grasses etc.	4
	Forbs	5
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	20
	Shrubs	4.2
	Grasses etc.	7.7
	Forbs	2.5
	Ferns	0
	Other	0
High Threat Weed cover		0.2

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	1
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	0
Length of logs (m)	5
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	65	6	70	65
Average of the 5 subplots	45.2				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Sandy clay
Soil Colour	Red	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	15/02/2023	Dinawan	DEH_W_804	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Aristida behriana	N	0.2	20	
SG	Atriplex leptocarpa	N	0.1	5	
SG	Atriplex semibaccata	N	1		
GG	Austrostipa nodosa	N	4		
GG	Austrostipa scabra	N	3		
FG	Boerhavia dominii	N	0.2	20	
	Brassica spp.	E	1		
TG	Callitris glaucophylla	N	20		
	Conyza bonariensis	E	0.5	50	
	Echium plantagineum	E	0.1	20	
SG	Enchylaena tomentosa	N	1		
FG	Euphorbia drummondii	N	0.1	5	
	Heliotropium europaeum	E	0.1	50	
	Lactuca spp.	E	0.1	5	
	Lepidium bonariense	E	0.1	10	
	Lycium ferocissimum	HTE	0.2	2	
FG	Maireana pentagona	N	0.1	2	
SG	Rhagodia spinescens	N	1		
GG	Rytidosperma caespitosum	N	0.5	50	
SG	Salsola tragus	N	0.1	7	
SG	Sclerolaena muricata var.	N	1		
FG	Sida corrugata	N	2		
	Solanum nigrum	E	0.1	3	
FG	Vittadinia cuneata var. cuneata	N	0.1	10	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	15/02/2023	Dinawan		Moderate	MGP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_805	Plot dimensions	50x20	Orientation of middle	19	
Easting 377211	Northing 6124624	IBRA region	Riverina	Photo #				
Plant Community Type		46				EEC: Yes	Confidence M	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	2
	Grasses etc.	8
	Forbs	6
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	1.4
	Grasses etc.	37.1
	Forbs	0.6
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	15	10	15	15
Average of the 5 subplots	15				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Grey brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	15/02/2023	Dinawan	DEH_W_805	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa nodosa	N	15		
GG	Austrostipa scabra	N	5		
FG	Calotis scabiosifolia var.	N	0.1	5	
GG	Chloris truncata	N	1		
GG	Enteropogon acicularis	N	10		
	Eragrostis cilianensis	E	0.1	4	
FG	Goodenia spp.	N	0.1	10	
FG	Leiocarpa panaetioides	N	0.1	1	
	Lolium rigidum	E	5		
SG	Maireana aphylla	N	1		
FG	Maireana pentagona	N	0.1	10	
FG	Ptilotus semilanatus	N	0.1	5	
FG	Rhodanthe corymbiflora	N	0.1	4	
GG	Rytidosperma caespitosum	N	0.1	10	
GG	Rytidosperma spp.	N	1		
SG	Sclerolaena muricata var.	N	0.4	5	
GG	Sporobolus caroli	N	3		
GG	Walwhalleya proluta	N	2		

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	15/02/2023	Dinawan		Moderate	MGP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_806	Plot dimensions	50x20	Orientation of middle	225
Easting 377024	Northing 6124547	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Yes	Confidence M

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	8
	Forbs	3
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	0.4
	Grasses etc.	31.4
	Forbs	0.3
	Ferns	0.1
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	5	10	30	50
Average of the 5 subplots	22				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Redbrown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	15/02/2023	Dinawan	DEH_W_806	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa scabra	N	0.1	10	
FG	Centipeda cunninghamii	N	0.1	50	
GG	Eleocharis pallens	N	5		
GG	Enteropogon acicularis	N	20		
GG	Eragrostis spp.	N	0.1	1	
	Lolium rigidum	E	5		
SG	Maireana aphylla	N	0.1	2	
SG	Maireana decalvans	N	0.1	5	
FG	Maireana pentagona	N	0.1	10	
EG	Marsilea drummondii	N	0.1	200	
FG	Ptilotus semilanatus	N	0.1		
GG	Rytidosperma caespitosum	N	5		
GG	Rytidosperma setaceum	N	0.1	10	
SG	Sclerolaena muricata var.	N	0.2	4	
GG	Sporobolus caroli	N	0.1	10	
GG	Walwhalleya proluta	N	1		

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	15/02/2023	Dinawan Wind		Intact	MGP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_807	Plot dimensions	50x20	Orientation of middle	121	
Easting 354260	Northing 6132250	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: Yes	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	11
	Grasses etc.	6
	Forbs	2
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	15
	Shrubs	6.8
	Grasses etc.	16.5
	Forbs	0.3
	Ferns	0
	Other	0
High Threat Weed cover		3

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	0
Length of logs (m)	20
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	10	5	3	5
Average of the 5 subplots	5.6				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	15/02/2023	Dinawan Wind	DEH_W_807	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	10		
TG	Alectryon oleifolius	N	5		
SG	Atriplex leptocarpa	N	0.2	20	
SG	Atriplex semibaccata	N	0.6	20	
GG	Austrostipa scabra	N	5		
SG	Chenopodium nitrariaceum	N	0.7	1	
GG	Chloris truncata	N	0.2	10	
FG	Crassula spp.	N	0.1	20	
FG	Einadia nutans	N	0.2	30	
SG	Enchylaena tomentosa	N	0.5	20	
GG	Enteropogon acicularis	N	10		
	Lycium ferocissimum	HTE	3		
SG	Maireana aphylla	N	0.5	2	
SG	Maireana decalvans	N	0.1	1	
SG	Maireana spp.	N	0.1	5	
SG	Rhagodia spinescens	N	2		
GG	Rytidosperma caespitosum	N	1		
GG	Rytidosperma setaceum	N	0.1	20	
SG	Salsola tragus	N	1		
SG	Sclerolaena birchii	N	0.1	2	
SG	Sclerolaena muricata var.	N	1		
GG	Walwhalleya proluta	N	0.2		

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	15/02/2023	Dinawan		DNG	Mgp and kk		
Zone 55	Datum GDA94	Plot ID	DEH_W_808	Plot dimensions	50x20	Orientation of middle	300
Easting 354213	Northing 6132147	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Myall	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	6
	Grasses etc.	4
	Forbs	6
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	0.6
	Grasses etc.	24
	Forbs	5.5
	Ferns	0
	Other	0
High Threat Weed cover		0.3

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	1	2	5	2	10
Average of the 5 subplots	4				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Flat	Soil Surface Texture	Red compacted
Soil Colour	Red	Site Drainage	Nil	Distance to nearest water	Unk

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	1	R	
Fire damage			
Storm damage			
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	15/02/2023	Dinawan	DEH_W_808	Mgp and kk

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex leptocarpa	N	0.1	20	
GG	Austrostipa nodosa	N	2	50	
GG	Austrostipa scabra	N	1	100	
FG	Boerhavia dominii	N	0.1	5	
FG	Chrysocephalum apiculatum	N	0.1	5	
FG	Dysphania pumilio	N	0.1	5	
GG	Enteropogon acicularis	N	20	200	
FG	Euphorbia drummondii	N	0.1	1	
	Heliotropium amplexicaule	HTE	0.2	100	Ground
	Hordeum leporinum	E	0.1	5	
SG	Maireana decalvans	N	0.1	1	
SG	Salsola tragus	N	0.1	20	
SG	Sclerolaena birchii	N	0.1	5	
SG	Sclerolaena muricata	N	0.1	20	
SG	Sclerolaena stelligera	N	0.1	1	
FG	Sida corrugata	N	5	200	
FG	Vittadinia cuneata	N	0.1	1	
GG	Walwhalleya proluta	N	1	100	
	Xanthium spinosum	HTE	0.1	1	

BAM Plot Data Sheet								Site Sheet no: 1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	15/02/2023	Dinawan		Mod_Good	MGP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_809	Plot dimensions	50x20	Orientation of middle	10	
Easting 357646	Northing 6123845	IBRA region	Riverina	Photo #				
Plant Community Type		160				EEC: No	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	5
	Grasses etc.	6
	Forbs	6
	Ferns	2
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0.4
	Shrubs	45.4
	Grasses etc.	17.1
	Forbs	1
	Ferns	1.1
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	10	15	5	5
Average of the 5 subplots	11				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	3	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	3	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	O	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	15/02/2023	Dinawan	DEH_W_809	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	0.4	1	
FG	Alternanthera denticulata	N	0.1	10	
FG	Calocephalus sonderi	N	0.1	5	
FG	Centipeda minima subsp.	N	0.5	100	
SG	Chenopodium nitrariaceum	N	40		
GG	Chloris truncata	N	0.4	50	
SG	Duma florulenta	N	5		
GG	Eleocharis pallens	N	15		
SG	Enchylaena tomentosa	N	0.1	5	
GG	Enteropogon acicularis	N	0.4	20	
GG	Eragrostis australasica	N	0.2	3	
FG	Euphorbia drummondii	N	0.1	10	
	Heliotropium europaeum	E	0.1	10	
GG	Juncus spp.	N	0.1	20	
SG	Maireana decalvans	N	0.1	5	
EG	Marsilea costulifera	N	0.1	50	
EG	Marsilea drummondii	N	1	1000	
SG	Sclerolaena muricata var.	N	0.2	10	
FG	Solanum esuriale	N	0.1	10	
FG	Teucrium racemosum	N	0.1	20	
GG	Walwhalleya proluta	N	1		

BAM Plot Data Sheet								Site Sheet no: 1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	15/02/2023	Dinawan		Mod_Good	MGP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_810	Plot dimensions	50x20	Orientation of middle	130	
Easting 360172	Northing 6125591	IBRA region	Riverina	Photo #				
Plant Community Type		160				EEC: No	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	6
	Forbs	4
	Ferns	2
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	58.2
	Grasses etc.	15.4
	Forbs	3.9
	Ferns	3.3
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	2	5	5	5	5
Average of the 5 subplots	4.4				

Notes	Too wet to run tape

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	2	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	2	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	15/02/2023	Dinawan	DEH_W_810	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Amphibromus nervosus	N	0.1	20	
FG	Centipeda minima subsp.	N	0.1	5	
SG	Chenopodium nitrariaceum	N	50		
SG	Duma florulenta	N	8		
GG	Eleocharis acuta	N	5		
GG	Eragrostis australasica	N	10		
GG	Eragrostis setifolia	N	0.1	10	
GG	Juncus spp.	N	0.1	5	
GG	Lachnagrostis filiformis	N	0.1	5	
EG	Marsilea costulifera	N	0.3	200	
EG	Marsilea drummondii	N	3	500	
FG	Ottelia ovalifolia subsp. ovalifolia	N	3		
SG	Sclerolaena muricata var.	N	0.2	10	
FG	Stellaria angustifolia	N	0.7	20	
FG	Teucrium racemosum	N	0.1	20	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	16/02/2023	Dinawan		Low	MGP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_811	Plot dimensions	50x20	Orientation of middle	103
Easting 361561	Northing 6129140	IBRA region	Riverina	Photo #			
Plant Community Type		28				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	7
	Grasses etc.	4
	Forbs	7
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	7
	Shrubs	2.9
	Grasses etc.	15
	Forbs	1.7
	Ferns	0
	Other	0
High Threat Weed cover		0.3

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	1
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	3
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	30	10	5	10
Average of the 5 subplots	14				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	2	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	16/02/2023	Dinawan	DEH_W_811	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex leptocarpa	N	1		
GG	Austrostipa scabra	N	3		
FG	Boerhavia dominii	N	0.1	10	
	Brassica spp.	E	0.5	20	
TG	Callitris glaucophylla	N	7		
	Cucumis myriocarpus subsp.	E	0.1	3	
FG	Dysphania pumilio	N	0.1	10	
GG	Enteropogon acicularis	N	10		
FG	Euphorbia drummondii	N	0.1	10	
	Heliotropium europaeum	E	0.3	100	
	Lepidium bonariense	E	0.1	6	
	Lolium rigidum	E	5		
	Lycium ferocissimum	HTE	0.2	1	
SG	Maireana brevifolia	N	0.3	3	
SG	Maireana decalvans	N	0.1	10	
SG	Maireana excavata	N	0.1	6	
FG	Malva spp.	N	0.1	1	
GG	Paspalidium constrictum	N	1		
GG	Rytidosperma caespitosum	N	1		
SG	Salsola tragus	N	0.3	10	
SG	Sclerolaena birchii	N	0.1	4	
SG	Sclerolaena muricata var.	N	1		
FG	Sida corrugata	N	1		
	Solanum nigrum	E	0.1	3	
	Trifolium arvense	E	5		
FG	Vittadinia cuneata	N	0.1	5	
	Xanthium spinosum	HTE	0.1	3	
FG	Zaleya galericulata	N	0.2	5	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	15/02/2023	Dinawan		Low	MGP KK			
Zone 55	Datum GDA94	Plot ID	DEH_W_812	Plot dimensions	50x20	Orientation of middle	40	
Easting 360051	Northing 6129613	IBRA region	Riverina	Photo #				
Plant Community Type		28				EEC: Yes	Confidence H	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	5
	Grasses etc.	6
	Forbs	7
	Ferns	0
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	15
	Shrubs	0.6
	Grasses etc.	5.6
	Forbs	0.8
	Ferns	0
	Other	0.1
High Threat Weed cover		0.5

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	2
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	2
No. trees with hollows	1

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	10	10	20	15
Average of the 5 subplots	12				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern	Sand hill	Slope	Slight slope and undulation	Soil Surface Texture	Soft
Soil Colour	Light brown orange	Site Drainage	Minimal	Distance to nearest water	Unk

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	O	
Cultivation (inc. pasture)	0		
Soil erosion	1	O	
Firewood/CWD removal			
Grazing (identify native/livestock	1	R	
Fire damage			
Storm damage	1	NR	
Weediness	2	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	15/02/2023	Dinawan	DEH_W_812	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Anthosachne scabra	N	0.5		
SG	Atriplex leptocarpa	N	0.1	2	
GG	Austrostipa nodosa	N	0.1	5	
FG	Boerhavia dominii	N	0.1	1	
TG	Callitris glaucophylla	N	15	1	
FG	Chrysocephalum apiculatum	N	0.1	2	
OG	Convolvulus spp.	N	0.1	5	
	Conyza bonariensis	E	0.1	5	
	Cucumis myriocarpus subsp.	E	0.1	1	
FG	Dysphania pumilio	N	0.1	3	
GG	Enteropogon acicularis	N	2		
	Heliotropium europaeum	E	0.5	100	
	Hordeum leporinum	E	0.2	20	
	Lepidium africanum	E	0.1	10	
	Lolium rigidum	E	0.1	10	
SG	Maireana brevifolia	N	0.2	1	
	Malva parviflora	E	0.1		
GG	Paspalidium constrictum	N	1		
GG	Rytidosperma caespitosum	N	1		
SG	Salsola tragus	N	0.1	5	
SG	Sclerolaena birchii	N	0.1	2	
SG	Sclerolaena muricata	N	0.1	2	
FG	Sida corrugata	N	0.2	200	
FG	Solanum esuriale	N	0.1	50	
	Solanum nigrum	E	0.1	2	
	Trifolium arvense	E	0.2	20	
FG	Vittadinia cuneata	N	0.1	5	
GG	Walwhalleya proluta	N	1		
	Xanthium spinosum	HTE	0.5	50	
FG	Zaleya galericulata	N	0.1	10	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	16/02/2023	Dinewan		Thinned	MGP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_813	Plot dimensions	50x20	Orientation of middle	128
Easting 358538	Northing 6135349	IBRA region	Riverina	Photo #			
Plant Community Type		15				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	8
	Grasses etc.	5
	Forbs	6
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	25
	Shrubs	12.3
	Grasses etc.	10.3
	Forbs	2.5
	Ferns	0.1
	Other	0
High Threat Weed cover		0.2

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	1
20 - 29cm	1
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	7
No. trees with hollows	2

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	1	5	5	25
Average of the 5 subplots	11.2				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	2	Soil Surface Texture	Clay loam
Soil Colour	Grey	Site Drainage	2	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	Thinned
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	16/02/2023	Dinewan	DEH_W_813	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex leptocarpa	N	0.2	20	
GG	Austrostipa scabra	N	0.2	20	
FG	Boerhavia dominii	N	0.1	20	
SG	Chenopodium nitrariaceum	N	4		
SG	Duma florulenta	N	2	4	
FG	Einadia nutans	N	2		
SG	Enchylaena tomentosa	N	2		
GG	Enteropogon acicularis	N	4		
TG	Eucalyptus largiflorens	N	25		
FG	Goodenia glauca	N	0.1	5	
	Lycium ferocissimum	HTE	0.1	1	
SG	Maireana brevifolia	N	0.5	6	
SG	Maireana decalvans	N	0.5	8	
EG	Marsilea drummondii	N	0.1	100	
GG	Rytidosperma caespitosum	N	3		
SG	Salsola tragus	N	0.1	5	
SG	Sclerolaena muricata var.	N	3		
FG	Sida spp.	N	0.1	1	
GG	Sporobolus caroli	N	0.1	3	
FG	Teucrium racemosum	N	0.1	10	
FG	Vittadinia cuneata	N	0.1	5	
GG	Walwhalleya proluta	N	3		
	Xanthium spinosum	HTE	0.1	5	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	16/02/2023	Dinewan		Thinned	MGP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_814	Plot dimensions	50x20	Orientation of middle	193
Easting 357519	Northing 6136327	IBRA region	Riverina	Photo #			
Plant Community Type		15				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	8
	Grasses etc.	5
	Forbs	9
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	25
	Shrubs	55
	Grasses etc.	2.8
	Forbs	1
	Ferns	0.2
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	1
30 - 49 cm	1
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	8
No. trees with hollows	4

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	10	30	15	20	10
Average of the 5 subplots	17				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1	Soil Surface Texture	Clay loam
Soil Colour	Grey	Site Drainage	1	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	NR	Thinned
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	16/02/2023	Dinewan	DEH_W_814	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex semibaccata	N	0.1	5	
GG	Austrostipa aristiglumis	N	0.2	5	
FG	Boerhavia dominii	N	0.1	10	
FG	Centipeda minima subsp.	N	0.1	100	
SG	Chenopodium nitrariaceum	N	35		
SG	Duma florulenta	N	4		
	Echium spp.	E	0.1	3	
FG	Einadia nutans	N	0.1	30	
GG	Eleocharis pallens	N	0.5	40	
GG	Enteropogon acicularis	N	1		
TG	Eucalyptus largiflorens	N	25		
	Heliotropium europaeum	E	0.1	10	
SG	Maireana brevifolia	N	0.5	10	
SG	Maireana decalvans	N	0.2	20	
SG	Maireana excavata	N	0.1	5	
FG	Malva spp.	N	0.1	5	
EG	Marsilea drummondii	N	0.2	400	
FG	Rumex dumosus	N	0.1	5	
SG	Sclerolaena muricata var.	N	15		
SG	Sclerolaena stelligera	N	0.1	1	
FG	Sida spp.	N	0.1	2	
FG	Solanum esuriale	N	0.2	50	
FG	Sonchus spp.	N	0.1	3	
GG	Sporobolus caroli	N	0.1	10	
FG	Teucrium racemosum	N	0.1	20	
GG	Walwhalleya proluta	N	1		
	Xanthium spinosum	HTE	0.1	3	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	16/02/2023	Dinewan		Thinned	MGP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_815	Plot dimensions	50x20	Orientation of middle	13
Easting 358443	Northing 6137003	IBRA region	Riverina	Photo #			
Plant Community Type		15				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	5
	Grasses etc.	5
	Forbs	8
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	30
	Shrubs	18.2
	Grasses etc.	15.2
	Forbs	0.9
	Ferns	0.1
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	1
30 - 49 cm	1
20 - 29cm	1
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	0
Length of logs (m)	10
No. trees with hollows	3

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	10	5	20	15	1
Average of the 5 subplots	10.2				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	2	Soil Surface Texture	Clay loam
Soil Colour	Grey brown	Site Drainage	2	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	Thinned
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	16/02/2023	Dinewan	DEH_W_815	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.1	20	
SG	Atriplex leptocarpa	N	0.1	10	
GG	Austrostipa aristiglumis	N	0.1	1	
FG	Boerhavia dominii	N	0.1	20	
FG	Centipeda minima subsp.	N	0.1	5	
SG	Chenopodium nitrariaceum	N	10		
SG	Duma florulenta	N	7		
FG	Einadia nutans	N	0.2	20	
GG	Enteropogon acicularis	N	2		
TG	Eucalyptus largiflorens	N	30		
FG	Goodenia glauca	N	0.1	10	
GG	Juncus spp.	N	0.1	5	
SG	Maireana decalvans	N	0.1	10	
FG	Maireana enchylaenoides	N	0.1	8	
EG	Marsilea drummondii	N	0.1	100	
GG	Paspalidium jubiflorum	N	10		
SG	Sclerolaena muricata var.	N	1		
FG	Sida corrugata	N	0.1	10	
	Sida rhombifolia	E	0.1	10	
FG	Solanum esuriale	N	0.1	20	
	Sonchus oleraceus	E	0.1	5	
GG	Walwhalleya proluta	N	3		
	Xanthium spinosum	HTE	0.1	4	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	16/02/2023	Dinawan		Moderate	MGP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_816	Plot dimensions	50x20	Orientation of middle	286
Easting 356479	Northing 6139471	IBRA region	Riverina	Photo #			
Plant Community Type		46				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	7
	Forbs	7
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	7.3
	Grasses etc.	47
	Forbs	0.7
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	30	25	10	5
Average of the 5 subplots	15				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Grey	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	0		
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	16/02/2023	Dinawan	DEH_W_816	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa aristiglumis	N	0.2	2	
GG	Austrostipa scabra	N	0.2	10	
	Avena fatua	E	0.1	5	
GG	Enteropogon acicularis	N	10		
GG	Eragrostis australasica	N	0.4	1	
FG	Goodenia pusilliflora	N	0.1	1	
FG	Leiocarpa panaetioides	N	0.1	1	
	Lolium rigidum	E	1		
SG	Maireana aphylla	N	7		
FG	Maireana pentagona	N	0.1	5	
FG	Rhodanthe corymbiflora	N	0.1	2	
GG	Rytidosperma caespitosum	N	1		
SG	Sclerolaena muricata var.	N	0.2	5	
SG	Sclerolaena stelligera	N	0.1	5	
FG	Sida corrugata	N	0.1	5	
GG	Sporobolus caroli	N	0.2	20	
FG	Teucrium racemosum	N	0.1	5	
FG	Vittadinia cuneata	N	0.1	3	
GG	Walwhalleya proluta	N	35		

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	16/02/2023	Dinewan		Moderate	MGP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_817	Plot dimensions	50x20	Orientation of middle	32
Easting 362855	Northing 6137350	IBRA region	Riverina	Photo #			
Plant Community Type		46				EEC: Yes	Confidence M

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	5
	Grasses etc.	11
	Forbs	6
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	3.7
	Grasses etc.	61.8
	Forbs	1.8
	Ferns	0.1
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	3	20	15	5	2
Average of the 5 subplots	9				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay loam
Soil Colour	Grey	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	16/02/2023	Dinewan	DEH_W_817	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa bigeniculata	N	0.2	10	
GG	Austrostipa nodosa	N	10		
GG	Austrostipa scabra	N	4		
	Avena fatua	E	0.2	20	
FG	Calotis scabiosifolia	N	1		
GG	Chloris truncata	N	0.2	30	
SG	Duma florulenta	N	0.5	1	
GG	Eleocharis pallens	N	0.2	30	
GG	Enteropogon acicularis	N	15		
FG	Leucochrysum molle	N	0.4	50	
	Lolium rigidum	E	3		
SG	Maireana aphylla	N	2		
SG	Maireana decalvans	N	0.1	10	
SG	Maireana excavata	N	0.1	5	
FG	Maireana pentagona	N	0.1	10	
EG	Marsilea drummondii	N	0.1	100	
GG	Rytidosperma caespitosum	N	1		
GG	Rytidosperma duttonianum	N	1		
SG	Sclerolaena muricata var.	N	1		
FG	Solanum esuriale	N	0.1	20	
GG	Sporobolus caroli	N	0.1	20	
FG	Teucrium racemosum	N	0.1	10	
GG	Tragus australianus	N	0.1	2	
FG	Vittadinia cuneata	N	0.1	5	
GG	Walwhalleya proluta	N	30		
	Xanthium spinosum	HTE	0.1	2	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	16/02/2023	Dinawan		Sparse	MGP and KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_818	Plot dimensions	50x20	Orientation of middle	290
Easting 364002	Northing 6140585	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Weeping myall	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	7
	Grasses etc.	5
	Forbs	5
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	6.1
	Shrubs	3.9
	Grasses etc.	13.1
	Forbs	0.9
	Ferns	0.1
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	1
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	12
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	10	10	5	5
Average of the 5 subplots	9				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Nil	Soil Surface Texture	Red brown compacted
Soil Colour	Red to light brown	Site Drainage	Nil	Distance to nearest water	Unk

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	1	NR	
Fire damage			
Storm damage			
Weediness			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	16/02/2023	Dinawan	DEH_W_818	MGP and KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia oswaldii	N	0.1	1	
TG	Acacia pendula	N	6	1	
SG	Atriplex semibaccata	N	1		
GG	Austrostipa scabra	N	5		
FG	Einadia nutans	N	0.5	20	
SG	Enchylaena tomentosa	N	0.1		
GG	Enteropogon acicularis	N	5		
GG	Juncus spp.	N	0.1	10	
SG	Maireana decalvans	N	0.5		
EG	Marsilea drummondii	N	0.1	10	
SG	Rhagodia spinescens	N	2		
GG	Rytidosperma caespitosum	N	2		
SG	Salsola tragus	N	0.1	10	
SG	Sclerolaena muricata	N	0.1	1	
SG	Sclerolaena stelligera	N	0.1	10	
FG	Sida corrugata	N	0.1	10	
FG	Solanum coactiliferum	N	0.1		
FG	Teucrium racemosum	N	0.1	1	
FG	Vittadinia cuneata	N	0.1	1	
GG	Walwhalleya proluta	N	1		

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	17/02/2023	Dinawan		Intact	MGP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_819	Plot dimensions	50x20	Orientation of middle	212
Easting 380768	Northing 6117093	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Yes	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	2
	Grasses etc.	9
	Forbs	10
	Ferns	0
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	20
	Shrubs	2.1
	Grasses etc.	26.4
	Forbs	1.1
	Ferns	0
	Other	0.1
High Threat Weed cover		0.1

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	1
Length of logs (m)	2
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	15	10	3	30	50
Average of the 5 subplots	21.6				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay
Soil Colour	Red brown	Site Drainage	0	Distance to nearest water	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	NR	
Cultivation (inc. pasture)	0		
Soil erosion	0		
Firewood/CWD removal	0		
Grazing (identify native/livestock	1	R	
Fire damage	0		
Storm damage	0		
Weediness	1		
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	17/02/2023	Dinawan	DEH_W_819	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	20		
SG	Atriplex semibaccata	N	0.1	2	
GG	Austrostipa aristiglumis	N	1		
GG	Austrostipa bigeniculata	N	10		
GG	Austrostipa nodosa	N	2		
GG	Austrostipa scabra	N	2		
FG	Calocephalus sonderi	N	0.1	1	
OG	Convolvulus spp.	N	0.1	20	
GG	Enteropogon acicularis	N	10		
FG	Euphorbia drummondii	N	0.1	10	
	Heliotropium europaeum	E	0.1	30	
GG	Juncus spp.	N	0.1	5	
FG	Maireana pentagona	N	0.1	10	
FG	Oxalis perennans	N	0.1	3	
FG	Ptilotus semilanatus	N	0.1	10	
GG	Rytidosperma caespitosum	N	0.2	20	
GG	Rytidosperma setaceum	N	0.1	10	
SG	Sclerolaena muricata var.	N	2		
FG	Sida corrugata	N	0.2	70	
FG	Solanum coactiliferum	N	0.1	2	
FG	Solanum esuriale	N	0.1	10	
FG	Teucrium racemosum	N	0.1	20	
FG	Vittadinia cuneata	N	0.1	4	
GG	Walwhalleya proluta	N	1		
	Xanthium spinosum	HTE	0.1	3	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	17/02/2023	Dinewan		Sparse	MGP KK		
Zone 55	Datum GDA94	Plot ID	DEH_W_820	Plot dimensions	50x20	Orientation of middle	260
Easting 381861	Northing 6117368	IBRA region	Riverina	Photo #			
Plant Community Type		26				EEC: Myall	Confidence H

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	2
	Grasses etc.	7
	Forbs	4
	Ferns	0
	Other	1
Sum of Cover of native vascular plans by growth form group	Trees	0.5
	Shrubs	0.7
	Grasses etc.	10.3
	Forbs	0.4
	Ferns	0
	Other	0.1
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	1
Length of logs (m)	3
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	2	5	2	5	5
Average of the 5 subplots	3.8				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	Nil	Soil Surface Texture	Compacted red clay loam
Soil Colour	Red	Site Drainage	Nil	Distance to nearest water	Unk

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	1	O	
Cultivation (inc. pasture)			
Soil erosion	1	R	
Firewood/CWD removal			
Grazing (identify native/livestock	1	R	
Fire damage			
Storm damage			
Weediness	1	R	
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	17/02/2023	Dinewan	DEH_W_820	MGP KK

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	0.5	4	
GG	Austrostipa bigeniculata	N	0.1	5	
GG	Austrostipa nodosa	N	0.5	50	
GG	Austrostipa scabra	N	5		
FG	Calocephalus sonderi	N	0.1	1	
GG	Chloris truncata	N	0.5	50	
OG	Convolvulus spp.	N	0.1	5	
GG	Juncus spp.	N	0.2	40	
SG	Maireana excavata	N	0.5	50	
FG	Maireana pentagona	N	0.1	5	
FG	Ptilotus semilanatus	N	0.1	2	
GG	Rytidosperma caespitosum	N	2		
GG	Rytidosperma duttonianum	N	2		
SG	Sclerolaena muricata	N	0.2		
FG	Sida corrugata	N	0.1	20	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	20/11/2023	Dinawan		Intact	NL & DM			
Zone 55	Datum GDA94	Plot ID	DEH_W_900	Plot dimensions	50x20	Orientation of middle	40	
Easting 359266	Northing 6141778	IBRA region	Riverina	Photo #				
Plant Community Type		26				EEC: None	Confidence M	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	7
	Grasses etc.	7
	Forbs	8
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	7
	Shrubs	22.5
	Grasses etc.	34.1
	Forbs	1.7
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	# Tree Stems Count
DBH	
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	1
5 - 9 cm	1
< 5 cm	0
Length of logs (m)	1
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	5	15	10	20	10
Average of the 5 subplots	12				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay loam
Soil Colour	Red brown	Site Drainage	Moderate	Distance to nearest water	300 metres

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	2	R	
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	20/11/2023	Dinawan	DEH_W_900	NL & DM

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
TG	Acacia pendula	N	7	3	
SG	Atriplex leptocarpa	N	0.1	10	
SG	Atriplex semibaccata	N	0.1	1	
GG	Austrostipa scabra	N	1	200	
	Avena spp.	E	0.1	1	
FG	Calotis hispidula	N	0.5	100	
FG	Calotis scabiosifolia	N	0.2	100	
GG	Chloris truncata	N	0.1	1	
FG	Einadia nutans	N	0.1	10	
SG	Enchylaena tomentosa	N	0.1	1	
GG	Enteropogon acicularis	N	2	100	
FG	Leiocarpa brevicompta	N	0.1	1	
FG	Leiocarpa panaetioides	N	0.1	10	
	Lolium rigidum	E	0.5	200	
SG	Maireana aphylla	N	15	100	
FG	Maireana pentagona	N	0.1	1	
SG	Rhagodia spinescens	N	7	20	
GG	Rytidosperma caespitosum	N	3	300	
GG	Rytidosperma setaceum	N	4	700	
SG	Salsola tragus	N	0.1	1	
SG	Sclerolaena muricata var.	N	0.1	1	
FG	Sida cunninghamii	N	0.5	100	
GG	Sporobolus caroli	N	4	600	
FG	Vittadinia cuneata	N	0.1	1	
	Vulpia bromoides	E	0.1	50	
GG	Walwhalleya proluta	N	20	1000	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	20/11/2023	Dinawan		Moderate	DM & NL			
Zone 55	Datum GDA94	Plot ID	DEH_W_901	Plot dimensions	50x20	Orientation of middle	320	
Easting 355957	Northing 6139996	IBRA region	Riverina	Photo #				
Plant Community Type		160				EEC: None	Confidence M	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	5
	Forbs	3
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	5.2
	Grasses etc.	25.7
	Forbs	0.3
	Ferns	0.1
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	0	0	5	0	0
Average of the 5 subplots	1				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay loam
Soil Colour	Brown	Site Drainage	Poor	Distance to nearest water	1.3 km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	2	R	
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	20/11/2023	Dinawan	DEH_W_901	DM & NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.1	1	
FG	Brachyscome spp.	N	0.1	1	
SG	Chenopodium nitrariaceum	N	5	20	
SG	Duma florulenta	N	0.1	1	
GG	Eleocharis pallens	N	15	500	
GG	Enteropogon acicularis	N	0.1	1	
GG	Eragrostis australasica	N	0.5	40	
GG	Juncus spp.	N	0.1	1	
FG	Leiocarpa brevicompta	N	0.1	1	
	Lolium rigidum	E	0.2	100	
SG	Maireana aphylla	N	0.1	1	
EG	Marsilea drummondii	N	0.1	1	
	Vulpia bromoides	E	0.1	1	
GG	Walwhalleya proluta	N	10	300	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	21/11/2023	Dinawan		Mod_Good	DM & NL		
Zone 55	Datum GDA94	Plot ID	DEH_W_902	Plot dimensions	50x20	Orientation of middle	270
Easting 355131	Northing 6139356	IBRA region	Riverina	Photo #			
Plant Community Type		160				EEC: None	Confidence L

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	4
	Forbs	4
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	17.1
	Grasses etc.	53.1
	Forbs	0.4
	Ferns	0.1
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	0	5	0	5	0
Average of the 5 subplots	2				

Notes	Unsure of PCT. Mapped as 26. Unlikely to be 26 though.

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Clay loam
Soil Colour	Brown	Site Drainage	Moderate	Distance to nearest water	2.1km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	2	R	
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	21/11/2023	Dinawan	DEH_W_902	DM & NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.1	1	
	Avena spp.	E	0.1	1	
SG	Chenopodium nitrariaceum	N	10	10	
SG	Duma florulenta	N	7	30	
GG	Enteropogon acicularis	N	1	100	
GG	Eragrostis australasica	N	2	30	
FG	Euphorbia drummondii	N	0.1	1	
GG	Juncus spp.	N	0.1	1	
FG	Leiocarpa spp.	N	0.1	1	
	Lolium rigidum	E	1	100	
EG	Marsilea drummondii	N	0.1	100	
SG	Sclerolaena muricata var. villosa	N	0.1	1	
FG	Solanum esuriale	N	0.1	1	
GG	Walwhalleya proluta	N	50	2000	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	21/11/2023	Dinawan		Low	DM & NL		
Zone 55	Datum GDA94	Plot ID	DEH_W_903	Plot dimensions	50x20	Orientation of middle	230
Easting 358131	Northing 6130642	IBRA region	Riverina	Photo #			
Plant Community Type		28				EEC: None	Confidence L

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	1
	Grasses etc.	3
	Forbs	4
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0.1
	Shrubs	0.1
	Grasses etc.	31.5
	Forbs	0.9
	Ferns	0
	Other	0
High Threat Weed cover		0.4

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	10	10	5	10	15
Average of the 5 subplots	10				

Notes	White cypress western rosewood sparse canopy, Nida Goosefoot. PCT mapping hasnt been done

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Sandy loam
Soil Colour	Yellow brown	Site Drainage	Moderate	Distance to nearest water	1.1km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	2	R	
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	21/11/2023	Dinawan	DEH_W_903	DM & NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa scabra	N	1	100	
	Avena spp.	E	2	100	
FG	Boerhavia dominii	N	0.1	1	
FG	Boerhavia repleta	N	0.1	1	
TG	Callitris glaucophylla	N	0.1	1	
	Echium plantagineum	E	0.1	1	
GG	Enteropogon acicularis	N	30	1000	
	Hordeum spp.	E	0.1	1	
	Lepidium africanum	E	0.1	1	
	Lolium rigidum	E	0.1	1	
	Lycium ferocissimum	HTE	0.4	3	
	Medicago truncatula	E	5	500	
GG	Rytidosperma caespitosum	N	0.5	100	
SG	Sclerolaena muricata var.	N	0.1	1	
FG	Sida corrugata	N	0.5	100	
FG	Solanum esuriale	N	0.2	100	
	Sonchus oleraceus	E	0.1	100	
	Trifolium arvense	E	15	1000	
	Vulpia bromoides	E	15	1000	
	Vulpia myuros	E	5	700	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	21/11/2023	Dinawan		Moderate	NL & DM			
Zone 55	Datum GDA94	Plot ID	DEH_W_904	Plot dimensions	50x20	Orientation of middle	10	
Easting 358641	Northing 6125950	IBRA region	Riverina	Photo #				
Plant Community Type		10				EEC: None	Confidence M	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	5
	Grasses etc.	4
	Forbs	5
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	15
	Shrubs	1.8
	Grasses etc.	5.7
	Forbs	2.6
	Ferns	0
	Other	0
High Threat Weed cover		1.1

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	2
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	3
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	40	30	30	30	20
Average of the 5 subplots	30				

Notes	

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	1 degree WSW aspect	Soil Surface Texture	Sandy loam
Soil Colour	Red brown	Site Drainage	Moderate	Distance to nearest water	1.6km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	2	R	
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	21/11/2023	Dinawan	DEH_W_904	NL & DM

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
SG	Atriplex semibaccata	N	0.5	20	
GG	Austrostipa nodosa	N	0.1	10	
GG	Austrostipa scabra	N	0.5	100	
FG	Boerhavia dominii	N	0.1	10	
TG	Callitris glaucophylla	N	15	1	
	Echium plantagineum	E	0.1	10	
FG	Einadia nutans	N	0.2	3	
GG	Enteropogon acicularis	N	5	300	
	Heliotropium europaeum	E	0.2	100	
	Hordeum spp.	E	7	1000	
	Lolium rigidum	E	4	800	
	Lycium ferocissimum	HTE	1	10	
	Malva parviflora	E	0.1	1	
	Marrubium vulgare	E	1	10	
	Medicago truncatula	E	0.1	1	
FG	Oxalis perennans	N	0.1	10	
SG	Rhagodia spinescens	N	0.1	1	
SG	Salsola tragus	N	0.1	1	
SG	Sclerolaena birchii	N	0.1	4	
SG	Sclerolaena muricata var.	N	1	8	
FG	Sida corrugata	N	2	300	
	Sisymbrium spp.	E	0.1	1	
FG	Solanum esuriale	N	0.2	100	
GG	Sporobolus caroli	N	0.1	1	
	Tribulus terrestris	E	0.1	1	
	Trifolium arvense	E	1	300	
	Vulpia bromoides	E	5	1000	
	Xanthium spinosum	HTE	0.1	1	

BAM Plot Data Sheet							Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders		
Date	21/11/2023	Dinawan		Low	DM & NL		
Zone 55	Datum GDA94	Plot ID	DEH_W_905	Plot dimensions	50x20	Orientation of middle	260
Easting 357939	Northing 6126527	IBRA region	Riverina	Photo #			
Plant Community Type		28				EEC: None	Confidence M

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	4
	Forbs	6
	Ferns	0
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	0
	Shrubs	1.2
	Grasses etc.	9.2
	Forbs	12.9
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	0
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	0
No. trees with hollows	0

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	20	10	10	30	10
Average of the 5 subplots	16				

Notes	Pine and myall

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Sandy loam
Soil Colour	Red brown	Site Drainage	Moderate	Distance to nearest water	1.2km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)	2	O	
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	2	R	
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	21/11/2023	Dinawan	DEH_W_905	DM & NL

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
GG	Austrostipa nodosa	N	0.2	30	
GG	Austrostipa scabra	N	1	100	
	Avena spp.	E	8	1000	
FG	Boerhavia dominii	N	0.5	200	
	Echium plantagineum	E	0.1	1	
GG	Enteropogon acicularis	N	6	300	
FG	Euphorbia drummondii	N	0.1	1	
	Heliotropium europaeum	E	0.5	200	
	Hordeum spp.	E	20	2000	
FG	Maireana enchylaenoides	N	0.1	1	
	Medicago truncatula	E	0.1	30	
SG	Rhagodia spinescens	N	0.1	1	
GG	Rytidosperma setaceum	N	2	200	
SG	Salsola tragus	N	0.1	5	
SG	Sclerolaena birchii	N	1	30	
FG	Sida corrugata	N	10	500	
FG	Sida cunninghamii	N	0.2	30	
FG	Solanum esuriale	N	2	500	
	Sonchus oleraceus	E	0.1	1	
	Trifolium arvense	E	4	200	
	Vulpia bromoides	E	15	1000	

BAM Plot Data Sheet								Site Sheet no:1 of 2
		Survey Name		Veg Zone ID	Recorders			
Date	21/11/2023	Dinawan		Moderate	NL & DM			
Zone 55	Datum GDA94	Plot ID	DEH_W_906	Plot dimensions	50x20	Orientation of middle	60	
Easting 357292	Northing 6127374	IBRA region	Riverina	Photo #				
Plant Community Type		10				EEC: None	Confidence M	

BAM Attribute (400m2 plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	5
	Grasses etc.	3
	Forbs	3
	Ferns	1
	Other	0
Sum of Cover of native vascular plans by growth form group	Trees	10
	Shrubs	31.2
	Grasses etc.	13.1
	Forbs	0.7
	Ferns	0.1
	Other	0
High Threat Weed cover		0

BAM Attribute (1000m2 plot)	
DBH	# Tree Stems Count
80+ cm	1
50 - 79 cm	0
30 - 49 cm	0
20 - 29cm	0
10 - 19 cm	0
5 - 9 cm	0
< 5 cm	0
Length of logs (m)	20
No. trees with hollows	2

BAM Attibute (1 x 1m plots)	Litter cover (%)				
Subplot score (% in each)	50	15	10	20	25
Average of the 5 subplots	24				

Notes	Confirm PCT. River rRed woodland wetland. Nitre goosefoot dominating understory with Lignum

Physiography + site features that may help in determining PCT and Management Zone

Landform Pattern		Slope	0	Soil Surface Texture	Sandy loam
Soil Colour	Dull brown	Site Drainage	Moderate	Distance to nearest water	1.9km

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood/CWD removal			
Grazing (identify native/livestock	2	R	
Fire damage			
Storm damage			
Weediness			
Other			

400 m2 plot: Sheet 2 of 2		**Survey Name**	**Plot ID**	**Recorders**
Date	21/11/2023	Dinawan	DEH_W_906	NL & DM

GF Code	Genus species	N,E or HTE	Cover	Abund	Stratum
FG	Alternanthera denticulata	N	0.5	100	
SG	Atriplex leptocarpa	N	0.1	1	
SG	Atriplex semibaccata	N	1	100	
GG	Carex inversa	N	8	700	
SG	Chenopodium nitrariaceum	N	25	50	
SG	Duma florulenta	N	5	40	
	Echium plantagineum	E	0.5	50	
FG	Einadia nutans	N	0.1	8	
TG	Eucalyptus camaldulensis	N	10	2	
	Hordeum spp.	E	4	500	
GG	Juncus flavidus	N	5	700	
	Lepidium africanum	E	0.2	100	
	Lolium rigidum	E	0.1	1	
	Marrubium vulgare	E	0.1	1	
EG	Marsilea drummondii	N	0.1	100	
FG	Rumex brownii	N	0.1	10	
SG	Salsola tragus	N	0.1	1	
	Sisymbrium spp.	E	1	500	
	Sonchus oleraceus	E	0.1	1	
	Trifolium arvense	E	0.5	100	
GG	Tripogon loliiformis	N	0.1	1	
	Vulpia bromoides	E	3	400	
	Vulpia myuros	E	0.1	40	

Appendix 4. Fauna

Table A 5: Fauna species recorded at the subject land

Common name	Scientific name
Mammals	
Cat	*Felis catus*
Brown Hare	*Lepus capensis*
Eastern Grey Kangaroo	*Macropus giganteus*
Red Kangaroo	*Macropus rufus*
House Mouse	*Mus musculus*
Rabbit	*Oryctolagus cuniculus*
Fox	*Vulpes vulpes*
Birds	
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*
Yellow Thornbill	*Acanthiza nana*
Buff-rumped Thornbill	*Acanthiza reguloides*
Chestnut-rumped Thornbill	*Acanthiza uropygialis*
Brown Goshawk	*Accipiter fasciatus*
Common Myna	*Acridotheres tristis*
Common Myna	*Acridotheres tristis*
Australian Owlet-nightjar	*Aegotheles cristatus*
Eurasian Skylark	*Alauda arvensis*
Chestnut Teal	*Anas castanea*
Grey Teal	*Anas gracilis*
Pacific Black Duck	*Anas superciliosa*
Red Wattlebird	*Anthochaera carunculata*
Australasian Pipit	*Anthus novaeseelandiae*
Southern Whiteface	*Aphelocephala leucopsis*
Fork-tailed Swift	*Apus pacificus*
Wedge-tailed Eagle	*Aquila audax*
Great Egret	*Ardea alba*
Intermediate Egret	*Ardea intermedia*
White-necked Heron	*Ardea pacifica*
Black-faced Woodswallow	*Artamus cinereus*
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*

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Common name	Scientific name
Masked Woodswallow	*Artamus personatus*
White-browed Woodswallow	*Artamus superciliosus*
Hardhead	*Aythya australis*
Australian Ringneck	*Barnardius zonarius*
Mallee Ringneck	*Barnardius zonarius barnardi*
Sulphur-crested Cockatoo	*Cacatua galerita*
Little Corella	*Cacatua sanguinea*
Pallid Cuckoo	*Cacomantis pallidus*
Pallid Cuckoo	*Cacomantis pallidus*
Australian Wood Duck	*Chenonetta jubata*
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*
Brown Songlark	*Cincloramphus cruralis*
Rufous Songlark	*Cincloramphus mathewsi*
Swamp Harrier	*Circus approximans*
Spotted Harrier	*Circus assimilis*
Grey Shrike-thrush	*Colluricincla harmonica*
Ground Cuckoo-shrike	*Coracina maxima*
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*
White-winged Chough	*Corcorax melanorhamphos*
Australian Raven	*Corvus coronoides*
Little Raven	*Corvus mellori*
Stubble Quail	*Coturnix pectoralis*
Pied Butcherbird	*Cracticus nigrogularis*
Grey Butcherbird	*Cracticus torquatus*
Black Swan	*Cygnus atratus*
Laughing Kookaburra	*Dacelo novaeguineae*
Plumed Whistling-Duck	*Dendrocygna eytoni*
Mistletoebird	*Dicaeum hirundinaceum*
Emu	*Dromaius novaehollandiae*
Little Egret	*Egretta garzetta*
White-faced Heron	*Egretta novaehollandiae*
Black-shouldered Kite	*Elanus axillaris*
Black-fronted Dotterel	*Elseyornis melanops*
Blue-faced Honeyeater	*Entomyzon cyanotis*
Galah	*Eolophus roseicapilla*
White-fronted Chat	*Epthianura albifrons*

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Common name	Scientific name
Crimson Chat	*Epthianura tricolor*
Brown Falcon	*Falco berigora*
Nankeen Kestrel	*Falco cenchroides*
Nankeen Kestrel	*Falco cenchroides cenchroides*
Australian Hobby	*Falco longipennis*
Black Falcon	*Falco subniger*
Singing Honeyeater	*Gavicalis virescens*
Gull-billed Tern	*Gelochelidon nilotica*
Peaceful Dove	*Geopelia placida*
Western Gerygone	*Gerygone fusca*
Magpie-lark	*Grallina cyanoleuca*
Painted Honeyeater	*Grantiella picta*
Australian Magpie	*Gymnorhina tibicen*
Australian Magpie	*Gymnorhina tibicen*
Whistling Kite	*Haliastur sphenurus*
Black-winged Stilt	*Himantopus himantopus*
Welcome Swallow	*Hirundo neoxena*
White-winged Triller	*Lalage sueurii*
Square-tailed Kite	*Lophoictinia isura*
Pink-eared Duck	*Malacorhynchus membranaceus*
Superb Fairy-wren	*Malurus cyaneus*
White-winged Fairy-wren	*Malurus leucopterus*
Yellow-throated Miner	*Manorina flavigula*
Noisy Miner	*Manorina melanocephala*
Brown-headed Honeyeater	*Melithreptus brevirostris*
Budgerigar	*Melopsittacus undulatus*
Rainbow Bee-eater	*Merops ornatus*
Little Pied Cormorant	*Microcarbo melanoleucos*
Jacky Winter	*Microeca fascinans*
Black Kite	*Milvus migrans*
Singing Bushlark	*Mirafra javanica*
Restless Flycatcher	*Myiagra inquieta*
Southern Boobook	*Ninox novaeseelandiae*
Blue Bonnet	*Northiella haematogaster*
Nankeen Night Heron	*Nycticorax caledonicus*
Cockatiel	*Nymphicus hollandicus*

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Common name	Scientific name
Crested Pigeon	*Ocyphaps lophotes*
Rufous Whistler	*Pachycephala rufiventris*
Striated Pardalote	*Pardalotus striatus*
House Sparrow	*Passer domesticus*
Plains-wanderer	*Pedionomus torquatus*
Australian Pelican	*Pelecanus conspicillatus*
Fairy Martin	*Petrochelidon ariel*
Tree Martin	*Petrochelidon nigricans*
Red-capped Robin	*Petroica goodenovii*
Little Black Cormorant	*Phalacrocorax sulcirostris*
Pied Cormorant	*Phalacrocorax varius*
Common Bronzewing	*Phaps chalcoptera*
Yellow-billed Spoonbill	*Platalea flavipes*
Royal Spoonbill	*Platalea regia*
Crimson Rosella	*Platycercus elegans*
Eastern Rosella	*Platycercus eximius*
Striped Honeyeater	*Plectorhyncha lanceolata*
Glossy Ibis	*Plegadis falcinellus*
Tawny Frogmouth	*Podargus strigoides*
Hoary-headed Grebe	*Poliocephalus poliocephalus*
Superb Parrot	*Polytelis swainsonii*
Grey-crowned Babbler eastern subspecies	*Pomatostomus temporalis temporalis*
Little Grassbird	*Poodytes gramineus*
Little Grassbird	*Poodytes gramineus*
Purple Swamphen	*Porphyrio porphyrio*
Australian Spotted Crake	*Porzana fluminea*
Red-rumped Parrot	*Psephotus haematonotus*
Mulga Parrot	*Psephotus varius*
Fuscous Honeyeater	*Ptilotula fusca*
Yellow-plumed Honeyeater	*Ptilotula ornata*
White-plumed Honeyeater	*Ptilotula penicillata*
White-fronted Honeyeater	*Purnella albifrons*
Grey Fantail	*Rhipidura albiscapa*
Willie Wagtail	*Rhipidura leucophrys*
Yellow-throated Scrubwren	*Sericornis citreogularis*
Weebill	*Smicrornis brevirostris*

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Common name	Scientific name
Diamond Firetail	*Stagonopleura guttata*
Pied Currawong	*Strepera graculina*
Apostlebird	*Struthidea cinerea*
Common Starling	*Sturnus vulgaris*
Black Honeyeater	*Sugomel nigrum*
Australasian Grebe	*Tachybaptus novaehollandiae*
Zebra Finch	*Taeniopygia guttata*
Australian White Ibis	*Threskiornis molucca*
Straw-necked Ibis	*Threskiornis spinicollis*
Sacred Kingfisher	*Todiramphus sanctus*
Black-tailed Native-hen	*Tribonyx ventralis*
Rainbow Lorikeet	*Trichoglossus haematodus*
Common Blackbird	*Turdus merula*
Masked Lapwing	*Vanellus miles*
Banded Lapwing	*Vanellus tricolor*
Reptiles	
Patternless Delma	*Delma inornata*
Bearded Dragon	*Pogona barbata*
Central Bearded Dragon	*Pogona vitticeps*
Eastern Brown Snake	*Pseudonaja textilis*
Shingle-back	*Tiliqua rugosa*
Eastern Blue-tongue lizard	*Tiliqua scincoides*
Gould's Goanna	*Varanus gouldii*
Lace Monitor	*Varanus varius*
Frogs	
Eastern Sign-bearing Froglet	*Crinia parinsignifera*
Eastern Banjo Frog	*Limnodynastes dumerilii*
Spotted Grass Frog	*Limnodynastes tasmaniensis*
Peron's Tree Frog	*Litoria peronii*
Southern Bell Frog	*Litoria raniformis*
Sudell's Frog	*Neobatrachus sudelli*
Crucifix Frog	*Notaden bennettii*
Fish	
Carp	*Cyprinus carpio*
Mosquito Fish	*Gambusia holbrooki*

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Table A 5: Bird species recorded at BUS points

Species	Status	CTL1	CTL2	CTL3	CTL4	CTL6	CTL7	CTL8	CTL9	CTL10	CTL11	CTL12	IMP1	IMP2	IMP3/ 18	IMP4	IMP5/ 19	IMP6	IMP7	IMP9	IMP10	IMP 11	IMP13	IMP 15	IMP1 6	IMP2 0	IMP21	IMP2 2
Apostlebird ***Struthidea cinerea***	Not Listed	N	Y	Y	Y	Y	Y	Y	N	N	Y	N	N	Y	Y	N	Y	N	Y	Y	N	N	N	Y	Y	Y	Y	Y
Australasian Grebe ***Tachybaptus novaehollandiae***	Not Listed	Y	N	N	N	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N
Australasian Pipit ***Anthus novaeseelandiae***	Not Listed	Y	Y	N	N	Y	N	Y	Y	Y	N	N	N	Y	N	Y	N	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y
Australian Hobby ***Falco longipennis***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	Y	N	N	N
Australian Magpie ***Gymnorhina tibicen***	Not Listed	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Australian Pelican ***Pelecanus conspicillatus***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Australian Raven ***Corvus coronoides***	Not Listed	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Australian Ringneck ***Barnardius zonarius***	Not Listed	Y	Y	Y	N	Y	Y	Y	N	N	Y	N	N	N	Y	N	Y	Y	Y	Y	N	Y	N	Y	Y	Y	N	Y
Australian White Ibis ***Threskiornis molucca***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Australian Wood Duck ***Chenonetta jubata***	Not Listed	Y	Y	N	N	N	N	Y	N	N	Y	N	N	N	Y	Y	N	Y	N	N	Y	N	N	N	Y	N	N	N
Banded Lapwing ***Vanellus tricolor***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N
Black Falcon ***Falco subniger***	Vulnerable, BC Act	N	N	N	N	Y	Y	Y	Y	N	N	N	N	N	N	N	Y	N	N	N	N	N	Y	N	Y	N	Y	N
Black Honeyeater ***Sugomel nigrum***	Not Listed	N	N	N	N	Y	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Black Kite ***Milvus migrans***	Not Listed	Y	Y	N	N	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y
Black Swan ***Cygnus atratus***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N
Black-faced Cuckoo-shrike ***Coracina novaehollandiae***	Not Listed	Y	Y	Y	N	Y	N	Y	Y	N	Y	Y	N	N	Y	Y	Y	N	N	N	Y	N	Y	Y	Y	Y	Y	Y
Black-faced Woodswallow ***Artamus cinereus***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	Y	N	Y	N	N
Black-fronted Dotterel ***Elseyornis melanops***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N
Black-shouldered Kite ***Elanus axillaris***	Not Listed	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

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Species	Status	CTL1	CTL2	CTL3	CTL4	CTL6	CTL7	CTL8	CTL9	CTL10	CTL11	CTL12	IMP1	IMP2	IMP3/ 18	IMP4	IMP5/ 19	IMP6	IMP7	IMP9	IMP10	IMP 11	IMP13	IMP 15	IMP1 6	IMP2 0	IMP21	IMP2 2
Black-tailed Native-hen ***Tribonyx ventralis***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	Y	N	N	N
Blue Bonnet ***Northiella haematogaster***	Not Listed	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Blue-faced Honeyeater ***Entomyzon cyanotis***	Not Listed	N	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y
Brown Falcon ***Falco berigora***	Not Listed	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
Brown Goshawk ***Accipiter fasciatus***	Not Listed	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Brown Songlark ***Cincloramphus cruralis***	Not Listed	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N
Brown-headed Honeyeater ***Melithreptus brevirostris***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N
Buff-rumped Thornbill ***Acanthiza reguloides***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N
Chestnut Teal ***Anas castanea***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Chestnut-rumped Thornbill ***Acanthiza uropygialis***	Not Listed	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	N	N	N
Cockatiel ***Nymphicus hollandicus***	Not Listed	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Common Bronzewing ***Phaps chalcoptera***	Not Listed	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N
Common Myna ***Acridotheres tristis***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Common Starling ***Sturnus vulgaris***	Not Listed	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Crested Pigeon ***Ocyphaps lophotes***	Not Listed	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Crimson Chat ***Epthianura tricolor***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N
Crimson Rosella ***Platycercus elegans***	Not Listed	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Eastern Rosella ***Platycercus eximius***	Not Listed	N	Y	Y	N	N	Y	N	N	N	N	N	N	N	Y	Y	N	N	Y	N	N	N	N	N	Y	N	N	N
Emu ***Dromaius novaehollandiae***	Not Listed	N	N	N	N	Y	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	Y	N	N	N
Eurasian Skylark ***Alauda arvensis***	Not Listed	N	N	N	N	N	N	N	Y	N	N	N	Y	Y	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N

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Species	Status	CTL1	CTL2	CTL3	CTL4	CTL6	CTL7	CTL8	CTL9	CTL10	CTL11	CTL12	IMP1	IMP2	IMP3/18	IMP4	IMP5/19	IMP6	IMP7	IMP9	IMP10	IMP11	IMP13	IMP15	IMP16	IMP20	IMP21	IMP22
Fairy Martin ***Petrochelidon ariel***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N
Galah ***Eolophus roseicapilla***	Not Listed	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Glossy Ibis ***Plegadis falcinellus***	Not Listed	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Great Egret ***Ardea alba***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Grey Butcherbird ***Cracticus torquatus***	Not Listed	Y	Y	Y	N	N	N	Y	N	N	Y	Y	N	N	Y	N	N	N	N	N	Y	Y	N	N	N	Y	N	Y
Grey Fantail ***Rhipidura albiscapa***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	Y	Y	N	N
Grey Shrike-thrush ***Colluricincla harmonica***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N
Grey Teal ***Anas gracilis***	Not Listed	Y	Y	N	N	N	N	Y	N	N	N	N	Y	N	N	N	N	N	N	Y	Y	N	Y	N	Y	N	N	N
Grey-crowned Babbler ***Pomatostomus temporalis temporalis***	Vulnerable, BC Act	N	Y	Y	N	Y	Y	Y	Y	N	Y	Y	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ground Cuckoo-shrike ***Coracina maxima***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y
Gull-billed Tern ***Gelochelidon nilotica***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Hoary-headed Grebe ***Poliocephalus poliocephalus***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Horsfield's Bronze-Cuckoo ***Chrysococcyx basalis***	Not Listed	N	Y	N	N	N	N	N	N	N	Y	N	N	N	N	Y	Y	N	N	N	N	Y	Y	Y	N	N	N	N
House Sparrow ***Passer domesticus***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N
Intermediate Egret ***Ardea intermedia***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Jacky Winter ***Microeca fascinans***	Not Listed	Y	N	N	N	N	N	N	N	N	Y	N	N	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N
Laughing Kookaburra ***Dacelo novaeguineae***	Not Listed	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Little Black Cormorant ***Phalacrocorax sulcirostris***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Little Corella ***Cacatua sanguinea***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N

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Little Egret ***Egretta garzetta***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N
Little Grassbird ***Poodytes gramineus***	Not Listed	N	N	N	N	Y	N	N	Y	N	N	N	N	Y	N	N	N	N	Y	N	N	N	Y	N	N	N	N	N
Little Pied Cormorant ***Microcarbo melanoleucos***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N
Little Raven ***Corvus mellori***	Not Listed	Y	Y	Y	N	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	N	N	Y	N	N	N	Y	Y	Y
Magpie-lark ***Grallina cyanoleuca***	Not Listed	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y
Masked Lapwing ***Vanellus miles***	Not Listed	Y	N	N	N	N	N	Y	Y	N	N	N	N	N	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N
Masked Woodswallow ***Artamus personatus***	Not Listed	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
Mistletoebird ***Dicaeum hirundinaceum***	Not Listed	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Mulga Parrot ***Psephotus varius***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	Y	N	N	N	N	N	N	N	N	N
Nankeen Kestrel ***Falco cenchroides***	Not Listed	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Noisy Miner ***Manorina melanocephala***	Not Listed	Y	Y	Y	N	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pacific Black Duck ***Anas superciliosa***	Not Listed	Y	N	N	N	Y	N	N	N	Y	N	N	Y	N	N	Y	N	Y	Y	N	N	N	Y	Y	N	N	N	Y
Pallid Cuckoo ***Cacomantis pallidus***	Not Listed	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Peaceful Dove ***Geopelia placida***	Not Listed	N	Y	Y	N	Y	Y	Y	Y	Y	Y	N	N	N	Y	Y	N	N	N	N	N	N	N	Y	Y	Y	N	N
Pied Butcherbird ***Cracticus nigrogularis***	Not Listed	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Pied Cormorant ***Phalacrocorax varius***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N
Pied Currawong ***Strepera graculina***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	Y	N	N	N	N	N	N
Pink-eared Duck ***Malacorhynchus membranaceus***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Plumed Whistling-Duck ***Dendrocygna eytoni***	Not Listed	Y	N	N	N	Y	N	N	N	Y	N	N	N	Y	Y	N	N	Y	Y	N	N	N	N	N	Y	N	N	N
Rainbow Bee-eater ***Merops ornatus***	Not Listed	N	N	N	Y	N	N	Y	Y	N	Y	N	N	N	Y	Y	N	N	N	Y	N	N	Y	N	Y	Y	N	Y

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Rainbow Lorikeet ***Trichoglossus haematodus***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N
Red Wattlebird ***Anthochaera carunculata***	Not Listed	N	N	Y	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Red-capped Robin ***Petroica goodenovii***	Not Listed	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	Y	N	N	N	N	N	N	N	Y	N	N	N
Red-rumped Parrot ***Psephotus haematonotus***	Not Listed	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Restless Flycatcher ***Myiagra inquieta***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Rufous Songlark ***Cincloramphus mathewsi***	Not Listed	N	N	N	Y	N	N	N	Y	N	Y	N	N	N	N	N	N	Y	N	Y	N	N	N	N	Y	N	N	N
Rufous Whistler ***Pachycephala rufiventris***	Not Listed	N	N	N	N	N	N	Y	N	N	N	Y	N	N	Y	N	Y	N	N	N	N	N	N	N	Y	N	N	N
Singing Bushlark ***Mirafra javanica***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N
Singing Honeyeater ***Gavicalis virescens***	Not Listed	Y	Y	Y	N	Y	Y	N	Y	N	Y	N	N	N	Y	N	Y	N	Y	N	N	Y	N	N	Y	N	N	N
Southern Whiteface ***Aphelocephala leucopsis***	Vulnerable, EPBC Act and BC Act	Y	Y	N	Y	N	N	N	Y	Y	Y	Y	N	N	Y	Y	N	N	N	N	N	N	Y	N	Y	Y	Y	N
Spiny-cheeked Honeyeater ***Acanthagenys rufogularis***	Not Listed	N	N	N	N	N	N	N	Y	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	N	N	N	N	N
Spotted Harrier ***Circus assimilis***	Vulnerable, BC Act	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y	N	Y	N	Y	N	N	N	N	N	Y	N	N
Straw-necked Ibis ***Threskiornis spinicollis***	Not Listed	Y	Y	N	N	Y	N	Y	N	N	N	N	Y	N	N	N	N	Y	Y	N	Y	N	Y	N	Y	N	N	N
Striated Pardalote ***Pardalotus striatus***	Not Listed	N	Y	N	N	N	N	Y	N	N	Y	Y	N	N	Y	Y	N	N	N	N	N	N	Y	N	Y	N	N	N
Striped Honeyeater ***Plectorhyncha lanceolata***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Stubble Quail ***Coturnix pectoralis***	Not Listed	N	N	N	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	Y	N	N	N
Sulphur-crested Cockatoo ***Cacatua galerita***	Not Listed	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Superb Fairy-wren ***Malurus cyaneus***	Not Listed	Y	N	N	Y	N	N	Y	Y	Y	Y	N	N	N	Y	Y	N	N	Y	N	N	Y	N	N	Y	Y	N	N

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Superb Parrot ***Polytelis swainsonii***	Vulnerable, EPBC Act and BC Act	N	Y	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	Y
Swamp Harrier Circus ***approximans***	Not Listed	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Tree Martin ***Petrochelidon nigricans***	Not Listed	Y	N	N	N	N	N	Y	Y	Y	N	N	N	N	Y	Y	N	N	N	N	N	N	Y	N	Y	N	Y	Y
Wedge-tailed Eagle ***Aquila audax***	Not Listed	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Weebill ***Smicrornis brevirostris***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	Y	N	N	N
Welcome Swallow ***Hirundo neoxena***	Not Listed	Y	Y	Y	N	Y	N	Y	Y	Y	N	N	Y	N	Y	Y	N	Y	Y	Y	Y	N	Y	N	N	Y	N	N
Western Gerygone ***Gerygone fusca***	Not Listed	N	N	N	N	N	N	Y	N	N	N	Y	N	N	Y	N	N	N	N	N	N	N	N	N	Y	Y	N	N
Whistling Kite ***Haliastur sphenurus***	Not Listed	Y	N	N	N	N	N	Y	N	N	N	N	Y	N	N	N	Y	N	N	Y	Y	Y	Y	Y	N	N	N	N
White-faced Heron ***Egretta novaehollandiae***	Not Listed	Y	Y	N	N	Y	Y	Y	N	N	N	Y	Y	Y	N	Y	N	Y	Y	N	N	N	N	N	Y	N	Y	N
White-fronted Chat ***Epthianura albifrons***	Vulnerable, BC Act	Y	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	Y	N	N	N	N	Y	N	N	N	Y	N
White-fronted Honeyeater ***Purnella albifrons***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
White-necked Heron ***Ardea pacifica***	Not Listed	Y	N	N	N	Y	N	Y	N	Y	N	N	Y	N	Y	Y	N	Y	N	Y	N	N	N	N	Y	N	N	N
White-plumed Honeyeater ***Ptilotula penicillata***	Not Listed	Y	N	N	N	N	N	N	N	N	N	Y	N	N	Y	Y	N	N	N	N	N	N	N	N	N	N	N	Y
White-winged Chough ***Corcorax melanorhamphos***	Not Listed	N	Y	Y	N	N	Y	Y	N	N	Y	Y	N	N	Y	Y	N	N	Y	N	N	Y	N	N	Y	N	N	N
White-winged Fairy-wren ***Malurus leucopterus***	Not Listed	Y	N	N	N	N	N	N	Y	Y	N	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	N	Y	N	Y	Y
White-winged Triller ***Lalage sueurii***	Not Listed	N	N	N	N	N	N	N	N	N	Y	Y	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Willie Wagtail ***Rhipidura leucophrys***	Not Listed	Y	Y	N	N	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	N	Y	Y	Y	N
Yellow Thornbill ***Acanthiza nana***	Not Listed	N	N	N	N	Y	N	N	N	N	N	N	N	N	Y	Y	N	N	N	N	N	N	N	N	Y	N	N	N
Yellow-billed Spoonbill ***Platalea flavipes***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N

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Yellow-plumed Honeyeater ***Ptilotula ornata***	Not Listed	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N
Yellow-rumped Thornbill ***Acanthiza chrysorrhoa***	Not Listed	N	Y	N	N	N	N	N	Y	N	Y	N	N	N	Y	Y	N	N	N	N	N	N	N	N	Y	Y	N	N
Yellow-throated Miner ***Manorina flavigula***	Not Listed	Y	Y	Y	N	Y	Y	Y	Y	N	N	N	N	N	Y	Y	Y	N	Y	N	N	Y	N	Y	N	Y	Y	Y
Yellow-throated Scrubwren ***Sericornis citreogularis***	Not Listed	N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Zebra Finch ***Taeniopygia guttata***	Not Listed	Y	N	N	N	N	N	N	N	Y	N	N	Y	Y	N	Y	N	Y	N	N	N	N	Y	N	N	Y	Y	N

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Appendix 5. SAII

Appendix 5.1. Plains Wanderer *Pedionomus torquatus*

Information required (BAM Section 9.1.2)	Response
1. Impacts to the species and the action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII.	
-	Plains Wanderer *Pedionomus torquatus* is listed under Principle 1 in TBDC. Listed has having a population reduction of >80% in 10 years or three generations. Surveys for Plains Wanderer were conducted in November 2022 (habitat assessment), and nocturnal surveys in March and April 2023, all well as opportunistically through all survey periods. Detailed habitat assessment was undertaken, as well nocturnal surveys and acoustic detection. One individual was recorded in the western portion of the site incidentally in Spring 2024, within PCT 46, adjacent to PCT 26 DNG and within 200m of an Important mapped area. A 300m buffer avoidance area was enforced based around the likely home range of this individual of up to 18 hectares. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat, were avoided as much as possible, see Section 7. Specifically, due to cryptic nature of this species and critically endangered listing, avoidance of suitable habitat and mapped important areas were incorporated early into project designs. Due to the dynamic nature of natural and derived grasslands, other areas of the subject land may provide habitat for Plains Wanderer at certain times pending fluctuating long term environmental conditions. Approximately 11.8 ha of important mapped area occurs within the development corridor, and 645 ha within the subject land. Buffers of 100m and 300m were employed on important mapped areas as a no go for turbine placement, and high constraint for civil construction. This resulted in large scale avoidance of SAII habitat. Impacts to 2.38 ha that are linear in nature have been calculated to occur directly to important mapped areas, all of as a result of road upgrades and access tracks that re extensions off existing roads and tracks. Of the 2.38 ha of direct impact to important mapped areas, all occur within the western portion of the site, and associated Stage 2 works. Additionally, 0.6 ha or 25% of the total areas impacted are based on Mapped Important Areas that comprise polygons mapped across existing roads and are cleared of an vegetation. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.
2a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:	
i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or	It is estimated that the species population has fallen from between approximately 1,000-3000 individuals to approximately 700 individuals over the last twenty years (WSP, 2022), and potentially as low as 300 (LLS, 2020). Approximately 300 - 700 individuals are thought to occur within the Riverina.
ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as	This decline in population estimates of Plains Wanderer are tied to habitat condition, which has been compromised by persisting dry conditions and land management practices throughout its range over the last 20 years (WSP, 2022). Additionally, to the loss and degradation of sparse, lowland native grasslands, caused by the conversion of native grasslands to dense introduced pasture or croplands (DoE, 2016).

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Information required (BAM Section 9.1.2)	Response
indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation, pathogens, pollutants, competitors or parasites	The vast majority (>99%) of records of Plains Wanderer in NSW now come from an area of the western Riverina bounded by Hay and Narrandera on the Murrumbidgee River in the north, the Cobb Highway in the west, the Billabong Creek in the south, and Urana in the east. Recent analysis of monitoring data collected between 2001 and 2014 from across sites in the Riverina region indicates that there was an overall decline in numbers of 93% over this time period (DoE 2016).
2b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by:	
i. an estimate of the species' current population size in NSW, and	The current estimate is between 300 to 700 individuals in NSW and between 1000 to 3000 in Australia (NSW and Victoria)
ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and	Current details in regard to Plains Wanderer population estimates are centered on the area of mapped habitat distribution in the Riverina area of NSW and monitoring of sites. (WSP,2022).
iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations	It is difficult to pinpoint the exact cause of rapid decline, but likely a combination of effects of sustained drought, clearing or conversion of native vegetation, particularly grasslands on grey soils where tussock forming grass remain optimal and more stable, as well increase predation by species such as foxes. However, when conditions are considered favorable, this species is capable of recovering.
2c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by:	
i. extent of occurrence	It is difficult to determine the current extent as data is limited but as of 2011, the estimated extent of occurrence of the species was 930 000 km square (DoE 2016). Likewise, the current area of occupancy, but as of 2011, the estimated area of occupancy was 330 km square (DoE 2016). Due to the dynamic nature of natural and derived grasslands to which habitat for the Plains Wanderer is critical, the area of occupancy maybe constantly changing.
ii. area of occupancy	
iii. number of threat-defined locations (geographically or ecologically distinct	The Riverina region is considered a population stronghold (DoE 2016).

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Information required (BAM Section 9.1.2)	Response
areas in which a single threatening event may rapidly affect all species occurrences), and	
iv. whether the species' population is likely to undergo extreme fluctuations	It is likely that the population of the Plains Wanderer will undergo extreme fluctuations with a decrease in numbers following significant drought events, as well sustained periods of above average rainfall, as result of lower breeding success. However, during repeated average years, and following on from drought events, Plains Wanderers have been shown to recover, however these events have been somewhat inconsistent in the last 20 years.
2d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because:	
i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site	Plains Wanderer breed in solitary pairs in a territory defended by the larger female, though they can be serially polyandrous. They are capable of breeding in their first year. The male does most of the incubation during the 23 day incubation period and is also primarily responsible for attending the young (DoE 2016). The species is considered to not have reproductive characteristics that limit its reproductive capacity. Other than the dynamic nature of the grasslands habitat and condition states the Plains Wanderer relies upon, it does not have abiotic factors or traits considered critical. Key threatening process applicable to this species are: • Clearing on native vegetation, particularly grasslands • Predation by foxes. • Invasion of exotic perennial grasses Concerns were raised that noise from WTGs will interfere with the Plains Wanderer's ability to communicate which will impact breeding and make them more vulnerable to predators. Plains Wanderer calls have an extremely low frequency range and this species has a narrow range of hearing, making them especially tolerant of loud noise. Plains-wanderers have large aural canal through the middle of their head which limits their ability to detect sounds in all but the lower frequency ranges. University researchers have observed Plains Wanderers remaining calm and continuing to feed in a noisy university animal house despite clanging of pans, vocalisations of sheep and bats and constant vehicle traffic. The call is described as a soft, low-pitched "oo-oo" sound, repeated at regular intervals during the breeding season, especially at night. These calls are audible to humans, which places them generally within the human hearing range (roughly 20 Hz to 20,000 Hz), however is likely to be around 200 Hz to 1,000 Hz, and centered around 450 Hz based off field recordings and acoustic surveys. Wind turbine noise occurs across a range of frequencies from infrasonic (0 to 20 Hz) up through low frequency sound (generally below or around 200 Hz), and into the higher audible frequency range above 200 Hz. Although there may cross over at the lower end of the range, there is a low risk that noise produced by wind turbines low frequent noise around up to and around 200 Hz would have a significant impact on masking communication, interfere with mating calls, or reduce territory defence efficiencies with calls thought to be between 200-and 100 Hz, or centered around 450 Hz.
ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or	
iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus)	
3. data deficient	
Where the TBDC indicates data is	Plains Wanderer are not listed in TBDC as a data deficient species. Due to the dynamic nature of natural and derived grasslands to which habitat for the Plains Wanderer is critical, areas of

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Information required (BAM Section 9.1.2)	Response
'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR	optimal habitat is considered uncertain.
4a. the impact on the species' population (Principles 1 and 2) presented by:	
i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the development site (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and	The Plains-wanderer mapped important area are based on 2001 Plains-wanderer primary habitat mapping completed for NPWS across 2.28 million hectares. The mapping identified 52,783 ha of primary habitat or 2.3% of the mapping area. Primary habitat of the Plains-wanderer typically comprises 50% bare ground, 10% fallen litter, and 40% herbs, forbs and grasses. Since the project's completion in 2001, the mapping has been updated from ground-truthing during regular Plains-wanderer surveys conducted by NSW DCCEEW staff. The NSW Draft Recovery Plan for the species states that in 2001/2002 most primary habitat had the carrying capacity of 1 pair of birds per 18 ha (NSW NPWS 2002). One individual was recorded and flushed in the western portion of the site incidentally in Spring 2024, within PCT 46, adjacent to PCT 26 DNG and within 200m of an Important mapped area. A 300m buffer avoidance area was enforced based around the likely home range of this individual of up to 18 hectares. It is difficult to accurately estimate numbers within the broader locality. Estimated numbers in Oolambeyan National Park as at 2021 was 5 individuals, whilst an additional 3 individuals were recorded at Bundure Travelling Stock Route (TSR) to the south of the subject land. Anecdotal evidence from the landowner indicated individuals are semi regularly seen historically on the Goolgumbla property. It is not anticipated the project will impact upon Plains Wanderer individuals. Future occupancy may be reduced, however due to variability and dynamic nature of grasslands that provides habitat for this species, this is difficult to quantify. Patches of potential habitat within the subject land primarily being low grasslands such as Riverina grasslands communities PCT 46 are estimated at 2,998 ha, but also grasslands derived from Weeping Myall communities contribute up to 13,708 ha. Approximately 11.8 ha of important mapped area occurs within the development corridor, and 645 ha within the subject land. Outside of important mapped areas, the project will result in the removal of linear areas up to 73.44 ha that may contain suitable habitat during dynamic grassland changes. The majority of these impacts occur in western areas during stage 2 of the project. No individuals are expected to be directly impacted by the project. The project is not expected to result in substantial indirect impacts to the species such as through increased habitat fragmentation. Plains-wanderers are known to be mainly sedentary, particularly when habitat is suitable, however they may move greater distances in response to changes in environment and habitat availability (Marchant and Higgins, 1993) (DoE 2016). The project will directly impact upon linear areas of suitable habitats, and in some cases create localised fragmentation of habitat via construction of roads and access tracks through areas of habitat. Increased predation and availability for movement for predators such as foxes through the subject land may occur, but will be mitigated, and already exists in the current rural landscape. However, no permanent barriers excluding the species from adjacent areas of suitable habitat, or preventing movements between
ii. an estimate of the number of individuals (mature and immature) to be impacted by the project and as a percentage of the total NSW population, or	
iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the project	

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Information required (BAM Section 9.1.2)	Response
	separated areas of habitat, will be created. Furthermore there are large areas of potentially (or dynamically) suitable habitat within the subject land that are not impacted by the project, which will persist into the future. Mitigation measures are listed in Section 9, which includes specific measures for Plains Wanderer Indicative stewardship sites being developed also contain mapped important areas and other areas of potential habitat to be conserved and managed
4b. impact on geographic range (Principles 1 and 3) presented by:	
i. the area of the species' geographic range to be impacted by the project in hectares, and a percentage of the total AOO, or EOO within NSW	This species was not recorded in detailed surveys undertaken in November 2022, March 2023 and April 2023, however one individual was recorded in the western portion of the site incidentally in Spring 2024, within PCT 46, adjacent to PCT 26 DNG and within 200m of an Important mapped area. A 300m buffer avoidance area was enforced based around the likely home range of this individual of up to 18 hectares. Due to the dynamic nature of the grasslands critical to this species, areas within the subject land may be suitable for this species in future, however, the most optimal areas of habitat have been avoided within the development footprint as far as practicable. Potentially suitable (but sub-optimal) areas within the subject land and development footprint include; <u>Subject Land</u> • Important mapped areas 645 ha • Riverine plains grasslands 2,998 (PCT 46) • Riverplain derived grasslands 13,708 (PCT 26 DNG) <u>Development corridor</u> • Important mapped areas 11.8 ha • Riverine plains grasslands 399 (PCT 46) • Riverplain derived grasslands 2,177 (PCT 26 DNG) <u>Development Footprint</u> • Important mapped areas 2.38 ha • Riverine plains grasslands 73.44 ha (PCT 46) • Riverine derived grasslands 342 (PCT 26 DNG)
ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat; OR impact will affect some habitat, but no individuals of the species will be directly impacted	
iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and	It is not anticipated that any direct impacts will occur to this species currently. The species national Extent of Occurrence is estimated as 930 000 km2 (93 million hectares), and national Area of Occupancy as 33,000 ha (Cth DCCEEW 2015). Extensive area of habitat will remain within the subject land and broader locality. Important mapped areas of habitat, and similar within the development footprint have been prioritised for avoidance. Mitigation measures such as coordinated fox control and grasslands management will likely provide more optimal habitat within the subject land and have effects more broadly in the landscape. Up to 125 credits will be retired for impacts to important mapped areas, as well as 3327 credits for impacts to 73 ha of impacts to PCT 46. This credits equate to the equivalent of 690 ha of offset that will contain suitable habitat for Plains Wanderer. Additional and

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Information required (BAM Section 9.1.2)	Response
distance over which genetic exchange can occur (e.g. seed dispersal) and pollination distance for the species	appropriate measures will be discussed in consultation with CPHR and DPHI and incorporated into the BMP if required.
iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects, likelihood of disturbance; and disease, pathogens and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR	

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Appendix 5.2. Claypan Daisy *Brachyscome muelleroides*

Information required (BAM Section 9.1.2)	Response
1. Impacts to the species and the action and measures taken to avoid the direct and indirect impact on the species at risk of an SAII.	
-	*Brachyscome muelleroides* has been surveyed throughout the development footprint throughout the development footprint in September and November 2022, 2023 and 2024 and has not been recorded. These surveys were not substantially impeded by flooding events in Spring 2022, which were more prevalent in the latter part of Spring 2022. However, overall, the amount of survey undertaken is representative to the size and requirements of each vegetation zone where habitat for this species is present. It is considered highly unlikely, given survey effort of microhabitats undertaken to date, that species will be recorded within the development footprint. Due to survey gaps, up to 35.62 ha of habitat is assumed present, but this considered to be very precautionary and inflated, based on the gaps occurring in similar habitat that has been surveyed, with no records to date. In terms of avoidance, detailed constraints assessments modelling of biodiversity vales was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat, were avoided as much as possible. This includes areas within the subject land considered potential habitat including within seasonally damp situations such as shallow depression sand around the margins of swamps, lagoons and claypans, on heavy grey cracking clays to lighter clay loam soils, in grassland and grassy woodland. This has resulted in multiple revisions of the development footprint as demonstrated in Section 7. This species prefers seasonally moist grey gilgaied soils on the floodplains with PCTS such as PCT 45 and PCT 46, which occur within the subject land. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.
2a. evidence of rapid decline (Principle 1, clause 6.7(2)(a) BC Regulation) presented by an estimate of the:	
i. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer), or	*Brachyscome muelleroides* is not listed under Principle 1 in TBDC. Little is known of the former distribution and abundance for this species. Changes to land use and resultant habitat modification from agricultural activities and altered hydrological regimes are thought to be a contributing cause to the species decline (Lucas, 2010).
ii. decline in population of the species in NSW in the past 10 years or three generations (whichever is longer) as indicated by: an index of abundance appropriate to the species; decline in geographic distribution and/or habitat quality; exploitation; effect of introduced species, hybridisation,	

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Information required (BAM Section 9.1.2)	Response
pathogens, pollutants, competitors or parasites	
2b. evidence of small population size (Principle 2, clause 6.7(2)(b) BC Regulation) presented by:	
i. an estimate of the species' current population size in NSW, and	*Brachyscome muelleroides* is not listed under Principle 2 in TBDC. The species is restricted to the mid Murray and Murrumbidgee Rivers region in NSW and Victoria. Current distribution and abundance are not currently well known, and subject to seasonal fluctuations and effects of drought. Only five sites have precise locality details, and four of these are on Morundah Station near Urana in NSW, which has almost all of the currently recorded plants (about 20,000).
ii. an estimate of the decline in the species' population size in NSW in three years or one generation (whichever is longer), and	Little is known about the current location and status of *Brachyscome muelleroides*. The species has been recorded from about 20 locations since 1900, only about 13 locations since 1930 and only eight locations since 1990. The most important site appears to be Morundah Station in NSW, a Commonwealth Department of Defence property leased for grazing, which has almost all currently recorded plants. One proposed recovery action is to survey for and monitor populations to gain more accurate information on distribution and abundance of *Brachyscome muelleroides* (Lucas, 2010)
iii. where such data is available, an estimate of the number of mature individuals in each subpopulation, or the percentage of mature individuals in each subpopulation, or whether the species is likely to undergo extreme fluctuations	
2c. evidence of limited geographic range for the threatened species (Principle 3, clause 6.7(2)(c) BC Regulation) presented by:	
i. extent of occurrence	*Brachyscome muelleroides* is listed under Principle 3 in TBDC. The extent of occurrence for *Brachyscome muelleroides* is <100 km square. The area of occupancy for *Brachyscome muelleroides* is <10 km square, about 20, 000 plants from the main population, but historical records have this species "plentiful" or abundant" at other areas. The subject lands on the western limit of the extent of occurrence and is generally considered from east of Narrandera (NSW) and Locksley (Vic), through to Wagga Wagga (NSW) in the east. This species has a highly restricted distribution. Only a single significant known population exists at Morundah Station near Urana NSW, with a few scattered and isolated patches near Rand, NSW. Of what is known, its preferred habitat is on grey cracking clay and gilgaied soils, often occurring with Marsilea species, soils on the floodplains of the Murray and Murrumbidgee Rivers. Associated PCTs such as PCT 45 and PCT 46, occur on this soil type and have largely been avoided as well as subjected to detailed survey. No records were found during surveys in September 2022 and September 2023 within the subject land.
ii. area of occupancy	
iii. number of threat-defined locations (geographically or ecologically distinct areas in which a single threatening event may rapidly affect all species occurrences), and	
iv. whether the species' population is likely to undergo extreme fluctuations	

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Information required (BAM Section 9.1.2)	Response
	It is likely that the population of this species will undergo extreme fluctuations within increased numbers during significant sustained rainfall/flooding events, and conversely, a decline in numbers during drought. This may have been evident following above average rainfall conditions and periodic flooding in 2022, and the subsequent season in 2023. No evidence of this species was recorded during September 2023 or November 2023, and following an above average rainfall year in 2022.
2d. evidence that the species is unlikely to respond to management (Principle 4, clause 6.7(2)(d) BC Regulation) because:	
i. known reproductive characteristics severely limit the ability to increase the existing population on, or occupy new habitat (e.g. species is clonal) on, a biodiversity stewardship site	*Brachyscome muelleroides* not listed under Principle 4 in TBDC. Information is currently lacking around the processes for recruitment for this species. It is thought that this species may require periodic flooding of its habitat to maintain the wet conditions suitable for seed set and germination. This may have been evident following above average rainfall conditions and periodic flooding in 2022, and the subsequent season in 2023. Germination and growth seem to be highly dependent upon wetter years, although the exact relationship between flooding and the species is not known. It appears that sufficient autumn rainfall that results in localised soil waterlogging, or periodic flooding, are required to initiate seed germination and plant growth (Lucas 2010). Despite targeted surveys taking place in September and November 2022, 2023 and 2024, this species was not recorded in suitable habitat. Key threatening process applicable to this species are: • Alternations of hydrology (natural flow regimes of rivers, streams and floodplains) • Clearing on native vegetation • Invasion of exotic perennial grasses.
ii. the species is reliant on abiotic habitats which cannot be restored or replaced (e.g. karst systems) on a biodiversity stewardship site, or	
iii. life history traits and/or ecology is known but the ability to control key threatening processes at a biodiversity stewardship site is currently negligible (e.g. frogs severely impacted by chytrid fungus)	
3. data deficient	
Where the TBDC indicates data is 'unknown' or 'data deficient' for a species for a criterion listed in Subsection 9.1.2(2.), the assessor must record this in the BDAR	*Brachyscome muelleroides* is not listed in TBDC as a data deficient species.

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Information required (BAM Section 9.1.2)	Response
4a. the impact on the species' population (Principles 1 and 2) presented by:	
i. an estimate of the number of individuals (mature and immature) present in the subpopulation on the development site (the site may intersect or encompass the subpopulation) and as a percentage of the total NSW population, and	This species was not recorded in detailed surveys undertaken in September 2022, September 2023 and November 2023, therefore considered unlikely to be present, a spatial survey gap of 35.62 ha occurs and will be surveyed further in Spring 2025. Although not recorded to date, suitable area and habitat within the development corridor and development footprint include: <u>Development corridor</u> • PCT 45 23.62 ha • PCT 46 400 ha <u>Development Footprint</u> • PCT 45 3.08 ha • PCT 46 73.79 ha It is not anticipated that impacts will occur to this species, as it has not been recorded during detailed surveys in September and November 2022, 2023 and 2024. These surveys were not substantially impeded by flooding events in Spring 2022, which were more prevalent in the latter part of Spring 2022. Additional surveys in Spring 2025 will account to the 35.62 of area remaining. Given survey effort to date in optimal seasons, and n records found, it is considered highly unlikely the species will be recorded in the remaining 35.62 ha. Within subject land, it is estimated there is the following amount of habitat that will contain suitable microhabitats for *Brachyscome muelleroides*. • Riverine plain grasslands – 3,337 ha (Development footprint impacts equate to 2 %)
ii. an estimate of the number of individuals (mature and immature) to be impacted by the project and as a percentage of the total NSW population, or	
iii. if the species' unit of measure is area, provide data on the number of individuals on the site, and the estimated number that will be impacted, along with the area of habitat to be impacted by the project	
4b. impact on geographic range (Principles 1 and 3) presented by:	
i. the area of the species' geographic range to be impacted by the project in hectares, and a percentage of the total AOO, or EOO within NSW	This species is listed in TBDC as occurring in the Wagga Wagga, Narranderra, Tocumwal and Walbundrie areas. Also occurs in north-central Victoria (only along the Murray from Tocumwal to the Ovens River) (BioNet 2023). The main population, ~20,000 plants, occurs near Urana at Morundah Station. It is not anticipated that impacts on the geographic range would occur for the project as a result from the clearing of native vegetation, increased weed invasion, or changes in hydrology with result from the project. Detailed mitigation measures will be implemented as per Section 9. This BDAR does not provide any new information that demonstrates that the principle identifying that the species is at risk of an SAII is not accurate.
ii. the impact on the subpopulation as either: all individuals will be impacted (subpopulation eliminated); OR impact will affect some individuals and habitat;	

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Information required (BAM Section 9.1.2)	Response
OR impact will affect some habitat, but no individuals of the species will be directly impacted	
iii. to determine if the persisting subpopulation that is fragmented will remain viable, estimate (based on published and unpublished sources such as scientific publications, technical reports, databases, or documented field observations) the habitat area required to support the remaining population, and habitat available within dispersal distance, and distance over which genetic exchange can occur (e.g., seed dispersal) and pollination distance for the species	
iv. to determine changes in threats affecting remaining subpopulations and habitat if the proposed impact proceeds, estimate changes in environmental factors including changes to fire regimes (frequency, severity); hydrology, pollutants; species interactions (increased competition and effects on pollinators or dispersal); fragmentation, increased edge effects,	

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Information required (BAM Section 9.1.2)	Response
likelihood of disturbance; and disease, pathogens, and parasites. Where these factors have been considered elsewhere in relation to the target species, the assessor may refer to the relevant sections of the BDAR or BCAR	

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Appendix 6. EPBC Act Significant Impact Criteria assessments

Important population

An important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- Key source populations either for breeding or dispersal.
- Populations that are necessary for maintaining genetic diversity, and/or
- Populations that are near the limit of the species range.

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Appendix 6.1. Painted Honeyeater *Grantiella picta*

Species background

Painted Honeyeater is listed as vulnerable under the EPBC Act. It has a specialised diet consisting mainly of mistletoe fruits, but also includes nectar (from flowering mistletoe, eucalypts and possibly banksias) and arthropods (DAWE 2021a). Painted Honeyeater is endemic to mainland Australia, found on the inland slopes of the Great Dividing Range from the Grampians, Victoria to Roma, Queensland. The species exhibits dispersive, seasonal north-south movements governed principally by the fruiting of mistletoe (Barea L.P & Watson D.M 2007). Many birds move after breeding to semi-arid regions such as north-eastern South Australia, central and western Queensland, and central Northern Territory.

The species inhabits mistletoes in eucalypt forests, woodlands, riparian woodlands of Black Box and River Red Gum, preferring a higher number of mature trees as these host more mistletoes. It is more common in wider blocks of remnant woodland than in narrower strips. The key threat to the species is habitat loss in both breeding and non-breeding habitats. Degraded private lands used for agriculture or grazing provide small opportunities for Painted Honeyeaters to persist in fragmented landscapes, but with many landowners considering mistletoes as a pest their ongoing removal threatens the survival of the species.

Occurrence in study area

Painted Honeyeater was recorded foraging within the subject land in high condition Weeping Myall vegetation, with areas where sighting occurred now excluded from the development corridor. Associated PCTs within the development corridor include PCTs 10, 13, 15, 17, 26, and 28, however suitable habitat is likely to constitute PCT 26 Intact only, given the species requires connected woodland with forging mistletoe. Historic records for the species occur north of the subject land, as well as to the southwest around Deniliquin.

SIC assessment for Painted Honeyeater

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species.
No. There is a low likelihood that the project would lead to a long-term decrease in the size of an important population of the Painted Honeyeater. Important populations of Painted Honeyeater have not been defined in the Commonwealth Conservation Advice (Commonwealth of Australia 2015). There are no recognised subpopulations and due to its dispersive movements it is considered to comprise a single population (Garnett, Szabo, & Dutson 2011). The number of individuals is estimated to be <10,000 and the population is thought to be in decline (DAWE 2021a). As it is considered a single population, individuals occurring within the study area would be part of an 'important population' for the purpose of the SIC assessment. Factors likely to contribute to a long-term decrease in the size of an important population of the Painted Honeyeater primarily relate to habitat loss, land clearance, and decreased abundance of mistletoe that is a vital foraging and breeding resource for the species. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This includes larger patches of native woodland vegetation, and higher quality, intact remnants. Within the development corridor, 679 ha of suitable vegetation would be retained, and within the broader subject land, 7,136 ha would be retained. An additional 44,000 ha within 50 km of the subject land will also be retained. Direct impacts to 128.73 ha of intact Weeping Myall woodland would occur as result of the project. Although these areas

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SIC assessment for vulnerable species
represent potential habitat for Painted Honeyeater, they occur as mostly smaller patches which are considered less suitable, or the fringing areas of larger patches of habitat, and as such are of lesser quality for Painted Honeyeater. Larger connected areas of intact Weeping Myall will remain. Painted Honeyeaters were recorded within the subject land, with the areas where the group were observed has now been removed from the development corridor. This has been taken into account when assessing the relative importance of the areas being removed for Painted Honeyeaters, in line with the recommendations in the National Recovery Plan (DAWE 2021a). Given that Painted Honeyeater prefers large remnants of vegetation, and selects nest sites in habitats where mistletoe prevalence and parasitism rates are high, and that large areas of suitable habitat will be retained within both the development corridor and subject land, with movement for this species not substantially fragmented, it is considered unlikely that the project would lead to a long-term decrease in the size of the population.
Reduce the area of occupancy of an important population.
No. The area of occupancy for Painted Honeyeater is thought to have declined but is not defined in the National Recovery Plan (DAWE 2021a). The project would result in direct impacts to 128.73 ha of intact Weeping Myall woodland representing potential habitat for Painted Honeyeater. However, the areas being removed are mostly smaller patches which are considered less suitable, or the fringing areas of larger patches of habitat, the majority of which would be retained. While the species was recorded twice within the subject land, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Within the development corridor, 679 ha of suitable vegetation would be retained, and within the broader subject land, 7,136 ha would be retained. An additional 44,000 ha within 50 km of the subject land will also be retained. While prescribed impacts of the project include collision risk, this species is not likely to be significantly impacted as it flies at canopy height and was not recorded within the RSA or unlikely to fly within RSA. Based on the size and quality of the areas proposed for removal, and their context in the broader landscape and areas to be retained, the project would not result in a significant reduction to the area of occupancy for the species.
Fragment an existing important population into two or more populations.
No. Due to its complex movement patterns typified by migration and local nomadism, the Painted Honeyeater has what is effectively a single national population. The species is highly mobile and individuals can move freely through areas of unsuitable and marginal habitat to seek out and exploit favourable habitat patches. The project would result in direct impacts to 128.73 ha of potential habitat for Painted Honeyeater, and therefore will result in some localised fragmentation, but is considered unlikely to result in any barriers to movement for the species such that it would fragment the local population. While the construction of wind turbines will generate prescribed impacts to the flight pathways for some bird species, it is not likely to fragment the local population of Painted Honeyeater given the species flies at canopy height. The areas of vegetation being removed are smaller patches or the fringing areas of larger patches, and as such would not impact on the connectivity of habitat within the broader landscape for this species.
Adversely affect habitat critical to the survival of a species.
No. Habitat critical to the survival of the species identified in the National Recovery Plan includes: • Known or likely breeding habitat in Boree/Weeping Myall, Brigalow woodlands, box-gum woodlands and box-ironbark forests on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. • All preferred foraging species within known and likely foraging habitat particularly mistletoes of the genus *Amyema* growing on forest and woodland eucalypts and acacias.

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SIC assessment for vulnerable species

- All Key Biodiversity Areas for Painted Honeyeater.
- Suitable habitat in future climate niches as information becomes available.

Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This includes avoidance of large, intact patches of Weeping Myall, likely to constitute critical habitat for Painted Honeyeater. Within the development corridor, 679 ha of suitable vegetation would be retained, and within the broader subject land, 7,136 ha would be retained. An additional 44,000 ha within 50 km of the subject land will also be retained. As this is consistent with the definition of critical habitat for the species, this represents a large area of retention in comparison to the vegetation being impacted by the project.

Direct impacts to 128.73 ha of intact Weeping Myall areas vegetation is predicted, which would also meet the definition of critical habitat for Painted Honeyeater. However, the areas of Weeping Myall being removed are mostly smaller patches which are considered less suitable for the species, or the fringing areas of larger patches of habitat. On two instances, sightings of the species occurred within the subject land, with these areas now removed from development corridor. It is possible the species utilises the subject land on occasion.

This has been taken into account when assessing the relative importance of the areas being removed for Painted Honeyeaters, in line with the recommendations in the National Recovery Plan (DAWE 2021a). In the broader landscape context, records are concentrated north of the subject land, and to the south-west around Deniliquin. Although the habitat being removed does meet the definition of critical habitat, its relative importance in the landscape is likely to be less than the areas being retained in both the subject land itself and within the broader landscape context.

The National Recovery Plan lists Key Biodiversity Areas (KBAs) relevant to the Painted Honeyeater, which do not include the subject land or nearby surrounds.

There is no current information on habitat associated with future climate niches.

Overall, the project will have direct impacts on 128.73 ha of habitat that meets the definition of critical habitat in the National Recovery Plan for Painted Honeyeater. However, as described in the National Recovery Plan, the habitat being impacted has been assessed in the broader landscape context to determine its relative importance for Painted Honeyeater. Given that the habitat being impacted is largely smaller patches, or the fringes of larger patches, that do not contain abundant Mistletoe, combined with the large areas of habitat to be retained both within and directly adjacent to the subject land, and the mobility of the species, it is overall considered unlikely that the project would result in a significant adverse impact to critical habitat for the Painted Honeyeater. The overall retention of 679 ha of suitable vegetation within the development corridor, and 7,136 ha within the broader subject land that that consists of higher quality and more connected potential habitat, is likely to outweigh the removal of 128.73 ha.

Disrupt the breeding cycle of an important population.

No. The project is expected to result in the removal of 128.73 ha of potential habitat. This habitat is associated with smaller patches of Weeping Myall or the fringes of larger patches, and is considered less suitable for Painted Honeyeater. The species selects nest sites in habitats where mistletoe prevalence and parasitism rates are high, which was not observed in the areas of habitat being removed, suggestion these areas are unlikely to represent preferred breeding habitat. The 128.73 of Weeping Myall woodland being removed constitutes a small proportion of available breeding habitat throughout the species' range. Within the development corridor, 679 ha of suitable vegetation would be retained, and within the broader subject land, 7,136 ha would be retained. An additional 44,000 ha within 50 km of the subject land will also be retained.

The removal of 128.73 ha of potential habitat, when considered in relation to the areas to be retained, would not be expected to disrupt the breeding cycle of the population. In addition, prescribed impacts arising from the construction and operation of the wind turbines are not considered to be significant, given the species flyways are below the turbine height.

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SIC assessment for vulnerable species

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

No. The project is expected to result in the removal of 128.73 ha of potential habitat. This habitat is associated with smaller patches of woodland or the fringes of larger patches, and is considered less suitable for Painted Honeyeater. This habitat is not considered to be quality Painted Honeyeater habitat and it is unlikely that removal of this habitat would result in species decline. Within the development corridor, 679 ha of suitable vegetation would be retained, and within the broader subject land, 7,136 ha would be retained and would remain available for the highly mobile Painted Honeyeater to continue to forage and breed within the locality.

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.

No. The project would be subject to a Biodiversity Management Plan that would include biosecurity measures to limit the likelihood of introducing invasive species during construction and operation of the project and details regarding feral animal control.
It is unlikely that the project would result in the establishment of new invasive species. The project is unlikely to exacerbate the current level of invasive species populations utilising the area, such as cats and foxes.

Introduce disease that may cause the species to decline.

No. There are no known diseases causing potential species decline to the Painted Honeyeater, or diseases to its preferred food source, mistletoe. The project would be unlikely to result in any increased risk of disease transmission to Painted Honeyeater such that the species would be at risk of decline.
The project is unlikely to introduce a disease that may cause the species to decline. The project would be subject to a Biodiversity Management Plan that would include measures for biosecurity and hygiene control to limit the introduction of pathogens as a result of the construction and operation of the project.

Interfere substantially with the recovery of the species.

No. Habitat loss and degradation is a key threat to the species. The project would result in direct impacts to 128.73 ha of intact Weeping Myall areas. The National Recovery Plan also states that protection of Painted Honeyeater breeding and foraging habitats at the local, regional and landscape scale is also an important objective. Within the development corridor, 679 ha of suitable vegetation would be retained, and within the broader subject land, 7,136 ha would be retained. It is considered unlikely that the amount of potential clearing would interfere substantially with the recovery of the species, particularly in the context of the higher quality areas of potential habitat that is being retained.

Conclusion.

Based on the assessment above, it is concluded that Painted Honeyeater is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project:

- Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population.
- Will not disrupt the breeding cycle of an important population, the local population or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not interfere will the recovery of the species.

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Appendix 6.2. Superb Parrot *Polytelis swainsonii*

Species background

Superb Parrot is listed as vulnerable under the EPBC Act. Superb Parrots are absent from large areas of the Riverina and northern Victoria, confined to the Barmah forest area with the core distribution being west of the Great Dividing Range in NSW from Canberra, Goulburn and as far west as Nyngan and Swan Hill. There are only three main breeding areas: an area of the south-west slopes bounded by Molong, Rye Park, Yass, Coolac, Cootamundra and Young (NSW); along the Murrumbidgee River, between Wagga Wagga and Toganmain Station, and farther north at Goolgowi (NSW); and along the Murray and Edward Rivers, from east of Barmah and Millewa State Forest to south of Taylors Bridge (NSW and Victoria). The species occurs in box-gum and acacia woodlands and riverine woodlands. They mostly feed on the ground on fruits and seeds from a variety of plants but also feed extensively in shrubs and trees. In the Riverina area, the Superb Parot nests in loose colonies in large, living or dead trees with many hollow branches, typically near watercourses. The same nest hollows are used in successive years, often by the same pair (DSE 2011).

It was formerly considered that there were two separate populations of the Superb Parrot, one in southern NSW and northern Victoria, and the other further north in NSW (Forshaw & Cooper 1981), but it is now apparent that only a single population exists (Forshaw & Cooper 2002; Garnett & Crowley 2000; Higgins 1999; Webster & Ahern 1992).

Major threats to the Superb Parrot are loss and degradation of habitat, competition for nest hollows, road kills, illegal removal of wild birds, Psittacine beak and feather disease (PBFD) and climate change.

Occurrence in study area

Superb parrot was recorded foraging onsite. Associated PCTs within the subject land include; 10, 13, 15, 17, 26 and 28, however suitable habitat is likely to constitute PCTs 10, 13, 15 and PCT 26 Intact only. There was no evidence of breeding observed within the subject land, and potential hollows were found to be preferentially in use by common species such as Blue Bonnets and Galahs. Sightings of these individuals were predominantly along road corridors and within Intact Weeping Myall vegetation, and on the odd occasion, flying at height above White Cypress Pine communities towards more intact Weeping Myall areas.

SIC assessment for Superb Parrot

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species.
No. There are no recognised subpopulations for the Superb Parrot and the species is considered to comprise a single population. Recent estimates suggest the population consists of approximately 20,000 mature individuals, and is considered to be in decline (DSE 2011). Individuals occurring within the study area would therefore be considered to be part of an 'important population' for the purpose of this SIC assessment. The main cause of population decline for Superb Parrot is habitat loss, particularly breeding habitat and nest sites in large hollow-bearing trees. Core breeding habitat is associated with the Barmah-Millewa River Red Gum Forest and Murrumbidgee Red Gum forest Key Biodiversity Areas (KBA), as well as the South-west Slopes of NSW KBA. Impacts to these critical habitat locations are a primary threat to the species (DSE 2011). The subject land contains suitable foraging habitat for the Superb Parrot in the form of woodlands and grasslands where seed, nectar and fruits are available for foraging. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided

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SIC assessment for vulnerable species
as much as possible. This includes larger patches of native woodland vegetation, and higher quality, intact remnants. Within the development corridor, 753 ha of suitable vegetation would be retained, as well as approximately 9,084 ha within the subject land. Direct impacts will include the removal of 132 ha of PCTs 10, 13, 15, and PCT 26 Intact which contain mature woody vegetation that constitute potential habitat for the Superb Parrot. The habitat being removed occurs as smaller patches and the edges of larger patches. Higher quality areas along water courses, road corridors and larger remnants have been largely avoided. Superb Parrot is a hollow-nesting species, and the project would result in the removal of nine hollow-bearing trees, out of 67 recorded within the subject land, all of which contain medium to large hollows considered potential habitat for the species. However, these are considered unlikely breeding habitat for the Superb Parrot, which is known to prefer riparian forests that include River Red Gums for breeding, particularly in the Barmah Forest in Victoria and the Millewa and Moira forests in NSW, as well as stretches of the Murrumbidgee River near Wagga Wagga and Darlington Point in NSW (DSE 2011). No evidence of breeding was recorded during surveys for Superb Parrot, though other common species were observed occupying hollows. It is likely that this species is present within the subject land for foraging only, moving to larger riparian areas containing patches or River Red Gums for breeding. The project would also result in impacts to a further ~419ha of native grassland vegetation, which does represent potential foraging habitat for the Superb Parrot. These areas may be utilised on a seasonal and transient basis by the species but are unlikely to be relied upon for its persistence in the landscape given the vast areas of similar or better quality habitat in the surrounding landscape. Prescribed impacts resulting from the project include the operation of WTGs. Superb parrot was recorded within the RSA, and flies at a height that puts it at a higher risk of collision. While large areas of suitable habitat will be retained within the development corridor and subject land, and remain available for Superb Parrot to utilise, a number of annual flights of the Superb Parrot is at risk of collision. Given this, and that the species was recorded numerous times within the subject land, and within RSA, therefore it is unlikely the project could lead to the long-term decrease in the size of an important population.
Reduce the area of occupancy of an important population.
Yes. The Superb Parrot is highly mobile, and their exact movements are not fully understood. An ongoing decline has been documented across their range, which is projected to further contract and undergo a south-eastern shift in response to climate change. The area of occupancy for the species has not been defined however, actions that remove critical habitat are considered likely to reduce the area of occupancy (DSE 2011). Critical habitat primarily refers to breeding habitat (tree hollows in riparian areas), and suitable foraging habitat in proximity to breeding areas. The project would not include the removal of areas of critical breeding habitat for the Superb Parrot. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Within the development corridor, 753 ha of suitable vegetation would be retained, as well as approximately 9,084 ha within the subject land. Direct impacts would occur to 132 ha of PCTs 10, 13, 15 and 26 in intact condition. In addition ~419 ha of grasslands including derived native grasslands will be impacted. These areas may be used on a seasonal or transient basis by the Superb Parrot but are unlikely to be relied upon for its persistence in the landscape and are not considered critical habitat. Prescribed impacts resulting from the project include the operation of WTGs. Superb parrot was recorded within the RSA, and flies at a height that puts it at a higher risk of collision. While larger areas of suitable habitat will be retained within the development corridor and subject land, and remain available for Superb parrot to utilise. A number of annual flights of the Superb Parrot is at risk of collision as well as the potential, albeit low likelihood, of macro avoidance of habitat within the subject land. As such, there is potential that the project would reduce the area of occupancy of an important population of Superb Parrot during the operational phase of the project through potential collisions or macro avoidance of habitat.

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SIC assessment for vulnerable species

Fragment an existing important population into two or more populations.

No. The Superb Parrot is a mobile species, capable of undertaking large movements as it migrates seasonally between breeding and non-breeding areas (DSE 2011). Individuals can also move through the landscape matrix to exploit favourable habitat patches and seasonal resources. Higher quality feeding habitats in the form of woodland areas with nectar, fruit and seed resources and adjacent grassland areas have largely been avoided and buffered during the design process. There would be direct impacts to 132 ha of PCT 10, 13, 15 and 26 in intact condition. While clearance would only occur in sporadic and linear areas for the WTG and access, the operational phase of the project has the capacity to act as a barrier to movement, due to the moderate collision risk and macro avoidance. However, it is not considered likely the Project may fragment an existing important population into two or more populations.

Adversely affect habitat critical to the survival of a species.

No. Key Biodiversity Areas (KBAs) defined in the National Recovery Plan are considered critical for supporting the long-term persistence of the species. Other critical habitat is associated with areas containing riparian woodlands, with suitable large, hollow-bearing trees for nesting and breeding. The project is not within a KBA and does not involve the removal of riparian woodlands that could be considered breeding habitat critical to the survival of the species.

Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. There will be direct impacts to 132 ha of PCT 10, 13, 15, and 26 (intact) that is considered potential habitat for Superb Parrot. This habitat occurs as small patches and the edges of larger patches, and is likely of lesser quality than larger, intact remnants and is therefore not consistent with habitat critical to the survival of the species. In addition, the project will result in prescribed impacts to the species such as high collision risk from operational WTGs.

A total of nine hollow-bearing trees are being removed as part of the project. No breeding has been recorded in these hollows either historically or during the current survey. There is a low likelihood that these trees represent critical habitat to the species' survival, particularly in the broader landscape context where it is likely individuals would target hollow-bearing trees in riparian vegetation containing dense River Red Gums for nesting.

Within the development corridor, 753 ha of suitable vegetation would be retained, as well as approximately 9,084 ha within the subject land. These larger, intact patches are likely to be more critical to the survival of the species than those being removed.

As described in the National Recovery Plan, where habitat cannot be avoided it should be offset. Under the BAM, foraging habitat for Superb Parrot impacted by the project would generate ecosystem and species credits that would be retired prior to construction.

Disrupt the breeding cycle of an important population.

No. No known breeding habitat will be impacted by the project. A total of nine hollow-bearing trees are being removed however, these are considered unlikely to be utilised by Superb Parrot as they are not associated with riparian habitats. Majority of riparian vegetation has been avoided and buffered as part of the detailed design of the project. Despite this, prescribed impacts arising from the operational phase of the project include a moderate collision risk for Superb Parrot. While potential breeding habitat within the subject land is suboptimal, the collision risk associated with the operation of the WTGs may result in a barrier to movement for the local population, resulting in fatality of breeding pairs. However, the reduction in small numbers of breeding individuals is unlikely to effect the overall breeding cycle of the Superb Parrot.

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SIC assessment for vulnerable species
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
Yes. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Additionally, no known breeding site will be impacted. The project would also result in the removal of up to ~419 ha of native vegetation likely to constitute potential foraging habitat for Superb Parrot. While large areas of similar habitat exist in the landscape, and will be retained as part of the Project, the collision risk resulting from the operation of WTGs following construction has the potential to act as a barrier to the movement of Superb Parrot and therefore isolate individuals within the local population. Therefore, there is potential that the project would isolate the availability 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. The project would be subject to a Biodiversity Management Plan that would include biosecurity measures to limit the likelihood of introducing invasive species during construction and operation of the project and details regarding feral animal control. It is unlikely that the project would result in the establishment of new invasive species. The project is unlikely to exacerbate the current level of invasive species populations utilising the area, such as cats and foxes.
Introduce disease that may cause the species to decline.
No. The project is unlikely to introduce a disease that may cause the species to decline. The project would be subject to a Biodiversity Management Plan that would include measures for biosecurity and hygiene control to limit the introduction of pathogens as a result of the construction and operation of the project.
Interfere substantially with the recovery of the species.
No. Habitat loss is a key threat to the Superb Parrot, particularly removal of critical breeding resources associated with large, hollow-bearing trees in riparian areas. The project would result in direct impacts of 132 ha of PCTs 10, 13, 15,and 26 (intact), however this vegetation is not considered suitable breeding habitat for Superb Parrot, or habitat critical to the survival of the species. Within the development corridor, 753 ha of suitable vegetation would be retained, as well as approximately 9,084 ha within the subject land. Wind turbine strike as a result of operational wind farms is also listed within the National Recovery Plan as a key threat to the species (DAWE 2021b). While there is unlikely to be an impact to breeding habitat and most high quality foraging habitat would be retained, the operation of WTGs within the subject land has the potential to result in the creation of a barrier to movement for the species, and habitat avoidance in proximity to WTGs. Therefore, the Project has the potential to interfere with the recovery of the Superb Parrot.
Conclusion.
Based on the assessment above, it is concluded that Superb Parrot has the potential to be significantly impacted by the project. This conclusion was made on the basis that the project: • May lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population. This results from removal of habitat and risk of collisions. • May isolate or decrease the availability or quality of habitat to the extent the species declines. • May interfere will the recovery of the species.

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Appendix 6.3. Southern Whiteface *Aphelocephala leucopsis*

Species background

Southern Whiteface is listed as vulnerable under the EPBC Act. The species is a small and stocky, thornbill-like bird with a brown dorsum, dark brown wings, a white belly and a black tail with narrow white tip. The species has characteristic facial markings, consisting of a white band across the forehead, with a darker streak along the top edge (Cth DCCEEW 2023a). The species lives in a wide range of open woodland and shrublands where there is an understorey of grasses and/or shrubs. Southern Whitefaces forage almost exclusively on the ground, favouring habitat with low tree densities and an herbaceous understorey litter cover. The species' diet consists of insects, spiders, and seeds. These birds usually forage in small groups, consisting of between two and eight individuals, but may be seen in larger flocks of up to 70, including mixed species feeding flocks (Cth DCCEEW 2023a).

The species occurs across most of mainland Australia, south of the tropics. While there are currently an estimated 477,000 mature individuals in the wild, the population has declined by an estimated 30 to 50% every ten years since 1999 (Cth DCCEEW 2023a). Habitat critical to the survival of Southern Whiteface includes areas of relatively undisturbed open woodland and shrublands with an understorey of shrubs and/or grasses, habitat with low tree density and an herbaceous understorey litter cover which provides essential foraging habitat, and living and dead trees with hollows and crevices which are essential for roosting and nesting. Habitat loss and fragmentation are considered the most likely causes of the species' current decline, through drought and extreme weather events also play a role.

Occurrence in study area

Southern Whiteface has been recorded within and adjacent to the subject land. Suitable habitat for this species is available in woodland, scattered trees and open farmland associated with PCTs 13, 15, and 26.

SIC assessment for Southern Whiteface

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species.
No. Important populations have not been defined in the Commonwealth Conservation Advice and a national recovery plan has not been prepared. The population is estimated to be 477,000 mature individuals in the wild, consisting of two subspecies: the south-east southern whiteface (410,000) and the south-west southern whiteface (67,000). Habitat loss and fragmentation is the likely cause of species decline, as a result of intensive agriculture and increasing drought. The subject land contains suitable habitat for the Southern Whiteface, which prefers open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. The species favours habitat with low tree densities an herbaceous understorey with litter cover. Several observations were made of Southern Whiteface within the subject land. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this subspecies, were avoided as much as possible. This includes larger patches of native woodland vegetation, and higher quality, intact remnants. There is a low likelihood that the project would lead to the long-term decrease in the size of the population of the Southern Whiteface.

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SIC assessment for vulnerable species

Reduce the area of occupancy of an important population.

No. No important populations have been identified for the Southern Whiteface. The extent of occurrence for the species is estimated to be 4,910,000 km^2, however the area of occupancy is contracting and is estimated to be 70,000 km^2. Reduced area of occupancy for the species is associated with the complete removal of habitat for intensive agriculture. Suitable habitat for this species occurs primarily in areas of open woodlands.
Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, including intact woodland areas that are the most likely habitat for this subspecies, were avoided as much as possible. The project is considered unlikely to significantly impact the area of occupancy of the Southern Whiteface.

Fragment an existing important population into two or more populations.

No. Southern Whitefaces are considered sedentary, but may move into wetter areas outside of their normal range during wetter years. It is unlikely that the project would result in fragmentation for the species. The operation phase of the project is considered compatible with continued occupation by Southern Whiteface, which would be able to utilise retained habitats within the subject land. Areas of habitat being removed are associated with small remnants and the fringes of larger remnants, which is unlikely to result in any barriers to movement. The species is able to move through open areas as well as lightly timbered woodlands, and it is unlikely that the project would result in a barrier to movement for the species.

Adversely affect habitat critical to the survival of a species.

No. The Conservation Advice for the Southern Whiteface defines habitat critical to its survival as:
Relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both;
Habitat with low tree densities and an herbaceous understory litter cover which provides essential foraging habitat;
Living and dead trees with hollows and crevices which are essential for roosting and nesting.

Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible.
Trees with small hollows or crevices are important resources for Southern Whiteface breeding. The project would result in the removal of nine hollow-bearing trees. Overall however, the majority of hollow-bearing trees have been avoided and would be retained, in addition to intact woodland areas that would contain suitable breeding resources for the Southern Whiteface. These trees are unlikely to be critical to the species' survival in the broader landscape context where large areas of suitable habitat will be retained.

Disrupt the breeding cycle of an important population.

No. There is a low likelihood that the project would result in any disruption to the breeding cycle. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible.
It is considered unlikely that the areas subject to removal would result in disruption of the breeding cycle to the Southern Whiteface.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

No. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible

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SIC assessment for vulnerable species
The project includes the removal of up to 15.08 ha of Black Box woodland, and 116.79 ha of intact Weeping Myall woodland representing habitat for this species, as well as nine hollow-bearing trees. Impacts as a result of the project are considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Within the subject land, 748 ha of suitable habitat would be retained. Furthermore the species occurs across the majority of southern Australia and as such localised impacts associated with the project will not impact habitat to the extent that the species as whole is likely to decline. In addition, mitigation methods implemented as part of a Biodiversity Management Plan for the project will ensure that indirect impacts including weed establishment and pests are minimised for the duration of the works and upon operation.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
No. The project would be subject to a Biodiversity Management Plan that would include biosecurity measures to limit the likelihood of introducing invasive species during construction and operation of the project and details regarding feral animal control. It is unlikely that the project would result in the establishment of new invasive species. The project is unlikely to exacerbate the current level of invasive species populations utilising the area, such as cats and foxes.
Introduce disease that may cause the species to decline.
No. The project is unlikely to introduce a disease that may cause the species to decline. The project would be subject to a Biodiversity Management Plan that would include measures for biosecurity and hygiene control to limit the introduction of pathogens as a result of the construction and operation of the project.
Interfere substantially with the recovery of the species.
No. There is currently no National Recovery Plan for the Southern Whiteface, however conservation and management priorities within the approved conservation advice for the species primarily relate to reducing clearing of critical habitat (particularly for agriculture), revegetation to expand and connect areas of existing habitat and minimising habitat degradation caused by livestock. The project includes the removal of up to 15.08 ha of Black Box woodland, and 116.79 ha of intact Weeping Myall woodland representing habitat for this species, as well as nine hollow-bearing trees. Within the subject land, at least 748 ha of suitable habitat would be retained. The operation phase of the project is considered compatible with persistence of Southern Whiteface in the landscape, and would not present a barrier to movement. The project is not likely to interfere substantially with the recovery of the species.
Conclusion.
Based on the assessment above, it is concluded that Southern Whiteface is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project: • Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population. • Will not disrupt the breeding cycle of an important population, the local population or species as a whole. • Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread. • Will not interfere will the recovery of the species.

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Appendix 6.4. Diamond Firetail *Stagonopleua guttata*

Species background

The Diamond Firetail is listed as vulnerable under the EPBC Act. It is a large, striking finch with a bright red bill, and red eyes and rump. Diamond firetails occur on the south-east mainland of Australia from south-east Queensland to Eyre Peninsula, South Australia, and about 300 km inland from the sea. Diamond firetails occur in eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats, including farmland and grassland with scattered trees. They prefer areas with relatively low tree density, few large logs, and little litter cover but high grass cover. Diamond firetails usually occur in flocks of between 5 to 40, and occasionally more. The species appears to be sedentary, though some populations move locally. Their flight is described as low and direct in long lines with slight undulations. Birds roost in dense shrubs or in smaller nests built especially for roosting (Cth DCCEEW 2023b).

Diamond Firetails are distributed across the south-east mainland of Australia, from south-east Queensland to south-east South Australia. While there are currently an estimated 136,000 mature individuals in the wild, the species' population has declined by approximately 30 to 50% within the last 10 years (Cth DCCEEW 2023b). The biggest contributor to this decline is the clearance of quality nesting and breeding habitat, though habitat degradation also plays a role.

Occurrence in study area

Diamond Firetail were recorded during detailed surveys. The species is thought to be sedentary, though some populations move locally.

SIC assessment for Diamond Firetail

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species.
No. There is a low likelihood that the project would lead to a long-term decrease in the size of an important population of the Diamond Firetail. There are currently estimated to be 136,000 mature individuals in the wild, however the reliability of these estimates is low (Cth DCCEEW 2023b) . No important populations have been identified for Diamond Firetail within the approved conservation advice for these species. The main threat causing local declines of Diamond Firetail populations is native vegetation clearance for large scale agriculture that has resulted in a decrease in the size and quality of important nesting and breeding habitats (Cth DCCEEW 2023b). Overgrazing and the replacement of native perennial grasses with exotic annual grasses has also led to food shortages during autumn and winter. The subject land contains habitat suitable for the Diamond Firetail, which prefers open forests and lightly timbered habitats, including farmland and grassland with scattered trees. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this subspecies, were avoided as much as possible. The operation phase of the project is also considered compatible with the foraging activity of Diamond Firetail, which would still be able to exploit seasonal grassland resources within the subject land following construction. Given the expansive areas of native vegetation in the broader landscape, and the large patches of suitable habitat within the subject land to be retained, the project is not expected to lead to long-term decreases in the size of the population of Diamond Firetail.

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SIC assessment for vulnerable species

Reduce the area of occupancy of an important population.

No. No important populations have been identified for Diamond Firetail. The extent of occurrence is estimated at 1,500,000 km^2 and the area of occupancy is estimated at 25,000 km^2.
Suitable habitat for this species occurs throughout the subject land in grasslands, lightly timbered and intact woodland remnants. Activity is likely to be concentrated in more remnant vegetation where suitable shrubs occur for shelter and roosting, however, contain low tree densities..
Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, including intact woodland areas that are the most likely habitat for species, were avoided as much as possible. Higher quality areas along water courses and larger remnants have been largely avoided and buffered. The habitat being removed occurs as smaller patches and the edges of larger patches. This would constitute a minor reduction in the potential area of occupancy available to the species that is unlikely to represent a significant impact.
The operation phase of the project is considered compatible with the foraging activity of Diamond Firetail, which would still be able to utilise grassland habitats within the subject land. The project is therefore considered unlikely to significantly impact the area of occupancy for the Diamond Firetail.

Fragment an existing important population into two or more populations.

No. Diamond Firetail is thought to be mostly sedentary, though some populations do undergo local movements. It is unlikely that the project would result in fragmentation for the species. Areas of suitable habitat being removed include smaller patches of woodland vegetation and the fringes of larger patches, which is unlikely to result in any barriers to movement. The operation phase of the project is considered compatible with the foraging activity of Diamond Firetail, which would still be able to utilise grassland habitats within the subject land. The species is able to move through open areas as well as lightly timbered woodlands, and it is unlikely that the project would result in a barrier to movement for the species.

Adversely affect habitat critical to the survival of a species.

No. The Conservation Advice for the Diamond Firetail defines habitat critical to its survival as:

- Eucalypt, acacia or casuarina woodlands, open forests and other lightly timbered habitats;
- low tree density, few large logs and little litter cover by high grass cover for foraging, roosting and breeding;
- drooping she-oak within the Mt Lofty Ranges.

Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible.
The operation phase of the project is considered compatible with ongoing occupation of the area by Diamond Firetail, which would be able to utilise grassland habitats following construction and within retained patches of vegetation.

Disrupt the breeding cycle of an important population.

No. Suitable foraging and breeding habitat for this species occurs throughout the subject land in grasslands, lightly timbered and intact woodland remnants. Activity is likely to be concentrated in more intact remnants where suitable shrubs occur for shelter, roosting and breeding. Breeding habitat is also associated with the stick nests of raptors, which were present, would be located in tall trees in the landscape.
There is a low likelihood that the project would result in any disruption to the breeding cycle. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This includes larger patches of native woodland vegetation, and higher quality, intact remnants, representing the most suitable breeding habitat for Diamond Firetail. As large areas of similar habitat exist in the landscape, and would be retained as part of the project, it is unlikely that the areas subject to removal would result in disruption of the breeding cycle of Diamond Firetail.

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SIC assessment for vulnerable species
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
No. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Additionally, no known breeding site will be impacted. Once operational, the subject land would continue to provide potential habitat for this species in the form of open grasslands that may provide foraging resources or movement corridors through the landscape. Impacts as a result of the project are considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. In addition, mitigation methods implemented as part of a Biodiversity Management Plan for the project will be implemented to ensure that indirect impacts including weed establishment are minimised for the duration of the works.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
No. The project would be subject to a Biodiversity Management Plan that would include biosecurity measures to limit the likelihood of introducing invasive species during construction and operation of the project and details regarding feral animal control. It is unlikely that the project would result in the establishment of new invasive species. The project is unlikely to exacerbate the current level of invasive species populations utilising the area, such as cats and foxes.
Introduce disease that may cause the species to decline.
No. The project is unlikely to introduce a disease that may cause the species to decline. The project would be subject to a Biodiversity Management Plan that would include measures for biosecurity and hygiene control to limit the introduction of pathogens as a result of the construction and operation of the project.
Interfere substantially with the recovery of the species.
No. There is currently no National Recovery Plan Diamond Firetail, however recovery actions are outlined within the approved conservation advice for the species. Those relating to the project include: • Retain and protect woodland, open forest, grassland and mallee habitat from clearing, fragmentation and disturbance (areas of 200 ha or greater within woody vegetation are particularly significant). • Protect and maintain areas of high-quality habitat, which includes open forest, woodland, mallee and grasslands with a diverse ground layer dominated by a mixture of grass species which seed at different times of year (providing a year-round food supply) and provides scattered shrubs for shelter. • Retain mistletoe and scattered patches of dense shrubs for nesting habitat, particularly in areas close to water. While the project will result in the removal of myall woodland, derived grasslands and small areas or riverine woodland habitats, the area of habitat to be removed by the project is surrounded by contiguous areas of suitable foraging and breeding habitat, with similar or higher quality resources. The project is unlikely to pose a barrier to movement of the species within the broader locality. Given these factors it is considered unlikely that the project will interfere with the recovery of these species.
Conclusion.
Considering the above factors, it is unlikely that the project will impose a significant impact Diamond Firetail as: • Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population. • Will not disrupt the breeding cycle of an important population, the local population or species as a whole. • Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.

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SIC assessment for vulnerable species

- Will not interfere will the recovery of the species.

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Appendix 6.5. Eastern Major Mitchell's Cockatoo *Lophochroa leadbeateri*

Eastern Major Mitchell's Cockatoo is listed as endangered under the EPBC Act. The eastern Major Mitchell's cockatoo lives in arid and semi-arid woodlands dominated by Mulga (*Acacia aneura*), Mallee and box eucalypts, Slender Cypress Pine (*Callitris gracilis*) or Belah (*Casuarina cristata*). Within these vegetation types, the subspecies main requirements are fresh surface water, and trees with suitable nesting hollows. The main threat causing the decline of the subspecies is habitat loss and degradation. A major aspect of habitat loss is the loss of large hollow-bearing trees which provide nest sites.

The subspecies occur in the Murray-Darling, Eyre and Bulloo River basins, from Isisford and Roma in the north, through western New South Wales to north-west Victoria and west to eastern South Australia.

Eastern Major Mitchell's Cockatoo has specific preference of nesting hollows close to wooded areas, using these areas for travel between feeding area and nesting or roosting sites. Fragmented landscapes, the vegetated corridors tend to be the preference for travel as well as roadside remnant vegetation patches (DCCEEW, 2023).

Eastern Major Mitchell's Cockatoo typically prefer hollows with the following characteristics (Cth DCCEEW 2023g):

- Average hollow entrance diameter of 13.3 x 27.7 cm (range 8-30 x 9-80 cm, horizontal x vertical diameter).
- Average hollow depth of 53.9 cm (range 19 – 180 cm).
- Average nest chamber floor diameter of 18 cm (range 9-34 cm).
- Average nest tree diameter at breast height of 72.5 cm (range 34-149 cm).

Occurrence in study area

Surveys for eastern Major Mitchell's Cockatoo were undertaken as part of the diurnal bird surveys and BBUS. The species was not recorded during these surveys, but has been recorded approximately 13 kilometres from the subject land. Foraging and breeding habitat is represented by large hollows and woodland communities within PCT's 13, 15, 26 and 45.

SIC assessment for Major Mitchell's Cockatoo

SIC assessment for Major Mitchell's Cockatoo
Lead to the long-term decrease in the size of a population.
No. There is a low likelihood that the project would lead to a long-term decrease in the size of the population of the eastern Major Mitchell's Cockatoo. The subspecies *Lophochroa leadbeateri leadbeateri* is commonly known as the Eastern Major Mitchell's Cockatoo. It is considered to exist as a single population, with no sub-populations identified in the Conservation Advice for the species (Cth DCCEEW 2023c). The population has undergone a severe reduction, and was estimated at around 15,000 mature individuals in 2011. The main threat causing decline of the subspecies is habitat loss and degradation, particularly the removal of large hollow-bearing trees which are used for nesting. Eastern Major Mitchell's Cockatoo requires large areas of intact woodland vegetation and corridors for movement across the landscape, with specific requirements for nesting tree species and hollow characteristics. Impacts that result in a decline of these requirements are considered likely to contribute to a decrease in the size of the population.

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SIC assessment for Major Mitchell's Cockatoo

The subject land contains habitat considered suitable for the subspecies. Large hollows occur in woodland communities within the site. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this subspecies, were avoided as much as possible. This includes larger patches of native woodland vegetation, and higher quality, intact remnants.
This species was not recorded during detailed BUS across a two year period, targeted surveys, or incidentally. Hollow bearing trees will be removed as part of the project, limited to nine. Turbine collision is possible, but overall risk is considered low.
Habitat being removed is linear in nature, occurs generally within smaller patches and the edges of larger patches. Higher quality areas along water courses and larger remnants have been largely avoided and buffered.
Eastern Major Mitchell's Cockatoo is a hollow-nesting species, and the project would result in the removal of nine hollow-bearing trees, out of 67 recorded within the subject land. Of these, only seven contain large hollows considered potential habitat for the species. No evidence of breeding was recorded during surveys for Major Mitchell's Cockatoo, and no historic records occur within the subject land of breeding by this species. It is considered unlikely that the species is utilising these hollows for breeding.
It is considered unlikely the project will lead to the long-term decrease in the size of the population of this subspecies.

Reduce the area of occupancy of the species

No. The species area of occupancy is estimated to be 225,000 km2 and is considered to have undergone a decline due to the ongoing loss and degradation of breeding habitat (Cth DCCEEW 2023c). Uncleared rangeland comprises much of its range, and it is thought that 20 – 30% of this range is still occupied.
The eastern Major Mitchell's Cockatoo prefers to feed in or close to wooded areas, and utilise wooded corridors for movement through fragmented landscapes. Wooded areas are therefore likely to be key habitat for the species.
Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, including intact woodland areas that are the most likely habitat for this subspecies, were avoided as much as possible. The project would remove relatively small areas of habitat within this expanse. The project would result in the removal of nine hollow-bearing trees, out of 67 recorded within the subject land. Of these, only seven contain large hollows considered potential habitat for the species. Impacts to foraging habitat will occur, and although the subject land contains suitable foraging habitat, as this species was not detected across two years of BBUS survey, it is like unlikely habitats within the subject land are utilised frequently by this species. It is unlikely the project will result in a substantial reduced area of occupancy for this species.

Fragment an existing population into two or more populations.

No. Eastern Major Mitchell's Cockatoo are highly mobile and individuals can move through areas of less suitable and marginal habitat to seek out and exploit favourable habitat patches. The subspecies prefer to feed in or close to wooded areas, and use wooded areas for travel between feeding areas and nesting or roosting sites (Cth DCCEEW 2023c).
Vegetation corridors will not be subject to large scale direct impacts by the project, and the level of habitat fragmentation, in relation to Eastern Major Mitchell's Cockatoo will generally be minimal. These habitats have largely been avoided and buffered during the design process and allows for movement throughout the subject land. The project is considered unlikely to result in fragmentation of the population, with suitable movement corridors being retained within the subject land and within the broader landscape context.

Adversely affect habitat critical to the survival of a species.

No. Eastern Major Mitchell's Cockatoos inhabit a wide range of plant communities, mostly in arid and semi-arid woodlands, always within easy reach of surface water. Habitat critical to the survival of the eastern Major Mitchell's cockatoo consist of:

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SIC assessment for Major Mitchell's Cockatoo

- Arid and semi-arid woodlands dominated by mulga (*Acacia aneura*), mallee and box eucalypts, slender cypress pine (*Callitris gracilis*) or belah (*Casuarina cristata*).
- Known habitat containing suitable attributes, including potential habitat for the subspecies, especially where there are large mature trees with suitable hollows; and
- Surrounding matrix of these areas for the role of providing movement corridors for dispersal across the landscape.

Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this subspecies, were avoided as much as possible. Areas of intact woodland have predominantly been avoided during the design process. There will be direct linear impacts to 0.19 of Red Gum Woodland, 15.08 ha of Black Box woodland, and 116.79 ha of Weeping Myall (intact) woodland, that could be considered potential habitat for the eastern Major Mitchell's Cockatoo.

A total of nine hollow-bearing trees are being removed as part of the project, with seven of these containing hollows of a suitable size for the eastern Major Mitchell's Cockatoo. No breeding has been recorded in these hollows either historically or during the current survey. There is a low likelihood that these trees represent critical habitat to the species' survival, particularly in the broader landscape context where it is likely individuals would target large, intact remnants for breeding.

Within the subject land, as this species was not recorded across two years of BBUS, and given the retention of a high percentage of the species' breeding and foraging habitat, the project is not expected to adversely affect habitat critical to the survival of the Eastern Major Mitchell's Cockatoos

Disrupt the breeding cycle of a population.

No. No known breeding habitat will be impacted by the project. A total of nine hollow-bearing trees are being removed as part of the project, with seven of these containing hollows of a suitable size for the eastern Major Mitchell's Cockatoo. No breeding has been recorded in these hollows either historically or during the current survey. Given the large amount of suitable habitat being retained, it is considered unlikely that the project would result in any disruption to the breeding cycle of the population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

No. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Additionally, no known breeding site will be impacted. Therefore, the magnitude of the impact is small in the context of other causes of habitat loss operating across the species' range and in isolation is unlikely to impact the species to the extent that it would cause a decline in the population.

Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.

No. The project would be subject to a Biodiversity Management Plan that would include biosecurity measures to limit the likelihood of introducing invasive species during construction and operation of the project and details regarding feral animal control.
It is unlikely that the project would result in the establishment of new invasive species. The project is unlikely to exacerbate the current level of invasive species populations utilising the area, such as cats and foxes.

Introduce disease that may cause the species to decline.

No. The project is unlikely to introduce a disease that may cause the species to decline. The project would be subject to a Biodiversity Management Plan that would include measures for biosecurity and hygiene control to limit the introduction

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SIC assessment for Major Mitchell's Cockatoo
of pathogens as a result of the construction and operation of the project.
Interfere substantially with the recovery of the species.
No. The main threat causing the decline of the subspecies is habitat loss and degradation. A major aspect of habitat loss is the loss of large hollow-bearing trees which provide nest sites. Actions that remove habitat critical to the survival of the subspecies would interfere with the recovery of the subspecies (Cth DCCEEW 2023c). The project would not be removing habitat critical to the survival of the subspecies, as no breeding habitat has been identified. High-quality woodland vegetation has largely been avoided, and this habitat is considered more likely to be critical to the subspecies' survival than that which is being removed.
Conclusion.
Based on the assessment above, it is concluded that Eastern Major Mitchell's Cockatoo is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project: • Will not lead to the long term decrease of a population, reduce the areas of occupancy or fragment an existing population. • Will not disrupt the breeding cycle of a population, or species as a whole. • Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread. • Will not interfere will the recovery of the species.

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Appendix 6.6. Australian Painted Snipe *Rostratula australis*

Species background

Australian Painted Snipe is listed as endangered under the EPBC Act. This species is a small, freshwater wader with a long bill that droops slightly at the tip. This species occurs in shallow freshwater (occasionally brackish) wetlands, both ephemeral and permanent, such as lakes, swamps, dams and marshy areas where there is a cover of grasses, lignum, samphire, low scrub or open timber. Australian Painted Snipe nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds. The nest consists of a scrape in the ground, lined with grasses and leaves. The species forages nocturnally on mud-flats and in shallow water. Feeds on worms, molluscs, insects and some plant-matter.

Australian Painted Snipe is a highly mobile species, their dispersive movements have been attributed to local conditions; with movements to flooded areas and from drying to permanent wetlands, away from areas affected by drought. Distribution includes scattered records across Australia. In NSW, many records are from the Murray-Darling Basin, with other important areas including the Hawkesbury River and the Clarence and lower Hunter Valleys.

Occurrence in the study area

Surveys for Australian Painted Snipe were undertaken as part of the diurnal bird surveys and BBUS. The species was not recorded during these surveys, despite periods of above average rainfall and flooding events increasing the quantity and availability of water within the subject land and surrounding landscape, but has been recorded approximately 25 kilometers from the subject land over 15 years ago. Suitable habitat for this species is broadly available within farm dams, and freshwater Lignum wetlands and shrublands within PCT 24, PCT 17, PCT 13 and PCT 15.

SIC assessment for Australian Painted Snipe

SIC assessment for Australian Painted Snipe
Lead to the long-term decrease in the size of a population of a species.
No. There is a low likelihood that the project would lead to a long-term decrease in the size of the population of the Australian Painted Snipe. The Australian Painted Snipe is a highly cryptic and poorly known species. The species forms a single, homogenous breeding population across most of Australia. The main threat considered likely to decrease the size of the Painted Snipe population is the loss and degradation of wetlands through drainage and the diversion of water for agriculture and reservoirs (Cth DCCEEW 2022a). No Painted Snipe were recorded within the subject land. Within the subject land, there are numerous ephemeral wetlands and drainage lines associated with topographic depressions of the floodplain. It is possible that these areas may be exploited by the Australian Painted Snipe on a seasonal or transient basis in response to suitable conditions. These habitats are not considered optimal habitat for the Australian Painted Snipe, however this species is known to fly to and from nomadically based on environmental conditions, influenced by factors such as habitat availability, water levels, and food resources as well as for breeding events between September and March. Swamps, and flooded grasslands may provide suitable habitat on the rare occasion during rare flooding events. Australian Painted Snipes typically fly at relatively low elevations, especially during their migration and foraging activities. They are not considered high-altitude migratory birds like some species of waterbirds and/or raptors. Instead, they tend to fly close to the ground, skimming over wetlands and vegetation as they move between feeding and breeding sites. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity

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SIC assessment for Australian Painted Snipe

value, and therefore most likely habitats for Australian Painted Snipe were avoided as much as possible. Suitable aquatic habitat and low-lying areas with potential for seasonal inundation throughout the subject land have been buffered and excluded by design from development, resulting in retention of larger Lignum swamps, farm dams and the Coleambally Outfall Drain.

Direct impacts to potential habitat for Australian Painted Snipe will be limited to small areas around Coleambally Outfall Drain and suboptimal ephemeral habitat within PCT 24, PCT 17, PCT 13 and PCT 15. associated with the removal of small areas of ephemeral lignum swamp and fringing areas. The project would retain larger and more intact wetland areas and would not result in barriers or obstructions to movement in the landscape for the species.

The project does not include any impacts that would result in the drainage and diversion of water or removal of large areas of key habitat.

The direct impacts that would occur to potential Painted Snipe habitat are considered negligible. The species is highly mobile, and capable of exploiting seasonally available resources across a large geographic area. As such, it is considered unlikely that Painted Snipe would be reliant on the marginal quality habitat being impacted as a result of the project for its persistence in the landscape. The project is therefore considered unlikely to lead to a long-term decrease in the size of an important population of the species.

Reduce the area of occupancy of a population.

No. The species is widespread and is not considered to have a restricted geographic distribution however, within its geographic range records are sparse and scattered, with movements of the species considered unpredictable. The area of occupancy is therefore much less than the extent of occurrence, 2000 km^2 compared with 7,100,000 km^2 (DSEWPC 2013).

Suitable habitat within its range is relatively restricted, and associated with shallow terrestrial freshwater (occasionally brackish) wetlands including temporary or permanent lakes, swamps and claypans as well as periodically inundated grasslands, saltmarsh, dams, rice crops, sewage farms and bore drains. The species is highly mobile, and capable of travelling large distances to exploit these resources as they become available across the landscape in response to prevailing weather conditions.

There is a low likelihood that the project would reduce the area of occupancy for the Australian Painted Snipe. Within the subject land, there are numerous ephemeral wetlands and drainage lines associated with topographic depressions of the floodplain that are most likely to represent suitable Painted Snipe habitat. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Suitable wetland habitat and low-lying areas have been largely excluded from the development by design, with direct impacts limited to small areas of potentially suitable habitat around Coleambally Outfall Drain and suboptimal ephemeral habitat within PCT 24, PCT 17, PCT 13 and PCT 15. Impacts to potentially suitable habitat surrounding the Coleambally Outfall Drain., are short-term and temporary, and would not affect the long-term suitability of these sites for use by Australian Painted Snipe.

The potential for the Australian Painted Snipe to flyover the subject land in search of suitable habitat cannot be discounted, however, a significant flyway is not anticipated. The operation of the project would not preclude this species from occurring in the landscape during high rainfall events. distribution of presumably higher quality habitat does not place the subject land in a location that is likely to be utilised for passage by the Australian Painted Snipe. This is supported by lack of detection of the species during BUS. Generally, assessment has found the risk the project poses for collision or barrier effect is low to negligible. The project is considered unlikely to result in a significant reduction to the area of occupancy for the Australian Painted Snipe.

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SIC assessment for Australian Painted Snipe

Fragment an existing population into two or more populations.

No. The project is considered unlikely to lead to fragmentation of the population. The species is highly mobile and capable of travelling large distances to exploit suitable resources. The nature of the project would not preclude Australian Painted Snipe from occupying the area during favourable conditions. The project is unlikely to incur major disturbance to higher condition mapped NSW wetlands or localised riparian corridors within the subject land and will not incur a disturbance to the key riparian corridors likely to be used by this species within the broader landscape between areas of habitat.
Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Suitable wetlands, including ephemeral water bodies and the Coleambally Outfall Drain would be retained as part of the project.

Adversely affect habitat critical to the survival of a species.

No. Habitat critical to the survival of this species as outlined by the National Recovery Plan is difficult to define into a single description due to variability of habitat used across its range (e.g., coastal and inland). Australian Painted Snipe are a highly mobile species, capable of undertaking large-scale movements to exploit ephemeral resources. The species is known to rely on wetlands for both breeding and foraging, and these habitats within its range can be considered as critical to the survival of the species. The habitat present within the subject land is not considered to constitute critical habitat for this species. The project would result in direct impacts to small areas around Coleambally outfall drain within existing crossings as well areas of marginal ephemeral habitat within PCT 24, PCT 17, PCT 13 and PCT 15. Although these habitats are wetland habitats and therefore potentially utilised by Australian Painted Snipe, they are considered low quality within the broader landscape context, where larger wetlands occur that would likely be preferred by Painted Snipe due to having increased foraging, breeding and sheltering opportunities.
Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Given the availability of higher quality habitat within the broader landscape, the impacts of the project on a small amount of potential habitat for Painted Snipe are considered minimal, and unlikely to affect the survival of the species.

Disrupt the breeding cycle of a population.

No. The Australian Painted Snipe breeds in response to seasonal rainfall patterns and wetland conditions, relying on wetlands and inundated areas for breeding and foraging (Cth DCCEEW 2022a). There is a low likelihood that the project would disrupt the breeding cycle of an important population. The project is unlikely to incur major disturbance to localised riparian corridors within the subject land and will not incur a disturbance to the key riparian corridors likely to be used by this species within the broader landscape between areas of key habitat is unlikely to result in any disruption to the breeding cycle, given the availability of other wetland areas and the broader landscape and the high mobility of the species. The project would not lead to the permanent degradation or removal of habitat such that the recruitment, survival or dispersal rates of an important population would be lowered enough to have a significant impact on 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.

No. The project is unlikely to modify remaining potential habitat that may be available to the species during flooding events such that the species is likely to decline. Australian Painted Snipe is a highly mobile species, and is capable of undertaking large spatial movements to exploit seasonally available resources. Removal of a minor amount of

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SIC assessment for Australian Painted Snipe
suboptimal habitat is unlikely to represent a significant loss of habitat for the species.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.
No. The project would be subject to a Biodiversity Management Plan that would include biosecurity measures to limit the likelihood of introducing invasive species during construction and operation of the project and details regarding feral animal control. It is unlikely that the project would result in the establishment of new invasive species. The project is unlikely to exacerbate the current level of invasive species populations utilising the area, such as cats and foxes.
Introduce disease that may cause the species to decline.
No. The project is unlikely to introduce a disease that may cause the species to decline. The project would be subject to a Biodiversity Management Plan that would include measures for biosecurity and hygiene control to limit the introduction of pathogens as a result of the construction and operation of the project.
Interfere substantially with the recovery of the species.
No. The project would not interfere with the recovery plan objectives, which are to sustain a positive population trend by minimising threats to the species, protecting its habitat and generating new knowledge. The project would remove a small amount of marginal quality potential habitat, but has avoided through design higher quality areas that may be utilised by the Painted Snipe.
Conclusion.
Based on the assessment above, it is concluded that Australian Painted Snipe is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project: • Will not lead to the long term decrease of a population, reduce the areas of occupancy or fragment an existing population. • Will not disrupt the breeding cycle of a population, or species as a whole. • Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread. • Will not interfere will the recovery of the species.

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Appendix 6.7. Australasian Bittern *Botaurus poiciloptilus*

Species background

The Australasian Bittern is listed as endangered under the EPBC Act. It is a large, stocky, thick-necked, heron-like bird and has a prominent black-brown stripe running down the side of the neck, the eyebrow is pale, and the chin and upper throat are white. In Australia, the Australasian Bittern occurs from south-east Queensland to south-east South Australia as far as the Adelaide Region, southern Eyre Peninsula, Tasmania and in the southwest of Western Australia (DEE 2019).

This species occurs in freshwater wetlands, and rarely, estuaries or tidal wetlands. Wetlands with tall, dense vegetation with aquatic habitat in up to 0.3 metres deep of water are utilised for foraging. Nesting occurs adjacent to relatively deep, densely vegetated freshwater swamps and pools, building a nest in vegetation generally up to 2.5 metres tall, with nests built up to around 0.3 metres above the water level (DEE 2019). Rice fields are also known to be frequently utilised by this species (DEE 2019).

The Australasian Bittern has primarily been impacted by the loss of wetland habitat through the diversion of water away from wetlands; drainage of swamps; and clearing for urban and agricultural development. Habitat degradation due to factors such as reduced water quality, invasion by weeds, impacts from grazing animals and reduced water flows due to a changing climate are also impacting on Australasian Bittern survival and breeding success. Predation by introduced species may also be limiting survival but more research is required to determine the relative importance of this threat.

Occurrence in study area

Australian Bittern has not been recorded within the subject land, but is known to move through the site during migration. Suitable habitat is present, represented by Lignum woodland and wetland PCT 13, but this is considered marginal habitat and unlikely to be used regularly or relied upon by the species. Habitat is also available associated with the Coleambally Outfall Drain and surrounding areas.

There is no optimal habitat for the Australasian Bittern within the subject land. The species is known to fly to and from breeding grounds in and around Leeton and Griffith in NSW, through to Victoria. It is very unlikely that this species would occur within the subject land, other than rare transient use or during increased seasonal flooding events and on short term, temporary basis.

SIC assessment for Australasian Bittern

SIC assessment for Endangered species
Lead to the long-term decrease in the size of a population.
No. There is a low likelihood that the project would lead to a long-term decrease in the size of an important population of the Australasian Bittern. It is estimated that there are 1300 mature Australasian Bittern individuals in Australia. These can be divided into two subpopulations, the south-eastern and the south-western subpopulations. The rice fields of the Riverina, including the Murrumbidgee and Coleambally Irrigation Areas support the largest known population of Australasian Bittern, and up to 59% of the national population (Cth DCCEEW 2022b). It is thought that the population has been in decline for over 30 years, associated with the loss of key breeding habitats. Current threats to the species are primarily associated with hydrological changes and habitat removal or modification, that would further reduce the availability and quality of breeding and foraging habitat for the species. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity

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SIC assessment for Endangered species

value, and therefore most likely habitats for Australasian Bittern, were avoided as much as possible. Within the subject land, there are numerous ephemeral wetlands and drainage lines associated with topographic depressions of the floodplain. Suitable aquatic habitat and low-lying areas with potential for seasonal inundation throughout the subject land have been buffered and excluded by design from development. Although it may utilise these habitats within the subject land on a seasonal or transient basis in response to flooding events, it is unlikely that the species relies upon these habitats to complete its lifecycle.

This species is known to fly to and from breeding grounds in and around Leeton and Griffith in NSW, through to Victoria Potential flight heights for Australasian Bitterns can vary depending on several factors, including habitat type, weather conditions, and behavioural patterns. Generally, Bitterns are known to fly at relatively low altitudes, often skimming over wetland vegetation such as reeds and grasses. This low-level flight behaviour is believed to be an adaptation to their hunting strategy, as they primarily prey on small fish, frogs, and invertebrates found in shallow water within wetland habitats. Bitterns are likely to fly lower to minimise energy expenditure and maintain stability due to their bulky heavy set build. However, prolonged flights over open areas and open habitats may occur on occasion, and they may occasionally ascend to slightly higher altitudes, particularly during certain behaviours such as territorial displays, courtship flights, or nomadic movements. It is not well known, and although possible, it is considered an unlikely event that Bitterns would fly within the RSA of this project, that being within 80-280m above ground level. Recent research shows they can ascend to higher altitudes, and although based on a small sample size of three individuals, recent GPS movement tracking of Australasian Bitterns in New Zealand has shown the species can fly within RSA height, with one individual spending 61% of its time at heights of 20–200 metres. Satellite tracking of the species in Australia has also shown the species flying at heights of 3–100 metres above ground (AOC, 2023). No recorded collisions with wind turbines for this species in NSW have been recorded. This species has a low risk of being effected by macro avoidance of large areas of turbines. No Australasian Bittern populations were detected or are known to occur within the subject land and none were detected across two years and eight seasons of BBUS.

There is a low likelihood that the project would result in the long-term decrease in the size of the population of Australasian Bittern.

Reduce the area of occupancy of the species.

No. The area of occupancy for Australasian Bittern is thought to have declined by 70 percent between 1977 and 2008 as a result of habitat loss, particularly breeding grounds (Cth DCCEEW 2022b). Changing water regimes and the loss or modification of wetland habitats is considered an ongoing threatening process for the Australasian Bittern. The area of occupancy was estimated at 1200 km2, with low reliability (NSW DCCEEW 2010) or estimated to be between 600 km^2 and 800 km^2 (DEE 2019), but this has likely further declined as a result of subsequent wetland loss.

Within the subject land, there are numerous ephemeral wetlands and drainage lines associated with topographic depressions of the floodplain. These areas are considered most likely to represent suitable habitat for Australasian Bittern.

This species is known to fly to and from breeding grounds in and around Leeton and Griffith in NSW, through to Victoria. Prolonged flights over open areas and open habitats may occur on occasion, and they may occasionally ascend to slightly higher altitudes, particularly during certain behaviours such as territorial displays, courtship flights, or nomadic movements. It is not well known, and although possible, it is considered an unlikely event that Bitterns would fly within the RSA of this project, that being within 80-280m above ground level. The species will continue to be able to forage and breed in retained habitat within and outside of the project area. It is considered unlikely that these minor impacts to potential habitat for this species would cause any meaningful reduction to the area of occupancy for the species, particularly given that areas of higher quality habitat would be retained as a result of the project.

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SIC assessment for Endangered species

Fragment an existing population into two or more populations.

No. The project is considered unlikely to lead to fragmentation of an existing population into two or more populations. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible The project is unlikely to incur major disturbance to mapped major wetlands or localised riparian corridors within the subject land and will not incur a disturbance to the key riparian corridors likely to be used by this species within the broader landscape between areas of key habitat.

The species is highly mobile and capable of travelling large distances to exploit suitable resources. The nature of the project would not preclude the species from occupying the area during favourable conditions, and will not act as a significant barrier or increase fragmentation between two or more potential populations.

Adversely affect habitat critical to the survival of a species.

No. Given that the Australasian Bittern is presumed to have undergone a severe reduction in numbers, based on historic habitat loss and degradation across the core part of its range, all natural habitat (including constructed wetlands with suitable habitat) in which the Australasian Bittern is known or likely to occur should be considered critical to the survival of the species (DEE 2019).

The Australasian Bittern prefers wetlands with dense vegetation from 0.5-3.5 metres in height, where it forages in still, shallow water up to 0.3 m deep, often at the edges of pools or waterways, or from platforms or mats of vegetation over deep water. It favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and reeds as well as rice crops (Cth DCCEEW 2022b).

The National Recovery Plan for the species defines critical habitat as any natural wetland habitat where the species is known or likely to occur (breeding or foraging habitat) within its known range. Critical habitat for the Australasian Bittern is therefore likely to occur within the subject land. Although it has not been recorded, there are nearby records associated with the Coleambally Irrigation Channel (Herring, M. 2023), and the Coleambally Irrigation Area further north. Tracking data also shows individuals undertaking migratory movements through the subject land, so it is reasonable to assume that suitable wetlands areas may be utilised by the species, presumably on a short-term and transient basis enroute to more suitable areas further north.

The majority of these potentially suitable areas, would be retained as a result of the project. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitats for the Australasian Bittern, were avoided as much as possible. Within the subject land, there are numerous ephemeral wetlands and drainage lines associated with topographic depressions of the floodplain. Suitable aquatic habitat and low-lying areas with potential for seasonal inundation throughout the subject land have been buffered and excluded by design from development, resulting in retention of larger lignum swamps, farm dams and the Coleambally Outfall Drain. These areas are considered marginal for Australasian Bittern, as they do not have dense vegetative cover or suitable water depth to be considered optimal habitat for the species. It is however possible that they are exploited on a seasonal or transient basis in response to flooding events, or on a temporary basis during migratory movements.

Given that areas of higher quality habitat will be retained, and direct impacts would be associated with marginal potential habitat for the Australasian Bittern, it is considered unlikely the project will adversely affect habitat critical to the survival of the species.

Disrupt the breeding cycle of a population.

No. The Australasian Bittern breeds from October to February in solitary pairs. However, sometimes several nests may be placed in close proximity to each other (Marchant & Higgins 1993). The species nests adjacent to relatively deep, densely

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SIC assessment for Endangered species

vegetated freshwater swamps and pools, building its nests under dense cover over shallow water (Marchant & Higgins 1990). The species prefers to nest in vegetation that is up to 2.5 m tall and the nests are placed about 30 cm above the water level (Marchant & Higgins 1990). The nest is a shallow structure of dry or green reeds, within a clump of reeds in water or a swamp and is built on a platform of bent-over reeds.

Despite occurring in a range of wetland types, breeding is known to occur in a much smaller sub-set of locations (Cth DCCEEW 2022b). Breeding has been confirmed in areas of the Riverina, predominantly the Coleambally Irrigation Area where irrigated rice crops provide optimal habitat for Australasian Bitterns.

Areas within the subject land are not considered suitable breeding habitat for the Australasian Bittern, which do not meet the requirements for breeding habitat. No breeding of Australasian Bittern has been recorded in the subject land, despite tracking efforts of individual birds travelling to and from the Coleambally Irrigation Area as part of the Bitterns in Rice Project (Herring, M. 2023). It is considered unlikely that Australasian Bittern utilise habitats within the subject land for breeding, and removal of a small amount of potential non-breeding habitat is unlikely to result in a disruption to the breeding cycle of Australasian Bittern.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

No. The project is unlikely to modify remaining potential habitat that may be available to the species during flooding events such that the species is likely to decline. Australasian Bittern is a highly mobile species, and is capable of undertaking large spatial movements to exploit seasonally available resources. Removal of a minor amount of suboptimal habitat is unlikely to represent a significant loss of habitat for the species, or contribute to its decline. Higher quality areas of habitat have been retained as a result of the project, and importantly remain more broadly within the landscape, and the nature of the project would not preclude the species from occupying habitats within the subject land during favourable conditions.

Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat.

No. The project would be subject to a Biodiversity Management Plan that would include biosecurity measures to limit the likelihood of introducing invasive species during construction and operation of the project and details regarding feral animal control.

It is unlikely that the project would result in the establishment of new invasive species. The project is unlikely to exacerbate the current level of invasive species populations utilising the area, such as cats and foxes.

Invasive weeds species are not known to directly harm populations of Australasian Bittern, but do have potential to reduce quality of habitat in wetland areas. The risk of introduction of weed species will be mitigated by the implementation of good soil transportation practices throughout works that will be detailed in the Construction Environment Management Plan (CEMP).

Introduce disease that may cause the species to decline.

No. The project is unlikely to introduce a disease that may cause the species to decline. The project would be subject to a Biodiversity Management Plan that would include measures for biosecurity and hygiene control to limit the introduction of pathogens as a result of the construction and operation of the project.

Interfere substantially with the recovery of the species.

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SIC assessment for Endangered species

A national recovery plan currently exists for Australasian Bittern. Actions outlined within the plan to aid in the recovery of the species relating to the project include:

- Identify subpopulations of high conservation priority.
- Identify key locations that require habitat protection and improvement.
- Protect areas of 'habitat critical for survival' that are not currently managed for nature conservation.
- Develop and implement a range of voluntary incentives for protecting Australasian Bittern habitat on private land.
- Undertake wetland restoration activities, to create suitable habitats for Australasian Bittern.
- Monitor habitat subject to restoration and enhancement.

The project would result in direct impacts to small areas of marginal wetland vegetation. In the broader landscape context, and based on tracking information of the species, the Coleambally Irrigation Area is considered to be a key location for breeding in the region and a key conservation priority. It is unlikely the project will result in substantial interference with the recovery actions listed for the species.

Conclusion

Based on the assessment above, it is concluded that Australasian Bittern is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project:

- Will not lead to the long term decrease of a population, reduce the areas of occupancy or fragment an existing population.
- Will not disrupt the breeding cycle of a population, or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not interfere will the recovery of the species.

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Appendix 6.8. Plains-wanderer *Pedionomus torquatus*

Distribution

Plains-wanderer *Pedionomus torquatus* (EPBC Act, Critically Endangered) occurs in semi-arid and arid NSW, with the core occurrence of records located between Narrandera in the east, Deniliquin in the south, Balranald in the west and Hilston in the north. Records are located is population clusters throughout western NSW including Mossgiel, Mungo National Park, Nearie Lake Nature Reserve and as far as Sturt National Park in north-west NSW (DoE 2016)

Habitat requirements

Preferred habitat is generally characterised as containing approximately 50 % bare ground, 10 % fallen litter, and 40 % grasses, herbs, and forbs, usually on hard red-brown loams (DPIE 2020). Grass tussocks are mostly shorter than five centimetres, with some patches of vegetation up to around 30 centimetres important for providing concealment. Inter-tussock space with bare earth and sparse litter is an important habitat component. Plains-wanderers do not use habitat that is too dense with limited space between tussocks, actively avoid areas of dense grass, and their presence is negatively correlated with increased grass height (DoE 2016, DPIE 2020). Open grassland structure is necessary to allow the birds to forage efficiently and to detect and avoid predators.

It should be noted that Plains-wanderer has also been recorded as occurring in low, sparse chenopod shrublands (Harrington et al, 1988), however, it is unknown as to whether the species can persist in these habitats over extended timeframes (DoE 2016).

Survey observation

Plains-wanderer Mapped Important Areas of habitat (NSW DCCEEW 20243) occur throughout the subject land. Surveys for Plains-wanderer focused on identifying grasslands outside of NSW DCCEEW Mapped Important Areas that nonetheless contained similar structural characteristics to these areas. At the time of surveys (March/April 2023), the grasslands observed, including the nearby Mapped Important Areas, contained habitat structure that was generally too dense as described in the *National Recovery Plan for the Plains-wanderer (Pedionomus torquatus)* (DoE 2016), the *Saving Our Species Plains-wanderer Habitat Management Guide* (DPIE 2020b), and more recent research by Nugent et al. (2022 *Multi-scale habitat selection by a cryptic, critically endangered grassland bird—The Plains-wanderer (Pedionomus torquatus): Implications for habitat management and conservation*. The habitat survey took into account the extended period of above-average rainfall as well as the likely light to moderate grazing regime prior to survey when assessing habitat suitability.

The grassland (and low open chenopod shrublands) within the subject land was found to be, almost uniformly, less than 25% bare ground with significant amounts of litter occupying the inter-tussock space and grass tussocks spaced closely together, much more so than the preferred inter-tussock space of 10-20 centimetres (DPIE 2020b).

Based on the dynamic nature of Riverina grasslands, presence of suitable habitat within the subject land, as well as expected suitable habitat and known records in the surrounding landscape, a population of Plains-wanderer is likely to exist. Based on the results of the habitat assessment, grazing levels within the subject land were of low density, based on biomass available, and grass cover being relatively high during the prolonged wet period over the 2021, 2022 and 2023 seasons. Given the density of the grasslands at the time of survey, most of the subject land, including Mapped Important Areas and the additional habitat area

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mapped by Biosis, would be unlikely to be utilised at the current time by the local population of the species. However, the habitat assessment applied a precautionary approach and considered that even though the majority of Mapped Important Areas grasslands were too dense in their current condition, additional areas were considered suitable habitat if they were similar in structure and composition to the Mapped Important Areas grasslands, as these areas were assessed based on their potential to support Plains-wanderers under different conditions than the conditions observed at the time of survey, namely if the site were subjected to increased grazing or a period of prolonged drought. The subject land has potential to support a local population of the species during periods of drought or more average years.

Approximately 645 hectares of Mapped Important Areas occur within the subject land, and 11.8 hectares within the development corridor. Other areas of potential habitat mapped by Biosis within the development corridor is 114.42 hectares.

Targeted surveys for this species were undertaken in March and April 2023.

SIC assessment for Plains-wanderer

SIC assessment for endangered species
Lead to the long-term decrease in the size of a population of a species.
No. A population of Plains-wanderer is considered reasonable likely to occur within the subject land based on recent records of the species in close proximity to the subject land, incidental observation of one individual within the subject land and the presence of suitable habitat within the subject land that is broadly connected to known habitats present within Oolambeyan National Park. The subject land supports areas of habitat, that whilst currently occurring in a form that is sub-optimal for Plains-wanderer (generally too dense), would nonetheless support the species following environmental conditions that result in reduced density of grass tussocks. Plains-wanderer primary habitat mapping completed by NPWS in 2001 across 2.28 million hectares, identified 52,783 ha of primary habitat NPWS 2002, which formed the basis of BAM Mapped Important Areas, approximately 645 ha of which occurs with the subject land. Carrying capacity was assessed by NPWS (2002) as at the time (2001 / 2002) as 1 pair of birds per 18 ha (NPWS 2002). However, within the Riverina the Plains-wanderer population is estimated to have undergone a reduction in numbers of approximately 75% during the 2002 drought, after which time there was only minor, staged increases in numbers between 2004 to 2010 (Parker & Baker-Gabb, 2013). Further population declines in the Riverina population of Plains-wanderer subsequently occurred following the increased rainfalls experienced from late 2010 to 2012 (Parker & Baker-Gabb, 2013). More recent analysis of monitoring data collected between 2001 and 2014 indicates that there was an overall decline in numbers of 93% across sites in the Riverina region over this time period (Cth DCCEEW 2015). Based on approximately 645 ha of mapped suitable habitat within the subject land, up to an estimated 4 pairs of birds may potentially occur within the subject land. The project is expected to impact upon approximately 2.38 ha of Mapped Important Habitat for Plains-wanderer, or a total of 73 ha of potential habitat when additional Biosis mapped habitat is considered. These impacts equate to 0.36% of the total Mapped Important Habitat, to up to 1.8% of the total mapped habitat within the development corridor. Based on the potential for the subject land to support up to 4 pairs of birds within approximately 645 ha of potential habitat, impacts to up to 1.8% of this habitat cannot be said to be likely to impact upon sufficient habitat such that the local population is impacted. However given the largely sedentary nature of the species and the low overall population numbers, in the unlikely event that proposed impacts were to occur directly to an area currently utilised by the species, it could be possible that a decrease to the size of the local population could occur.
Reduce the area of occupancy of a population.

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SIC assessment for endangered species

Yes. As outlined above, based on approximately 645 ha of suitable habitat within the subject land, up to an estimated 4 pairs of birds may potentially occur within the subject land. Home ranges of individual birds is up to 21 ha in the Riverina (12 ha on average), with pairs' home ranges equating to approximately 18 hectares due to around half of a pairs home ranges overlapping individual home ranges overlapping (CoA 2015). Based on the largest estimate of each individual bird requiring 21 ha of non-overlapping habitat, the maximum area of occupancy of the potential population that could occur within the subject land would be 210 ha, or 26 % of the mapped suitable habitat. Based on these figures it is possible that impacts to 2.38 of mapped important mapped areas and 73.44 ha of potential habitat by the project would reduce the area of occupancy of a population. However given, the largely sedentary nature of the species and the low overall population numbers, in the unlikely event that proposed impacts were to occur directly to an area currently utilised by the species, it could be possible that a reduction in the population's area of occupancy could occur.

Fragment an existing population into two or more populations.

No. The project is not expected to result in substantial fragmentation impacts to the population of Plains-wanderers potential occurring within the subject land. Plains-wanderers are known to be mainly sedentary, particularly when habitat is suitable, however they may move greater distances in response to changes in environment and habitat availability (Marchant and Higgins, 1993) (CoA 2015). The project will directly impact upon areas of suitable habits, and in some cases create localised fragmentation of habitat via construction of roads and access tracks through areas of habitat. However, no permanent barriers excluding the species from adjacent areas of suitable habitat, or preventing movements between separated areas of habitat, will be created. Furthermore there are large areas of suitable habitat within the subject land that are not impacted by the project, which will persist into the future, including approximately 645 ha of Mapped Important Areas, of which a large portion occurs within indicative stewardship sites associated with the project and 2,998 ha of potential riverine grassland areas within the subject land more broadly.

Adversely affect habitat critical to the survival of a species.

Yes. The National Recovery Plan for Plains-wanderer (DoE 2016) states habitat critical to the survival of this species includes:

- Any regions where the species is likely to occur, and
- Any newly discovered locations that extend the likely range of the species.

The subject land occurs in a "region where the species occurs", supports habitat considered suitable to support the species, occurs proximal to recent records of the species, and has the potential to support up to 4 pairs of birds. As such, mapped habitats within the subject land are considered habitat critical to the survival of the species.
Given the sedentary nature of the species, and overall low population umbers, impacts to 2.38 ha of important mapped areas and 73.44 ha of potential habitat is considered likely to adversely affect habitat critical to the survival of a species.

Disrupt the breeding cycle of a population.

No. Plains-wanderers breed in solitary pairs that require an area of approximately 18 hectares due to around half of a pairs home ranges overlapping individual home ranges overlapping (CoA 2015). It is possible that up to 4 pairs of birds could utilise habitats with the subject land based on current population estimates. Whilst it is unlikely that impacts associated with the project would occur to areas currently being utilised for breeding, given the sedentary nature of the species and overall low population umbers, if impacts were to occur directly to a breeding pair, this may be considered a disruption to the breeding cycle of the overall population.

Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Yes. Estimated total population numbers of Plains-wanderers within NSW are between 200 and <1000 individuals (Cth DCCEEW 2015). As outlined above, the project is considered likely to impact upon habitat considered critical to the survival of the species, and has the potential to impact the size and reduce the area of occupancy of a population of the species. If any of these impacts were to occur to the between 1 and 4 pairs of birds potentially utilising the habitat present

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SIC assessment for endangered species
within the subject land, this would equate to an impact to 1% and 5% of the lower estimate, and 0.2% and 1% of the upper estimate, of the total population of the species. In the worst case scenario impact of loss of habitat associated with the project resulting in impacts to 4 pairs of birds, or 5% of the total population of the species, the project would be considered likely to impact habitat to a level where the species is likely to decline. The potential for this worst case scenario impact to occur is very low, however it illustrates that due to the low overall population numbers of the species some potential for substantial impacts at the species level remain.
Result in invasive species that are harmful to a species becoming established in the species' habitat.
No. The subject land is already located within a highly modified environment, dominated in land used for agricultural activities, with invasive species harmful to Plains-wanderer, such as Foxes, already well established. As a part of the Biodiversity Management Plan, a Weed and Pest Management component will be strictly implemented to prevent the increase in invasive species as a result of the project
Introduce disease that may cause the species to decline.
No. The project is not likely to introduce any diseases this species is susceptible to. In addition to this the project will implement several controls and management plans including a Biodiversity Management Plan and a Weed and Pest Management Plan. Considering the nature of the project and the management plans which will be implemented, it is considered unlikely the project would introduce disease that may cause the species to decline.
Interfere substantially with the recovery of the species.
No. The National Recovery Plan for this species outlines the following objectives: • Reverse the long-term population trend of decline and increase the numbers of Plains-wanderers to a level where there is a viable, wild breeding population, even in poor breeding years, and • Enhance the condition of habitat across the Plains-wanders' range to maximise survival and reproductive success, and provide refugia during periods of extreme environmental fluctuation. The project will not interfere substantially with these recovery objectives.
Conclusion.
The project is considered to have the potential to result in a significant impact to Plains-wanderer**.** This assessment has found that the project: • Is likely to adversely affect habitat critical to the survival of the species and reduce the area of occupancy of a population. • Has some potential to impact the species' habitat to the extent that the species is likely to decline. • Is unlikely to lead to the long-term decrease in a population of this species or disrupt the breeding cycle of this species. However there is a possibility these impacts could occur. • Will not fragment an existing population into two or more populations, result in invasive species becoming established in the species' habitat, introduce disease that may cause the species to decline, or interfere with the recovery of the species. Based on it being possible that a number of key Significant Impact Criteria could occur as a result of the project, the conclusion of a potential significant impact to Plains-wanderer is considered warranted.

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Appendix 6.9. Corben's Long-eared Bat – *Nyctophilus corbeni*

Distribution

This species occurs across NSW, with a primary band of records leading north-east through inland areas from Wentworth across to Moree (NSW DCCEEW 2024b). Potential occurrence is noted throughout most of inland, semi-arid and arid NSW (DCCEEW 2024).

Habitat Requirements

This species occurs in a wide range of habitats including inland woodland with box, ironbark, cypress pine, Buloke, brigalow, Belah, Smooth-barked Apple, River Red Gum, Black Box and various types of mallee (Threatened Species Scientific Committee 2015). The species is noted as being more abundant in extensive stands of vegetation in comparison to small or fragmented woodland patches, suggesting a large home range. Old growth vegetation is likely a critical component to this species habitat requirements (Threatened Species Scientific Committee 2015). Corben's Long-eared Bat is not considered to be at risk of turbine strike due it its flight characteristics being generally below RSA height, with a slower, more manoeuvrable flight, below canopies and in and around vegetation.

Survey observation

No threatened species were positively identified during the bat utilisation survey effort completed by nature Advisory, however, three species complexes were identified. One of the three species complexes has the potential of being Corben's Long-eared Bat *Nyctophilus corbeni*. This species has been assessed within the BDAR as having the potential to occur and as such, is subject to assessment below.

SIC assessment for Corben's Long-eared Bat

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species.
No. The subject land occurs within the known distribution of this species. A call complex was identified during the bat utilisation survey effort which has the potential of being Corben's Long-eared Bat *Nyctophilus corbeni.* Species complexes occur, as not all microbat species are able to be consistently or reliably identified using echolocation detection alone. Where this occurs, groupings are compiled of possible species and labelled as a species complex**.** Habitat for Corben's Long-eared Bat is primarily within extensive, albeit patchy occurrences of White Cypress Pine Open Woodland (PCT 28), and areas of Black Box Woodland (PCTs 13 and 16) scattered throughout the subject land. Due to most of the WTGs being located >200m away from watercourses, the majority of this habitat is not proposed to be directly impacted. However, a small number of WTGs are adjacent to this habitat and also require clearing for access tracks for construction and operation purposes. In regard to collision risk, this is considered low to negligible, as this species is highly manoeuvrable and able to change direction often and quickly (Churchill 2008) as well as prefer to fly very close to vegetation, usually at canopy height, where they weave between gaps in the canopy (Churchill 2008). Mitigation measures including two-staged clearing procedures will be undertaken for removal of any hollow-bearing trees or those with fissures. In the event this species is identified. Works would cease and further assessment would be undertaken. Considering the above, the project is unlikely to lead to a long-term decrease in an important population of Corben's Long Eared Bat

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SIC assessment for vulnerable species
Reduce the area of occupancy of an important population.
No. The species is known to be more abundant in extensive stands of vegetation, in comparison to smaller woodland patches, suggesting its home range is probably large. Based on this large home range, it can be assumed that if a population of the species occurs within the subject land it would likely utilise habitats across the majority of the site and within the surrounding locality. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This includes larger patches of native woodland vegetation, and higher quality, intact remnants of Black Box dominated woodland and higher quality patches of White Cypress Pine communities. The project is not expected to reduce the area of occupancy of the population, especially given the species is likely to be able to persist during operation of the project.
Fragment an existing important population into two or more populations.
No. The project is not anticipated to increase fragmentation within the population's distribution. The project will result in linear removal of some areas of suitable habitat, and the removal of nine hollow bearing trees, however a larger percentage of habitat will be retained. Further to this, the proposed operational impacts are limited to widely spaced wind turbines and relatively low usage access tracks and is therefore, in conjunction with this bats particular and preferred flight and foraging behaviours, it is unlikely to significantly prevent dispersal of this mobile species, into contiguous areas of habitat within and outside of the subject land.
Adversely affect habitat critical to the survival of a species.
No. Habitat critical to the survival of Corben's Long-eared Bat has not been defined in an approved national recovery plan for the species or in the approved conservation advice for the species. While habitat within the subject land includes potential for foraging, breeding, roosting and dispersal, it is not considered to be habitat that is critical for the species' survival nationally.
Disrupt the breeding cycle of an important population.
No. There is little information available on the species' reproductive biology, but breeding is thought to be seasonal with maternity colonies of 10-20 individuals roosting in dead trees including cypress. Mitigation measures including stop works procedure will be undertaken for removal of any hollow bearing trees that could support this species, in the event this species is identified. Works would cease and further assessment would be undertaken. Given the large amount of suitable habitat being retained, it is considered unlikely that the project would result in any disruption to the breeding cycle of the population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
No. Habitat reduction is considered unlikely to cause the species to decline. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This includes larger patches of native woodland vegetation, and higher quality, intact remnants of Black Box dominated woodland and higher quality patches of White Cypress Pine communities. Furthermore, the quality of retained habitats will not be decreased as the risk of collision and/or barrier effect from WTGs is negligible.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
No. The project would be subject to a Biodiversity Management Plan that would include biosecurity measures to limit the likelihood of introducing invasive species during construction and operation of the project and details regarding feral animal control. It is unlikely that the project will result in the establishment of new invasive species. The project is unlikely to exacerbate the current level of invasive species populations utilising the area, such as cats and foxes.

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SIC assessment for vulnerable species
Introduce disease that may cause the species to decline.
No. The project is not likely to introduce any diseases this species is susceptible to. In addition to this the project will implement several controls and management plans including a BBAMP, Biodiversity Management Plan and a Weed and Pest Management Plan. Considering the nature of the project and the management plans which will be implemented, it is considered unlikely the project would introduce disease that may cause microbat species to decline.
Interfere substantially with the recovery of the species.
No. An approved national recovery plan has not been prepared for Corben's Long-eared Bat, however the Threatened Species Scientific Committee (TSSC) has prepared Conservation Advice for the species which outlines recovery actions. Habitat loss and fragmentation are listed as known key threats to the species in the Conservation Advice.
Conclusion.
Based on the assessment above, it is concluded that Corben's Long-eared Bat is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project: • Will not lead to the long term decrease of a population, reduce the areas of occupancy or fragment an existing population. • Will not disrupt the breeding cycle of a population, or species as a whole. • Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread. • Will not interfere will the recovery of the species**.**

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Appendix 6.10. Southern Bell Frog *Litoria raniformis*

Species background

Southern Bell Frog (also known as the Growling Grass Frog) is listed as vulnerable under the EPBC Act. The species has declined in both distribution and abundance in NSW, but has persisted in irrigated rice-growing areas along the Murrumbidgee and Murray Rivers (Pyke & Muir 2008), including the Coleambally Irrigation Area and the Lowbidgee floodplain which occur in close proximity to the subject land. In the semi-arid part of its range, the species typically requires large, continuous areas containing both permanent and ephemeral waterbodies that undergo regular flooding. Waterbodies containing diverse aquatic vegetation are needed for floating, calling and foraging, surrounded by habitat that contains suitable refugia (DSE 2012). In the study area, suitable habitat is associated with permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys.

Breeding occurs during the warmer months and is triggered by flooding or a significant rise in water levels. The species has been known to breed anytime from early spring through to late summer/early autumn (Sept to April) following a rise in water levels.

The main threats to Southern Bell Frog include habitat loss, degradation and modification, fragmentation and isolation of populations, and introduced predators and disease (DEWHA 2009).

Occurrence in study area

The Coleambally Irrigation Area occurs north of the subject land, and is listed as a Priority Management Site under the NSW Saving Our Species strategy (SOS). It comprises a series of wetlands (primarily on private land), interspersed with irrigated crops, primarily rice. Irrigated rice crops are thought to be key breeding habitat for the species within the Coleambally Irrigation Area, so much so that they are considered unlikely to breed in waterbodies other than rice fields, including supply channels, drainage channels or other water bodies (Pyke & Muir 2008). Permanent wetlands are more likely to be occupied by the species and to provide important core breeding habitat. Seasonally flooded sites are also likely to be used during high-rainfall years (DEWHA 2009). In the semi-arid zone, individuals are unlikely to move further than 5 kilometres between water bodies in the absence of major flood events. Within the subject land, there is habitat connectivity (terrestrial and aquatic) between waterbodies on site, and between waterbodies at neighbouring sites, including the Coleambally Irrigation Area via the Coleambally Irrigation Channel that runs through the eastern portion of the subject land.

Surveys for Southern Bell Frog within the subject land occurred following above average rainfall and flooding events in 2022, 2023 and 2024. As a result, Southern Bell Frog was recorded in high numbers throughout the subject land, reflecting the species' ability to occupy marginal habitats to exploit seasonal conditions and disperse terrestrially through the landscape in wet years (DEWHA 2009).

Outside high rainfall events and flood years, areas that provide permanent water sources occur within the Coleambally Outfall Drain, as well as farm dams and the larger areas of lignum swamp. The site also contains numerous topographic depressions that may be utilised seasonally depending on local rainfall. Coleambally Outfall Drain is not considered to be optimal habitat as it lacks diverse aquatic flora required for breeding. It is likely to act as a dispersal pathway however, likely bringing frogs down from the priority sites associated with the Coleambally Irrigation Area. It was noted that where more permanent water was found and *Gambusia holbrooki* were present, the Southern Bell Frog was not recorded or observed to be present. Where more

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permanent water was found, such as irrigation channels and farm dams, and where Gambusia holbrooki was not present, mature individuals, immature individuals and tadpoles were observed.

Associated PCTs within the subject land include PCTs 10, 13, 15, 17, 24, 28, and 45, however suitable habitat is likely to constitute PCTs 13, 15, 17, and 24 that comprise wetland vegetation.

SIC assessment for Southern Bell Frog

SIC assessment for vulnerable species

Lead to the long-term decrease in the size of an important population of a species.

No. There is a low likelihood that the project would lead to a long-term decrease in the size of an important population of the Southern Bell Frog. The Significant Impact Guidelines for Growling Grass Frog consider any viable population as an important population for the species (DEWHA, 2009b). The guidelines define a viable population as 'one which is not isolated from other populations or water bodies, such that it has the opportunity to interact with other nearby populations or has the ability to establish new populations when water bodies fill and become available'.

Southern Bell Frogs were recorded during targeted surveys over numerous years in large numbers within the subject land. As the population meets the criteria in the definition above, records within the subject land are considered to represent an important population for the species. Individuals are likely to be connected with those in the Coleambally Irrigation Area priority management site located to the north. The area was experiencing a seasonal boom at the time of survey following above average rainfall in the region that had led to localised flooding, a known mechanism for facilitating dispersal and widespread breeding events for the species (DEWHA 2009), resulting in movement between the two areas and into the surrounding landscape. Outside of these times, the subject land is connected to the Coleambally Irrigation Area via the Coleambally Irrigation Channel and Coleambally Outfall Drain that runs through the eastern and northern portions of the subject land respectively, and may act as a dispersal pathway.

Factors likely to lead to a long-term decrease in the size of a population include land clearing, changed hydrological regimes, increasing salinity, draining and removal of wetlands, isolation of breeding habitats and fragmentation of dispersal corridors (DSE 2012).

Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitats for the Southern Bell Frog, were avoided as much as possible. Within the subject land, there are numerous ephemeral wetlands and drainage lines associated with topographic depressions of the floodplain. Suitable aquatic habitat and low-lying areas with potential for seasonal inundation throughout the subject land have been buffered and excluded by design from development, resulting in retention of larger lignum swamps and farm dams. Direct impacts include 17.11 ha of ephemeral habitat within PCT 17, PCT 15, and PCT 13. Direct impacts to Southern Bell Frog habitat are likely to represent marginal and opportunistic habitat, rather than core breeding habitat. These areas may be occupied on a seasonal or transient basis in response to flooding events, but are unlikely to maintain a resident population. In addition, 103.8 ha will be retained within the development corridor, and approximately 2,454 ha within the broader subject land.

The main area of suitable permanent habitat for Southern Bell Frog is associated with the Coleambally Outfall Drain, Lignum and Chenopod dominated wetlands and irrigated cropping areas with a more frequent source of permanent water in the landscape. The latter did contain evidence of tadpoles where Gambusia were not recorded. The project would involve some minor construction associated with the Coleambally Outfall Drain, and around irrigated cropping areas, that would not prevent future occupation or dispersal by the Southern Bell Frog.

The project would not result in changed hydrological regimes.

The project would result in some removal of suitable terrestrial dispersal habitat however, critical areas associated with waterbodies have been largely avoided through the design stage and the application of buffers. The operation phase of the project is considered compatible with Southern Bell Frog dispersal, and although the project would modify the terrestrial habitat it is unlikely to result in permanent barriers or obstructions to movement in the landscape for the

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Southern Bell Frog during periods of high rainfall.
All potential indirect impacts such as noise, sediments and pollutants will be managed through the Biodiversity Management Plan to ensure that the project does not compromise surrounding water quality which in turn, could impact on the species' habitat and food resources.
In consideration of the above, the project is considered unlikely to lead to a long-term decrease in the size of an important population.

Reduce the area of occupancy of an important population.

No. The area of occupancy for the Southern Bell Frog has not been defined in the National Recovery Plan. The species has a broad distribution with two distinct biogeographical groups. In the northern part of its range, frogs are concentrated in landscape refugia such as permanent waterbodies, and breeding and landscape dispersal are triggered by high rainfall and flood events (DSE 2012).
Southern Bell Frog was observed repeatedly within the subject land, even within areas not typical consistent with their preferred habitat (26 DNG). This is likely in response to the above average rainfall experienced in the area prior to survey, which facilitates landscape dispersal and breeding in this species (DSE 2012). The area of occupancy within the landscape for Southern Bell Frog at the time of survey was likely to be near the maximum extent for the species following the initial surveys in 2022. Subsequent surveys in 2023 and 2024 for Southern Bell Frog in the subject land reflect seasonal changes of occupation contracting to permanent and semi-permanent wetlands following receding of floodwaters.
There is a low likelihood that the project would reduce the area of occupancy for an important population of Southern Bell Frog. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Suitable wetland habitat and low-lying areas have been largely excluded from the development by design, with a total of 17.11 ha of direct impacts within ephemeral habitat within PCT 13, 15 and 17. Where impacts to known habitat are likely to occur (such as crossings along the Coleambally Outfall Drain), these would be temporary and would not result in permanent changes to the habitat such that it would be rendered unsuitable for Southern Bell Frog.
Although the project would result in some removal of suitable dispersal habitat, critical areas of habitat surrounding permanent or semi-permanent waterbodies have largely been avoided through the design stage. The operation of the project is considered compatible with Southern Bell Frog dispersal, and although the project would modify the terrestrial habitat it is unlikely to preclude Southern Bell Frog from dispersal during periods of high rainfall to areas of retained habitat within the subject land.
There is a low likelihood that the project would result in a significant reduction in the area of occupancy of the Southern Bell Frog.

Fragment an existing important population into two or more populations.

No. Spatial arrangement and connectivity among waterbodies within the landscape is a key factor in determining presence of Southern Bell Frog at a given site (DEWHA 2009). The long-term viability of individual populations is dependent on a matrix of aquatic and terrestrial habitats that provide dispersal corridors to and from local breeding sites (DEWHA 2009). Landscape alterations that decrease connectivity between habitat patches are therefore likely to impact the viability of individual populations (DEWHA 2009).
The project is considered unlikely to lead to fragmentation of an important population into two or more populations. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Direct impacts will be limited to 17.11 ha designated for wind turbines and associated infrastructure. However, suitable wetlands, including ephemeral water bodies and the capacity within the Coleambally Outfall Drain would be retained as part of the project. This would result in a matrix of suitable wetlands remaining available for the Southern Bell Frog within the landscape, which would still be connected by suitable dispersal corridors. Impacts to suitable habitat such as the Coleambally Outfall Drain, are

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short-term and temporary, and would not affect the long-term suitability of these sites for occupation by the Southern Bell Frog.

The species is known to be capable of colonising agricultural and moderate to high rainfall pastoral land provided there are adequate waterbodies present both permanent and ephemeral (DSE 2012). While the project will result in the removal of 17.11 ha of native vegetation and pastoral land, areas to be removed are sporadic within the landscape (wind turbines) and will not result in the significant modification to dispersal pathways. The project is considered compatible with long-term dispersal for the species within the landscape. It is therefore unlikely that the development would alter the availability or accessibility of waterbodies within the landscape that may be utilised by Southern Bell Frog either permanently or seasonally.

Adversely affect habitat critical to the survival of a species.

No. Habitat critical to the survival of the species would include all breeding habitats, as well as associated waterbodies within the landscape matrix used during periods of dispersal, and surrounding refugia for individuals during hibernation. Habitat critical to the survival of the species has been identified in the SOS strategy for Southern Bell Frog, which includes the Coleambally Irrigation Area north of the site, a priority management site for the Southern Bell Frog. The habitat associated with this site is considered of high quality and vital in the long-term survival of the species and preventing further declines. Impacts to this habitat would therefore be a mechanism that may contribute to the species decline. It is therefore important to note that the project would not modify, destroy, remove or isolate the availability or quality of habitat associated with the priority management site that is critical to the ongoing survival of the Southern Bell Frog.

There is a low likelihood that the project would adversely affect habitat critical to the survival of the Southern Bell Frog through impacts within the subject land. Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Direct impacts will be limited to 17.11 ha designated for wind turbines and associated infrastructure. Indirect and prescribed impacts such as noise associated with the operational stage of the wind farm are not likely to be significant as they will be managed under a Biodiversity Management Plan for the project. Given the extent of impacts, the number and diversity of water bodies available to the species is likely to remain largely unchanged as a result of the project, and there would be no permanent alteration to connectivity during flood events.

Approximately 103.8 ha will be retained within the development corridor, and 2454 ha within the broader subject land. Therefore, movement corridors and access to suitable waterways will still be available to the Southern Bell Frog following completion of the development and during the operational phase.

The project would not limit dispersal corridors or access to other suitable low-lying areas in the landscape, that would remain available to the Southern Bell Frog during periods of high-rainfall.

Disrupt the breeding cycle of an important population.

No. The Southern Bell Frog is reliant on aquatic and riparian habitats for breeding and the subsequent development of the larval stage (DSE 2012). Following breeding, the species is known to disperse into the landscape, particularly during flooding events. There is a low likelihood that the project would disrupt the breeding cycle of an important population. Direct impacts constitute the removal of 17.11 ha of PCTs 13, 15, 17 and 24, however, this is unlikely to result in any disruption to the breeding cycle, given 108.8 ha will be retained within the development corridor, and approximately 2454 ha within the broader subject land, particularly the Coleambally Irrigation Area priority site which is a key source population in the region. The project would not lead to the permanent degradation or removal of habitat such that the recruitment, survival or dispersal rates of an important population would be lowered enough to have a significant impact on the species.

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Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

No. Quality habitat for Southern Bell Frog includes permanent and semi-permanent waterbodies, particularly those subject to seasonal flooding, containing submergent and emergent vegetation for calling, foraging and floating. Thick vegetation, rocks, logs and other debris adjacent to waterways are also important for shelter, particularly during winter hibernation (DEWHA 2009). Detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. Direct impacts will be limited to 17.11 ha suboptimal ephemeral habitat within PCT 13, 15, 17 and 24. This is considered a relatively minor impact when considered in relation to habitat available in the landscape. Prescribed impacts arising from the operational phase of the project such as noise would be managed under a Biodiversity Management Plan and are not considered to be significant. The project would not lead to the permanent degradation or removal of habitat such that the recruitment, survival or dispersal rates for Southern Bell Frog would be impacted such 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. The project does not include any known mechanism that would result in the establishment of invasive species harmful to Southern Bell Frog that are not already present in the area. The project would be subject to a Biodiversity Management Plan that would include biosecurity measures to limit the likelihood of introducing invasive species during construction and operation of the project and details regarding feral animal control.
It is unlikely that the project would result in the establishment of new invasive species. The project is unlikely to exacerbate the current level of invasive species populations utilising the area, such as cats and foxes.

Introduce disease that may cause the species to decline.

No. The project does not include any known mechanism that would result in the establishment of disease (i.e. Chytrid fungus) harmful to Southern Bell Frog that is not already present in the area. The project is unlikely to introduce a disease that may cause the species to decline. The project would be subject to a Biodiversity Management Plan that would include measures for biosecurity and hygiene control to limit the introduction of pathogens as a result of the construction and operation of the project.

Interfere substantially with the recovery of the species.

No. The project will not interfere with the recovery of the species in respect to the specific objectives for recovery outlined in the in the *National Recovery Plan for Growling Grass Frog* (Clemann and Gillespie 2012).

Conclusion.

Based on the assessment above, it is concluded that Southern Bell Frog is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project:

- Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population.
- Will not disrupt the breeding cycle of an important population, the local population or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.

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SIC assessment for vulnerable species

- Will not interfere will the recovery of the species.

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Appendix 6.11. A spear-grass *Austrostipa wakoolica*

Species background

Austrostipa wakoolica is listed as endangered under the EPBC Act. The species is a densely-tufted, perennial spear-grass species which grows over one metre tall. The species is characterised by leaves that are flattened or rolled, 1.5 to 2.5 millimetres wide at their bases, slightly too strongly ribbed and densely hairy. The flower-heads are spreading and moderately dense. The species flowers in response to rain, and has been recorded flowering from October to December (DCCEEW 2014).

The species does not tolerate disturbance, and as such, requires protection from impacts of grazing and rabbits. Periodic flooding is required to maintain wet conditions within its habitat. *Austrostipa wakoolica's* distribution is confined to the floodplains of the Murray River tributaries of central-western and south-western NSW. The most significant threats to the population are habitat reduction and modification from pastoral development, irrigation and altered flooding regimes; grazing including that by domestic stock, rabbits, and kangaroos; drought due to rainfall-dependence of the species; and weed invasion and competition, particularly from exotic grasses (DCCEEW 2014).

Austrostipa wakoolica within the subject land

Recorded habitats include the edge of a lignum swamp in brown loam, creek banks in grey silty clay, mallee and lignum sandy loam flat, open cypress pine forest on low range in sandy soil and a low rock rise fenced-off from stock for about 18 months (DECCW, 2014). Can be associated with PCT 13, PCT 17, PCT 26 and PCT 28 has been assumed present in the latter zones where survey effort is deficient.

SIC assessment for *Austrostipa wakoolica*

SIC assessment for Endangered species
Lead to a long-term decrease in the size of a population
No. *Austrostipa wakoolica* has not been surveyed adequately to date, due to flooding and access constraints in November 2022, 2023 and 2024, with 16.41 ha still currently assumed present. It will be subject to further survey in November 2025. Extensive survey has been completed, and the species not found to date. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This included known habitats such as lignum swamp in brown loam with box and mallee, creek banks in grey silty clay, mallee and lignum sandy loam flat, open cypress pine forest on low range in sandy soil (DECCW, 2014). Regardless of the outcomes of the additional surveys, potential indirect impacts will be managed through mitigation measures which are outlined in the BDAR, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures. If the species is detected, further avoidance will be prioritised. It is considered unlikely that the project will lead to a long term decrease in the size of a population.

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SIC assessment for Endangered species
Reduce the area of occupancy of a population
No. *Austrostipa wakoolica* has not been surveyed adequately to date, due to flooding and access constraints in November 2022, 2023 and 2024, with 16.41 ha still currently assumed present.. It will be subject to further survey in November 2025. Extensive survey has still been completed with areas or habitat that have had survey completed, this species was not identified. This species was subject to further survey in November 2024. Assumed areas where this species may be present is approximately 16.41 ha within PCT 28. This species can be associated with PCT 17 and PCT 26, and minor occurrences in PCT 13 , however representative survey has been conducted within these areas. It is unlikely that impacts would substantially reduce the occupancy for this species.
Fragment an existing population into two or more populations.
No. *Austrostipa wakoolica* has not been surveyed adequately to date, and has been assumed present within16.41 of unsurveyed area. Habitat within the subject land is partially fragmented by historical and ongoing land clearing and grazing regimes. Regardless of the further surveys to be undertaken, it is unlikely the project would result in the fragmentation of a population.
Adversely affect habitat critical to the survival of a species.
No. No critical habitat for this species has been determined. Due to key avoidance measures, it is unlikely that any habitat critical for this species would occur in the subject land, and therefore be impacted.
Disrupt the breeding cycle of an important population.
No. It is not considered likely an important population of *Austrostipa wakoolica* occurs within the subject land.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
No. Due to key avoidance measures and survey undertaken to date, it is unlikely that impacts to optimal habitats, as well as areas of sub optimal habitat where this species is less likely to be present, will lead to a decline in the availability of quality habitat for this species, due to the large expanses of similar habitat in the surrounding landscape.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
No. Proactive and adaptive mitigation measures will be implemented during construction and operation. Within the subject land, this species habitat is highly dynamic, subject to moderate levels of grazing and does contain patches of weeds such as *Lolium, Hordeum* and other environmental weeds. It is considered unlikely that the project would substantially reduce the quality or integrity of the community's occurrence or significantly increase the spread of invasive species locally and or more broadly.
Introduce disease that may cause the species to decline.
No. There currently no known diseases causing potential species decline to *Austrostipa wakoolica*.

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SIC assessment for Endangered species
Interfere substantially with the recovery of the species.
No. There is currently no known recovery plan in place for this species, however key threats listed in the conservation advice do consider habitat reduction and altered flooding regimes, primarily related though to agricultural development, to be a key threatening process to this species. It is not considered likely that the project will result in substantial impacts to the recovery of *Austrostipa wakoolica*.
Conclusion.
Based on the assessment above, it is concluded that *Austrostipa wakoolica* is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project: • Will not lead to the long term decrease of a population, reduce the areas of occupancy or fragment an existing population. • Will not disrupt the breeding cycle of a population or species as a whole. • Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread. • Will not substantially interfere with the recovery of the species.

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Appendix 6.12. Claypan Daisy *Brachyscome muelleroides*

Species background

Claypan Daisy is listed as vulnerable under the EPBC Act. The species is an annual herb which grows to 7-14 centimeters tall. The plant's single white flowers, which are only 4 millimetres across, are produced from September to November, at the ends of thread-like stems. Thread-like, 5.5 centimeter long leaves also grow from these stems. The species is endemic to south-eastern Australia, where it is restricted to the floodplains of the Murray and Murrumbidgee Rivers and their tributaries in northern Victoria and southern New South Wales, in the Riverina and southwestern Slopes IBRA bioregions

While little is known about the former distribution and abundance of Claypan Daisy, is it likely that there has been a historical decline in abundance of the species, as much of the area within its distribution has been cleared for agriculture (DSE 2010a). The most significant threats to the species include altered hydrological regimes, invasive weeds, and grazing. A national recovery plan has been developed for the species. Claypan Daisy occurs in seasonally damp situations such as shallow depressions and around the margins of swamps, lagoons and claypans, on heavy grey cracking clays to lighter clay loam soils, in grassland, grassy woodland and open forest habitats, growing in association with various grasses and seasonal aquatic plants such as *Marsilea* species.

Claypan Daisy within the subject land

This species prefers seasonally moist grey gilgaied soils on the floodplains within PCTs such as PCT 45 and PCT 46, which occur patchily across the subject land.

SIC assessment for Claypan Daisy

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species.
No. Targeted surveys for *Brachyscome muelleroides* have been carried out throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024. This species has not been recorded. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 35.62 ha. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible (including within seasonally damp situations such as shallow depression sand around the margins of swamps, lagoons and claypans, on heavy grey cracking clays to lighter clay loam soils, in grassland and grassy woodland). It is considered unlikely that the project will lead to a long term decrease in the size of an important population.
Reduce the area of occupancy of an important population.
No. An important population is considered to occur at Morundah Station and not linked or connected to the subject land. *Brachyscome muelleroides* has been surveyed for throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024. Approximate area of occupancy is restricted to the highest areas of potential habitat within PCT 45 and PCT 46, and would be reduced by 76 ha that is linear in nature, however as the species has not been recorded, and an important population is not considered to occur, a substantial impact to an area of occupancy of an important population is not considered likely.

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SIC assessment for vulnerable species
Fragment an existing important population into two or more populations.
No. Habitat within the subject land is partially fragmented by historical and ongoing land clearing and grazing regimes. An important population is not considered to occur. *Brachyscome muelleroides* has been surveyed for throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024 and has not been recorded. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 35.62 ha. It is considered unlikely any fragmentation would occur.
Adversely affect habitat critical to the survival of a species.
No. No habitat critical to the survival of this species is considered likely
Disrupt the breeding cycle of an important population.
No. *Brachyscome muelleroides* has been surveyed for throughout the development footprint in September 2022-September 2022, 2023 and 2024 and November 2022, 2023 and 2024 and has not been recorded. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 35.62 ha. The project is unlikely to significantly impact on the breeding cycle of an important population of this species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
No. *Brachyscome muelleroides* has been surveyed for throughout the development footprint in September 2022-September 2022, 2023 and 2024 and November 2022, 2023 and 2024 and has not been recorded. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 35.62 ha In terms of avoidance, detailed constraints assessment modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat, were avoided as much as possible. This includes areas within the subject land considered potential habitat including within seasonally damp situations such as shallow depression sand around the margins of swamps, lagoons and claypans, on heavy grey cracking clays to lighter clay loam soils, in grassland and grassy woodland. Up to 76 ha of habitat that is linear in nature may be impacted but this is unlikely to decrease the availability or quality of habitat and result in species decline, due to the substantial areas of similar habitat in the surrounding landscape.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
No. Proactive and adaptive mitigation measures will be implemented during construction and operation. Within the subject land, this species habitat is highly dynamic, subject to moderate levels of grazing and does contain patches of weeds such as *Lolium, Hordeum* and other environmental weeds. It is considered unlikely that the project would substantially reduce the quality or integrity of the community's occurrence or significantly increase the spread of invasive species locally and or more broadly.
Introduce disease that may cause the species to decline.

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SIC assessment for vulnerable species

No. There currently no known diseases causing potential species decline to *Brachyscome muelleroides*

Interfere substantially with the recovery of the species.

No. A current recovery plan is in place for this species (Lucas, 2010). Key threats included altered hydrological regimes, invasive weeds and grazing impacts. It is not considered likely that the project will result in exacerbating these threats and result in substantial impacts to the recovery of *Brachyscome muelleroides*.
Potential impacts will be managed through mitigation measures which are outlined in the BDAR, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.

Conclusion.

Based on the assessment above, it is concluded that *Brachyscome muelleroides* is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project:

- The species was not recorded during surveys.
- Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population.
- Will not disrupt the breeding cycle of an important population, the local population or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not substantially interfere with the recovery of the species.

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Appendix 6.13. Mossgiel Daisy *Brachyscome papillosa*

Species background

The Mossgiel Daisy is listed as vulnerable under the EPBC Act. The species is a multi-stemmed perennial herb that grows up to 40 centimetres tall. Its stemless leaves grow up to 7 centimetres long and leaf edges range from being smooth edges to deeply indented. Solitary flowerheads are mauve with a yellow centre and occur on stems 10-25 centimeters tall between June and December. The species is known mainly to occur from Mossgiel to Urana, in south-western NSW. The main threat to the abundance and distribution of Mossgiel Daisy is land clearing for pasture, with other possible threats including possible habitat disturbance by feral pigs, the presence of introduced weeds, and changes to fire regimes (DEWHA 2008).

Mossgiel Daisy within the subject land

This species prefers grey and brown clay soils dominated by chenopod species and associated with PCTs 13, PCT15, PCT 17 PCT 24 and PCT 46, which occur within the subject land. Habitat within the subject land is considered suboptimal, with more optimal habitat occurring further to west of the subject land, within areas dominated by *Atriplex vesicaria* and *Maireana aphylla (OEH, 2018)*.

SIC assessment for Mossgiel Daisy

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species.
No. Targeted surveys for *Brachyscome papillosa* have been carried out throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024 and has not been recorded. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 44.42 ha. Detailed constraints assessment modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat, were avoided as much as possible. This includes areas within the subject land considered potential yet sub optimal habitat including within PCT, 13, PCT 15, PCT 17, and PCT 46. *Brachyscome papillosa* occurs over 25 km from the subject land, with the most recent record from over 20 years ago. It is considered unlikely that the project will lead to a long term decrease in the size of an important population.
Reduce the area of occupancy of an important population.
No. Strongholds for the species occur between Hay and Balranald where it appears in large numbers. *Brachyscome papillosa* has been surveyed for throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024. Approximate area of occupancy is restricted to the highest areas of potential habitat with PCT, 13, PCT 15, PCT 17, and PCT 46 and would be reduced by 90.90 ha that is linear in nature, however as the species has not been recorded and an important population is not considered to occur, a substantial impact to an area of occupancy of an important population is not considered likely.
Fragment an existing important population into two or more populations.
No. Habitat within the subject land is partially fragmented by historical and ongoing land clearing and grazing regimes. An important population is not considered to occur. *Brachyscome papillosa* has been surveyed for throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024 and has not been recorded. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in

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SIC assessment for vulnerable species
survey effort due changing designs has resulted assuming presence across 44.42 ha. It is considered unlikely any fragmentation would occur.
Adversely affect habitat critical to the survival of a species.
No. No critical habitat for this species has been determined. Due to key avoidance measures, it is unlikely that any habitat critical for this species would occur in the subject land, and therefore be impacted.
Disrupt the breeding cycle of an important population.
No. *Brachyscome papillosa* has been surveyed for throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024 and has not been recorded. The project is unlikely to significantly impact on the breeding cycle of an important population of this species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
No. The species was not recorded in the subject land. This local scale loss of habitat is not considered likely to cause *Brachyscome papillosa* to decline considering there are higher quality patches of habitat available in the region, and the wide-ranging nature of the species and large areas of more optimal habitats outside of the subject land.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
No. Proactive and adaptive mitigation measures will be implemented during construction and operation. Within the subject land, this species habitat is highly dynamic, subject to moderate levels of grazing and does contain patches of weeds such as *Lolium, Hordeum* and other environmental weeds. It is considered unlikely that the project would substantially reduce the quality or integrity of the community's occurrence or significantly increase the spread of invasive species locally and or more broadly.
Introduce disease that may cause the species to decline.
No. The project will not result in the introduction of a disease that is harmful to *Brachyscome papillosa*.
Interfere substantially with the recovery of the species.
No. There is currently no recovery plan in place for this species, however key threats listed in the conservation advice do consider habitat reduction due to agricultural practices such as cropping and improved pastures, as well stock trampling and road maintenance. It is not considered likely that the project will result in substantial impacts to the recovery of *Brachyscome papillosa*.
Conclusion.
Based on the assessment above, it is concluded that *Brachyscome papillosa* is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project: • The species was not recorded during surveys.

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SIC assessment for vulnerable species

- Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population.
- Will not disrupt the breeding cycle of an important population, the local population or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not substantially interfere with the recovery of the species.

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Appendix 6.14. Winged Peppercress *Lepidium monoplocoides*

Species background

Winged Peppercress is listed as endangered under the EPBC Act. The species is an erect herb or perennial forb, which grows 15-20 centimetres high, with angular and striped stems which are roughened with small warts. The plant grows narrow and linear leaves, mostly 2-7 centimetres long, with small flowers, borne in elongated clusters, with the petals minute or absent. Fruit in the form of a flattened circular pod grows on a spreading stalk (DSE 2010b).

Winged Peppercress is widely distributed on the inland plains of south-eastern Australia, occurring from northern NSW to western Victoria. The species is currently known from 13 locations, six in Victoria and seven in NSW. The total population is estimated at <3,000 plants each in Victoria and NSW.

Winged Peppercress within the subject land

Winged Peppercress is known to occur within the Murrumbidgee IBRA subregion, and historically within the Riverina and this distinctive perennial forb was not recorded in the subject land during field surveys that included targeted searches of suitable PCTs. BioNet lists Winged Peppercress as associated with the following PCTs 10, PCT 13, PCT 15, PCT 24 and PCT 26. Based on habitat quality, current survey effort and the localised nature of possible impacts if a population were to occur, it is concluded the Project is unlikely to lead to a significant impact.

SIC assessment for Winged Pepper-cress

SIC assessment for Endangered species
Lead to a long-term decrease in the size of a population
No. Targeted surveys for *Lepidium monoplocoides* have been carried out throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024. and has not been recorded. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 212.44 ha in which microhabitats could occur. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025. Detailed constraints assessment modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat, were avoided as much as possible. This includes areas within the subject land considered potential habitat including within PCT 10, PCT 13, PCT 15, and PCT 26. *Lepidium monoplocoides* was not recorded within the subject land during targeted surveys to date. It is considered unlikely that the project will lead to a long term decrease in the size of an important population.
Reduce the area of occupancy of the species
No. *Lepidium monoplocoides* has been surveyed for throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024. Considering survey effort completed to date, with this species not recorded, and due to key avoidance measures of this species preferred habitats, it is estimated the area of occupancy restricted to the highest areas of potential habitat within PCT 10, PCT 13, PCT 15, and PCT 26, a total reduction in occupancy of 15.28 ha of optimal areas of habitat, and 800.55 ha of sub optimal areas, with both impacts linear in nature are not likely to be significant. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 212.44 ha in which microhabitats could occur. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and

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SIC assessment for Endangered species
outside the amended development footprint. Further surveys will be undertaken in Spring 2025
Fragment an existing population into two or more populations.
No. Habitat within the subject land is partially fragmented by historical and ongoing land clearing and grazing regimes. A population is not considered to occur, and thus the project will not lead to fragmentation of an existing population.
Adversely affect habitat critical to the survival of a species.
No. Critical habitat has not been declared for *Lepidium monoplocoides*.
Disrupt the breeding cycle of a population.
No. *Lepidium monoplocoides* regenerates from seed dispersal and often in response to rainfall events. Little is known of the biology and ecology of the *Lepidium monoplocoides.* Numbers of adult plants fluctuate from year to year and, like many annual species occurring in dry environments, some seed probably remains dormant in the soil for several years. Given partial vegetation clearing and soil disturbance will occur as part of the works, and there is the possibility to allow regeneration of low shrubs and groundcovers, if individuals of a local *Lepidium monoplocoides* population remain undetected, there could be potential natural regeneration post-disturbance given its life history. Land could be rehabilitated to allow ground layer recovery and management post construction. Therefore, the project is unlikely to disrupt the breeding cycle of a population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
No. The species was not recorded in the subject land. This local scale loss of habitat is not considered likely to cause *Lepidium monoplocoides* to decline considering there are higher quality patches of habitat available in in the region, and the wide-ranging nature of the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
No. The localised occurrences of habitat for the species are subject to existing weed invasion and pest animals as a result of land clearing and surrounding agricultural land use. The project are unlikely to result in an increase of invasive species within the known and potential habitat for *Lepidium monoplocoides.* Construction activities will be managed through standard practices to avoid new introductions and further spread of existing weeds.
Introduce disease that may cause the species to decline.
No. The project will not result in the introduction of a disease that is harmful to *Lepidium monoplocoides*.
Interfere substantially with the recovery of the species.
The National Recovery Plan for *Lepidium monoplocoides* identifies seven specific objectives for the recovery of the species are to: • Determine distribution, abundance and population structure

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SIC assessment for Endangered species

- Determine habitat requirements
- Manage threats to populations
- Identify key biological functions
- Determine growth rates and viability of populations
- Establish a seed bank
- Build community support for conservation

Considering the above factors, the Project will not interfere substantially with the recovery of *Lepidium monoplocoides*.

Conclusion.

Based on the assessment above, it is concluded that *Lepidium monoplocoides* is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project:

- Will not lead to the long term decrease of a population, reduce the areas of occupancy or fragment an existing population.
- Will not disrupt the breeding cycle of a population, or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not interfere will the recovery of the species.

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Appendix 6.15. Chariot Wheels *Maireana cheelii*

Species background

Chariot Wheels is listed as vulnerable under the EPBC Act. The species is a perennial forb which grows to approximately 20 centimetres high, with striped and woolly stems and a fleshy swollen taproot. Leaves are narrow, cylindrical, and slender. The distribution of the species is restricted to the southern Riverina region of NSW, mainly in the area between Deniliquin and Hay. The plant is usually found on heavier, grey clay soils with Bladder Saltbush *Atriplex vesicaria*. The species also tends to grow in shallow depressions, often on eroded or scalded surfaces (DSE 2010c).

While little is currently known about the former distribution of Chariot Wheels, it is likely that this species was once more extensively distributed and abundant throughout the inland plains from northern Victoria, through inland NSW to southern Queensland. While perennial saltbush and grassy/herb once dominated native vegetation communities throughout this region, their areas have been severely depleted due to agriculture, especially cropping and grazing. Current threats to the species include damage and destruction of habitat, weed invasion, grazing and rising salinity (DSE 2010c)

Chariot Wheels within the subject land

Recorded habitats include on the heavier grey soils and on the edge of a lignum swamp in brown loam and areas of grey silty clay with slight depressions and microrelief, with a high proportion of bare ground. Can be associated with PCT 46 and PCT 26 and has been subject to survey within these areas.

SIC assessment for Chariot Wheels

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species.
No. Although the National Recovery Plan for this species lists known population areas within the core distribution outlined for this species in NSW, important populations have not been defined. It is likely that the entire core area, based on an assessment of records, is a fragmented concentration of sub-populations, and the subject land occurs on the eastern edge of existing records. As such the population within the subject land is considered an Important Population based on being near the limit of the species range (Commonwealth of Australia 2013). Targeted surveys for *Maireana cheelii* have been carried out throughout the development footprint in September 2022, 2023 and 2024, and November 2022, 2023 and 2024. This species has not been recorded. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 238.04 ha. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025. In terms of avoidance, detailed constraints assessment and modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat for this species, were avoided as much as possible. This includes areas within the subject land considered potential yet habitat including within PCT 26 and PCT 46. *Maireana cheelii* occurs over 20 km from the subject land to the west. It is considered unlikely that the project will lead to a long term decrease in the size of an important population.
Reduce the area of occupancy of an important population.
No. Suitable habitat is broadly available within woodland and grassland PCTs 26 and 46 however does not fall within a known home range or on the limit of distribution. Strongholds for the species occur between Hay and Balranald where it

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SIC assessment for vulnerable species
appears in high numbers. *Maireana cheelii* has been surveyed for throughout the development footprint in September 2022, 2023 and 2024, and November 2022, 2023 and 2024 and has not been recorded. It is unlikely that any reduction in occupancy is considered significant for this species. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 238.04 ha. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025
Fragment an existing important population into two or more populations.
No. Habitat within the subject land is partially fragmented by historical and ongoing land clearing and grazing regimes. An important population is not considered to occur. *Maireana cheelii* has been surveyed for throughout the development footprint in September 2022, 2023 and 2024, and November 2022, 2023 and 2024 and has not been recorded. Therefore, it is considered unlikely any fragmentation would occur.
Adversely affect habitat critical to the survival of a species.
No. Critical habitat has not been declared for *Maireana cheelii*.
Disrupt the breeding cycle of an important population.
No. *Maireana cheelii* has been surveyed for throughout the development footprint in September 2022, 2023 and 2024, and November 2022, 2023 and 2024 and has not been recorded. As such, genetic diversity and dispersal locally and regionally is unlikely to be effected and overall, it is considered unlikely to significantly impact on the breeding cycle of this species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
No. The species was not recorded in the subject land. This local scale loss of habitat is not considered likely to cause *Maireana cheelii* to decline considering there are higher quality patches of habitat available in the region, and the wide-ranging nature of the species and more optimal habitats outside of the subject land
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
No. Proactive and adaptive mitigation measures will be implemented during construction and operation. Within the subject land, this species habitat is highly dynamic, subject to moderate levels of grazing and does contain patches of weeds such as *Lolium, Hordeum* and other environmental weeds. It is considered unlikely that the project would substantially reduce the quality or integrity of the community's occurrence or significantly increase the spread of invasive species locally and or more broadly.
Introduce disease that may cause the species to decline.
No. The project will not result in the introduction of a disease that is harmful to *Maireana cheelii*.
Interfere substantially with the recovery of the species.
No. A current recovery plan is in place for this species (Mavromihalis, 2010). Key threats included altered threats to populations such as by land clearing and habitat reduction. It is not considered likely that the project will result in

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SIC assessment for vulnerable species
exacerbating these threats and result in substantial impacts to the recovery of *Maireana cheelii*. Potential impacts will be managed through mitigation measures which are outlined in the BDAR, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.
Conclusion.
Based on the assessment above, it is concluded that *Maireana cheelii* is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project: • The species was not recorded during surveys. • Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population. • Will not disrupt the breeding cycle of an important population, the local population or species as a whole. • Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread. • Will not substantially interfere with the recovery of the species.

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Appendix 6.16. Turnip Copperburr *Sclerolaena napiformis*

Species background

Turnip Copperburr is listed as endangered under the EPBC Act. The species is a small perennial chenopod shrub, characterised by slender branches sparsely covered in short erect or curled hairs, and linear to narrowly obovate leaves, covered with appressed hairs. The plant's flowers are green and tiny while fruits have 5-6 spines and are sparsely to moderately pubescent. The species is endemic to south-eastern Australia, found in native grasslands and grassy woodlands on relatively fertile clay-loam soils (DSE 2010d).

A total of 25 populations of the species have been identified, with upper estimates of total abundance being less than 30,000 individuals. Previous distribution and abundance of the species is not known, however, judging by current distribution and habitat preferences, it is likely that the species was once distributed across a wide area of the Murray-Darling Basin in NSW and Victoria, across grasslands and grassy woodland communities. These habitats have been largely cleared for pasture. The current major threats to the species are considered to include weed invasion, habitat destruction and degradation, altered fire regimes, grazing and increased soil salinity (DSE 2010d).

Turnip Copperburr with the subject land

Recorded habitats include native grasslands and grassy woodlands on relatively fertile clay-loam soils particularly areas with *Austrostipa nodosa* and *Chloris truncata* tussock grasslands on grey to red-brown cracking clays and clay loams. Within the subject land, this includes areas of PCT 26 DNG and PCT 46. Vegetation structure may play an important role in the location of populations, with the species apparently absent from sites dominated by thick swards of grass, which forms majority of subject land, with only small areas of mosaic microrelief resulting in reduced grass cover, and increased forb richness.

SIC assessment for Turnip Copperburr

SIC assessment for Endangered species
Lead to a long-term decrease in the size of a population
No. Detailed constraints assessment modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat, were avoided as much as possible. This includes areas within the development corridor considered potential habitat including within PCT 26 DNG, in particular sparse areas of less grass dominance and records of *Swainsona murrayana* and *Swainsona sericea,* as well as PCT 46. *Sclerolaena napiformis* was not recorded within the subject land during targeted surveys. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 238.97 ha. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025. It is considered unlikely that the project will lead to a long term decrease in the size of a population.
Reduce the area of occupancy of the species
No. *Sclerolaena napiformis* has been surveyed throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 238.97 ha. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside

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SIC assessment for Endangered species
the amended development footprint. Further surveys will be undertaken in Spring 2025. Due to key avoidance measures of this species preferred habitats, it is estimated the total potential reduction in area of occupancy restricted to the highest areas of potential habitat within PCT 26 DNG and PCT 46, however as the species has not been recorded, and an important population is not considered to occur, a substantial impact to an area of occupancy of an important population is not considered likely.
Fragment an existing population into two or more populations.
No. Habitat within the subject land is partially fragmented by historical and ongoing land clearing and grazing regimes. A population is not considered to occur.
Adversely affect habitat critical to the survival of a species.
No. Critical habitat has not been declared for *Sclerolaena napiformis*
Disrupt the breeding cycle of an important population.
No. *Sclerolaena napiformis* has been surveyed throughout the development footprint in September 2022, 2023 and 2024 and November 2022, 2023 and 2024 and has not been recorded. As such, genetic diversity and dispersal locally and regionally is unlikely to be effected and overall, it is considered unlikely to significantly impact on the breeding cycle of this species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
No. The species was not recorded in the subject land. This local scale loss of habitat is not considered likely to cause *Sclerolaena napiformis* to decline considering there are higher quality patches of habitat available in in the region, and the wide-ranging nature of the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
No. The localised occurrences of habitat for the species are subject to existing weed invasion and pest animals as a result of land clearing and surrounding agricultural land use. The project are unlikely to result in an increase of invasive species within the known and potential habitat for *Sclerolaena napiformis.* Construction activities will be managed through standard practices to avoid new introductions and further spread of existing weeds.
Introduce disease that may cause the species to decline.
No. The project will not result in the introduction of a disease that is harmful to *Sclerolaena napiformis.*
Interfere substantially with the recovery of the species.
The National Recovery Plan for *Sclerolaena napiformis* (Mavromihalis, 2010) identifies seven specific objectives for the recovery of the species are to: • Determine distribution, abundance and population structure

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SIC assessment for Endangered species

- Determine habitat requirements
- Manage threats to populations
- Identify key biological characteristics
- Determine life history and viability of populations
- Establish a seed bank
- Build community support for conservation

Considering the above factors, the Project will not interfere substantially with the recovery of *Sclerolaena napiformis*.

Conclusion.

Based on the assessment above, it is concluded that *Sclerolaena napiformis* is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project:

- Will not lead to the long term decrease of a population, reduce the areas of occupancy or fragment an existing population.
- Will not disrupt the breeding cycle of a population, or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not interfere will the recovery of the species.

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Appendix 6.17. Red Darling Pea *Swainsona plagiotropis*

Species background

Red Darling Pea is listed as vulnerable under the EPBC Act. The species is a small, perennial herb which grows to 30 centimetres tall. The compound leaves are 5 to 10 centimetres long, with 17 to 23 narrow leaflets. Flowers are 10 to 15 millimetres long, have a characteristically sideways twisted keel and fade to violet with age. The species occurs on relatively open native grasslands with 350 to 450 millimetres average annual rainfall, and on seasonally waterlogged red-brown clay and clay loam soils.

Approximately 60 populations of the species are currently known. This species occurs in the upper Murray River valley in the south-western plains of NSW and into Victoria. The Red Darling Pea was apparently abundant and widely distributed within the main part of its range at the time of European settlement of the Riverina plains. While the species is still relatively widely distributed and can be locally abundant in years of good rainfall, it is predicted that the abundance had declined due to land use changes across much of its distribution. Current threats to the species include weed invasion, grazing, habitat destruction and degradation, rising soil salinity and climate change.

Red Darling Pea in the subject land

Recorded habitats include native grasslands and grassy woodlands on relatively fertile clay-loam soils particularly areas with *Austrostipa nodosa* and *Chloris truncata* tussock grasslands on grey to red-brown cracking clays and clay loams. Within the subject land, this includes areas of PCT 26 DNG and PCT 46. Vegetation structure may play an important role in the location of populations, with the species apparently absent from sites dominated by thick swards of grass, which forms majority of subject land, with only small areas of mosaic microrelief resulting in reduced grass cover, and increased forb richness. Weeping Myall communities, both woodland and DNG, are largely homogeneous through the broader region and subject land (i.e. similar species composition), small areas of microrelief do occur on occasion that form small mosaic alterations with the introduction of some additional species, more consistent with other vegetation types, and the overall structure. Areas of derived grassland with an open structure, herb-rich inter-tussock spaces and presence of cryptogamic crust, and in the absence of *Walwhalleya proluta, Plains Grass Austrostipa aristiglumis* and *Enteropogon acicularis* as the dominant species. Swainsona habitat has also been observed to have a lower cover of grazing-tolerant robust chenopods and less dense grass sward, and where grazing activities were limited to cattle, and in the absence of heavier sheep grazing

SIC assessment for Red Darling Pea

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species.
No. Detailed constraints assessment modelling of biodiversity values was undertaken to ensure areas of high biodiversity value, and therefore most likely habitat, were avoided as much as possible. This includes areas within the development corridor considered potential habitat including within PCT 26 and PCT 46. *Swainsona plagiotropis* occurs over 20km from the subject land. This species is primarily found on the Hay Plain, which occurs anecdotally west of Oolambeyan National park on the flat scalded plains towards Balranald, but also known to occur within the Jerilderie Nature Reserve, where this species was observed from in September 2023. *Swainsona plagiotropis* has been surveyed for throughout the development footprint in September 2022, 2023 and 2024 and has not been recorded. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has

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SIC assessment for vulnerable species
resulted assuming presence across 35.62 ha. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025. It is considered unlikely that the project will lead to a long term decrease in the size of an important population.
Reduce the area of occupancy of an important population.
No. Suitable habitat is broadly available within woodland and grassland PCTs 26 and 46 where vegetation structure is limited to sites largely lacking thick swards of grass. Strongholds for the species occur between Hay and Balranald where it appears in high numbers. Known to occur within the Jerilderie Nature Reserve, to which this species was observed at the latter in September 2023. *Swainsona plagiotropis* has been surveyed for throughout the development footprint in September 2022, 2023 and 2024 and has not been recorded. It is unlikely that any reduction in area of occupancy restricted to the highest areas of potential habitat within PCT 26 DNG and PCT 46 is considered significant for this species.
Fragment an existing important population into two or more populations.
No. Habitat within the subject land is partially fragmented by historical and ongoing land clearing and grazing regimes. An important population is not considered to occur. *Swainsona plagiotropis* has been surveyed for throughout the development footprint in September 2022 and September 2023 and has not been recorded. Although not detected in surveys to date across a large portion of the development footprint, spatial gaps in survey effort due changing designs has resulted assuming presence across 35.62 ha. It is considered highly unlikely this species is present and will be impacted based on survey effort to date within and outside the amended development footprint. Further surveys will be undertaken in Spring 2025. It is considered unlikely any fragmentation would occur.
Adversely affect habitat critical to the survival of a species.
No. Critical habitat has not been declared for *Swainsona plagiotropis*.
Disrupt the breeding cycle of an important population.
No. *Swainsona plagiotropis* has been surveyed for throughout the development footprint in September 2022 and September 2023 and has not been recorded. As such, genetic diversity and dispersal locally and regionally is unlikely to be effected and overall, it is considered unlikely to significantly impact on the breeding cycle of this species.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.
No. The species was not recorded in the subject land. This local scale loss of habitat is not considered likely to *Swainsona plagiotropis* to decline considering there are higher quality patches of habitat available in the region, and the wide-ranging nature of the species and large areas of more optimal habitats outside of the subject land.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
No. Proactive and adaptive mitigation measures will be implemented during construction and operation. Within the subject land, this species habitat is highly dynamic, subject to moderate levels of grazing and does contain patches of weeds such as *Lolium, Hordeum* and other environmental weeds. It is considered unlikely that the project would substantially reduce the quality or integrity of the community's occurrence or significantly increase the spread of invasive species locally and or more broadly.

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SIC assessment for vulnerable species

Introduce disease that may cause the species to decline.

No. The project will not result in the introduction of a disease that is harmful to *Swainsona plagiotropis.*

Interfere substantially with the recovery of the species.

No. A current recovery plan is in place for this species (Tonkinson, 2010) and identifies eight specific objectives for the recovery of the species are to:

- Determine distribution, abundance and population structure
- Identify habitat requirements
- Ensure that all populations and their habitat are protected and managed appropriately
- Manage threats to populations
- Identify key biological characteristics
- Determine life history and viability of populations
- Maintain ex situ collections
- Build community support for conservation

Potential impacts will be managed through mitigation measures which are outlined in the BDAR, which includes but not limited to detailed BMP, pre-clearance surveys, adaptive management and unexpected finds procedures.

Conclusion.

Based on the assessment above, it is concluded that *Swainsona plagiotropis* is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project:

- The species was not recorded during surveys.
- Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population.
- Will not disrupt the breeding cycle of an important population, the local population or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not substantially interfere with the recovery of the species.

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Appendix 6.18. Slender Darling Pea *Swainsona murrayana*

Species background

Slender Darling Pea has been identified across most of inland NSW. Records of this species occur in patches from Moama to Moree and Broken Hill to north-west of Bourke. A large concentration of records are triangulated roughly between Moama, Narranderra and Hay (NSW DCCEEW 2024c).

The approved conservation advice for this species (Cth DCCEEW 2008a) details the species is '*found in grassland, herbland and open Black-box woodland, often in depressions...in heavy grey or brown clay, loam or red cracking clays...often associated with low chenopod shrubs, wallaby grass and spear grass*'.

Slender Darling Pea within the subject land

Targeted surveys identified a population of this species within the subject land. The targeted survey effort recorded an estimated 1,332 flowering/fruiting individuals within the subject land, with approximately 42 hectares of optimal habitat. Of this, it is estimated only a few individuals will be impacted within a 2.7 hectare area. This species has also been assumed present in vegetation zones where adequate survey is yet to be completed and until further survey can be undertaken in September 2025. Additionally a further estimated 2,000 individuals within 42 hectare area of optimal habitat were observed during targeted surveys for the adjacent Dinawan Solar Farm, of which 8.5 hectares of known habitat would be impacted.

SIC assessment for Slender Darling Pea

SIC assessment for vulnerable species
Lead to the long-term decrease in the size of an important population of a species.
No. A recovery plan has not been adopted for this species. The population of Slender Darling Pea within the subject land cannot be said to be: • Key source populations either for breeding or dispersal • Populations that are necessary for maintaining genetic diversity, and/or • Populations that are near the limit of the species range. As such the population within the subject land is not considered an Important Population of the species. The subject land occurs within an area of concentrated records for this species within NSW. Targeted surveys across the broader subject land identified a minimum population estimate of at least 1,334 individuals, of which a limited number of individuals will be directly impacted by the project. Up to 42 ha of optimal habitat has been recorded within the development corridor and subject land, however numerous designs revisions have occurred to avoid and minimise impacts to larger patches to ensure a viable local population can be maintained. Impacts will occur to isolated individuals and small patches, totalling approximately 2.6 ha of known occurrence. All records and suitable habitat were found to be in certain habitats of reduced grass cover, increase forb cover with species such as Bulbine lily. The project will result in an impact to known habitat for the species, but will not lead to a decrease in the size of an important population.
Reduce the area of occupancy of an important population.
No. The population within the subject land is not considered an Important Population of the species, and as such the project will not result in the reduction of the area of occupancy of an important population of this species.
Fragment an existing important population into two or more populations.

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SIC assessment for vulnerable species
No. The project will not fragment the identified population, where this species was identified in all surrounding areas of the subject land. Connectivity will be maintained both within and adjacent to the subject land.
Adversely affect habitat critical to the survival of a species.
No. Critical habitat has not been mapped for this species, therefore 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary: • For activities such as foraging, breeding, roosting, or dispersal. • For the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators). • To maintain genetic diversity and long term evolutionary development. • For the reintroduction of populations or recovery of the species or ecological community. Habitat within the subject land is unlikely to meet the above criteria and be determined critical habitat.
Disrupt the breeding cycle of an important population.
No. The project would result in the removal of a small number of fruiting individuals, and may result in the ongoing disturbance to the seed bank of potential germinating. Breeding would be disrupted for the individuals that occur within the development footprint, however, the remaining recorded individuals within the retained habitat would not incur disruptions to the breeding cycle. Genetic diversity and dispersal locally and regionally is unlikely to be effected and overall, it is considered unlikely to significantly impact on the breeding cycle of this species. The population within the subject land is not considered 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.
No. As noted above, targeted survey effort recorded an estimated 1,332 flowering/fruiting individuals within the subject land. Of this, it is estimated only a few individuals will be impacted within a 2.6 ha area. This species has also been assumed present in vegetation zones where adequate survey is yet to be completed, up to 390 hectares, and until further survey can be undertaken in September 2025. Additionally a further estimated 2,000 individuals within 30 ha area of optimal habitat were observed during targeted surveys for the adjacent Dinawan Solar Farm, of which 8 ha of known habitat would be impacted. The loss of approximately 2.6 ha of optimal habitat, and a select few individuals is not considered an action that would modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent this species is likely to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat.
No. The subject land is already located within a highly modified environment, dominated by land used for agricultural activities. As a part of the construction and operational management of the project a Weed and Pest Management Plan will be implemented to prevent the spread of invasive species. The CEMP and BMP to be implemented would action measures, including weed control to ensure any occurrence of this species outside the disturbance corridor are not out competed by exotic species and control the introduction of new weed species. With the implementation of the CEMP and BMP it is considered unlikely the project would introduce disease that may cause the species to decline.
Introduce disease that may cause the species to decline.
No. The project is not likely to introduce any diseases this species is susceptible to. In addition to this, the project will implement several controls and management plans including a CEMP and BMP.

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SIC assessment for vulnerable species

Interfere substantially with the recovery of the species.

No.

A recovery plan has not been adopted for this species. The approved conservation advice lists the following information:

- Threats:
  - Grazing from domestic livestock and rabbits.
  - Weed invasion.
  - Cultivation.
  - Roadside maintenance activities.
- Summary of regional and local priority actions:
  - Habitat loss, disturbance and modification:
    - Monitor known populations for threats and recovery progress.
    - Identify populations of high conservation priority and investigate formal agreements with landholders.
    - Manage hydrology and salinity.
    - Control access routes to minimise disturbance from public.
    - Minimise impacts from known land uses.
  - Trampling, browsing or grazing:
    - Develop and implement stock management plans.
    - Implement threat abatement plans for control and eradication of rabbits, goats and feral pigs.
  - Fire:
    - Develop and implement a suitable fire management strategy.
    - Provide maps to RFS and seek inclusion of mitigative measures for BMPs.
  - Conservation information:
    - Raise awareness in the local community, distribute information and establish formal management arrangement with land holders.
  - Invasive weeds:
    - Identify and remove weeds that could become a threat.
    - Management sites to prevent introduction of weeds.
    - Control use of herbicides in known sites.

The project will not interfere with the priority actions listed above. Mitigation measures, including exclusion of grazing, implementation of weed control and management plans are in line with the actions listed above. Monitoring of impacted population areas post construction has been recommended to be implemented as part of the BMP.

Conclusion.

Based on the assessment above, it is concluded that *Swainsona murrayana* is unlikely to be significantly impacted by the project. This conclusion was made on the basis that the project:

- Will not lead to the long term decrease of an important population, reduce the areas of occupancy or fragment an existing important population.
- Will not disrupt the breeding cycle of an important population, the local population or species as a whole.
- Will not adversely modify the species habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not substantially interfere with the recovery of the species.

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Appendix 6.19. Natural Grasslands of the Murray Valley Plains

Community background

The vegetation is dominated by the ground layer with range of perennial grasses, forbs and small shrubs with typical characteristic species including *Rytidosperma*, *Austrostipa, Chloris, Enteropogon, Bulbine, Calotis, Chrysocephalum, Ptilotus, Rhodanthe, Swainsona,* with occasional *Atriplex* and *Maireana* (SEWPAC, 2012). Past and present grazing regimes as well as drought and rainfall patterns influence the composition of the community, and as such, some species may not always be evident above-ground, but instead exist in the seedbank (Threatened Species Scientific Committee, 2012). Most occurrences of the community are associated with alluvial sediments and gently undulating gilgai plains on heavy-textured grey cracking clay soils, however, does have a minor association with red and brown clay soils (TS Committee, 2012). The community is similar to some other derived grassland forms of the Weeping Myall woodlands listed under both the BC Act and EPBC Act however, it generally differs in the proportional composition of species (TS Committee, 2012).

Natural grasslands in the subject land

Due to the seasonal and dynamic aspects of determining natural and derived grasslands in the Riverina, a precautionary approach was undertaken. Areas of PCT 45 and PCT 46 that are located within slightly lower lying grey loam to cracking clay loosely fit the description of the EPBC Act listed Murray Valley Plains Natural Grassland TEC despite the region being on the north western edge of the TEC distribution. These native grasslands are in moderate condition due to long term grazing. The grasslands are dominated by native Spear-grasses *Austrostipa spp*., Wallaby-grasses *Rytidosperma spp*., Windmill Grass *Chloris truncata*, Panic-grass *Walwhalleya proluta* and Curly Windmill Grass *Enteropogon acicularis.* A range of grazing tolerant native herbs are present and some less grazing-tolerant native plant species occur at low densities that form mosaic in amongst Weeping Myall woodland and derived areas.

SIC assessment for Natural grasslands

SIC assessment for critically endangered communities
Reduce the extent of an ecological community
Yes. The project would result in a reduction of the extent of the Natural Grasslands of the Murray Valley Plains by 76.87 ha. Potential areas of vegetation that will have patches commensurate with this TEC within the development corridor is 423 ha and within the subject land is approximately 3,337 ha. It is estimated in the Riverina that approximately 61,000 ha remain in the region. Although areas of this TEC have been avoided, and restricted to more linear impacts in nature, the overall amount of impact and potential for cumulative impacts, it is likely that significant impacts would occur to this TEC, given its critically endangered status. The vast majority of these impacts would occur as a result of stage 2 of the project, as it would account for the loss of 2% of remaining TEC in the locality, and 17% of the assessed community within the development corridor.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
Yes. The project would result in a reduction of 76.87 ha with this community generally occurring within a fragmented landscape impacted land use such as such as agriculture, transport and other rural infrastructure. Due to key avoidance measures implemented for these areas, it is unlikely that the project will exacerbate any impacts and result in significant increase in substantial fragmentation of this community beyond the exiting environment and land use, however minor fragmentation may still occur

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SIC assessment for critically endangered communities
Adversely affect habitat critical to the survival of an ecological community
No. The current advice on Natural Grasslands of the Murray Valley Plains (SEWPAC, 2012) does not indicate or describe any habitats or areas critical to the survival of this community. Due to key avoidance measures implemented for these areas, it is unlikely that the project will have impacts considered significant on critical habitat.
Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
No. The project is considered unlikely to substantially modify or destroy above mentioned abiotic factors due to small areas of local scale loss of habitat, mitigation measures and key avoidance of larger more viable patches.
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting
No. The project would result in a reduction of 76.87 ha which is generally in moderate to good condition, although subject to moderate levels of grazing regimes, both sheep and cattle. Impacts will not substantially fragment areas of this TEC that remain, meaning persistence of large high quality areas of grassland will be retained locally. The project is considered unlikely to cause substantial change to species composition of an occurrence of this TEC, particularly in retained areas and areas located more broadly, or outside of the subject land.
Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: **– assisting invasive species, that are harmful to the listed ecological community, to become established, or** **– causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological** **- community which kill or inhibit the growth of species in the ecological community**
No. Within the subject land, this TEC is highly dynamic, subject to moderate leaves of grazing and does contain patches of weeds such as *Lolium, Hordeum* and other environmental weeds. It is considered unlikely that the project would substantially reduce the quality or integrity of the community's occurrence or significantly increase the spread of invasive species locally and or more broadly. Proactive and adaptive mitigation measures will be implemented.
Interfere with the recovery of an ecological community
No. No national recovery plan currently exists for this community. Although 76.87 ha will be impacted, due to key avoidance measures implemented, retaining areas of this community and commitment to improve/maintain principles, it is unlikely that impacts resulting from the project will result in substantial impacts relating to the recovery of this TEC.
Conclusion.
Based on the assessment above, it is concluded that Natural Grasslands of the Murray Vallely Plains is likely to be significantly impacted by the project. This conclusion was made on the basis that the project: • Will reduce the extent of a critically endangered community. • Lead to minor fragmentation of an critically endangered community However the project • Will not disrupt critical habitat of this community.

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SIC assessment for critically endangered communities

- Will not adversely modify the habitat or introduce invasive species/diseases – project mitigation measures are to be implemented to mitigate any potential weed incursion/disease spread.
- Will not significantly interfere will the recovery of the species.

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Appendix 6.20. Weeping Myall Woodlands

Distribution

Weeping Myall Woodlands is listed as Endangered under the EPBC Act. The community occurs in small pockets throughout the inland alluvial plains west of the Great Dividing Range in NSW and QLD and is dominated by Weeping Myall *Acacia pendula*. The main threats to this community are clearing for cropping, ongoing degradation, weed invasion and herbivory by the Bag-shelter Moth (*Ochrogaster lunifer*) (TSSC 2009b). There is no adopted or made Recovery Plan for this ecological community.

Habitat and occurrence in the subject land

Field investigation determined a total of approximately 5,771 hectares of PCT 26 Weeping Myall woodland vegetation occurs within the subject land and 991. 3 hectares and 150.46 hectares occurs within the development corridor and development footprint respectively, that meet the listing requirements for Weeping Myall Woodlands TEC under the EPBC Act. The vast majority of the PCT 26 vegetation occurs in as DNG, which does not support the structural requirements for the EPBC Act listed community (Section 3.2.4). Only High and Moderate condition patches were determined to align with the Weeping Myall Woodlands TEC as they contained a canopy consisting of at least 5% Weeping Myall trees per hectare in patch greater than 0.5 hectares, contained more than two layers of regenerating Weeping Myall, and a tallest living layer of at least 4 metres. The project will result in the clearing of 150.46 hectares of this TEC.

SIC assessment for Weeping Myall Woodlands

SIC assessment for endangered and critically endangered ecological communities
Reduce the extent of an ecological community
Yes. Weeping Myall Woodlands occur in a broad arch across inland south-eastern Australia from the Victorian-NSW border into central Queensland (CoA 2009b). The development corridor contains a total of 873 ha of Weeping Myall Woodlands, of which 128 ha (or 15%) will be directly impacted. An approximate amount of 7,264 ha occurs within the broader subject land, but it is uncertain how much of this would meet the requirements of the EPBC listing. Though impacts to the community will occur in a highly fragmented agricultural landscape within a central part of its geographic distribution the removal of 128 ha is considered likely to significantly lead to an overall reduction in the extent of the community.
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines
Yes. Although project will remove up to 128 ha of this TEC, connectivity of the patches outside the disturbance footprint will be maintained within the subject land. Operational impacts will be limited to widely spaced wind turbines and associated relatively low usage access tracks which are unlikely to restrict the dispersal of genetic material for species present within the community. Considering the above, the proposed impacts are unlikely to significantly increase fragmentation of the community, however minor fragmentation pf patches meeting the MNES criteria may occur.
Adversely affect habitat critical to the survival of an ecological community
No. There is no adopted or made Recovery Plan for this ecological community and no critical habitats have been formerly identified by the Australian Government. Under the EPBC Act, 'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary: • for activities such as foraging, breeding, roosting, or dispersal • for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)

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SIC assessment for endangered and critically endangered ecological communities

- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

The development corridor contains 873 ha of Weeping Myall Woodland well with the ecological communities known range. The habitat it occupies cannot be said to fulfil any of the above criteria in the national context. Approximately, 15% only would be impacted, with 85% retained and managed, which is unlikely to adversely impact habitat critical for the TEC to persist.

Modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival

No. Construction is likely to result permanent as well as short term temporary disturbance to soil, however construction is unlikely to substantially alter surface drainage patterns. It is unlikely that the proposed construction would alter the surface drainage, or flow regimes of watercourses within the landscape such that, substantial changes to the water regime would be observed. The construction and operation of the wind farm would not alter the nutrient levels of the soil. Persistence of adjacent undisturbed patches of Weeping Myall Woodlands are not considered likely to be compromised by the project.

Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting.

No. All Weeping Myall Woodland stands occur in a fragmented rural / agricultural landscape where existing land use impacts have most likely reduced community integrity and functionality historically. Further clearing of the scale and extent required for the project is linear and is unlikely to further reduce species diversity and simplify community structure, as percentage of removal is not likely to reduce genetic exchange between species within the retained patches. As a part of the construction and operation management of the project a Weed and Pest Management Plan will be implemented to prevent spread of invasive species.

Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

- **assisting invasive species, that are harmful to the listed ecological community, to become established, or**
- **causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community.**

No. Most locations where this community occurs are subject to a level of existing weed invasion, pest animals, erosion and chemical inputs as a result of surrounding agricultural land use. Construction activities can be managed through standard practices to avoid further sedimentation and pollution. As a part of the construction and operation management of the project a Weed and Pest Management Plan will be implemented to prevent the spread of invasive species. Therefore, proposed impacts are unlikely to increase invasive species or the use fertilizers and herbicides above existing levels.

Interfere with the recovery of an ecological community.

No. There is no adopted or made Recovery Plan for this ecological community. The approved conservation advice (DoEWHA 2008) for this species details the following recovery and threat abatement actions required for this community:

- Protecting remnants of the listed EEC through the development of conservation agreements and covenants.
- The use of strategic grazing that allows regeneration.
- Replating of understory species where they have been depleted.
- Use of lopping methods that do not result in the death of dominant tree species.
- Avoiding the application of fertilisers and herbicides in or near remnants.
- Protecting remnants from weeds including the speedy eradication of any new invasions.
- Raising awareness of the ecological community within the community.

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SIC assessment for endangered and critically endangered ecological communities

The project will not interfere with these recovery objectives given the area of the community to be impacted is small in nature.

Conclusion

The project is considered likely to significantly impact this EEC due to a substantial reduction in the extent of the ecological community by 128 ha, as well have the potential to cause minor fragmentation to MNES patches. However the project will not;

- Adversely affect habitat critical to the survival of the EEC.
- Modify or destroy abiotic (non-living) factors the EEC relies on.
- Cause a substantial change in the species composition or a reduction in the quality or integrity of the EECs occurrence.
- Interfere with the recovery of the EEC.

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Appendix 6.21. Fork-tailed Swift *Apus pacificus*

Distribution

The Fork-tailed Swift (*Apus pacificus*) is listed as migratory under the EPBC Act, and under the bilateral migratory bird agreements Australia has with Japan (JAMBA), China (CAMBA) and the Republic of Korea (ROKAMBA). The Fork-tailed Swift is a regular non-breeding migrant from Asia and generally occurs over all states and territories of Australia. Within NSW, few populations of the species have been found west of the Great Divide.

Habitat requirements

Within Australia, they mostly occur over inland plains preferring dry or open habitats, but can occur around riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They forage aerially, up to hundreds of metres above ground, but also less than 1 m above open areas or over water. They often occur in areas of updraughts, especially around cliffs and are said to search along edges of low-pressure systems, which assist flight. Low-flying Swifts are said to be precursors of unsettled weather, possibly because insect prey fly at a lower altitude when the air is humid and when the air density is low (Cameron 1952). The Fork-tailed Swift does not breed in Australia. They generally arrive in Australia around October, and depart mid-April to May.

Survey observation and important habitat

Numerous individuals of Fork-tailed Swift across were sobered incidentally enroute between BBUS surveys in March 2024.

SIC assessment for Ford-tailed Swift

SIC assessment for listed migratory species
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.
No. The project is unlikely to impact areas of important habitat for this species. Within Australia, the species is considered to be predominately aerial, however as the project is a wind farm development, this may alter the airspace above the project, therefore this species may be at risk of blade strike if in the area, or avoidance of potential habitats currently present once the wind farm becomes operational. Fork-tailed Swift undertake extensive migrations, traveling thousands of kms from their breeding grounds to their wintering areas. Their movements are influenced by factors such as food availability, weather patterns, and breeding cycles. Potential collisions is likely to be infrequent, and large-scale disruption to movement pathways is not expected, due to the irregularity of the species' occurrence, and the small numbers possibly affected do not represent a significant proportion of the total population of this species, therefore the overall risk is considered low. Potential indirect impacts will be managed through mitigation measures which are outlined in Section 9, which includes but not limited to detailed BMP and BBAMP, pre-clearance surveys, adaptive management and unexpected finds procedures.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.
No. The project will not lead to invasive species that are harmful to the Fork-tailed Swift. The project will implement several controls including a Pest and Weed Management Plan as well as BBAMP.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant

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SIC assessment for listed migratory species
proportion of the population of a migratory species.
No. The total global population of the Fork-tailed Swift is not well known. Population estimates for this species can be challenging due to their wide-ranging habitats and migratory patterns. However, they are generally considered to have stable population. Flocks of up to 50-90,000 have been recorded in Australia. Given several individuals were recorded on one occasion within the subject land, across a two year period, it is considered unlikely that an ecologically proportion of the species could be present and impacted by the Project. This the species does not breed in Australia (breeds in eastern Asia). Due to it flying to height of up to 300m, the species is considered to be at risk of blade strike, or avoidance of the area and operational wind turbines, therefore it is possible the species migration activity could be disrupted. However the species presence within the subject land is likely to be infrequent due to the irregularity of its occurrence, and the small numbers possibly affected do not represent a significant proportion of the total population of this species.
Conclusion.
The project is not considered likely to significantly impact this species. This assessment has found the project is unlikely to: • Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species. • Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species. • Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

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Appendix 7. Streamlined assessment module – Scattered trees assessment

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Requirements for application of Streamlined assessment module – Scattered trees assessment

As outlined in Appendix B of the BAM (DPIE 2020a) - an assessment of the impact of clearing scattered trees can be made using this module where:

- The impacts of clearing or development proposals are for vegetation that meets the definition of scattered trees, and
- The scattered tree is not a threatened species itself nor does it have any record of candidate species credit species (flora or fauna) incidentally using it, and
- The impact is unlikely to be serious or irreversible.

As only part of the development corridor contains scattered trees, this module has been used to assess only the impacts associated with the portion of the development footprint impacting upon scattered trees.

Scattered trees are defined under the BAM if the trees meet any of the three definitions provided in Appendix B. The definition relevant to the current assessment is as follows:

- Scattered trees are three or fewer trees that have a DBH of greater than or equal to 5 cm and are within a distance of 50 m of each other, that in turn, are greater than 50 m away from the nearest living tree that is greater than or equal to 5 cm DBH, and are completely separated by 100% exotic vegetation, human-made surfaces or bare ground.

In this case, all trees occur on current or previously cropped land. Furthermore, all trees mapped as scattered paddock trees occur are Category 2-regulated land and are surrounded by Category 1-exempt land.

Map the scattered tree vegetation zone and determine the assessment class

The follow data collection steps must be undertaken to map the scattered tree vegetation zone and determine the assessment class of each tree:

- Map scattered trees proposed to be removed by the project.
- Identify the genus and species of each tree.
- Assign each tree into one of the following classes:
- Class 1: trees that are <20 cm DBH and without hollows.
- Class 2: trees that are ≥20 cm DBH and less than the large tree benchmark for the most likely plant community type, or trees that are <20 cm DBH that contain at least one hollow.
- Class 3: trees that are greater than or equal to the large tree benchmark for the most likely plant community type.
- Record any sightings (e.g. in hollows) or evidence (e.g. scats) of threatened species (flora or fauna) using the scattered trees.

The table below provides a list of the scattered trees recorded within the subject land and likely to be impacted by the project. Many of trees were verified, some were recorded by desktop only, and assumed to be class 3 trees.

Scattered trees were recorded on-ground using handheld uncorrected GPS devices, and as such to account for potential GPS error, a 10 meter buffer was applied to the development footprint when selecting scattered trees considered impacted by the project.

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Furthermore a number of trees (or clusters of trees) were found not to meet the requirements for mapping as scattered trees when on-ground assessment was completed. This was largely due to trees being present in groups/clusters that comprised a combined cover value too high to be considered as a scattered tree defined by the BAM. This resulted in a number of small clusters being included as vegetation zones, as outlined in Section 3.3 above.

Mapped scattered trees are illustrated on Figure 10 within the BDAR.

Table A 6: Mapped scattered trees likely to be impacted by the project

Tree ID	Species	Class	Number of hollows	Development footprint	Development corridor	Stage
PT1	Weeping Myall	Class 2	No	Yes	Yes	Stage 2
PT2	Weeping Myall	Class 2	No	Yes	Yes	Stage 2
PT3	Weeping Myall	Class 2	No	Yes	Yes	Stage 2
PT4	Weeping Myall	Class 2	No	No	Yes	Stage 2
PT5	Weeping Myall	Class 2	No	No	Yes	Stage 2
PT6	Black Box	Class 2	No	Yes	Yes	Stage 2
PT7	Weeping Myall	Class 2	No	Yes	Yes	Stage 2
PT8	Weeping Myall	Class 2	No	Yes	Yes	Stage 2
PT9	Weeping Myall	Class 2	No	Yes	Yes	Stage 2
PT10	Weeping Myall	Class 2	No	Yes	Yes	Stage 2
PT11	Weeping Myall	Class 2	No	Yes	Yes	Stage 2
PT12	Weeping Myall	Class 2	No	Yes	Yes	Stage 2
PT13	Weeping Myall	Class 2	No	Yes	Yes	Stage 2
PT14	Weeping Myall	Class 2	No	Yes	Yes	Stage 2
PT15	White Cypress Pine	Class 2	No	No	Yes	Stage 2
PT16	White Cypress Pine	Class 2	No	No	Yes	Stage 2
PT17	White Cypress Pine	Class 2	No	No	Yes	Stage 2
PT18	Assumed - Black Box	Class 3	Yes (Assumed)	Yes	Yes	Stage 1
PT19	Assumed - Black Box	Class 3	Yes (Assumed)	No	Yes	Stage 1
PT20	Assumed - Black Box	Class 3	Yes (Assumed)	No	Yes	Stage 1
PT21	Assumed - Black Box	Class 3	Yes (Assumed)	No	Yes	Stage 1

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Tree ID	Species	Class	Number of hollows	Development footprint	Development corridor	Stage
PT22	Assumed - Black Box	Class 3	Yes (Assumed)	Yes	Yes	Stage 1
PT23	Assumed - Black Box	Class 3	Yes (Assumed)	No	Yes	Stage 1
PT24	Weeping Myall	Class 2	No	Yes	Yes	Stage 1
PT25	Weeping Myall	Class 2	No	Yes	Yes	Stage 1
PT26	Weeping Myall	Class 2	No	No	Yes	Stage 1
PT27	Weeping Myall	Class 2	No	No	Yes	Stage 1
PT28	Weeping Myall	Class 2	No	No	Yes	Stage 1
PT29	Weeping Myall	Class 2	No	No	Yes	Stage 1
PT30	Weeping Myall	Class 2	No	No	Yes	Stage 2

The table below provides a summary of the numbers and classes of scattered trees likely to be impacted by the project. As outlined in Section B.3 of the BAM, no further assessment is required for Class 1 scattered trees, as they are considered to support negligible biodiversity value.

Table A 7: Summary of scattered trees likely to be impacted by the project

Class	No. trees impacted – directly or indirectly
1	-
2	14
3	2

Assessment of entities at risk of a serious or irreversible impact

The BAM requires the identification of all species at risk of a SAII that would be impacted on by the proposed clearing of the scattered trees.

No such entities exist as part of the current assessment.

Determine the offset requirements

The table below provides the project's offset associated with the proposed clearing of scattered trees, as calculated in accordance with Section B5 of the BAM. The offset requirement is also presented as a BAM Credit Summary Report provided below.

The BAM Calculator case number for the scattered tree assessment is 00034895/BAAS17051/24/00047205 (Stage 1) and 00034895/BAAS17051/25/00055371 (Stage 2). Credit reports are provided in Section 13.

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Table A 8: Offset credit calculations for impacted scattered trees

PCT	Class	Contains hollows	No. of trees	Credit required
PCT 13 Black Box - Lignum woodland wetland	2	No	1	1
	3	Yes	2	2
PCT 26 Weeping Myall open woodland	2	No	13	7
TOTAL				**10**

Threatened ecological communities

Vegetation within the subject land was found to represent one TEC listed under the NSW BC Act, which can occur as single trees. As such trees representing PCT 26 are considered to represent their associated TECs. Further information is provided in the below.

Table A 9: Summary of BC Act TECs represented as scattered trees

BC Act TEC	Listing status	PCT	Impacts
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	Endangered	PCT 26 Weeping Myall open woodland of the Riverina Bioregion and NSW South Western Slopes Bioregion	• 13 scattered paddock trees

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Appendix 8. CRM overview and performance

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Wind Energy and Wildlife Conservation

A Description of the Biosis Model to Assess Risk of Bird Collisions With Wind Turbines

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ABSTRACT We describe the model of Biosis Propriety Limited for quantifying potential risk to birds of collisions with wind turbines. The description follows the sequence of the model's processes from input parameters, through modules of the model itself. Aspects of the model that differentiate it from similar models are the primary focus of the description. These include its capacity to evaluate risk for multi-directional flights by its calculation of a mean presented area of a turbine; its use of bird flight data to determine annual flux of movements; a mathematical solution to a typical number of turbines that might be encountered in a given bird flight; capacity to assess wind-farm configurations ranging from turbines scattered in the landscape to linear rows of turbines; and the option of assigning different avoidance rates to structural elements of turbines that pose more or less risk. We also integrate estimates of the population of birds at risk with data for numbers of their flights to predict a number of individual birds that are at risk of collision. Our model has been widely applied in assessments of potential wind-energy developments in Australia. We provide a case history of the model's application to 2 eagle species and its performance relative to empirical experience of collisions by those species. © 2013 The Wildlife Society.

KEY WORDS bird, collision, model, risk, turbine, wind energy.

A number of mathematical models have been developed for the purposes of either describing the interaction of a bird with a wind turbine or to predict the risks of bird collisions with turbines (Tucker 1996*a*, *b*; Podolsky 2003, 2005; Bolker et al. 2006; Band et al. 2007). Tucker (1996*a*, *b*) and Band et al. (2007) detailed their models in the peer-reviewed literature. The collision risk model developed by Biosis Propriety Limited has been widely used to assess wind-energy developments in Australia since 2002, but it has not previously been described in detail. Given high levels of interest in effects of wind turbines on fauna, we believe it is important for the model to be accessible.

Our model provides a predicted number of collisions between turbines and a local or migrating population of birds. It has the potential to be modified to accommodate Monte-Carlo simulation, although at its core it uses a deterministic approach. It is modular by design, and allows various customizations, depending upon the unique configuration of the wind facility and characteristics of the taxa modeled.

The initial calculation involves species-specific parameters for speed and size of birds and specifications of the turbine, including its dimensions and rotational speed of its blades. Using these parameters, we derive the mean area of turbine presented to a bird in flight. This allows the model to accommodate flight approaches from any potential direction. Alternatively, unidirectional flights can be modeled by using the relevant turbine surface area presented to birds approaching from a given direction.

Data for bird flights are collected at the wind-farm site according to a specific and consistent field methodology. These data are used to determine the flux (density) of bird flights. When combined with turbine specifications, this yields the probability of collision during a single flight–turbine interaction. The density flux approach has not been used for this application previously.

The number of movements at risk of collision with one turbine is then scaled according to a typical number of turbines that a bird might encounter in a given flight. This is further refined by a metric for the capacity of the particular species to avoid collisions. Where a population census or estimate is available for the number of birds that may be at risk, a further deduction is used to attribute the number of flights-at-risk to individuals, and hence provide a final model output as the number of individuals at risk of collisions. The ability to transform from flights-at-risk to individuals-at-risk has been uniquely developed and applied as a routine component of our model.

DESCRIPTION OF THE MODEL

The model requires data for input parameters and, using these, functions in a sequence of modules (Fig. 1).

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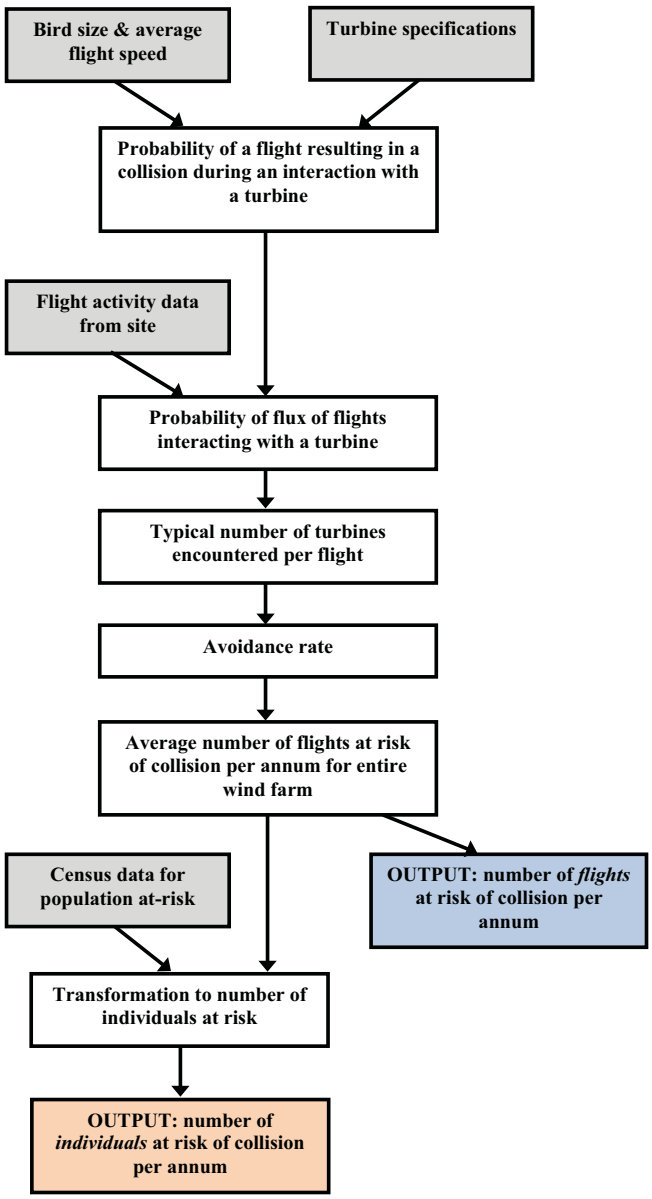


Figure 1. Overview of the collision risk model that quantifies risk to birds of colliding with wind turbines, showing input parameters (gray boxes), modules, and sequence.

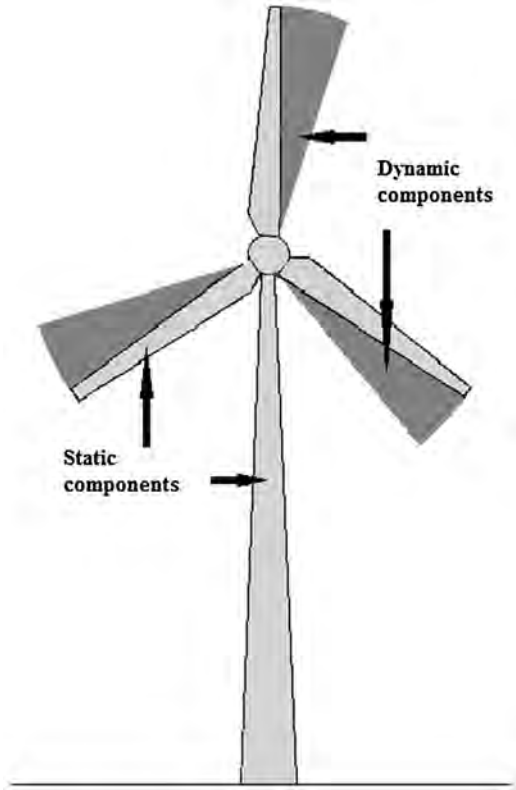


Figure 2. Schematic indication of the static and dynamic components of a wind turbine that may be encountered by a flying bird. The dynamic component is the area swept by rotor blades during the time that a bird of a particular species would take to pass through the rotor-swept zone.

Model Inputs

Turbine parameters.—The primary risk faced by a flying bird, whether it may strike or be struck by a turbine, is that the machine presents a potential obstacle in its path. Ultimately this equates to the surface area of the turbine presented to the bird from whatever its angle of approach. Other models, such as probably Band et al. (2007), use individualistic representations of birds. Our model uses a projection of the presented area onto all possible flight angles. For this reason, multiple dimensions of turbine components and rotor speed for the particular type of turbine are used as input values to the risk model. Turbine specifications are as provided by the machine's manufacturer.

The modeled wind turbine consists of 2 fundamental components representing potentially different risks. We refer to these as the static and dynamic components (Fig. 2). The static areas of a turbine include all surfaces of the entire machine comprising a tower, which in current turbines is a simple taper with known base and top diameters; a rectangular nacelle housing the generator; a hemi-spherical hub; and rotor blades that taper in 2 planes. The dynamic component is the area swept by the leading edges of rotor blades during the time that a bird would take to pass through the rotor-swept zone.

Size and flight speed of birds.—For each taxon, the model requires values for the total length of the bird in flight, from bill tip to tip of the tail or outstretched legs, and the average speed of the species' flights. We obtained bird lengths either from museum specimens or from standard ornithological texts.

Accurate determinations of bird flight speeds can be complex and difficult to obtain (Videler 2005, Pennycuick 2008) and published data are not available for most species. However, published radar studies (e.g., Bruderer 1995, Bruderer and Boldt 2001) provide ranges of flight speeds for a variety of species, including congenerics with similar morphologies and ecological traits to a number of species we have assessed. Use of radar to collect bird flight data at the wind-farm site may provide flight speeds for species of interest. We consider that average ground speed (as opposed to air speed) is appropriate for modeling of multidirectional movements of birds.

Bird flight data.—The model requires data from the wind-farm site for the number of flights made by species of interest within a measured time and volume of airspace. Movement data may be obtained from fixed-time point counts using a methodology adapted from Reynolds et al. (1980), incorporating an effective detection range (Buckland et al. 1993). It may be collected by human observers or by using horizontal and vertical radar combined with call recording or visual species identification (e.g., Gauthreaux and Belser 2003, Desholm et al. 2006). Data represent the number of flights that birds make within a cylinder of airspace that is centered horizontally on the observer and the height of which is the maximum reached by rotor blades of the turbines. The data collection regime is designed with the aim of providing a representative sample of flight activity across the local range of diel, seasonal, and other environmental variables.

Model Modules

Probability of a single flight interacting with a turbine.—In some situations, such as during highly directional migratory passage, the presented area of turbines is determined from the angle of the birds' flight relative to the compass orientation of turbines. However, for the great majority of species (including temporary or permanent residents at an on-shore wind farm) this does not apply, and flights can be expected to approach turbines from any direction. For this situation, all dimensions of the turbine contribute to the area with which a flying bird might collide and the model uses a simple integration to determine a mean presented area. This represents a substantial advance over other collision risk models that depend on the assumption of a specific angle of approach as a bird encounters a turbine (e.g., Tucker 1996*a*, *b*; Bolker et al. 2006; Band et al. 2007).

We calculate the area presented by the static components of a turbine using a conservative assumption that none of them overlap or obscure any others. The area of each component is calculated individually, and these are then summed to determine a total static area for the turbine. Static areas are calculated from the simple length × width dimensions of all components visible by line of sight. These are then projected onto an arbitrary approach direction (effectively scaling by the cosine of the approach angle). For example, viewed directly from one side, only the side panel of the nacelle is visible. However, approached from 45° to the turbine, both the front and side panels are visible, and are thus scaled by $\cos(45) \varrho 1/\sqrt{2}$ to match that particular angle of view.

We calculate the dynamic area, swept during the movement of blades, from the dimensions of the stationary blades and the distance they travel at their average speed during the time taken by a bird to fly through the rotor-swept area. We assume that all flights involve forward movement, so the swept-area is derived from the length and speed of the particular species of bird, in combination with the thickness of the sweeping blade.

Each rotor blade is tapered in 2 planes. Thus the thickness of the blades, used to determine the time taken for a bird to cross through the swept area, is actually a function of the point in the rotor radius at which an individual bird's flight intersects the swept area. This presents a complication that we overcome by defining an effective blade, which is a simple rectangular cross-section that sweeps out precisely the same volume of space as the physical blade. In doing so, we calculate a constant thickness of blade that accounts for the fact that the thinner tips actually sweep far more space than the thicker base of the blade. This ensures also that our flux calculation is not compromised by introduction of a spatial variation at odds with other aspects of the model.

A further input parameter is the percentage of time per annum when rotors are not turning due to inappropriate wind speeds and routine turbine maintenance. Prior to commissioning of a wind farm, wind speed data are usually gathered and the expected percentage of downtime due to inappropriate wind speeds is determined. During downtime periods the rotor simply stops turning; and so risks associated with dynamic components only are reduced by this percentage of time, while all static components of the turbine remain as potential obstacles to flying birds.

Combining all presented areas of the turbine.—Modeling for multidirectional bird movements requires no dependence on approach angles nor on complexities of interactions between flight direction and wind direction. We thus reduce the turbine to its mean presented area. This is solved by the equation

$$\frac{1}{\pi}\int_0^{\pi} A(\theta)\,\mathrm{d}\theta$$

where A is the presented area of the turbine as a function of approach angle θ. We solve this numerically using a trapezoidal integrator (Press et al. 1992).

Probability of multiple flights interacting with a turbine.—Because counts of bird flights have been made across the wind-farm site and there is no obligatory relationship between point-count locations and particular sites proposed for turbines, we combine the data collected from all point counts. This provides a measure of flight activity, which is assumed to be constant across the site. Thus the field data reduce to a single ratio value for the subject species, which is the sum of all flights documented during all counts divided by the total time of observations. This equates to a maximum likelihood estimation of the mean of an assumed Poisson distribution.

To calculate a number of flights at risk of collision, we first reduce documented bird movements (M) to a measure of flux (F) using the equation

$$F = \frac{M}{T_{\mathrm{obs}} A_{\mathrm{obs}}}$$

where T_{obs} is the combined total time of all point counts and A_{obs} is the area of the vertical plane dissecting the observation cylinder. This flux is a measure of bird movements per time per square meter of vertical airspace. The third dimension, volume of airspace, is redundant (or tacit) due to the

assumption that, unless involved in a collision, flight paths do not end arbitrarily in space.

We next multiply activity measure by the number of minutes in which the species is active during the 24-hour diel period, T, and the total presented area of the turbine, A. For year-round resident species, the "active minutes" are calculated for the entire year, while for seasonal or migratory species, they are calculated for the portion of the year that the species is present at the site. This then gives a measure of risk to the bird movements, $M_{\text{risk}} = \text{FTA}$.

Because the flight data are a measure of movements by the species in question and do not discriminate the number of individuals making the movements, the measure (M_{risk}) quantifies the total movements-at-risk for the species and does not reflect risk to individual birds.

To determine a risk rate from total of recorded movements-at-risk, it is necessary to extrapolate to a total number of expected bird movements per annum, M_{yearly}. We calculate this from the flight data, extrapolating the movements to a yearly total through the equation

$$M_{\text{yearly}} = M \frac{T_{\text{yearly}}}{T_{\text{obs}}}$$

We then deduce a probability of flights at risk of collision as $M_{\text{risk}}/M_{\text{yearly}}$. Note that T_{year} is the total time in a year, and not the diel activity period of the species, which has already been factored into the calculation of movements at risk.

The resultant value is now a probability of flights being at risk of collision with a single turbine. To this point, no account is taken of the bird's own ability to avert a collision. This is modified later through use of an avoidance factor.

Estimating number of turbines encountered per flight.—Every turbine is presumed to represent some risk for birds, so the total number of turbines proposed for the wind farm is an input to the model. Turbine layout of modern wind farms is primarily determined by the wind resource and turbines are micro-sited accordingly. Consequently, the machines are usually scattered on the landscape. Older wind farms had turbines arrayed in rows, and occasional modern facilities may be linear where they follow a single topographic feature.

To account for the number of turbines with which a single flight might interact, it would be necessary either to know precisely the route of every flight or to make informed assumptions about flight paths. The manner in which turbines are arrayed in the landscape is important to ascertain a typical number of turbines that a bird might encounter in a given flight. This number differs according to whether turbines are in a scattered array or a single row, and these require different calculations.

For a row of turbines, the likely number of encounters can be visualized by considering a row of N turbines in plan view and a flight path at angle Φ to the row. A flight directly along the line of turbines (Φ') will interact with all N turbines. As the angle of flight relative to the row increases toward 90°, flight paths have potential to interact with fewer turbines until an angle (Φ'') is reached at which the path has potential to interact with a maximum of one turbine.

For a single row of turbines, we define the piecewise smooth function, which gives the number of turbines for a given angle of crossing with,

$$n_{\text{interaction}} = \begin{cases} N, & \text{if } \theta \le \phi\prime \\ \cot(\theta), & \text{if } \phi' < \theta \le \phi'' \\ 1, & \text{if } \phi'' < \theta \le \frac{\pi}{2} \end{cases}$$

This gives us an expected number of interactions as

$$\langle n_{\text{interaction}} \rangle = \frac{2}{\pi} \left[N \arctan\left(\frac{1}{N}\right) + \frac{\pi}{4} - \ln\left(\sqrt{2}\sin\left(\arctan\left(\frac{1}{N}\right)\right)\right)\right]$$

For scattered turbine arrays it is not realistic to assume that a bird will encounter all turbines in the wind farm in a given flight. We assume each flight has potential to cross between any 2 points on the outer edges of the farm. Given the size of most on-shore wind farms, this is a reasonable assumption for typical species of concern, such as raptors. When multiple flight paths are drawn randomly across the plan view of a wind farm, some paths may be circuitous and have potential to encounter many turbines, while others will pass through a small portion of the site and have potential to encounter relatively few turbines.

To deduce an average number of turbines likely to be encountered by any flight we use a topological, non-affine mapping technique. This spatial transformation can be illustrated as follows: if we were to throw a lasso around the perimeter of the site and shorten it to its minimum, we would find that all the turbines had collected in a circle. A straight flight path through this "lassoed" site is mathematically equivalent to a random walk across the unconstrained layout. The average of all flight paths crossing the center of this remapped farm will intersect with $\sqrt{N}$ turbines (where N is the total no. of turbines in the wind farm). This value is used in the model for the number of turbines that might be encountered per flight within a scattered turbine array.

For arrays that are neither entirely scattered nor linear, the model employs a simple weighted average of the values for fully scattered and entirely linear arrays.

Application of turbine avoidance capacity.—Birds have substantial ability to avoid obstacles; therefore, it is necessary to incorporate this capacity into the model. In common with other workers (Percival et al. 1999), we use "avoidance" in specific reference to behavior on the part of a bird that averts a potential collision with a turbine. The "avoidance rate" equates to the proportion of flights that might otherwise have involved interaction with a turbine but where the bird alters course and the flight does not result in a collision. For the purposes of the model it is of no consequence whether or not this is a result of a cognitive response by the bird to the presence of the turbine.

Turbine avoidance remains little-studied for any species, and empirical information about actual avoidance can be obtained for a given site only by studying the responses of birds in the presence of operational turbines (Chamberlain et al. 2006). One recent investigation has compared flight behaviors of 2 species of eagles in the presence of turbines at

2 operating wind farms with their behaviors at a site without turbines (Hull and Muir 2013).

Avoidance rate is incorporated into the model by scaling the movements at risk by $(1 - v)$, where v is a measure of the bird's ability to avoid objects. In this scenario, $v = 0$ corresponds to a blind, non-responsive projectile, and $v = 1$ represents a perfectly responsive bird able to avoid any object.

A novel feature of our model is its capacity to apply different avoidance values to the static and dynamic portions of a turbine. As noted by Martin (2011), birds are known to collide with both stationary and moving parts of turbines. This aspect of our model allows for differences in capacity of birds to detect and avoid the large, static components of modern turbines relative to their capacity to detect and avoid the small and fast-moving leading edges of rotor blades.

Size of population at risk.—When information about the size of the population at-risk is available, this can be factored directly into our model to provide results in the form of an expected number of individuals at risk of collision per annum. This is an important consideration because an input measured in terms of bird movements cannot provide an output in terms of individual birds. This aspect appears to have been largely overlooked by other workers, although Chamberlain et al. (2006) alluded to the use of a number of flights only, without incorporation of the number of individuals, as a potential issue in evaluation of collision estimates provided by the Band model (Band et al. 2007).

To deduce a predicted number of individual birds that are at risk of collision, a valid estimate is required of the number of individuals that may interact with turbines at the wind farm in the course of a year. If it is not feasible to obtain this for a species, then the output of the collision risk model will necessarily be the number of flights-at-risk per annum. Although this metric is not predictive of the number of individuals that might collide, it permits risk to be compared for various designs of a wind farm or between one facility and another. In rare cases, such as where there is a single migration passage through the site per annum, the number of movements may equate with the number of individual birds that are at risk. The great majority of risk modeling we have undertaken has been for raptors that are year-round residents. Due to their territoriality and relatively low densities, our studies at wind-farm sites have been able to ascertain the number of individuals using a site per annum, including both resident adults and juveniles, with a high level of confidence. For some other species, such as cranes (Gruidae), we have undertaken home-range studies to determine numbers present during the breeding season, and we have obtained local census data to estimate numbers of individuals that might encounter turbines during non-breeding seasons.

Given a population estimate, the number of flights at risk is attributed equally to the relevant number of individuals through the simple relation $M_{\text{individuals}} = \text{Yearly Movements}/\text{Population}$. We can then attribute individual mortality through

$$\text{mortality} = \text{Population}\left(1 - \frac{\text{Movements At Risk}}{\text{Yearly Movements}}\right)^{M_{\text{individuals}}}$$

MODEL VALIDATION

The model we describe here has been used to assess potential turbine collision risk for numerous species of birds for 23 commercial-scale wind farms proposed in Australia and one in Fiji. Eleven of these facilities have subsequently been built and are now operational. The model's projections have been used by regulatory authorities in determination of approval or modification to wind-farm designs for a range of species of concern. These include taxa as diverse as the orange-bellied parrot (*Neophema chrysogaster*), wedge-tailed eagle (*Aquila audax*), brolga (*Grus rubicunda*), and the large and readily observable Pacific fruit-bat (*Pteropus tonganus*) in Fiji.

The model's performance can be validated only when it can be compared with post-construction mortality data that are sufficient to permit calculation of an actual annual mortality rate and a 95% confidence interval for that rate. Conditions of regulatory approval for most wind farms that have been built to-date in Australia have varied considerably between state jurisdictions and over time. Generally they have not required rigorous investigation or public reporting of avian collisions that occur during operation. We have thus had limited opportunity to validate our model against empirical information for actual collisions. However, where these are available, we can compare the model's predicted average estimates with the measured confidence interval for actual mortalities to assess its predictive capacity. We present one such case study below.

Comparing the Model's Predictions With Empirical Data—A Case History

Substantial investigations have been undertaken at Bluff Point and Studland Bay wind farms in northwestern Tasmania entailing a number of studies of wedge-tailed eagle and white-bellied sea-eagle (*Haliaeetus leucogaster*). These have included utilization surveys designed to measure eagle activity before and after development of the wind farm; collision monitoring; eagle breeding success; eagle behaviors and movements relative to turbines and observers; and investigations and trials aimed at reduction of collisions (Hull et al. 2013). Commissioning of turbines began at Bluff Point Wind Farm in 2002 and at Studland Bay Wind Farm in 2007. Bluff Point Wind Farm consisted of 37 Vestas V66 turbines in a scattered array on an area of 1,524 ha. Studland Bay Wind Farm was situated 3 km south of Bluff Point and comprised 25 Vesta V90 turbines in a scattered array over an area of 1,410 ha. Both wind farms were close to the coast of northwestern Tasmania and resident white-bellied sea-eagles and Tasmanian subspecies of wedge-tailed eagle (*A. a. fleayi*) occurred at both sites.

Monitoring Eagle Flights

Movement data for both species were collected during point counts at Bluff Point Wind Farm site in 3 years prior to construction of turbines and in 4 years after they commenced operating. At Studland Bay, they were collected in 6 years prior to turbine construction and in 3 years after turbines commenced operation. As prescribed by regulatory authorities, point counts were undertaken in the austral autumn and spring. Ten replicate point counts were made in each season

at 18 locations per wind farm. There were 545 point counts undertaken at Bluff Point between 1999 and 2007 and 854 point counts at Studland Bay between 1999 and 2009.

Collision Risk Model Results

We used the model to estimate risk based on movement data collected prior to construction for populations of 6 wedge-tailed eagles and 4 white-bellied sea-eagles at-risk per annum at each of the 2 wind farms.

State regulatory authorities have required that the collision risk model be re-run with the accumulated sum of eagle movement data obtained during the entire period of both pre-construction and operation of the 2 wind farms spanning the period from 1999 to 2009 (Table 1). We modeled static avoidance rate at 99% in all cases.

Documented Eagle Collisions

Carcass monitoring surveys were conducted at the Bluff Point and Studland Bay wind farms since they commenced operating. Fences to exclude mammalian scavengers were maintained at 27% of turbines across the 2 sites. All turbines, both fenced and unfenced, were searched routinely within a 100-m radius of the tower base. Search frequency was initially informed by trials to determine rates of loss to scavengers and of observers' capacity to detect carcasses. Since 2007, searches were carried out twice weekly during periods that may have represented higher risk to the species (i.e., eagle display period Jun–Aug, inclusive; and eagle fledging period mid-Dec–Feb, inclusive) and fortnightly outside these periods (Hull et al. 2013). Assessment of the extent of undetected eagle collisions (Hydro Tasmania 2012; Hull et al. 2013) concluded that it is unlikely that significant numbers of eagle carcasses were missed because they are conspicuous; the search zone around turbines was adequate to detect eagle carcasses where they will fall after colliding with turbines (Hull and Muir 2010); personnel on site had capacity to detect carcasses that may have been moved from the formal search zones; eagle carcasses in vegetation were found not to decompose readily and, even when scavenged, remains were identifiable; avian scavengers did not remove all evidence of carcasses and, although mammalian scavengers could remove carcasses, this was controlled at the subset of fenced turbines; survey intensity was informed by predetermined scavenger removal rates; and, although a small number of eagles survived collision with a turbine, in all documented cases such birds were unable to fly and are likely to have been detected because both scavenger exclusion and farm fences prevented them from leaving the site.

Table 1. Modeled mean annual turbine collision estimates for 2 eagle species based on movement data collected over the span of pre-construction and operation of 2 wind farms in northwestern Tasmania, Australia, from 1999 to 2009. Estimates are shown for 4 potential dynamic avoidance rates. Static avoidance rate was modeled at 99% in all cases

	White-bellied sea-eagle		Wedge-tailed eagle	
Dynamic avoidance rate (%)	Bluff Point	Studland Bay	Bluff Point	Studland Bay
90	0.9	0.8	2.7	1.9
95	0.5	0.4	1.5	1.1
98	0.2	0.2	0.7	0.5
99	0.1	0.1	0.4	0.3

Comparison of Collision Risk Model Estimates With Actual Mortality Rates

Given constraints of statistically low collision numbers, the model's estimates of annual collisions, based on the combined total of movement data from pre-construction and operation of the 2 wind farms from 1999 until 2009 (Table 1), compare well with actual mortality of the 2 eagle species at both wind farms (Table 2). The model's estimate of the number of wedge-tailed eagle collisions per annum at Bluff Point at a 95% avoidance rate was 1.5, which is the same as the mean number of documented mortalities per annum. Estimates provided for this case by model iterations for 90% and 95% avoidance rates fell within the 95% confidence interval of measured mortality rates. The model's estimates for number of collisions at a 95% avoidance rate for white-bellied sea-eagles at Bluff Point (0.5) and for wedge-tailed eagles at Studland Bay (1.1; Table 1) also closely approximated the mean numbers of documented mortalities per annum for the 2 species (0.4 and 1.0, respectively; Table 2). For those cases, the model's estimates for the range of avoidance rates between 90% and 99% fell within the 95% confidence interval of measured mortality rates. No white-bellied sea-eagle collisions have yet been reported from Studland Bay so, to date, the model's estimates are higher than actual experience for that species there.

MANAGEMENT IMPLICATIONS

We consider that there are 2 different, although not mutually exclusive, applications for modeling of bird collision risks at prospective wind farms. These are to provide projections of long-term effects of a particular wind-energy facility on key bird species; and to determine relative risks for key species that are associated with different wind-farm sites, different portions of large wind farms, and different types of turbines and/or turbine configurations.

In many respects, we consider the latter use of collision risk modeling is the most important contribution it offers. This application provides a tool for planning of wind farms to avoid, reduce, or mitigate potential risks to birds. The model we describe here has now been used in such an iterative manner for a number of prospective sites to evaluate relative risks to key species posed by different types, sizes, numbers, and layouts of turbines.

The integration in our model of data for numbers of bird flights with numbers of birds in the population at-risk is key to the accurate prediction of potential numbers of collisions. This aspect appears not to have been adequately considered previously but has real implications to the appropriate determination of actual risks posed by a wind farm. Our model's use of bird flight data to determine annual flux of movements; a mathematical solution to the typical number of turbines that might be encountered in a bird flight; capacity to assess wind-farm configurations ranging from turbines scattered in the landscape to linear rows of turbines; and the option of assigning different avoidance rates to components

Table 2. Average annual mortality rate and variance for 2 eagle species based on carcasses detected at 2 wind farms in northwestern Tasmania, Australia

	White-bellied sea-eagle		Wedge-tailed eagle	
Wind farm	**Mean annual mortality**	**Annual variance (95% CI)**	**Mean annual mortality**	**Annual variance (95% CI)**
Bluff Point 2002–2012	0.4	0.1–1.0	1.5	0.8–2.6
Studland Bay 2007–2012	0.0	0.0–0.7	1.0	0.3–2.2

of turbines that pose more or less risk, all represent refinements designed to improve the predictive capacity of turbine collision risk modeling.

In the cases outlined here, where long-term mortality data sets have permitted validation of the model's collision estimates at given avoidance rates, the two have closely approximated each other. We will seek further opportunities to compare the results of our model with empirical mortality information from operating wind farms, with a view to wider application of the model.

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Performance of the Biosis wind turbine avian collision risk model evaluated for two species of Australian eagles

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Introduction

A number of avian collision risk models are used internationally to provide forecasts of the potential for various species of birds to collide with wind turbines. Their principal application has been to inform impact assessment as a component of regulatory consent processes for proposed wind energy projects.

While it is difficult to determine the frequency of bird collisions at offshore wind farms because it is not possible to search for bird carcasses as is traditionally done at onshore facilities, validation is feasible at terrestrial wind farms. Nonetheless, few pre-consent projections of avian turbine collision risk models used for onshore wind farms have been validated by comparing them with empirical experience of operational wind farms (Masden and Cook 2016). Since validation of that kind is the real test of the performance of models, it is important that the pre-operational projections of models are compared with subsequent experience at operational wind farms. The nature of mathematical models lends them to refinement based on appropriate validation.

The general lack of model validation seems to result from a regulatory context in many jurisdictions whereby collision risk modelling is undertaken as a prerequisite to a consent decision, but once consent has been granted little further consideration is given to its estimates. However, it is also the case that a variety of factors present significant constraints on the capacity to accurately determine the total numbers of collisions that occur at operational wind farms for almost all species (see *Pre-requisites to validation*, below) and this can make it difficult to validate the forecasts of collision risk modelling.

One evaluation exercise undertaken across 46 small wind farms in Germany (Grünkorn et al. 2017) concluded that the Band model (Scottish Natural Heritage 2010a; b) substantially underestimated real numbers of fatalities for various species. In that study bird activity data was collected during operation of the wind farms rather than prior to construction and it is not apparent whether that may have influenced results.

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The Biosis avian collision risk model was developed in the early 2000s when commercial-scale wind energy was in its infancy in Australia. The model has been used to provide quantified assessment of the potential for various species of birds to collide with wind turbines for multiple proposed wind energy facilities since then.

Performance of the model can be evaluated only by comparing its forecasts of bird collision rates (generally prepared prior to wind farm construction) with rates experienced during the operation of wind farms. The latter requires post-construction mortality data of sufficient quality and quantity to permit estimation of annual mortality rate with high precision (see *Pre-requisites to validation*, below).

Background to turbine collision risk modelling

Quantitative modelling to estimate the number of collision mortalities of threatened birds is widely used as part of environmental impact assessments for proposed wind energy facilities (Huppop et al. 2006, Masden & Cook 2016, Smales 2017, Cook & Masden 2019).

Modelling of avian collision risk with wind turbines provides results measured as forecasts of the per annum average number of individual birds that may collide with turbines at a proposed wind energy facility. The forecasts are usually of very low numbers and, by the application of a range of avoidance rates (see below), a range of results is routinely provided. Frequently this range is quite narrow and, as in the examples set out here, is for an impact of within one or two individuals per annum. To the best of our knowledge, no other form of environmental impact assessment for fauna in Australia requires forecasts with this level of precision for the number of individual animals that may be impacted by a proposed action.

A modelling approach to collision risk allows the incorporation of uncertainties. These relate to imperfect knowledge about the behaviours of birds in the presence of a proposed wind farm. All modelling of this type entails the use of assumptions, but the use of a mathematical modelling approach for avian collision risk requires that necessary assumptions are based on available empirical information. Hence, collision risk is best modelled only for species for which empirical data about their flight activity has been obtained from the site of a proposed wind farm, ideally during a period sufficient to encompass a range of seasonal and other environmental conditions.

Mathematical modelling of risk is intended to provide an articulated and replicable evaluation of what may occur in the real world. The rationale behind predictions is explicitly stated in the mathematics of the model, which means that the logical consistency of the predictions can be evaluated. The explicit nature of inputs and rigour entailed in modelling means that the process is replicable, consistent and open to analysis, criticism or modification when new information becomes available. Although it is necessary to include some assumptions and arbitrary choices when deciding on the structure and parameters of a model, these choices are explicit.

Collision risk modelling incorporates multiple variables and uses specifications of the wind farm and of turbines, along with values for size and speed of particular species, and data for flight heights and flight

frequency collected during dedicated investigations at the site. The outputs of the model are numerical estimates of the rates of annual mortalities of relevant species of birds due to turbine collisions.

The modelling process uses data specific to particular turbines and relevant species of birds recorded at the wind farm site. Bird flight data represent a sample of the flight activity of particular species measured against time and airspace. In subsequent collision risk modelling, the sample of bird flights obtained from the site are extrapolated to provide per annum rates of flights that might interact with the total number of turbines proposed for the wind farm.

Avoidance rates

Avoidance rate is the capacity for a bird to avoid a collision (Cook et al. 2014), whether that occurs due to a cognitive response on the part of a bird or by chance (Martin 2011).

Birds are generally adept at avoiding obstacles within their flight space but the capacity of a bird to avoid a collision is clearly an important element in consideration of this risk. 'Avoidance' is recognised at different spatial scales. The best definitions of these are provided by Cook et al. (2014) and are summarised as follows: (1) macro-avoidance occurs when a bird responds to the presence of an entire wind farm by flying around or over it; (2) meso-avoidance refers to the response in which birds fly within the overall wind farm but avoid collisions by choosing to fly only in the airspace between turbines, or in the space below rotor-sweep; and (3) micro-avoidance happens when a bird, flying in close proximity to a turbine and that is otherwise on a collision course, does not in fact collide with the turbine. These were illustrated by Smales (2017) and are reproduced here as Figure 1.

Macro-avoidance is a simple measure of displacement of birds from the area occupied by an operational wind farm. Micro-avoidance may include cognitive behaviour in which a bird becomes aware of danger and takes evasive action, or simple chance resulting in inadvertent safe passage between turbine blades. Data for bird flight activity is collected at the site of a proposed wind farm in the absence of any turbines and thus without any avoidance. For this reason, avoidance rates applied in risk modelling must encompass the potential for avoidance at all three spatial scales.

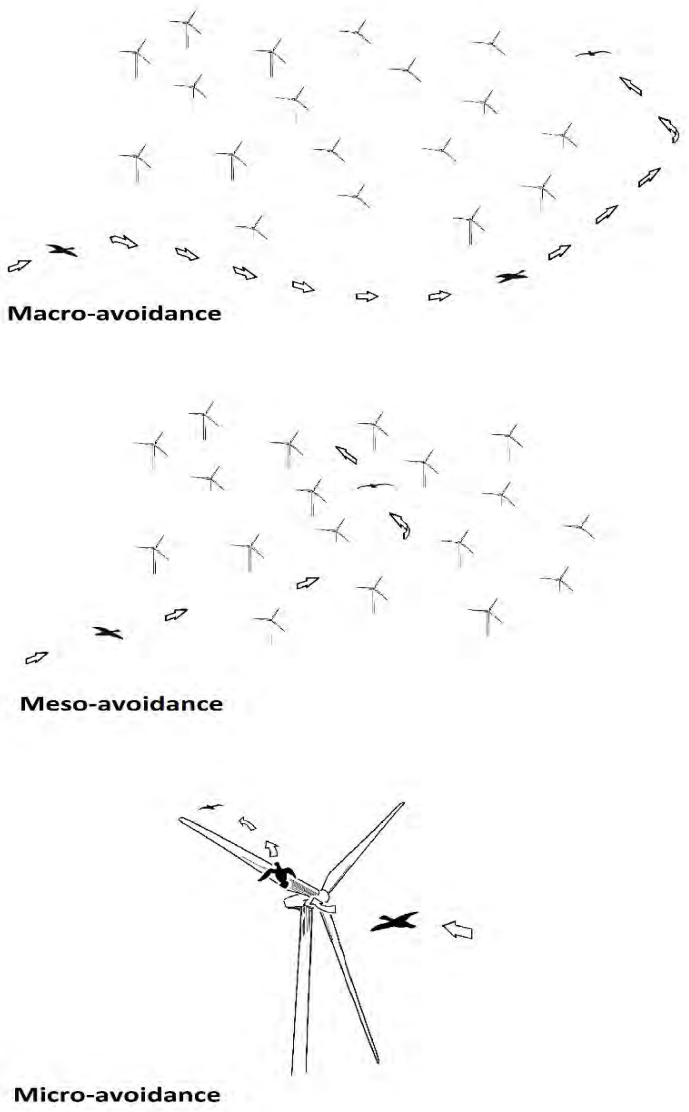


Figure 1 Three spatial scales at which avoidance of collision may occur (Smales 2017).

An avoidance parameter is incorporated into the collision risk model by scaling the number of movements at risk by (1 – v), where perfect avoidance capacity equates to 1.0, and v is a measure of the rate at which birds avoid turbines. Thus, an avoidance rate of 0.90 equates to one flight in 10 in which a bird does not avoid a turbine; an avoidance rate of 0.98 equates to one flight in 50 in which a bird does not avoid a turbine, and an avoidance rate of 0.99 equates to one flight in 100 in which a bird does not avoid a turbine.

Ideally, empirical data from observational investigations of birds flying within an operating wind farm would provide 'real' rates at which birds avoid turbine collisions at the various spatial scales. However, as discussed by various authors (Chamberlain et al. 2006; Madders & Whitfield 2006; Cook et al. 2012, Smales 2017), it has proven difficult to obtain empirical data for actual turbine avoidance rates from observational

studies. At least in part, this is because, while human observers very rarely document collisions, they experience difficulty in determining the precise flight path of a bird and whether it is actually on a potential collision course, and hence whether avoidance of any kind was involved when no collision occurs.

Owing to the difficulties associated with observational studies of avoidance, avoidance rates have usually been determined not from direct observations of the behaviour of birds within a wind farm, but by an indirect derivation in which an 'avoidance rate' is calculated from the difference between the collision rate projections of a model and the number of fatalities that actually occur (Whitfield 2009; Band 2012; Cook et al. 2012, 2014; Grünkorn et al. 2017; Smales 2017). That is: avoidance rate = 1 – (actual deaths/predicted deaths assuming no avoidance). This approach has a number of problems. Estimation of the total number of deaths at onshore wind farms is based on the number of collision carcasses detected during a search regime, and accounting for carcasses missed by searchers and lost to scavengers. While methods to account for searcher efficiency and carcass persistence have improved (e.g. Huso et al. 2017), the process most often results in mortality estimates with very large confidence intervals. As a consequence, a derived avoidance rate will be imprecise. In addition, the simple difference between the number of fatalities predicted and those experienced may include multiple factors other than avoidance and will also encompass any error in the model (Whitfield 2009; Hull & Muir 2013; Cook et al. 2014; Grünkorn et al. 2017; Smales 2017).

Some advances have been made recently in efforts to obtain empirical data for actual collisions (e.g. Coppack et al. 2015; Cullinan et al. 2015; Larkin 2015; Perrow et al. 2015; Skov et al. 2018). Such studies describe methods using technologies such as fixed pencil-beam radar in combination with an infrared-sensitive camera system, automated thermal imaging, multidimensional radar and Global Positioning System (GPS) boat-based tracking to detect and record collisions and birds' avoidance of collisions at offshore wind farms. While similar technologies have begun to be applied at a few onshore Australian wind farms to achieve targeted curtailment of turbines when a bird is detected in close proximity to a turbine, they have not been applied to ascertain avoidance rates.

In the Biosis model, the turbine is decomposed into its static and dynamic components. The entire turbine (including the tower, nacelle and the rotor when stationary) represents the static component. The dynamic component is the volume swept by the leading edge of the rotor blades in the time it takes a bird of a given length and flight speed to pass across the depth of the rotor-swept disk. Static components (i.e. the stationary turbine) are considered to pose minimal collision risk as they are very likely to be seen and avoided by birds in flight. The dynamic component of the sweeping rotor blades is considered to represent higher risk due to their speed and the likely difficulty of a bird in flight avoiding them. The model takes the two elements into account by allocating different avoidance rates to them.

Model result metrics

Collision risk results are projections extrapolated from the sampled rates of flight activity of a particular species. With the incorporation of a site population estimate, the model's results are expressed as the average number of potential collisions by individual birds that may occur per annum for the various

modelled avoidance rates.

Results are shown to one or more decimal places as per original modelling. This is done for the purposes of indicating differences between results rather than to indicate precision in the results.

The model is necessarily deterministic, but it is important to note that if collisions occur at the operational wind farm their numbers can be expected to vary around a long-term mean for any species.

At present, there are no avoidance rates obtained from empirical studies available for any species of Australian bird. For this reason, results of the Biosis collision risk model are routinely provided for a range of dynamic avoidance rates, often from 0.90 or 0.95 to 0.99.

Model validation

Pre-requisites to validation

Performance of the model can be evaluated only by comparing its forecasts of bird collision rates (generally prepared prior to wind farm construction) with rates experienced during operation of the wind farm. The latter requires post-construction mortality data that is sufficient to permit calculation of a quite precise annual mortality rate. Conditions of regulatory approval for most wind farms that have been built to-date in Australia have varied considerably within and between State jurisdictions and over time. While post-construction monitoring of bird collisions with wind turbines and periodic estimation of total strike rates have been regulatory conditions of approval for many wind energy projects, there has been no standard methodology for these (Moloney et al. 2019) and the consequent variation in reported results has hampered capacity to validate forecasts of the model.

Post-construction monitoring of bird mortalities is a sampling exercise and it is always likely that only a portion of the total number of collision victims will be detected even by well-designed and effective regimes of carcass searches. Factors influencing this include the rate at which carcasses disappear due to scavengers or natural decay; the capacity of searchers to find carcasses; the interval between regular searches and, the portion of the turbine array which is searched. Estimates of total mortality, based on the number of carcasses detected, take account of these additional factors but all of them encompass uncertainty. Worldwide evidence indicates that bird collisions with wind turbines are relatively rare events and for any given species, the number of carcasses detected is most often very low. For each of 56 species of birds, Moloney et al. (2019) document a mode of just 1 fatality detected during monitoring of a combined total 15 wind farms, each of which was monitored for between 2 and 3.5 years. As a consequence, estimates of total collision mortality for birds most often have confidence intervals that may be orders of magnitude greater than the number of carcasses detected. Another consequence of low numbers of collisions is that annual averages of fatalities are prone to significant influence of inter-annual variability (Huso et al. 2017; Moloney et al. 2019).

For these reasons, the ideal species to use in evaluation of the model's performance will be one that has the following characteristics:

- is not favoured by scavengers so that carcasses are likely to persist and be found
- is readily detected by searchers
- has a relatively high collision rate

These characteristics provide data allowing for greater confidence when the number of carcasses detected is used as the basis for calculating an estimate of total collision fatalities.

A recent study of bird carcass persistence at Yaloak South wind farm in southern Victoria (Elmoby Ecology Bennett 2019; 2020; 2021) placed multiple bird carcasses over a period spanning four years and used remote cameras to monitor their persistence. The study included a total of 24 Wedge-tailed Eagle *Aquila audax* carcasses that were monitored until no evidence of the carcasses remained. This was the first substantial investigation using eagle carcasses in Australia.

The study found that Wedge-tailed Eagle carcasses had a mean persistence time of 260 days with a 95% confidence interval of between 119 and 567 days, whereas for all small and medium-sized birds (including some small raptors) mean persistence time was 2.8 days with a 95% confidence interval of between 2 and 4 days.

It was found that the Red Foxes *Vulpes vulpes*, the principal scavenger of bird carcasses at the site, ignored Wedge-tailed Eagle carcasses. The one potential scavenger detected was other Wedge-tailed Eagles, however they did not remove carcasses, which substantially remained in place (E. Bennett pers. comm.). The Elmoby Ecology Bennett reports conclude that there was a high level of confidence that all Wedge-tailed Eagles killed by collision with wind turbines were found and thus that the number of eagles detected were highly likely to reflect the total number of collisions by the species. A similar conclusion was previously drawn for Wedge-tailed Eagle collisions at Bluff Point and Studland Bay wind farms in Tasmania (Hydro Tasmania 2013; Hull et al. 2013) (see below), albeit it without the corroborating evidence from carcass persistence trials using eagles. At those two wind farms scavenger-exclusion fences were in place around a radius of a subset of turbines and they prevented removal of collision carcasses by mammals such as Tasmanian Devils *Sarcophilus harrisii*.

The Wedge-tailed Eagle is one of a very small number of species that experience a relatively high turbine collision rate. Moloney et al (2019) document a total of 58 Wedge-tailed Eagles found during carcass searches at 15 wind farms that were each monitored for between 2 and 3.5 years.

Wedge-tailed Eagles maintain large territories and, by comparison with many other bird species, occur at low densities. These factors along with their flight behaviour and the capacity to readily distinguish adults from younger birds, makes it relatively straightforward to estimate with good precision the number of Wedge-tailed Eagles utilising a wind farm site. The ability to make such an estimate is a key requirement allowing the Biosis model to provide an output in terms of the number of individuals at risk per annum.

No displacement of eagles is apparent at any operational wind farm studied in Australia and it thus appears that macro-avoidance does not have an influence on collision risk for eagles here.

All of these aspects serve to make the Wedge-tailed Eagle a good species for use in validation of the Biosis collision risk model. For the reasons set out above, estimates of total mortalities for the species (by others) are considered to closely equate to the numbers of carcasses detected and to have small 95% confidence intervals. This means that comparisons of model projections and actual mortalities described below, allow avoidance rates to be derived with a high degree of confidence.

Comparing the model's predictions with empirical data – case histories

The Biosis model has been used to provide projections of potential collisions by Wedge-tailed Eagles and/or White-bellied Sea-eagles *Haliaeetus leucogaster* as part of environmental impact assessments for the following projects:

- Codrington Wind Farm, Victoria
- Bluff Point Wind Farm, Tasmania
- Studland Bay Wind Farm, Tasmania
- Yaloak Wind Farm, Victoria
- Yaloak South Wind Farm, Victoria
- Musselroe Wind Farm, Tasmania
- Cattle Hill Wind Farm, Tasmania
- Low Head Wind Farm, Tasmania
- Kentbruck Wind Farm, Victoria

Codrington, Bluff Point, Studland Bay, Yaloak South, Musselore and Cattle Hill wind farms have all been operational for a number of years. Codrington was the first commercial scale wind farm built in Australia. Carcass searches were undertaken there under seven turbines for just seven months. No eagle carcasses were found. Yaloak Wind Farm did not proceed as proposed but was replaced by the smaller Yaloak South Wind Farm. Collision risk modelling for Cattle Hill Wind Farm was undertaken for a proposal with more than twice the number of turbines that were subsequently installed. Cattle Hill also operates a successful automated system to detect either species of eagle and curtail turbines whilst an eagle is within a predetermined proximity of a turbine (Goldwind 2022). This system facility was not envisaged at the time of the modelling. As a consequence of the differences between the proposed and actual wind farm, the model results were for a greater number of eagle mortalities than have been reported from the operational wind farm. Low Head Wind Farm is not yet operational and planning processes for Kentbruck are in process at the time of writing.

The Biosis model was used to provide projections of potential collisions by Wedge-tailed Eagles for four of these wind farms where intensive carcass searching was subsequently undertaken and for which results are publicly available. They are Bluff Point, Studland Bay, Musselroe and Yaloak South wind farms. At the first three of these, White-bellied Sea-eagles were also resident and modelling was also provided for that species and mortality results for it are also published. We consider it is likely that the factors that make the

Wedge-tailed Eagle particularly suitable for use in validation of the model apply equally to the White-bellied Sea-eagle and the following case examples provide details for both species.

Eagle flight activity data was collected by Biosis prior to wind farm construction at Bluff Point, Studland Bay and Musselroe wind farms. At Yaloak South Wind Farm, eagle flight activity data was collected by others during 2006. Biosis collected additional data in 2009 and 2010. In all cases Biosis prepared the collision risk modelling. Carcass searches during the operation of the wind farms were undertaken by other parties in all cases.

Data for the results of carcass searches for eagles were provided by wind farm operators and/or consultant reports prepared by those parties.

Bluff Point and Studland Bay wind farms

Substantial investigations of the Tasmanian subspecies of Wedge-tailed Eagle *Aquila audax fleayi* and White-bellied Sea-eagle have been undertaken at Bluff Point and Studland Bay Wind Farms operated by Woolnorth Renewables in north-western Tasmania. These included utilisation surveys designed to measure eagle activity before and after development of the wind farm; collision carcass monitoring; eagle breeding success; and eagle behaviours and movements relative to turbines. Details of design and outcomes of these are provided in annual environmental performance reports prepared by Woolnorth Renewables and its predecessors. Hull et al. (2013) detail a specific study of eagle behaviour during early years of the operation of the two wind farms. Commissioning of turbines began at Bluff Point Wind Farm in 2002 and at Studland Bay Wind Farm in 2007. Bluff Point Wind Farm consists of 37 Vestas V66 turbines in a scattered array on an area of 1,524 ha. Studland Bay Wind Farm is situated 3 km south of Bluff Point and comprises 25 Vesta V90 turbines in a scattered array over an area of 1,410 ha. Both wind farms are close to the coast and both species are resident at both sites.

Monitoring eagle flights

Flight activity data for both species were collected during 20-minute point counts at Bluff Point Wind Farm site during three years prior to construction of turbines and in four years after they commenced operating. At Studland Bay, they were collected in six years prior to turbine construction and in three years after turbines commenced operation. As prescribed by regulatory authorities, point counts were undertaken in autumn and spring. Ten replicate point counts were made in each season at each of 18 locations within each wind farm. There were 545 point counts undertaken at Bluff Point between 1999 and 2007 and 854 point counts at Studland Bay between 1999 and 2009.

Collision risk model results

The model was used to estimate risk for populations of six Wedge-tailed Eagles and four White-bellied Sea-eagles at each of the two wind farms.

State regulatory authorities required that the collision risk model be re-run with the accumulated sum of eagle movement data obtained during the entire period of both pre-construction and operation of the two of the two wind farms spanning the period from 1999 to 2009 (Table 1). As the numbers of eagles using the sites were not apparently affected, it was reasonable to pool the data from both periods. Static avoidance was modelled at a rate of 0.99 in all cases and dynamic avoidance at 0.90; 0.95; 0.98 and 0.99 (Biosis Research 2008, 2010; Smales et al. 2013). The model results are shown in Table 1.

Table 1. Modelled mean annual turbine collision estimates for White-bellied Sea-eagle and Wedge-tailed Eagle at Bluff Point and Studland Bay Wind Farms for four avoidance rates.

	White-bellied Sea-eagle		Wedge-tailed Eagle	
Avoidance rate	Bluff Point	Studland Bay	Bluff Point	Studland Bay
0.90	0.9	0.8	2.7	1.9
0.95	0.5	0.4	1.5	1.1
0.98	0.2	0.2	0.7	0.5
0.99	0.1	0.1	0.4	0.3

Documented eagle collisions

Carcass monitoring surveys were conducted at Bluff Point and Studland Bay wind farms from when they commenced operating. Fences to exclude mammalian scavengers were maintained at 27% of turbines across the two sites. All turbines, both fenced and unfenced, were searched routinely within a 100 m radius of the tower base. Red Fox does not occur in Tasmania but native mammals with capacity to scavenge eagle carcasses include the Tasmanian Devil *Sarcophilus harrisi* and Spot-tailed Quoll *Dasyurus maculatus*. The region of the wind farms is an area where facial tumour disease has had little impact on the Tasmanian Devil population.

The frequency of carcass searches was informed by trials to determine rates of loss to scavengers and of observers' capacity to detect carcasses. From 2007, searches were carried out twice weekly during periods that may have represented higher risk to the species (i.e. eagle courtship display period June – August, inclusive, and eagle fledging period mid December – February, inclusive) and fortnightly outside these periods (Hull et al. 2013). Carcass searches were undertaken by human observers. Searches were carried out at Bluff Point in eleven years (2003 – 2013, inclusive) and at Studland Bay they were carried out in seven years (2007 - 2013, inclusive).

Assessment of the extent of undetected eagle collisions (Woolnorth Wind Farm Holding 2013) concluded that it is unlikely that significant numbers of eagle carcasses were missed because they are conspicuous; the search zone around turbines was adequate to detect eagle carcasses where they fell after colliding with turbines (Hull and Muir 2010); personnel on site had capacity to detect carcasses that may have been moved from formal search zones; eagle carcasses in vegetation were found not to decompose readily and,

even when scavenged, remains were identifiable; and, while mammalian scavengers could remove carcasses this was controlled at the subset of fenced turbines; survey intensity was informed by predetermined scavenger removal rates; and, while a small number of eagles survived collision with a turbine, in all documented cases such birds were unable to fly and are likely to have been detected as both scavenger exclusion or farm fences prevented them from leaving the immediate area. The empirical results of eagle carcass persistence trials recently provided by Elmoby Ecology Bennett (2021) corroborate the conclusions of Hydro Tasmania (2013) and Hull et al. (2013).

Table 2 shows the numbers of carcasses of the two species detected at the two sites for each year of monitoring.

Table 2. Numbers of collision mortalities of two species of eagle detected during targeted searches at Bluff Point and Studland Bay Wind Farms.

	Bluff Point		Studland Bay	
Year	White-bellied Sea-eagle	Wedge-tailed Eagle	White-bellied Sea-eagle	Wedge-tailed Eagle
2003	0	1		
2004	0	0		
2005	0	0		
2006	0	6		
2007	0	1	0	3
2008	1	3	0	1
2009	1	1	0	0
2010	0	1	0	1
2011	0	0	0	0
2012	0	0	0	0
2013	0	0	0	0
total	2	13	0	5

Mean annual mortality rates and associated 95% confidence intervals for both species at the two wind farms are shown in Table 3.

Table 3. Mean annual mortality rates and variance for eagle species based on carcasses detected at Bluff Point and Studland Bay wind farms.

	White-bellied Sea-eagle		Wedge-tailed Eagle	
Year	Bluff Point	Studland Bay	Bluff Point	Studland Bay
mean annual mortalities	0.18	0.00	1.18	0.71
annual variance (95% C.I.)	0.01-0.41	-	0.15-2.22	0.00-1.48

Comparison of collision risk model estimates with actual mortality rates

Estimates of annual collisions modelled for avoidance rates between 0.90 and 0.99 correctly encompassed the long-term average of real collisions for both species at the two wind farms. The 95% confidence intervals associated with the average real collision rates were entirely encompassed by the model's estimates.

Comparison of the model's projections (Table 1) with the annual average documented collision rates (Table 3) indicate the following:

- For White-bellied Sea-eagle at Bluff Point the annual average of actual mortalities (0.18) is slightly lower than the model's projections for an avoidance rate of 0.98 (0.2 collisions p.a.)
- No White-bellied Sea-eagle collisions were recorded during five years of monitoring at Studland Bay so the model's estimates are higher than actual experience for that species there.
- For Wedge-tailed Eagle at Bluff Point the annual average of actual mortalities (1.18) is between the model's projections for an avoidance rate of 0.95 and 0.98 (1.5 – 0.7 collisions p.a.) and most closely approximates an avoidance rate of 0.96.
- For Wedge-tailed Eagle at Studland Bay the annual average of actual mortalities (0.71) is between the model's projections for an avoidance rate of 0.95 and 0.98 (1.1 – 0.5 collisions p.a.) and most closely approximates an avoidance rate of 0.97.

Hull and Muir (2013) documented turbine avoidance from observations of eagle activity at these two wind farms. They found that White-bellied Sea-eagles showed empirical avoidance rates of 0.89 and 0.97 at Studland Bay and Bluff Point, respectively, and that Wedge-tailed Eagles had empirical avoidance rates of 0.81 and 0.90, at Studland Bay and Bluff Point, respectively. These values are as expected because they indicate that the principal avoidance they documented was meso-avoidance (the rate at which the birds flew within the wind farm but avoided close proximity to turbines). However, as a small number of collisions occurred at the wind farms, it is evident that some eagles did, in fact fly within the rotor-swept zone of turbines. This indicates that in addition to meso-avoidance, a level of micro-avoidance occurs. This additional level of avoidance serves to increase the overall avoidance rate of eagles at the wind farms. It is therefore reasonable to assume that the overall avoidance rates for the two species would be higher than the meso-avoidance rates documented by Hull and Muir (2013).

Musselroe Wind Farm

Substantial investigations have been undertaken at Musselroe Wind Farm operated by Woolnorth Renewables at Cape Portland in north- eastern Tasmania. These have included utilisation surveys designed to measure eagle activity before and after development of the wind farm; collision carcass monitoring; eagle breeding success; eagle behaviours and movements relative to turbines and investigations and trails aimed at reduction of collisions. Details of design and outcomes of these are provided in annual

environmental performance reports prepared by Woolnorth Renewables and its predecessors. Commissioning of turbines began at Musselroe Wind Farm in 2013. The wind farm consists of 56 Vesta V90 turbines in a scattered array. The wind farms is close to the coast and both species are resident at the site.

Monitoring eagle flights

Flight activity data for both species were collected during timed point counts at Musselroe Wind Farm site during three years prior to construction of the wind farm. Data were recorded from nine point count locations during 2002 and then at 19 fixed point count locations, including the original nine sites, during 2005 and 2006.

Collision risk model results

The model was used to estimate risk based on movement data for populations of eight Wedge-tailed Eagles and eight White-bellied Sea-eagles at the wind farm.

Collision risk modelling was undertaken for a number of turbine configurations under consideration in 2011 (Biosis Research 2011). That included the design that was subsequently built and has been operational since 2013. Static avoidance was modelled at a rate of 0.99 in all cases and dynamic avoidance at 0.90; 0.95; 0.98 and 0.99. The model results are shown in Table 4.

Table 4. Modelled mean annual turbine collision estimates for White-bellied Sea-eagle and Wedge-tailed Eagle at Musselroe Wind Farms for four avoidance rates.

Avoidance rate	White-bellied Sea-eagle	Wedge-tailed Eagle
0.90	0.53	2.05
0.95	0.31	1.23
0.98	0.17	0.69
0.99	0.13	0.50

Documented eagle collisions

Carcass monitoring surveys were conducted at Musselroe Wind Farm since it commenced operating. All turbines were searched routinely within a 100 m radius of the tower base. Native mammals with capacity to scavenge eagle carcasses include the Tasmanian Devil and Spot-tailed Quoll. Tasmanian Devils have remained quite prevalent at Musselroe Wind Farm (Driessen et al. 2018).

As required by the State and Commonwealth regulators, the monitoring regime for detecting bird collisions at wind turbines during the period from 2013 to 2017 differed in intensity across the site in line with perceived risk. Six turbines in the north-west of the array were monitored twice weekly during periods that were regarded as high risk for migratory waders (during the portion of the year in which those species are present in Australia and utilised nearby wetlands). Outside these periods and across the rest of the wind

farm, each turbine was searched once every eight weeks, using a regime in which a quarter of the turbines were searched every two weeks (Woolnorth Wind Farm Holding 2014). After it became evident that migratory waders were not materially at risk of turbine collisions, from November 2017 a change to the search regime was approved and from then all turbines have been searched once every eight weeks, using a regime in which a quarter of the turbines were searched every two weeks (Woolnorth Wind Farm Holding 2019). Carcass searches were undertaken by human observers. Searches have been carried out at Musselroe in 10 years (2013 – 2022, inclusive (Woolnorth Renewables 2022).

Assessment of the extent of undetected eagle collisions at Musselroe is outlined in Woolnorth Wind Farm Holding (2016). Searcher efficiency trials and carcass persistence trials were undertaken and results for eagles is reported to have been similar to that at Bluff Point and Studland Bay wind farms where searcher efficiency for large birds was 98%. Carcass persistence trials at Musselroe demonstrate there was an average time to complete disappearance of 80 days with a 95% confidence interval of between 74 and 86 days. As each turbine was surveyed every 8 weeks, these trials indicate that the majority of eagle collision fatality carcasses would have been detectable during at least one or more surveys. Results of the trials indicate there is a high probability that the great majority, if not all, eagle carcasses have been detected.

Table 5 shows the numbers of carcasses of the two species detected at the two sites for each year of monitoring.

Table 5. Numbers of collision mortalities of two species of eagle detected during targeted searches at Musselroe Wind Farm.

Year	White-bellied Sea-eagle	Wedge-tailed Eagle
2013	1	2
2014	0	0
2015	0	4
2016	0	1
2017	0	2
2018	0	2
2019	0	8
2020	0	7
2021	1	0
2022	0	3
total	2	29

Mean annual mortality rates and associated 95% confidence intervals for both species at the two wind farms are shown in Table 6.

Table 6. Mean annual mortality rates and variance for eagle species based on carcasses detected at Musselroe Wind Farm.

Year	White-bellied Sea-eagle	Wedge-tailed Eagle
mean annual mortalities	0.20	2.90
annual variance (95% C.I.)	0.00-0.45	1.30-4.50

Comparison of collision risk model estimates with actual mortality rates

Estimates of annual collisions modelled for avoidance rates between 0.90 and 0.99 correctly encompassed the long-term average of real collisions for White-bellied Sea-eagle at the wind farm. The 95% confidence intervals associated with the average real collision rates were entirely encompassed by the model's estimates for that species.

Comparison of the model's projections (Table 4) with the annual average documented collision rates for White-bellied Sea-eagle (Table 6) indicate that:

- For White-bellied Sea-eagle at Musselroe the model's projections for an avoidance rate of slightly less than 0.98 (0.17 collisions p.a.) closely approximates the annual average of actual mortalities (0.20).

The model's estimates of annual collisions for Wedge-tailed Eagle at avoidance rates between 0.90 and 0.99 were a little lower than the mean annual number of collisions that occurred.

Comparison of the model's projections (Table 1) with the annual average documented collision rates for Wedge-tailed Eagle (Table 3) indicate that:

- At Musselroe the model's projections for an avoidance rate of 0.90 (2.05 collisions p.a.) was lower than the annual average of actual mortalities (2.90).

While the model's forecasts are lower than the annual average of actual mortalities known to have occurred, they are still close to that value. As noted above, annual averages of fatalities are prone to significant influence of inter-annual variability. In the case of Wedge-tailed Eagles at Musselroe, there were eight years in which mortalities detected were between 0 and 4 and two years in which there were 7 and 8 known mortalities. It is not known whether this degree of variation may continue over the life of the wind farm, but it remains plausible that the model's projections will encompass the annual average of actual mortalities over that timespan.

Yaloak South Wind Farm

Yaloak South Wind Farm is operated by Pacific Hydro Pty Ltd near Ballan in western Victoria. The wind farm consists of 14 Senvion MM92 turbines in a scattered array. The wind farm property and immediate vicinity have a high degree of topographic variability including a significant escarpment associated with the Parwan

Valley. The wind farm is situated on the plateau above the escarpment. The local area is attractive to Wedge-tailed Eagles as its topography creates thermal uplift for soaring and local land uses provide substantial food resources. Studies of the species there have included utilisation surveys designed to measure eagle activity before and after development of the wind farm; collision carcass monitoring; eagle breeding success; eagle behaviours and the most comprehensive and long-term investigations of eagle carcass persistence and searcher efficiency undertaken in Australia. Details of design and outcomes of these are provided in reports prepared by consultants for Pacific Hydro (Biosis 2019; Elmoby Ecology Bennett 2019, 2020, 2021). The wind farm reached practical completion in 2018 and a three-year post-construction program of monitoring of eagles commenced in July 2018.

Monitoring eagle flights

Flight activity data for Wedge-tailed Eagles were obtained during point counts undertaken during 2006 and between July 2009 and March 2010. Ten point count locations were used for a total of 543 x 20-minute counts.

Collision risk model results

The model was used to estimate risk based on movement data for a Wedge-tailed Eagle population in which an average of six birds using the site for 90% of the year and fifteen birds using the site for 10% of the year. These values were agreed to by State regulators prior to final modelling undertaken as part of environmental assessment of the proposed wind farm.

Static avoidance was modelled at a rate of 0.99 in all cases and dynamic avoidance at 0.90; 0.95; 0.98, 0.99 and 0.998. The model results are shown in Table 7.

Table 7. Modelled mean annual turbine collision estimates for Wedge-tailed Eagle at Yaloak South Wind Farms for five avoidance rates.

Avoidance rate	6 Wedge-tailed Eagles (90% of year)	15 Wedge-tailed Eagles (10% of year)	Combined annual total collisions
0.90	4.4	0.9	5.3
0.95	3.2	0.5	3.7
0.98	2.0	0.3	2.3
0.99	1.5	0.2	1.7
0.998	0.3	0.0	0.3

Documented eagle collisions

Carcass monitoring surveys were conducted at Yaloak South Wind Farm since it commenced operating. All turbines were searched routinely to cover a horizontal radius of 60 metres centered on the base of the

turbine tower. On the basis of analyses of Huso and Dalthorp (2014) this search zone was selected to encompass more than 95% of collision carcasses for the dimensions of turbines at the wind farm.

As required by State regulators, the monitoring regime for detecting bird collisions at wind turbines differed in frequency over time in response to the findings of preceding search periods. Carcass surveys were conducted by trained detection dogs and their handlers weekly between July 2018 and June 2019, fortnightly between June 2019 and December 2019 and monthly from January 2019 to June 2021, inclusive, at all 14 turbines. Additional 'pulse' surveys were conducted between November and May in each of the three years of the program for the detection of bats, but also documented all birds found. A total of 1355 surveys were undertaken at the 14 turbines over the three-year period.

Overall, searches were carried out at Yaloak South in three years (from July 2018 – June 2021, inclusive (Elmoby Ecology Bennet 2021).

As discussed previously, investigations at Yaloak South included study of bird carcass persistence and searcher efficiency (Elmoby Ecology Bennett 2019; 2020; 2021), with a specific focus on Wedge-tailed Eagles and was the first substantial investigation using eagle carcasses in Australia. The study found that Wedge-tailed Eagle carcasses had a mean persistence time of 260 days with a 95% confidence interval of between 119 and 567 days, whereas for all small and medium-sized birds (including some small raptors) mean persistence time was 2.8 days with a 95% confidence interval of between 2 and 4 days. The Elmoby Ecology Bennett reports conclude that there was a high level of confidence that all Wedge-tailed Eagles killed by collision with wind turbines were found and thus that the number of eagles detected was highly likely to reflect the total of collisions by the species.

Table 8 shows the numbers of Wedge-tailed Eagle carcasses detected at the site for each year of monitoring.

Table 8. Numbers of collision mortalities of Wedge-tailed Eagles detected during targeted searches at Yaloak South Wind Farm.

Year	Wedge-tailed Eagle
2018/19	4
2019/20	3
2020/21	4
total	11

The mean annual mortality rate and associated 95% confidence intervals for the species at Yaloak South Wind Farm is shown in Table 9.

Table 9. Mean annual mortality rate and variance for Wedge-tailed Eagle based on carcasses detected at Yaloak South Wind Farm.

Year	Wedge-tailed Eagle
mean annual mortalities	3.62
annual variance (95% C.I.)	0.04-7.29

Comparison of collision risk model estimates with actual mortality rates

Estimates of annual collisions modelled for avoidance rates between 0.90 and 0.998 correctly encompassed the long-term average of real collisions for Wedge-tailed Eagle at the wind farm. The 95% confidence intervals associated with the average real collision rates were largely encompassed by the model's estimates for the species.

Comparison of the model's projections (Table 7) with the annual average documented collision rates for Wedge-tailed Eagle (Table 9) indicate that:

- The model's projections for an avoidance rate of 0.95 (3.7 collisions p.a.) closely approximates the annual average of actual mortalities (3.62).

Conclusion

The Biosis collision risk model has provided forecasts of the annual average numbers of turbine collisions by Wedge-tailed Eagle and White-bellied Sea-eagle. Comparison of the forecasts with data for known and estimated total collisions from targeted carcass searches at four operational wind farms indicate that results of the model for the range of avoidance rates reported were accurate and in every case the forecasts were precise to within less than one Wedge-tailed Eagle collision per annum and were more accurate for White-bellied Sea-eagles.

It is not feasible to make similar comparisons for the great majority of bird species that may interact with wind turbines in Australia due to a high degree of uncertainty about the true numbers of collisions that occur. The factors influencing uncertainty are outlined in *Pre-requisites to validation*, above. Careful and refined design of carcass search regimes, such as standard use of pulse searches, and the application of appropriate, specific mathematical methods to the estimation of total collisions (e.g. Huso et al. 2017) should be used in efforts to reduce such uncertainties.

In 2006 the then Australian Government Department of the Environment and Heritage published reports by Biosis Research (2006) that provided methodologies for assessment of cumulative impacts due to turbine collisions of multiple wind energy facilities. Four species of birds, including the Tasmanian Wedge-tailed Eagle were used as examples of how this could work. That work was not prepared for, and was not used for, environmental impact assessment of any project. The exercise was undertaken for many wind

farms, including a significant number that were then mooted but have not since been carried to fruition and are no longer proposed. Some of the wind farms that have since been built differ from the designs that were then proposed. The reports noted the heuristic value of mathematical modelling. At the time of preparation of that work there was almost no empirical information about actual collisions by Wedge-tailed Eagles. The report said that it was likely that avoidance rates for Tasmanian Wedge-tailed Eagle would generally be in the range of 0.95 to 1.00 in most conditions. Then available information for the closely related Golden Eagle *Aquila chrysaetos* was cited that suggested an avoidance rate of greater than 0.99. At the request of the Department of the Environment and Heritage, the report provided modelling for avoidance rates of 0.95, 0.98 and 0.99, but also noted, "we recommend that [avoidance rate] is a key area requiring further soundly based investigation within operational wind farms." The case studies detailed above have used collision risk modelling that was prepared specifically for wind farms as designed and subsequently approved and now in operation. The comparisons with documented eagle collisions have achieved the recommendation of the 2006 Biosis Research report.

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Appendix 9. Working Draft Bird and Bat Adaptive Management Plan

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Dinawan Wind Farm

Bird and Bat Adaptive Management Plan

WORKING DRAFT – FOR CONSULTATION

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Glossary

BAM	NSW Biodiversity Assessment Method 2020
BBAMP	Bird and Bat Adaptive Management Plan
BBAMP area	The Dinawan Wind Farm project area, synonymous with the term 'subject land' used in the BDAR and 'Project Area' used in the EIS and other technical studies.
BBUS	Bird and bat utilisation surveys
BUS	Bird utilisation surveys
BC Act	*Biodiversity Conservation Act 2016*
BCT	New South Wales New South Wales Department of Climate Change, Energy, Environment and Water's Biodiversity Conservation Trust
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offsets Scheme
BRW	Biodiversity risk weighting
CPHR	New South Wales Department of Climate Change, Energy, Environment and Water's Conservation Programs, Heritage and Regulation Group
CRM	Collision Risk Model/Modelling
Cth DCCEEW	Commonwealth Department of Climate Change, Energy, Environment and Water
DCDB	Digital cadastral database
Development footprint	The area of land that is directly impacted by the proposal
Development site	The broader area in which the subject land is located.
DP	Deposited Plan
DTDB	Digital topographic databases
EIS	Environmental Impact Statement
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	*Commonwealth Environment Protection and Biodiversity Conservation Act 1999*
GIS	Geographic Information System
IBRA	Interim Biogeographic Regionalisation of Australia
LEP	Local Environmental Plan
LGA	Local Government Area
Locality	Area located within 50 km radius from the BBAMP area
NPWS	National Parks and Wildlife Service
NSW DCCEEW	NSW Department of Climate Change, Energy, Environment and Water
Project Area	Term used in the EIS and other technical studies, which is synonymous with the term 'subject land' used in the BDAR.
REZ	Renewable Energy Zone

RTE	Real Time Expansion
RtS	Response to Submissions
SEARs	Secretary's Environmental Assessment Requirements
SCADA	Supervisory Control and Data Acquisition
SSD	State Significant Development
Subject Land	The land subject to development to which the BAM has been applied. Synonymous with the Project Area from the EIS (and other technical studies).
TARP	Trigger Action Response Plan
WHS	Work Health and Safety
WTG	Wind turbine generators

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1 Introduction

1.1 Project background

EMM Consulting Pty Ltd on behalf of Spark Renewables (henceforth the Applicant), proposes to develop Dinawan Wind Farm (the project) west of Kidman Way, between the township of Coleambally and Jerilderie (the BBAMP area) in New South Wales (NSW).

The project is classified as State Significant Development (SSD) and is assessed under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

A referral under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was submitted to the Commonwealth Department of Climate Change, Energy, Environment and Water (Cth DCCEEW). The Commonwealth Minister for the Environment declared the project to be a Controlled Action which requires assessment under the provisions of the EPBC Act.

Biosis Pty Ltd was commissioned by the Applicant to prepare the Bird and Bat Adaptive Management Plan (BBAMP) for the project, as part of Response to Submissions (RtS) requests and in accordance with state and federal guidelines. The BBAMP applies to the entire study area, henceforth referred to as the BBAMP area (Figure 1).

The following document is a working draft, submitted with the project's Biodiversity Development Assessment Report (BDAR) as part of the Response to Submission phase of the project. It will be reviewed, updated and finalised following receipt of development consent and EPBC Referral determination, and in consultation with relevant authorities.

1.1.1 Project description

The project will have a generation capacity of up to 1.2 GW, with construction anticipated to commence in 2025, and expected to be completed over approximately 60 months in total. It is anticipated that the project will be constructed in two stages, over approximately 36 months per stage, and allowing for overlap between stages. It is expected the project would be in operation for between 25 to 35 years.

The project will include the installation of up to approximately 200 Wind Turbine Generators (WTGs), positioned to balance maximisation of electricity generation from the available wind resource, with minimisation of environmental impacts. The WTGs will be installed in the eastern (Stage 1) and western (Stage 2) wind areas, as shown on Figure 1.

Site access points will be on McLennons Bore Road, Fernbank Road and Goolgumbla Road within the Mabins Wells / Argoon locality, with WTG and infrastructure components most likely to be transported from Port of Newcastle.

1.2 The BBAMP area

The BBAMP area (Figure 1) occurs within:

- Riverina Interim Biogeographic Regionalisation of Australia (IBRA) Bioregion.
- Murrumbidgee IBRA Subregion.

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- Murrumbidgee and Murray catchments.
- Murray Local Land Services (LLS) Management Area.
- Murrumbidgee Local Government Area (LGA).
- Land zoned RU1 Primary Production under the Murrumbidgee Local Environmental Plan 2013 (LEP).

1.3 Purpose and objectives of this BBAMP

This BBAMP has been prepared in accordance with the recommendations / mitigation measures outlined in the project's BDAR (Biosis 2024). Please note that this document is a working draft for consultation and initial assessment only, and revisiting triggers/thresholds during finalisation of the BBAMP (in consultation with Conservation Programs, Heritage and Regulation Group (CPHR, previously Biodiversity Conservation and Science Group)) provides an opportunity to review following completion of additional baseline studies and collision risk modelling, that may be more specifically tied to a smaller number of wind turbines and/or project construction staging.

The NSW Biodiversity Assessment Method (BAM) requirements for a BBAMP in relation to impacts are considered uncertain at the time of development of the project's BDAR (BAM Section 8.5) (Biosis 2024). Impacts considered uncertain relate to potential bird and bat collision with operational turbines, and an adaptive management approach is required to minimise and mitigate potential operational impacts. It should be noted that NSW-specific guidelines for wind farms are yet to be formally published and released, and future policy guidance may influence the scope and content of future this BBAMP.

The overall objectives of the BBAMP are to provide an effective monitoring program and strategy to manage and mitigate operational issues relating to bird and bat (microbats) impacts for the wind farm, to monitor and assess for impacts considered uncertain at the time of approval, and prescribe additional compensatory measures for residual prescribed impacts, if required. Additionally, the framework aims to provide certainty to the consent authority and stakeholders prior to approval that measures for minimising biodiversity impacts during operation have been clearly defined that address potential prescribed impacts that cannot be quantified prior to approval.

The BBAMP has been guided by a collision risk assessment and turbine risk assessment and importantly, it has been informed by site-specific baseline data, to build an adaptive management approach that will minimise the risk of any significant impact to resident, nomadic and migratory bird and bat species and ensure a viable local population is maintained for relevant threatened or at-risk species.

The BBAMP includes the following key objectives:

- Detail the methods and results of baseline, site-specific data relevant to threatened and at-risk bird and bat species.
- Detail the measures that would be implemented on site for minimising bird and bat strike during operation of the development.
- Define trigger levels for further investigation of the potential impacts of the project on particular bird or bat species or populations.
- Detail the Trigger Action Response Plan (TARP) to monitor and report on the effectiveness of these measures, and any bird and bat strikes on the site.
- Provision of an adaptive management program that would be implemented if the development is found to be having an adverse impact on a particular threatened or at-risk bird and/or bat species.

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- Provisions for the reporting of data to regulatory agencies.
- Outline an evaluation and review cycle for the BBAMP.

Following project approval, the BBAMP would be updated to address any consent conditions specific to turbine strike or project layout issued in the conditions of consent.

1.4 Roles and responsibilities

Meeting the objectives of this BBAMP is ultimately the responsibility of the Applicant and future operators of the wind farm where operational responsibilities are delegated. Ensuring implementation of this BBAMP will require ongoing consultation with regulatory bodies including New South Wales Department of Climate Change, Energy, Environment and Water (NSW DCCEEW) and Cth DCCEEW to ensure compliance with the performance criteria set out in this BBAMP.

A suitably qualified ecologist should be engaged by the Applicant to ensure the bird and bat survey methods outlined in the BBAMP are followed. The ecologist would also be required to review the BBAMP and prepare reports relevant to the bird and bat monitoring program. The ecologist would need to work closely with the Applicant's operational environmental managers/advisors at the wind farm site.

Implementation of novel technological approaches to reduce collision risk to microbats (SMART curtailment), will require ongoing collaboration between the equipment manufacturers, engineers and ecologists to be successful. It is the responsibility of the Applicant to engage with relevant experts to implement the proposed strategies.

1.5 Sources of information

Sources of information used in the BBAMP include relevant guidance documents, databases, spatial data, literature and previous site reports, including:

- Onshore Wind Farms - interim guidance on bird and bat management (DAWE 2022).
- Wind Farms and Birds – Interim Standards for Risk Assessment' issued by the Australian Wind Energy Association (AusWEA 2005).
- Unpublished South West Biodiversity and Conservation Division *Draft Turbine Risk Assessment Guidance* (NSW DCCEEW 2023a).
- Unpublished South West Biodiversity and Conservation Division *Suggested BBUS Method* (NSW DCCEEW 2023b).
- NSW *Biodiversity Assessment Method* (BAM) (DPIE 2020).
- Onshore Wind Farms - interim guidance on bird and bat management (DAWE 2022).
- Records of flora and fauna from within 50 kilometres (the locality) were collated from the following databases and datasets were reviewed as part of the BDAR (Biosis 2024):
    - Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) Protected Matters Search Tool for matters protected by the EPBC Act.
    - NSW BioNet - the database for the Atlas of NSW Wildlife, NSW Department of Climate Change, Energy, Environment and Water (NSW DCCEEW), for species, populations and ecological communities listed under the BC Act.
    - Birdlife Australia, the New Atlas of Australian Birds 1998-2015.

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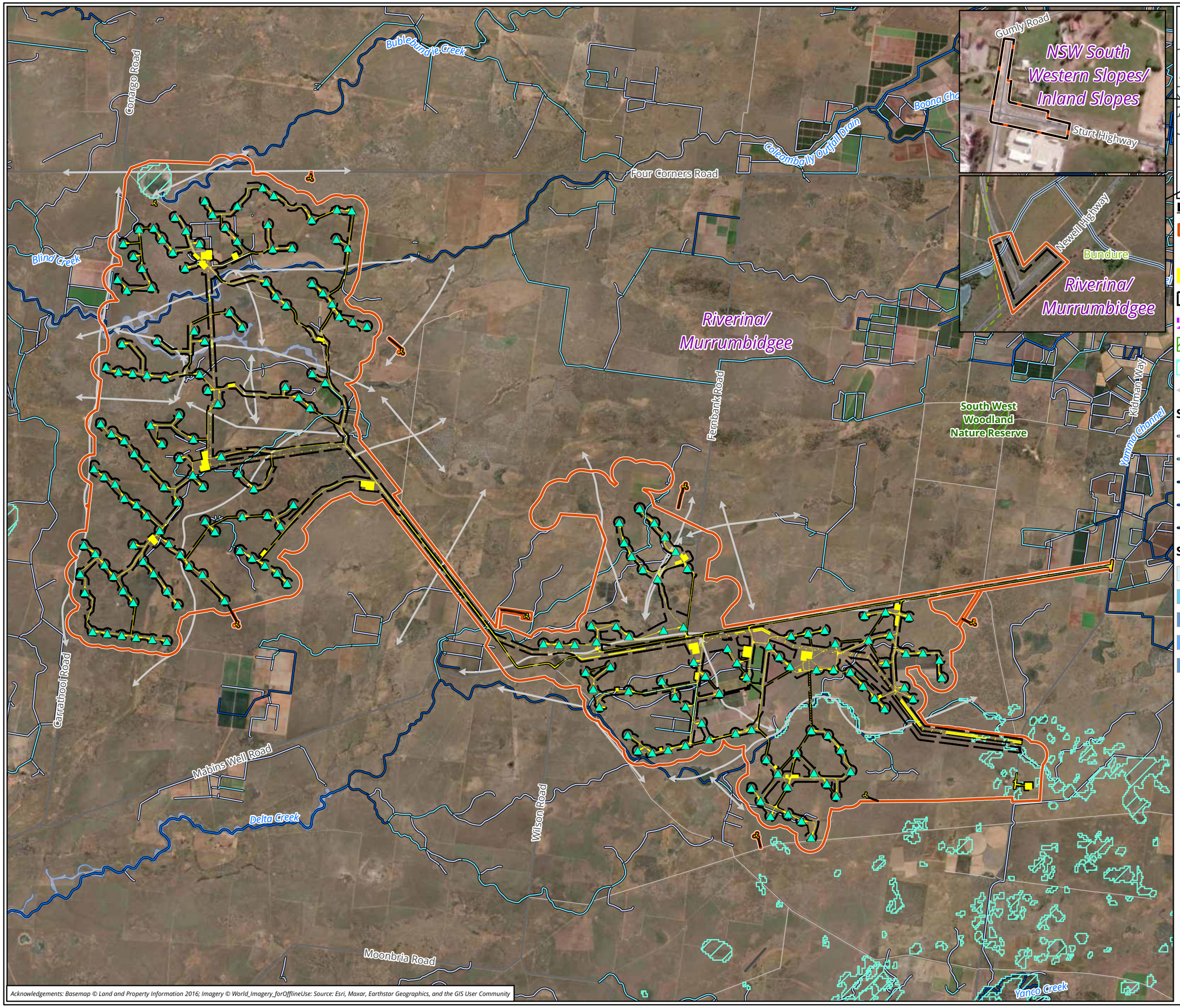
  - Australasian Bat Society Bat map https://www.ausbats.org.au/batmap.html
  - Collision data from other operating wind farms in New South Wales.
- Previous reports prepared for the project, including:
  - *Dinawan Wind Farm Biodiversity Development Assessment Report* (Biosis 2024).
  - *Dinawan Energy Hub biodiversity constraints and opportunities assessment* (Biosis 2021).

Basemap data was obtained from NSW Land and property information (LPI) 1:25,000 digital topographic databases (DTDB), with cadastral data obtained from LPI digital cadastral database (DCDB).

The following spatial datasets were utilised during the development of this report:

- Interim Biogeographic Regionalisation of Australia (IBRA) Version 7.
- Spatial data associated with:
  - The NSW PCTs, as held within the BioNet Vegetation Classification database (NSW DCCEEW 2024a).
  - Relevant vegetation mapping, such as (Riverina Region Version v1.2 – VIS_ID 4469 (DPIE 2016)).

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Legend

- Subject land
- Wind turbine
- Development footprint
- Development corridor
- IBRA Region/Sub-region
- National Park/Reserve
- Local wetlands
- Connectivity

Strahler stream order

- 1
- 2
- 3
- 4
- 5

Strahler stream order buffers

- 1
- 2
- 3
- 4
- 5

Figure 1 Location of the BBAMP area

0 1 2 3 4 5

Kilometers
Scale: 1:135,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

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Matter: 41170, Date: 10 April 2025,
GIS: JMS, Checked by: CH, Last edited by: jshepherd
Location: P:\41100s\41170\Mapping\
41170_BBAMP.aprx
Layout: 41170_BBAPM_F1_Location

Acknowledgements: Basemap © Land and Property Information 2016; Imagery © World_Imagery_forOfflineUse: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

2 Baseline information

2.1 Pre-construction bird and bat surveys

Baseline (pre-construction) surveys on threatened bird and microbat species as well as non-threatened species considered at moderate or greater risk of collision impacts from the development (at-risk species) were conducted for the project during field investigations for the BDAR (Biosis 2024) between February 2022 and March 2024. Surveys for birds and bats within the study area were undertaken in accordance with:

- NSW *Biodiversity Assessment Method* (BAM) (DPIE 2020).
- *Survey guidelines for Australia's threatened birds: Guidelines for detecting birds listed as threatened under Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010a).
- *Survey guidelines for Australia's threatened bats: Guidelines for detecting bats listed as threatened under Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010b).
- *'Species credit' threatened bats and their habitats: NSW survey guide for the Biodiversity Assessment Method* (OEH 2018).
- *Guidelines for detecting bats listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999* (DEWHA 2010b).
- Unpublished South West Biodiversity and Conservation Division *Suggested BBUS Method* (NSW DCCEEW 2023b).
- Biosis' BBUS method.

One of the key objectives for the collection of detailed baseline data was to gather adequate replicable information on the existing bird and bat species abundance and activity (site utilisation) prior to commencement of operation of the wind farm.

The methods used for all baseline surveys are set out in the project BDAR (Biosis 2024). Investigations of the site utilisation patterns of bird and bat species in the BBAMP area have been established as a Before-After-Control-Impact (BACI) assessment design. Surveys prior to construction of the facility include Before and Control components. Studies after commissioning of the wind farm provide After, Control and Impact components. The BACI design is intended to be able to measure changes that may result from operation of the wind farm. Annual reviews of the results of the BACI studies will be used to refine the adaptive framework of this BBAMP for management of the wind farm.

The cumulative results of the baseline surveys have informed the current plan and its adaptive framework for management of the wind farm, particularly in respect of the risk assessment process set out below. The baseline investigations have documented species of birds and microbats present and the risk assessment has been applied to them. The adaptive approach will permit application of the risk assessment process to address any identified new or altered risks for known species or for any additional species found to be using the BBAMP area.

The locations of all bird and bat utilisation survey points are identified in Figure 2. These include 16 impact survey points representative and randomised across all associated turbine sites and 10 control sites. Control sites were located at least 500 metres from proposed turbine locations in areas of similar habitat to that found within the impacted areas.

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Bat echolocation calls were recorded by Biosis, as outlined in the BDAR (Biosis 2024), using automated ultrasonic bat detectors. The principal objective of the surveys was to determine the species diversity of microbats within the BBAMP area and their activity levels in different habitat types. More detailed analysis was also undertaken to compare spatial and temporal changes in bat activity across the site. One detector was also placed at height (approximately 60 metres elevation), with a paired unit at ground level to assess differences in bat activity and species composition.

Surveys for birds and bats have been undertaken at a series of point locations that provide a sample of habitats and environments for birds and bats, providing point locations at which relevant species are detected. Bat activity was found to be higher within wetter areas within the subject land such as floodplain woodland and shrublands. This is consistent with what would be expected in dry, open landscapes. Species diversity at height was lower than that recorded at ground level.

There is potential that collision risk for various species may differ between turbines and this will continue to be monitored as part of investigations of both bird and bat utilisation (i.e., continuation of baseline monitoring) and of bird and bat collisions, as set out in this plan. In accordance with the adaptive management framework, responsive actions will be implemented as necessary. We note, that the international and Australian literature includes a number of studies of raptors that have demonstrated that presence and even rates of baseline utilisation are poor predictors of collision risk (Madders & Whitfield 2006, de Lucas et al. 2008, Ferrer et al. 2011, Hull & Cawthen 2013).

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3 Bird and bat impact risk assessment

3.1 Approach to risk assessment

3.1.1 Qualitative risk assessment

A risk matrix has been developed and applied for individual species of birds and bats that incorporates probability that the wind farm might alienate birds or bats from habitats at the wind farm and the likelihood that particular species might collide with turbines. Risks are ranked as; negligible, low, moderate, high or severe on the basis of a set of defined likelihood and consequence factors.

The risk assessment has also been applied to additional species of raptors and some bats that are not threatened. Risk assessment for these additional species was undertaken particularly because it is considered that their flight behaviours may put them at a greater risk of collisions than most other taxa.

The risk assessment was based on 200 turbines with the following characteristics:

- A rotor diameter of 172 m.
- Maximum upper RSA (blade tip) of 236 m.
- Hub height of 150 m.
- Minimum lower minimum RSA of 64 m.
- Further amendments to hub height (i.e., up to 164 m) and/or maximum tip height (i.e., up to 250 m) will require an additional collision risk model (CRM) prior to construction.

The risk matrix assigned based on the likelihood, is shown in Table 1 below. This risk assessment is summarised in Appendix 1.1 for birds and Appendix 1.2 for bats.

Table 1 Qualitative risk assessment criteria for likelihood and consequences of the impacts of turbine strike for birds and microbats

Likelihood	Criteria	Consequence	Criteria
Rare	An event may occur only in unusual circumstances (less than 5%). The risk event is only theoretically possible, or would require exceptional circumstances to occur.	**Negligible**	Occasional individuals lost but no reduction in population viability.
Unlikely	It is less probable than not that the risk event could occur in any year (< 50%).	**Minimal**	Repeated loss of small number of individuals but no reduction in population viability.
Likely	It is equally probable that the risk event could or could not occur in any year (50%).	**Moderate**	Moderate loss in numbers of individuals, leading to minor reduction in population viability for between one and five years.
Possible	It is more probable than not that the risk event could occur in any year (>50%).	**Significant**	Major loss in number of individuals, leading to reduction in population viability for between five to 10 years.

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Probable	It is very probable that the risk even could occur in any year (>95%).	**Severe**	Extreme loss in number of individuals, leading to reduction in population viability for a period of at least 10 years.

Descriptions of likelihood and consequence factors for birds and bats are set out in Table 2.

Table 2 Qualitative risk assessment matrix for significance of impacts of potential turbine collisions for birds and microbats

Likelihood	Consequence				
	Negligible	Minimal	Moderate	Significant	Severe
Rare	Negligible	Negligible	Negligible	Low	Low
Unlikely	Negligible	Negligible	Low	Moderate	High
Likely	Negligible	Low	Moderate	High	High
Possible	Negligible	Low	Moderate	High	Severe
Probable	Negligible	Low	High	Severe	Severe

Bird collision risk assessment

An impact assessment for native and avian species that may be subject to indirect impacts associated with blade strike during the operational phase of the project is required during the approval phase of the project. Biosis undertook a qualitative risk assessment and CRM using the results of bird utilisation surveys to assess the impact of turbine strike for avian species known or considered to have the potential to occur within the BBAMP area, which is provided in Appendix 1.1.

Forest owl species recorded or assumed present within, and/or immediately surrounding, the BBAMP area are included as part of this risk assessment and have all been assessed as negligible risk of impact through blade strike, due to their behaviour of flying within or just above the canopy, and therefore below rotor swept height.

Microbat collision risk assessment

Project impacts on bats are primarily focused on the potential for collisions with turbines.

'Collision' is used here in reference to incidents in which a bat physically strikes, or is struck by, the moving blades of a turbine and to the potential for barotrauma. Barotrauma in bats was described by Baerwald et. al. (2008) as the fatal effect on an animal's respiratory tract due to its encountering a rapid change in air pressure close to a moving turbine blade. The effect has since been questioned as it has been shown to be difficult to diagnose and may have been confused with traumatic injury associated with direct collisions (Rollins et al. 2012).

The reasons that bats may fly in close proximity to wind turbines are not fully understood. Some techniques intended to deter bats from approaching wind turbines have been tried overseas. The great majority of them are experimental and they have not been widely applied to commercial wind energy facilities and there is no body of peer-reviewed rigorous evidence for their performance. At present a 'best practice' mechanism for deterrence of bats in Australian environments is not available.

A range of microbat species recorded within the project area occur at varying frequencies at altitudes (flights above ground level) that put them at risk of collision with the turbine rotor blades. Based on the specifications

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of the turbine options being considered for the operational phase of the project, the worst-case scenario turbine will result in a rotor swept area of 172 metres diameter occurring between 64 and 236 metres above ground level.

Ultrasonic bat detectors do not provide absolute abundance data, as it is not possible to distinguish between multiple individuals flying past the detector, or one individual making repeated passes. Similarly, call data does not provide information on the behaviour of the bat such as the direction or exact height of flight. Species abundance or flight frequencies therefore cannot be determined from bat call data. The number of calls recorded provides a comparable index of activity to estimate the foraging selectivity of bats between habitat types across the site.

As a consequence, there are also no available methods to model or forecast potential numbers of collisions that might occur. Records of bat echolocation calls are the best available method to consistently determine species of bats present and to provide a representation of the variable activity of a given species. It should be noted that bat calls may not be an accurate surrogate measure of bat flight activity and that detection and recording of echolocation calls are subject to a variety of limitations.

Assessment of potential impacts to microbats as a result of turbine strike has therefore been undertaken by way of a qualitative risk assessment used to determine the likelihood of impact and the potential consequences of any impact that may occur, and is provided in Appendix 1.2.

3.1.2 Turbine strike consequence assessment

The potential risk and consequence of turbine strike has been assessed for at-risk bird and bat species within the BBAMP area using qualitative risk assessment and quantitative CRM where possible. Further assessment is provided to determine which turbines present the highest risk of potential collisions to allow for targeted mitigation to be applied to reduce the potential risk and consequences of strikes that may occur. This assessment considered the likelihood of each turbine resulting in potential strikes, largely dependent on surrounding habitat types and its proximity to operational turbines, and the potential consequence of collisions on species and populations, which is largely driven by the at-risk and conservation status of those species.

The NSW DCCEEW Conservation Programs, Heritage and Regulation Group (CPHR, previously Biodiversity Conservation and Science Group) *Draft Turbine Risk Assessment and Avoidance Guidance* (NSW DCCEEW 2023a) has been adapted to include the level of risk each species is subject to from collision with turbines in the context of the BBAMP area. The recommended turbine consequence severity rating included in the CPHR guidance applies a 'one size fits all' approach based on threat status and gives no consideration to potential frequency of impact (turbine strike) or local population dynamics. Nor does it consider species listed as Migratory under the EPBC Act. It is important to consider these and other factors when determine how severe the consequences of one (or more) turbine strikes may be to any given species.

The adapted CPHR turbine strike consequence severity rating is provided in Table 3 below.

Table 3 Adapted CPHR turbine strike consequence matrix

Threat status (BC Act or EPBC Act)	Bird or bat species 'at-risk' rating				
	Negligible	Low	Moderate	High	Severe
At-risk (non-threatened)	Negligible	Minor	Moderate	Moderate	Major
Migratory	Negligible	Minor	Moderate	Major	Severe

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Threat status (BC Act or EPBC Act)	Bird or bat species 'at-risk' rating				
	Negligible	Low	Moderate	High	Severe
Vulnerable	Negligible	Minor	Moderate	Major	Severe
Endangered	Minor	Moderate	Major	Severe	Severe
Critically Endangered or potential SAII	Minor	Major	Major	Severe	Severe

3.1.3 Collision risk modelling

Collisions of birds and bats with wind turbines have been documented to occur at various frequencies around the world. Quantitative modelling to estimate the number of collision mortalities of threatened and non-threatened taxa is widely used as part of environmental impact assessments for proposed wind energy facilities (Masden & Cook 2016).

The impact of any collisions on the viability of threatened and non-threatened fauna populations is more important than determination of simple numbers of mortalities, and population models can be used in combination with results of CRM to evaluate such impacts, but population modelling would be a separate exercise to the CRM presented here.

Modelling of collision risk is reliant on empirical data for flights by species at the wind farm site. There is no practicable method to obtain species-specific flight data for bats that are likely to utilise the site and bat-call data does not provide information about the number of flights by microbats. CRM has therefore been confined to diurnal birds and cannot be applied to nocturnal birds or bats.

Mathematical modelling of risk is intended to provide an articulated, transparent and replicable evaluation of what may occur in the real world. The rationale behind projections is explicitly stated in the mathematics of a model, which means that the logical consistency of the predictions can be easily evaluated. The explicit nature of inputs and rigour entailed in modelling means that the process is replicable and consistent and it is open to analysis, criticism or modification when new information becomes available. Modelling is designed as a mechanism to evaluate uncertainties – if there was no uncertainty there would be no need to use a model. As a consequence of uncertainty in various parameters, some assumptions are required and while it is necessary to include some assumptions and arbitrary choices when deciding on the structure and parameters of a model, these choices are explicit. To the extent feasible, assumptions are informed by the best available information.

Models are also valuable for their heuristic capacities as they focus attention on important processes and parameters entailed in risk (Brook et al. 2002). Their very nature facilitates incorporation of information as it is learnt (Burgman 2005) and refinements should thus be expected of any model.

Most factors related to the layout, dimensions and geometry of turbines are known. The risk modelling detailed here entails the use of informed assumptions related particularly to the flights of birds. The bird utilisation data collected from the site provides an empirical basis for extrapolations required for use in the model. We consider the assumptions and values used are reasonable and they are informed by available information about the ecology of relevant species. As a consequence, we consider the results of modelling detailed here provide a basis for evaluation of probable effects of the proposed project on relevant species of birds.

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The only alternative to a quantitative modelling approach is one of qualitative subjective judgement. All the benefits of using mathematical modelling outlined above are difficult, if not impossible to achieve with a purely qualitative assessment. A description of the Biosis CRM can be found in Smales et al. (2013).

3.2 Summary of collision risk

3.2.1 Qualitative risk assessment results

Based on the tables in Appendix 1, a total of 25 bird species and six bat species have been assessed as being subject to a greater than negligible risk of impact resulting from blade strike. Greater than negligible risks relate to either an expectation for more frequent collisions with turbines due to a species proclivity for flights within rotor swept height, or more substantial impacts to local populations due to individuals comprising a more significant and/or substantial portion of the local population.

The 25 bird species considered to be subject to a greater than negligible risk of impact based on qualitative risk from turbine strike (at-risk species) are:

- Fork-tailed Swift *Apus pacificus* (Migratory, EPBC Act).
- Wedge-tailed Eagle *Aquila audax* (Not listed under the EPBC Act or BC Act).
- White-necked Heron *Ardea pacifica* (Not listed under the EPBC Act or BC Act).
- Australasian Bittern *Botaurus poiciloptilus* (Endangered, EPBC Act and BC Act).
- Australian Wood Duck *Chenonetta jubata* (Not listed under the EPBC Act or BC Act).
- Spotted Harrier *Circus assimilis* (Vulnerable, BC Act).
- Australian Raven *Corvus coronoides* (Not listed under the EPBC Act or BC Act).
- Plumed Whistling-Duck *Dendrocygna eytoni* (Not listed under the EPBC Act or BC Act).
- Little Egret *Egretta garzetta* (Not listed under the EPBC Act or BC Act).
- White-faced Heron *Egretta novaehollandiae* (Not listed under the EPBC Act or BC Act).
- Black-shouldered Kite *Elanus axillaris* (Not listed under the EPBC Act or BC Act).
- Galah *Eolophus roseicapilla* (Not listed under the EPBC Act or BC Act).
- Brown Falcon *Falco berigora* (Not listed under the EPBC Act or BC Act).
- Nankeen Kestrel *Falco cenchroides* (Not listed under the EPBC Act or BC Act).
- Black Falcon *Falco subniger* (Vulnerable, BC Act).
- Australian Magpie *Gymnorhina tibicen* (Not listed under the EPBC Act or BC Act).
- Whistling Kite *Haliastur sphenurus* (Not listed under the EPBC Act or BC Act).
- Little Pied Cormorant *Microcarbo melanoleucos* (Not listed under the EPBC Act or BC Act).
- Black Kite *Milvus migrans* (Not listed under the EPBC Act or BC Act).
- Yellow-billed Spoonbill *Platalea flavipes* (Not listed under the EPBC Act or BC Act).
- Crimson Rosella *Platycercus elegans* (Not listed under the EPBC Act or BC Act).
- Superb Parrot *Polytelis swainsonii* (Vulnerable, EPBC Act and BC Act).
- Australian Painted Snipe *Rostratula australis* (Endangered, EPBC Act and BC Act)

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- Australian White Ibis *Threskiornis molucca* (Not listed under the EPBC Act or BC Act).
- Straw-necked Ibis *Threskiornis spinicollis* (Not listed under the EPBC Act or BC Act).

The six bat species considered to be subject to a greater than negligible risk of impact from turbine strike are:

- White-striped Free-tailed bat *Austronomus australis* (Not listed under the EPBC Act or BC Act).
- Gould's Wattled Bat *Chalinolobus gouldii* (Not listed under the EPBC Act or BC Act).
- Inland Free-tailed Bat *Ozimops petersi* (Not listed under the EPBC Act or BC Act).
- Southern Free-tailed bat *Ozimops planiceps* (Not listed under the EPBC Act or BC Act).
- Eastern Free-tailed Bat *Ozimops ridei* (Not listed under the EPBC Act or BC Act).
- Yellow-bellied Sheathtail-bat Saccolaimus flaviventris (Vulnerable, BC Act).

As impacts associated with blade strike to the above species cannot be quantified and are considered uncertain, adaptive management is required allowing for ongoing monitoring of bird and bat mortality, continual testing of the assumptions of the impact assessment, and implementation of adaptive management measures to reduce measured impacts.

It should be noted that the vast majority of bird and bat species recorded or have the potential to utilise the habitats within or surrounding the BBAMP area are considered to have a low or negligible risk of collision mortality, with no significant broader impacts to regional populations anticipated. There are three bird species that are considered to be subject to be a moderate risk of collision mortality (White-fronted Chat, Black Falcon and Superb Parrot), and three species with a high risk of collision mortality (Wedge-tailed Eagle, Black-shouldered Kite, Nankeen Kestrel). All bats are considered low risk of collision mortality.

The qualitative risk assessment indicates that collision or barotrauma due to interaction by birds or bats with turbines represents a greater risk than does the possibility that the wind farm might alienate birds or bats from their habitats, or that it might present a barrier to their movements. All species were considered to have a negligible risk of indirect / barrier effects, with exception to Wedge-tailed Eagle and Australasian Bittern, which have been assessed to have a low risk of indirect / barrier effects. Empirical evidence from operational wind farms in Australia supports this approach, as collisions by some species certainly occur, but there is no known documentary evidence for wind farm infrastructure resulting in alienation of Australian species of birds or bats.

For that reason, this BBAMP is substantially concentrated on management to reduce effects of turbine collisions. There remains provision within the BBAMP however, to monitor and assess any residual impacts related to barrier effect, and an adaptive management framework in place to respond to any identified impacts. This could be reliant on future comparison of bird and bat activity data during the operational phase with pre-development datasets from approvals phase Bird and Bat Utilisation Survey (BBUS) program.

Measures to avoid and minimise collision impacts have been included throughout the development of the design for the project, including the selection of wind farm layouts, access roads and the transmission line route, in consultation with NSW DCCEEW and other relevant stakeholders. These project updates that have resulted in changes to turbine spacing and locations, as well as the incorporation of buffer areas on important ecological features are considered to substantially reduce the potential for barrier effects across the BBAMP area.

This BBAMP is applicable to all the taxa listed in Appendix 1. It also applies to any species subsequently found to occur at the site and that are listed as:

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- Threatened or migratory under provisions of the EPBC Act.
- Threatened on schedules of the NSW *Biodiversity Conservation Act 2016* (BC Act).
- Non-threatened species of 'at-risk' birds and bats that were not previously known or predicted for the site and/or have not been the subject of a risk assessment.

For the purpose of this BBAMP, these are collectively termed at-risk species. Impacts to some of the above species could be quantified using CRM, as detailed below.

3.2.2 Collision risk modelling results

Following the results of the Bird Utilisation Surveys (BUS), undertaken across eight seasons and two years (2022–2024), the CRM was run for all species for which there were any flights recorded within rotor swept height. That included all flights documented from between 64 and 236 metres above the ground.

Table 4 below presents the modelled movements at risk and mortality results for the 19 species recorded at RSA height based on possible derived site populations. Movements at risk are provided in addition to the annual mortality estimate. The movements at risk are provided here expressed as projected numbers of annual flights that may be at risk of turbine collisions. Results are provided for three potential avoidance rates.

Table 4 CRM movements at risk and mortality results for species recorded at RSA height with possible derived site populations

Common name	Scientific name	Movements at risk			Mortality (Collisions/Year)		
		Dynamic rotor avoidance rate					
		95%	98%	99%	95%	98%	99%
Aquila audax	Wedge-tailed Eagle	3.90	1.92	1.26	3.67	1.87	1.24
Ardea pacifica	White-necked Heron	1.40	0.76	0.55	1.35	0.75	0.54
Chenonetta jubata	Australian Wood Duck	0.67	0.58	0.56	0.66	0.58	0.55
Circus assimilis	Spotted Harrier	0.27	0.15	0.11	0.27	0.15	0.10
Corvus coronoides	Australian Raven	1.64	1.44	1.38	1.63	1.43	1.37
Dendrocygna eytoni	Plumed Whistling-Duck	4.49	2.79	2.22	4.22	2.69	2.16
Elanus axillaris	Black-shouldered Kite	1.34	1.20	1.15	1.34	1.20	1.15
Eolophus roseicapilla	Galah	7.83	7.70	7.66	7.80	7.67	7.63
Falco berigora	Brown Falcon	0.72	0.55	0.50	0.72	0.55	0.50
Falco cenchroides	Nankeen Kestrel	2.76	2.13	1.92	2.74	2.12	1.91
Falco subniger	Black Falcon	0.86	0.52	0.40	0.79	0.49	0.39
Haliastur sphenurus	Whistling Kite	0.52	0.31	0.24	0.52	0.31	0.24
Milvus migrans	Black Kite	0.65	0.44	0.37	0.65	0.44	0.37
Nymphicus hollandicus	Cockatiel	2.79	1.45	1.00	2.46	1.36	0.96
Phalacrocorax varius	Pied Cormorant	0.29	0.16	0.11	0.29	0.16	0.11

Common name	Scientific name	Movements at risk			Mortality (Collisions/Year)		
		Dynamic rotor avoidance rate					
		95%	98%	99%	95%	98%	99%
Platalea flavipes	Yellow-billed Spoonbill	0.65	0.31	0.19	0.62	0.30	0.19
Polytelis swainsonii	Superb Parrot	3.51	2.57	2.26	3.28	2.44	2.16
Sturnus vulgaris*	Common Starling*	19.97	19.38	19.18	19.77	19.19	18.99
Threskiornis spinicollis	Straw-necked Ibis	1.32	1.09	1.02	1.31	1.09	1.02

On the assumption that the collision avoidance capacity of the species in Table 4 is at least 95%, the results can be summarised as follows:

- Eight species with less than one flight per annum that would be at some risk of collision.
- Nine species with one to five flights per annum that would be at some risk of collision.
- Two species with greater than five flights per annum that would be at some risk of collision.

In summary, the CRM has resulted in the following number of expected yearly collisions (and thus mortalities) for each of the threatened species (based on avoidance rates of 95%):

- The Superb Parrot has three flights per annum that would be at some risk of collision.
- The Black Falcon has less than one flight per annum that would be at some risk of collision.
- The Spotted Harrier has less than one flight per annum that would be at some risk of collision.

3.3 Turbine risk assessment

3.3.1 Turbine strike likelihood assessment results

The potential risk of impact to species associated with turbine placement, barriers to movement and potential collision with turbine blades, has been assessed on a per turbine basis, termed 'Turbine Risk' . Turbine risk is a factor of the likelihood of a collision occurring and the potential consequences of that collision, the results of which are presented in Appendix 2.

Factors considered when assessing the likelihood of a collision occurring prior to any operational mitigation measures and strategies being implemented include:

- Proximity to potential microbat roosts.
- Distance to foraging habitat, post construction.
- Connectivity and likely movement pathways.
- Presence of raptor nests.
- Fauna sightings within the development footprint and surrounds.
- Presence of hollow-bearing trees as well as potential owl habitat (assumed and confirmed).
- Canopy buffer to rotor swept height.

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Turbine strike likelihood has been assessed relative to the criteria outlined in the CPHR *Draft Turbine Risk Assessment and Avoidance Guidance* (NSW DCCEEW 2023a), with adjustments made to the recommended criteria to better suit site conditions and to focus on potential flightpaths of at-risk species.

Turbine strike likelihood criteria, developed for the project are presented in Table 5 below. The risk rating of each turbine is provided in Appendix 2. The following turbine parameters have been included as the 'worst case scenario' turbine being considered for the project.

- A hub height of 150 m.
- A blade length of 86 m.
- A RSA height of 64 m (minimum) to 236 m (maximum).

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Table 5 Turbine strike likelihood criteria

Key habitat features	
• Key habitats for at-risk species that occur on one, or both, sides of a turbine, such that flights between, or into/out of, habitat features/patches are more likely to occur within, or in close proximity to, RSA. • Patches are ≥1 ha in area providing larger, higher quality habitat likely to be used more frequently, by more birds and bats, and more regularly by resident species. • Lakes, wetlands and larger watercourses (or large dams) on one, or both, sides of a turbine increasing the risk of collisions from fauna flying into or out of the habitat feature. Ephemeral wetlands relevant for flood years only. • Blade tip distances to ephemeral wetlands and waterways, and major movement corridors. • Migratory or nomadic species habitual flight path, or key local flyways. • Stick nest potentially supporting breeding raptors.	
Relevant habitat feature and buffers to WTGs	**Likelihood of turbine strike**
• Limited habitat features <1000 m from WTG blade tip.	**Rare** An event may occur only in unusual circumstances (<5%)
• Minor wetland or woodland habitats occur >200 m from WTG blade tip, on one side only. • Minor wetland or woodland habitats occur >500 m from WTG blade tip, on both sides of turbine. • Main watercourse or major wetland habitats occur >500 m from WTG blade tip, on one side only. • Minor deviations from the above rule set where habitats are particularly small, isolated, or degraded	**Unlikely** An event could occur during some circumstances (>5 - <50%).
• Minor wetland or woodland habitats (as stated above) occur <200 m of WTG, on one side only. • Minor wetland or woodland habitats (all PCT woodland habitats) occur 200–500 m of WTG, on both sides of turbine. • Major wetland habitats occur >200 m from WTG blade tip, on one side only. • Stick nest occurs >200 m from WTG blade tip. • Irrigated cropping areas where flocking bird may intermittently congregate. • Minor deviations from the above rule set where habitats align with 'possible' likelihood assessment.	**Possible** An event could occur during most circumstances (>50% - <95%).
• Major wetland habitats occur <200 m from WTG blade tip, on one or both sides of turbine. • PCT 10, PCT 13, PCT 15, PCT 28 woodland habitats occur <200 m from WTG blade tip, on both sides of turbine. • Stick nest occurs <200 m from WTG blade tip.	**Probable** An event is expected to occur in most circumstances (>95%).

3.3.2 Turbine strike consequence assessment results

The consequences of a turbine strike to those species of birds and bats determined to be 'at-risk' has also been assessed based on a matrix outlined in the CPHR Draft Turbine Risk Assessment and Avoidance Guidance (NSW DCCEEW 2023a), with adjustments made to the recommended criteria to better suit the project.

The adapted CPHR turbine strike consequence severity rating is provided in Table 6 below.

Table 6 Adapted CPHR turbine strike consequence matrix

Threat status (BC Act or EPBC Act)	Bird or bat species 'at risk' rating				
	Negligible	Low	Moderate	High	Severe
At risk (non-threatened)	Negligible	Minor	Moderate	Moderate	Major
Migratory	Negligible	Minor	Moderate	Major	Severe
Vulnerable	Negligible	Minor	Moderate	Major	Severe
Endangered	Minor	Moderate	Major	Severe	Severe
Critically Endangered or potential SAII	Minor	Major	Major	Severe	Severe

The results of the above assessment for birds and bats concluded to hold more than a negligible consequence are provided in Table 7 below.

Table 7 Turbine strike consequence for at-risk bird and bat species

Scientific name	Common name	Threat status		Risk assessment conclusion (Refer to Appendix 2)	Turbine strike consequence rating	Key habitat features
		EPBC	BC			
Birds						
Apus pacificus	Fork-tailed Swift	Mi	-	Low	Minor	Woodlands, open areas
Aquila audax	Wedge-tailed Eagle	-	-	High	Moderate	Woodlands, open areas
Ardea pacifica	White-necked Heron	-	-	Low	Minor	Wetlands
Botaurus poiciloptilus	Australasian Bittern	EN	EN	Low	Moderate	Wetlands
Chenonetta jubata	Australian Wood Duck	-	-	Low	Minor	Wetlands
Circus assimilis	Spotted Harrier	-	VU	Low	Minor	Woodlands, open areas
Corvus coronoides	Australian Raven	-	-	Low	Minor	Woodlands, open areas
Dendrocygna eytoni	Plumed Whistling-Duck	-	-	Low	Minor	Wetlands
Egretta garzetta	Little Egret	-	-	Low	Minor	Wetlands
Egretta novaehollandiae	White-faced Heron	-	-	Low	Minor	Wetlands
Elanus axillaris	Black-shouldered Kite	-	-	High	Moderate	Woodlands, open areas

Scientific name	Common name	Threat status		Risk assessment conclusion (Refer to Appendix 2)	Turbine strike consequence rating	Key habitat features
		EPBC	BC			
Eolophus roseicapilla	Galah	-	-	Low	Minor	Woodlands, open areas
Falco berigora	Brown Falcon	-	-	Low	Minor	Woodlands, open areas
Falco cenchroides	Nankeen Kestrel	-	-	High	Moderate	Woodlands, open areas
Falco subniger	Black Falcon	-	VU	Moderate	Moderate	Woodlands, open areas
Gymnorhina tibicen	Australian Magpie	-	-	Low	Minor	Woodlands, open areas
Haliastur sphenurus	Whistling Kite	-	-	Low	Minor	Woodlands, open areas
Microcarbo melanoleucos	Little Pied Cormorant	-	-	Low	Minor	Wetlands
Milvus migrans	Black Kite	-	-	Low	Minor	Woodlands, open areas
Platalea flavipes	Yellow-billed Spoonbill	-	-	Low	Minor	Wetlands
Platycercus elegans	Crimson Rosella	-	-	Low	Minor	Woodlands
Polytelis swainsonii	Superb Parrot	VU	VU	Moderate	Moderate	Woodlands
Rostratula australis	Australian Painted Snipe	EN	EN	Negligible	Minor	Wetlands
Threskiornis molucca	Australian White Ibis	-	-	Low	Minor	Wetlands
Threskiornis spinicollis	Straw-necked Ibis	-	-	Low	Minor	Wetlands
Bats						
Austronomus australis	White-striped Freetail-bat	-	-	Low	Minor	Woodlands
Chalinolobus gouldii	Gould's Wattled Bat	-	-	Low	Minor	Woodlands
Ozimops petersi	Inland Free-tailed Bat	-	-	Low	Minor	Woodlands
Ozimops planiceps	Southern Free-tailed bat	-	-	Low	Minor	Woodlands
Ozimops ridei	Eastern Free-tailed Bat	-	-	Low	Minor	Woodlands
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	-	VU	Low	Minor	Woodlands

Key habitats outlined above include roosting / breeding opportunities for at-risk species, and in the context of waterbirds species include wetland forage habitats, where habitual flights are more likely to bring individuals in closer proximity to turbine RSA, and thus increase the risk of collision. Key habitats form the basis of the turbine strike likelihood assessment provided in Section 3.3 below.

Turbine risk combines the results of the assessment of turbine strike consequence and turbine strike likelihood and relates to the collision risk each individual turbine represents for bird and bat fauna presented within the BBAMP area. The risk assessment has again been based on the CPHR *Draft Turbine Risk Assessment and Avoidance Guidance* (NSW DCCEEW 2023a), with adjustments to the proposed matrix and assessment approach made to better reflect the habitats, aerial fauna, and movements patterns within the BBAMP area, as well as the results and conclusions of the bird utilisations studies, qualitative risk assessments, and CRM, undertaken as part of this assessment. The turbine risk assessment considerations and matrix applied to the project is outlined in Table 8 and Table 9.

Table 8 Qualitative risk consideration for turbines

Risk	Collision Risk	Barrier Effect Risk
Low	Potential unacceptable triggers considered unlikely. Adaptive management and monitoring of impact triggers required within the BBAMP.	Negligible impacts on connectivity or for the turbine to influence altered flight behaviour or sterilise habitat for a species.
Moderate		Minor impacts on connectivity and low potential for turbines to influence altered flight behaviour or sterilise habitat for a species.
High	Potential unacceptable triggers considered possible. Stringent mitigation required pending adaptive management to be identified within the BBAMP.	Considerable impacts on connectivity and potential for turbines to influence altered flight behaviour or sterilise habitat for a species.
Very high	Potential unacceptable triggers considered probable. Stringent mitigation measures required prior to construction and detailed within BBAMP. Consider relocation or removal of turbines.	Significant impacts on connectivity and likely for turbines to influence altered flight behaviour or sterilise habitat for a species.

Table 9 Turbine risk assessment matrix

Likelihood	Consequence (of a collision from an at-risk species)			
	Minor	Moderate	Major	Severe
Rare	Low	Low	Moderate	High
Unlikely	Low	Moderate	High	High
Possible	Moderate	Moderate	High	Very high
Probable	Moderate	High	Very high	Very high

After updates to the project layout, 62 turbines have been assessed as low risk and will be subject to initial monitoring and, if required, mitigation strategies to reduce potential impacts to threatened species. A total of 138 turbines have been assessed as representing a moderate to high collision risk based on current data and assessment, including 105 moderate and 33 high. No turbines have been assessed as representing a very high collision risk (Appendix 2). Preventative operational mitigation strategies have been developed for higher risk turbines (Section 5), with additional mitigation strategies subject to tier triggers outlined in Section 4.3.

Following the implementation of stringent safeguards, including mitigation measures, triggers, curtailment strategies and monitoring periods, it is anticipated that the overall turbine risk for collision and barrier effect impacts will be low.

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4 Significant impact and trigger levels

Information in this section is provided as part of the TARP.

4.1 Guiding principles for determining significance of impacts

At present there is limited information about rates of bird and bat fatalities at Australian wind farms. Peer-reviewed information exists from two Tasmanian wind farms with a combined total of 62 turbines that were monitored for different periods but over a total span of eight years (Hull & Cawthen 2013, Hull et al. 2013, Moloney et al. 2019, Bennett et al. 2022). They detected 245 bird carcasses and 54 bat carcasses during a total of 12,908 searches. It is important to note that due to sampling methods, their detection rates do not equate to total numbers of collision fatalities that may have occurred. Nonetheless, extrapolating from their samples it appears unlikely that total collision fatalities represent significant impacts on the population viability of any species.

Available evidence from operational wind farms offers some information about the incidence of turbine collisions by bat species in Victoria. The Arthur Rylah Institute of the Victorian Department of Environment, Land, Water and Planning (DELWP) published an investigation of bird and bat mortality at operational wind farms (Moloney et al. 2019). Data was collated from post-construction mortality surveys, many of which were undertaken using purpose-trained detector dogs, covering the period from 2003 to 2018 at 15 Victorian wind farms. Bats represented 44% of the 1011 bat or bird carcasses found dead at Victorian wind farms (based on the data available to February 2018). Carcasses of at least 13 species of bat have been recorded, with the majority (67%) of bat records being of the White-striped Freetail Bat *Austronomus australis*.

While the most desirable outcome for the project is that the wind farm will operate without any negative effect on birds and bats, it is recognised that some impact is likely to occur. The overarching objective will be that the wind farm does not have a significant impact on the viability of the population of any species. It is worth noting that density dependence is an important ecological concept of relevance for consideration of effects on viability of wildlife populations. In essence, the size of any natural population is regulated by availability of resources to support it. This will include food, breeding sites, roost sites, mating opportunities, all of which in combination represent 'habitat' for the species in question. Where an impact removes habitat, the population will be reduced as a direct consequence. However, where the key resources for the species are not reduced and the population is otherwise stable, the mortality of one individual makes resources available to another whose survival prospects are improved and the net result is that the size of the population is not altered. Construction and operation of the wind farm will have little impact on resource availability for most species of birds and bats. Mortalities due to turbine collisions can be expected to function in accordance with density dependence, with little influence on the equilibrium of affected populations.

Various guidelines published by the Commonwealth for application of the EPBC Act offer some principles of value in consideration of impacts on populations. Significant impact guidelines for threatened and migratory species listed under the EPBC Act are contained in *Matters of National Environmental Significance: Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013), which also provides criteria for what might constitute a 'significant impact'. However, the criteria are not quantifiable in numbers of individual animals and only three of at-risk for the project is listed under the EPBC Act.

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The *EPBC Act Policy Statement 2.3 Wind Farm Industry* (DEWHA 2009) provides some further explanation and examples relative to potential effects of the wind industry. The following excerpt is useful in its indication that the risk should be considered as proportional to the population size of particular species:

> *An activity that affects, or is likely to affect, a small number of individuals usually would not be expected to have a significant impact on the species as a whole. However, when a species or community is in small numbers nationally, or its distribution or habitat is limited, or if the habitat has particular importance for the species, the activity could have a significant impact. In general, this would apply to species or communities that are most at risk of extinction and are, as such, listed as critically endangered or endangered.*
>
> *An action is likely to have a significant impact on a species listed as vulnerable where it significantly affects an important population of that species. An example might be where a wind farm is proposed on an island or headland, or near a wetland, that has a key breeding population of a bird species listed as vulnerable. The breeding frequency and success rate for that species would also be relevant considerations.*

None of the at-risk species for the project are covered by the *Referral guideline for 14 birds listed as migratory species under the EPBC Act* (DoE 2015), nonetheless it provides further guidance in that it considers that a significant impact would entail mortalities equalling or exceeding 1% of the population of a species and that further investigation would be required if it equalled or exceeds 0.1% of the population.

4.2 Defining performance criteria

The Commonwealth guidance documents clearly indicate that the level of impact that may be significant is based on the measure of change experienced by the population of a threatened or migratory species. This population approach is ecologically meaningful as it responds appropriately to the population sizes of different species. Ideally, it would be possible to consider a number of turbine collision mortalities for a particular species as a proportion of its entire population, then determine numbers and frequency of collisions that would warrant management response(s) according to whether they represent an ecologically important influence on the population's viability (Smales 2017). That approach requires good estimates for the population sizes of relevant species. Biosis undertook a process to estimate the sizes of the potential populations of the 19 species for the site that were recorded flying at RSA height for use in CRM for these species.

It is extremely unlikely that bird and bat fatalities due to collisions by any species in the BBAMP area will be sufficient to represent a significant impact on the species overall population (e.g., equal to or exceeding 1% of the population of any species). However, in the absence of numerical population data for each species, pre-determined trigger levels will be applied that are substantially below the numbers of collision mortality events that are considered likely to represent a significant impact on the viability of the overall population of any species (i.e., 1% of the population). This approach is precautionary, and considered the most appropriate means of effectively measuring impacts to any at-risk populations or species during the operational phase of the development, allowing for adaptive mitigation responses to proactively avoid any likelihood of impacts, let alone significant impacts, to species. Alerts, trigger levels and adaptive management actions will apply where the number of collisions in a defined period represents a low, but uncertain potential to result in a negative effect on the local population of a species.

These trigger levels are detailed in Section 4.3 below.

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4.3 Trigger levels for management responses to bird and bat collisions

Trigger levels are for numbers of bird and bat fatalities detected during carcass searches (see Section 6.2). It is important to note that the number of fatalities detected by searches will almost certainly not represent the total number of animals killed, because searches rarely detect all carcasses and because some carcasses will be removed by scavengers before they can be found. These effects are well known and there is an existing science for determining estimates of total mortalities from numbers of mortalities detected during searches (Huso et al. 2017). While estimation of total numbers of collision fatalities is important and will be undertaken for the proposed wind farm, the small numbers of carcasses that are generally found at wind farms in Australia most often result in estimates of total mortality with very large confidence intervals (CIs), usually using 95% CI. For that reason, extrapolated estimates of total mortality do not provide a sound basis for use as trigger levels.

At a minimum, the following definitions (Table 10) are considered a trigger-level alert and if realised would warrant an increased focus on areas of concern to determine whether further action is required. Mitigation measures relevant to each alert level are described in Section 7.

Several higher-risk turbines have been grouped in management clusters (see Figure 2) for the purposes of precautionary management and triggers. If one turbine within a cluster is subject to a trigger, all clustered turbines would be subject to investigation.

Table 10 Investigation and monitoring triggers for bird and bat strike (Tier 1)

Tier	Type	Trigger	Mitigation
Tier 1 alert	Threatened species	Where any carcass; feather spot, or injured individual (likely caused as a result of turbine collision) is found under or close to (within 200 m or up to twice the blade length) any wind turbine during any single mortality search or incidentally by wind farm personnel.	Tier 1 mitigation instigated
	Non threatened at-risk species	For Wedge-tailed Eagle, if the number of carcasses found within any two-month search cycle monitoring event is greater than or equal to 25% of the annual modelled collision rate (at 95% avoidance rate). For other species where CRM has been undertaken, if the number of carcasses found within any two-month search cycle monitoring event is greater than or equal the annual modelled collision rate (at 95% avoidance rate). For species without CRM, where three or more (total) carcasses; feather spots, or injured individuals (likely caused as a result of turbine collision) of a single species are found under or close to (within 200 m or up to twice the blade length) any wind turbine during any single two-month search cycle monitoring event or incidentally by wind farm personnel.	
	Other species	Where ten or more (total) carcasses; feather spots, or injured individuals (likely caused as a result of turbine collision) of a single species are found under or close to (within 200 m or up to twice the blade length) any wind turbine during any single two-month search cycle monitoring event or incidentally by wind farm personnel.	
	Nesting	An at-risk or threatened species is recorded nesting within 200 m of an operational turbine blade tip.	

The following definitions (Table 11) are considered an unacceptable impact and require action be taken. A detailed investigation and stringent temporary or permanent mitigation would be required should they occur.

The results of this investigation would be used to inform any temporary and/or permanent mitigation measures required. Adaptive management responses for the below triggers are detailed in Section 4.6.

Table 11 Investigation and monitoring triggers for bird and bat strike considered unacceptable impacts (Tier 2 and 3)

Tier	Type	Trigger	Mitigation
Tier 2 impact	Non threatened at-risk species	• Where population* numbers are known: - Any impact that is likely to reduce the total species' population by more than 1% over a two-year period. • Where population numbers are not known: - For Wedge-tailed Eagle, if the number of carcasses found within any two-month search cycle monitoring event is greater than or equal to 50% of the annual modelled collision rate (at 95% avoidance rate). - For other species where CRM has been undertaken, if the number of carcasses found within any two-month search cycle monitoring event substantially exceeds the annual modelled collision rate (double the modelled 95% avoidance rate). - For species without CRM, where five or more (total) carcasses; feather spots, or injured individuals (likely caused as a result of turbine collision) of a single species are found under or close to (within 200 m or up to twice the blade length) any wind turbine during any single two-month search cycle monitoring event or incidentally by wind farm personnel. • Where three or more Tier 1 alerts for non-threatened at-risk species are triggered in a six-month period.	Tier 2 and 3 mitigation instigated
Tier 3 impact	Threatened species	• Where population* numbers are known: - Any impact that is likely to reduce the total species' population by more than 1% for at least a five-year period. • Where population numbers are not known: - Where three or more (total) carcasses, feather spots, or injured individuals (likely caused as a result of turbine collision) of a single species are found under or close to (within 200 m or up to twice the blade length) any wind turbine per two-month cycle** search regime monitoring event or during incidental searches. • Where three or more Tier 1 alerts for threatened species are triggered in a six-month period.	

*Population relevant to the operation of the wind farm will be determined (where possible) in consultation with NSW DCCEEW via a detailed monitoring plan, and based on baseline and ongoing utilisation survey data and dependent on species by species basis.

**A two-month cycle is the search of turbines split across a two month period, prioritising moderate and high risk turbines

This BBAMP details measures to reduce the number of Tier 1, Tier 2 and Tier 3 impacts. Broadly, these will include general mitigation measures and specific trigger related mitigation, including but not limited to, those demonstrated in Table 12 below.

Table 12 Mitigation measures and options

Type	Mitigation considerations and response
General	• All high-risk turbines will be feathered to prevent free-wheeling prior to predetermined cut-in speeds (i.e., blades will be rotated or 'pitched' into a position that reduces the turbine's rotation during times of low energy generation). • Ongoing reassessment of species risk levels and thus relevant trigger-levels. • Periodic review of the turbine curtailment / mitigation strategy and monitoring program every two years. • Incorporate any operational mitigation measures developed during the preparation and implementation of the project Biodiversity Management Plan (BMP) relating to monitoring of active nests / nest trees. • Encourage habitat use offsite through establishment of Biodiversity Stewardship Agreements (BSAs) and associated habitat restoration in the area proximal (greater than 200 m) to the wind farm and likely to be utilised by the local population of birds and bats. • Minimising availability of raptor perches on infrastructure within close proximity to turbines and overhead powerlines. • Installation of marker balls, flags or rotating markers on transmission lines to prevent collisions and deter perching. • Prompt animal carcass removal within the 200 m of a turbine (within 24 hours of discovery) to minimise raptor scavenging opportunities and reviewed annually. • Participation on local (site-based) and co-ordinated (LLS and NPWS) feral animal control programs in consultation with the landholder (i.e., European Rabbits *Oryctolagus cuniculus*, wild Dogs *Canis lupus familiaris* and European Foxes *Vulpes vulpes*) and in line with carcass removal protocols. • Increased mitigation of turbines presenting increased risk to at-risk waterbirds when increased suitable wetland habitats occur within / surrounding the BBAMP area during flood years (see further detail below). • Investigation of potential deterrents or evolving technologies, such as: - Ultrasonic technologies such as the SMART (Song Meter with Analysis and Remote Transfer) system by Wildlife Acoustics (see further detail below). - Consideration of radar (or optical sensor) or live camera technologies for automatic, reactive and temporary curtailment of turbines such as IdentiFlight avian detection system at high-risk turbines (see further detail below). - Avoiding or limiting the use of artificial lighting (synchronising flashing red light if required) on turbines and other infrastructure within close proximity to turbines. - Consider novel deterrent techniques related to blade visibility (i.e., painting one blade a different colour). - Use of 'acoustic lighthouse' to deter avian activity by broadcasting, for example, audible frequencies of 4–6 kHz in front of turbine towers to encourage avoidance behaviour (as detailed in Boycott et al. (2021)). • Annual reporting to include triggers relating to the re-assessment of the mitigation strategies to be implemented over the following year of operation where Tier 1 and/or Tier 2 and 3 triggers have occurred: - Additional triggers will be developed that consider the actual/extrapolated impacts to bird and bat species calculated across the preceding year, and include associated mitigation measures and potential additional offsets for the following year of operation.
Tier 1 alert mitigation and response	Initiate rapid assessment framework for Tier 1 alerts within the BBAMP to identify the most effective mitigation measures to be implemented, including but not limited to: • Increased monitoring of a relevant turbine(s) for a seven-day period following a Tier 1 alert to determine a one-off event, or a potential ongoing event.

Type	Mitigation considerations and response
	• Increased frequency of carcass removal, or increased use of other methods of deterrence (where relevant). • In the case of at-risk species or threatened species nesting within 200 m of an operational turbine blade tip, the nesting event will be allowed to occur, with increased monitoring, potential for temporary curtailment in line with Tier 2 and Tier 3 recommendations until removal of the nest following the breeding event can be undertaken. Any mitigation is to be consistent with development consent conditions. • The assessment is to determine possible causes of alert and identify if additional mitigation is required.

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Type	Mitigation considerations and response
Tier 2 and 3 impact mitigation and response	Initiate rapid assessment framework for Tier 2 and Tier 3 triggers within the BBAMP to identify the most effective mitigation measures to be implemented: • Consider temporarily ceasing operation of a turbine(s) relevant to the impact trigger event during the rapid investigation. • Increased daily carcass searches for 14 days following discovery of a Tier 2 or Tier 3 trigger, to be undertaken within the subsequent four weeks of the trigger event by suitable trained ecologist, environmental advisor and/or detector dog services. • Consideration of deterrents such as of 'acoustic lighthouses' (or similar mobile technology) for a minimum seven-day period for automatic, reactive and temporary curtailment of turbines relating to a Tier 2 or 3 alert. • The assessment is to determine possible causes of the impact and identify the additional mitigation measures required to be implemented to minimise recurrence of the impact (as far as is practicable). Pending an investigation into Tier 2 and Tier 3 impacts being detected, the following mitigation options may be required in consultation with the Applicant, suitably qualified ecologists, other relevant experts and CPHR: • Implementation, increase, or re-location of collision risk reduction technologies such as SMART curtailment (microbats) or avian detection systems (birds). • Implementation of low-wind speed, nocturnal curtailments to reduce the potential for microbat collision during periods of highest activity. • Consideration of increased cut-in speeds for microbat impacts. • Temporary turbine shut down during periods of low visibility (i.e., fog), if suspected as the cause of collision(s). • Regular use of 'acoustic lighthouse' to deter avian activity by broadcasting, for example, audible frequencies of 4 – 6 kHz in front of turbine towers to encourage avoidance behaviour (as detailed in Boycott et al 2021). • Short-term seasonal shutdowns (e.g., based on migratory periods, ephemeral wetland flood events, or nesting events). For example, in the case of an at-risk species or threatened species nesting within 200 m of a turbine, the nesting event will be allowed to occur, with increased monitoring and/or temporary curtailment. • Short-term shutdowns where there is a delay in getting the necessary personnel to site to undertake increased turbine monitoring and relevant assessments. • Immediate reassessment of current mitigation strategy being implemented and if required adjustment (or inclusion if not being implemented for the specific turbine) to reduce the potential for reoccurrence of the unacceptable impact. This reassessment may be required on a temporary or permanent basis. • Consider novel techniques as research develops in relation to altered blade visibility, such as painting one blade black. Note that this method may not be feasible due to the weight of the paint altering the balance of the turbine (May et al. 2020).

4.4 Trigger levels for barrier effects

Although the overall risk of barrier effects and altered flight behaviour based on the information available and literature review is considered low, adaptive management, additional mitigation and compensatory measures may be required should a residual impact resulting from barrier effects occur.

If after the five-year ongoing monitoring period, there is a noted discernible statistical reduction or anomaly in abundance or activity of an at risk or threatened species, additional investigations into possible causes would occur. If it is determined that the operational wind farm was a key factor, additional assessment against key

relevant Test of Significance criteria or Significant Impact Criteria would be used to quantify or measure the level of impact, and if determined that an event resulting from barrier effects warranted additional mitigation, compensatory measures or species specific offsetting, these would be developed in consultation with NSW DCCEEW, the Applicant, the project ecologist and Cth DCCEEW.

4.5 Monitoring of performance

Assessment against performance criteria and trigger thresholds will require a program of ongoing operational monitoring of bird and bat site utilisation as prescribed in Section 6.1, as well as a regime of searches for dead birds and bats under turbines to monitor collisions as detailed in full in Section 6.2.

The Applicant will work with regulatory authorities to share data and continue to contribute to the growing body of literature around bird and bat collisions at operational wind farms. Operational monitoring and adaptive management will ensure that any unacceptable events that may occur are captured and mitigated, thus providing an ongoing feedback loop to further reduce the potential for the project to result in substantial operational impacts to bird and bat species and populations.

The need for adjustments to the mitigation strategy will be determined through regular monitoring on the efficacy of the current strategy. Adjustments may include additional curtailment measures if an unacceptable number of strikes are found to occur, or a reduction in curtailment if it is considered safe to do so.

4.6 Adaptive management framework

A post-commissioning monitoring approach is set out below. Its results will be used to inform subsequent decisions about the requirement for any modified or additional management actions aimed at further reduction of effects on threatened and at-risk species. Contingency measures and corrective actions are outlined in Section 7.1 and a framework for their application provided in Section 7.2.

Annual reporting will be prepared and submitted to NSW DCCEEW and other relevant authorities as required, as detailed in Section 6.5.2. The report will provide results of all investigations and studies related to effects of the proposed wind farm on bird and bat species of concern. In collaboration with NSW DCCEEW, the results will be considered to determine whether any changes to processes or management actions are required. Any such changes will be focussed on improvements to reduce impacts on bird and bat species of concern, specifically, in the event that detected collisions with turbines by any such species have reached or exceeded trigger levels set out herein.

Appropriate mitigation measures can be prepared only if a cause, or causes, of ecologically significant impacts on the relevant species is known. If a cause is not readily apparent, then investigation of the reason(s) for the impact must be undertaken prior to proposal of a mitigation strategy. Advice from NSW DCCEEW will be sought with regard to design and implementation of any such investigations and of an ultimate mitigation strategy, if required. NSW DCCEEW will be notified within two working days of determination by the Applicant or the contracted qualified ecologist that a trigger level for any species of concern is detected. Liaison with NSW DCCEEW will commence to determine a strategy aimed at reducing the incidence of collisions as soon as is practical thereafter. A decision framework for actions to be taken following a trigger level event is provided in Section 7.2.

Any mitigation strategy will follow SMART principles and be tailored to the needs of the particular species affected and will be formulated if and when the nature and cause(s) of the impact are known. It will be submitted to NSW DCCEEW and will be implemented when approved. The BBAMP deliberately avoids being

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overly prescriptive as to the exact mitigation measures to be implemented to allow for novel technologies to be explored and for mitigation measures to be truly adaptive, whereby management measures are tailored to the circumstances of the impact trigger and a rigorous program of monitoring can be determined to test any management measures implemented.

Commencement of wind farm operation is defined as the date when all of the following have occurred:

- All turbines are commissioned and tested.
- All turbines have been handed over from the Supply and Installation Contractor to the Developer.
- Australian Energy Market Operator testing is complete (grid compliance testing).

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5 Preventative mitigation measures

This section details the ongoing, preventative mitigation measures committed to by the Applicant, to manage operational risks of the wind farm and minimise impacts to birds and bats. As part of the adaptive management framework of the BBAMP, the below mitigation measures are subject to change throughout the duration of the BBAMP based on the results of monitoring surveys, technological advances, or new alternative mitigation measures that may be more effective or appropriate for the site.

5.1 Increased mitigation of turbines during flood years

Increased mitigation of turbines presenting increased risk to at-risk waterbirds is likely to be required when increased suitable wetland habitats occur within / surrounding the BBAMP area during flood years. Within the BBAMP area, smaller sporadic wetlands/depressions are scattered throughout. The BBAMP area is characterised by flat terrain and is subject to periodic inundation. These flood prone areas may provide movement and dispersal areas for waterbirds, which was evident during the spring 2022 flooding event. Flood events may increase the area of suitable habitat in close proximity to operational turbines during flood years and increase collision risk to a range of at-risk waterbird species.

Key local flyways are likely to occur between these habitats during flood years and measures have been developed to minimise potential barrier effect, however increased collision risk for species utilising these ephemeral habitats may require a mitigation strategy. This strategy will be fully developed in consultation with the relevant regulators, but is expected to include items such as:

- Details of catchment-scale flood event monitoring or locally intense rainfall events requirements that would trigger additional monitoring of habitats in proximity to the operational wind farm.
- Development of threshold triggers for further investigation and implementation of seasonal event-based mitigation strategies.
- Increased monitoring of turbines and habitats within 500 m of ephemeral waterbodies and creeklines during flood events to detect the presence of target at-risk species (Section 6).
- Additional mitigation strategies that may include:
  - Installation of deterrent measures such as acoustic lighthouses (Section 7.1.1).
  - Installation of mobile (or fixed from commissioning) automatic detection systems to monitor for at-risk species presence (Section 5.1).
  - Implementation of live (temporary / short-term) turbine shutdowns, or longer-term turbine shutdowns until such time as floodwaters and habitat have receded to threshold levels determined to no longer present an unacceptable heightened collision risk (Section 7.1.9).
- End of curtailment would be determined via field survey confirmation that birdlife and habitat value had reduced significantly enough back to pre-flood conditions for operation of the turbines to not increase collision risk for at risk species.

It is noted from anecdotal evidence the region floods every five to seven years, however the volume of water in the environment over spring 2022 was the result of flooding at the end of the triple La Niña event that brought increased rainfall to south-eastern Australia between September 2020 and February 2023. It is not considered likely that floods such as these will occur numerous times in the expected 30-year lifetime of the project. La Niña conditions over three consecutive summers, as contributed to the water levels observed in

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spring 2022, are rare and have only occurred three times since 1950 (in 1973-76, 1998-2001, and 2020-2023). Any event-based mitigation triggers will need to consider the effects of climate change on rainfall levels into the future as well as historical weather data.

5.2 Turbine curtailment for microbats

5.2.1 Proactive low wind-speed curtailment

Guiding principles for the wind farm in relation to the BBAMP is to operate without any significant impact on the viability of the local and/or overall population of any species of birds or bats. To this end, a proactive low wind-speed turbine curtailment strategy will be implemented during the operational phase of the project. The proactive curtailment strategy will include:

- All high-risk turbines being feathered to prevent free-wheeling prior to predetermined cut-in speeds (i.e., prior to energy generation).

This type of proactive management strategy will help to minimise collision risk without the loss of electricity generation. Turbine risk will initially be based on the assessment included in the BDAR, however assessment of risk levels will be ongoing with the implementation of the BBAMP, and turbines subject to feathering may change.

The proposed proactive low wind speed curtailment strategy combined with the ongoing monitoring schedule and responsive management actions is considered to provide industry best practise and the best possible opportunity for minimising the potential for the project to result in operational impacts to local species populations. Low wind speed curtailment is known to be an effective means of reducing the risk of blade strike for microbats, and there is a growing body of literature of the topic from Australia and around the world that will continue to be reviewed during regular re-evaluation of the project's current strategy.

As turbine risk is reassessed over the operational phase of the project, updated risk ratings are to be applied to each turbine, or cluster of turbines, with regards to the low wind-speed curtailment strategy.

Further reactive increases to turbines' cut-in speeds may be required if trigger alerts are realised, further discussed in Section 7.1.6.

5.2.2 Smart curtailment

Although blanket curtailment approaches are often successful in reducing bat fatalities, they also result in a reduced energy generation capacity and often coincide with periods of high electrical demand. This renders them potentially unsustainable in the long-term for many wind generation operations.

In an attempt to reduce bat fatalities while optimising energy production, more tailored strategies are being developed to increase the time during which turbines can continue operation and power production relative to blanket operational mitigation approaches. Smart curtailment approaches are being developed that use and combine information about real-time bat activity and environmental information, such as weather conditions, in order to guide curtailment decisions based on real-time risks to bats. Smart curtailment provides wind energy facilities with a pathway for reducing bat fatalities whilst also reducing curtailment time when compared to blanket curtailment techniques thereby maximising energy production whilst minimising impacts to bats.

Studies trialling the approach overseas have achieved significant reductions in bat mortality without the need for blanket curtailment of turbines at lower wind speeds (Hayes et al. 2019). However, there are no

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comparable studies available for Australian wind farms. Furthermore, overseas studies have often been used in conjunction with automated bat call identification software, which is not currently available for Australian bat species. Automated identification allows bat calls to be identified to species level in real-time and in a consistent, repeatable and time-efficient way.

Recent technological advances have seen the release of smart curtailment systems that may be applicable to the project. For example, the SMART (Song Meter with Analysis and Remote Transfer) system by Wildlife Acoustics, allows ultrasonic detectors to be mounted to the nacelles of turbines and files containing probable bat call information to be transmitted in real-time via modems and the cellular network to a database system where the information can then be analysed. The SMART system allows for user defined alarms which match bat call parameters that can be directly input into curtailment decision-making processes in real-time.

Technology such as the SMART system provides real potential for a tailored curtailment approach at the project facility that would provide operational flexibility in allowing turbines to continue producing energy when they might otherwise be curtailed based only on wind speed information.

When the smart curtailment acoustic monitoring system is engaged, real-time monitoring of microbat activity would allow turbines to be curtailed when bat activity reaches a pre-determined threshold. The smart curtailment acoustic monitoring system can also be switched off when wind speeds reach thresholds above which bat activity (and therefore collision risk) are low. Under these circumstances, electricity generation would proceed without intervention until wind speeds fall below the pre-determined threshold. This approach has been the subject of a study by Hayes et al. (2019) that found implementing a similar acoustic monitoring and remote curtailment system when wind speeds were below 7.9 metres per second, without the use of blanket low wind speed curtailments, reduced bat fatalities by 85 %.

The potential effectiveness of any installed system will be considered as part of triggers following carcass search methods as detailed in Section 6.2.1.Assuming the site trigger levels of impact that requires installation of such technologies, SMART curtailment systems may be a valuable method to minimise fatalities of microbats.

5.3 Automated avian detection systems

Technology related to SMART curtailment systems for birds are advancing at a rapid rate. Automated avian detection systems allow for detection of bird species and the triggering of curtailment of select turbines. The IdentiFlight avian detection system (IDF) was designed in the United States of America (USA) specifically to reduce Golden Eagle mortalities on wind farms, with testing suggesting that use of the system has achieved an 85% reduction in eagle fatalities at a wind farm site in Wyoming, USA (McClure et al. 2022).

The IDF system combines high-precision optical technology with artificial intelligence to detect raptors and other protected bird species within a 1 kilometre range. The IDF System tracks the movement of objects within its range, and quickly determines whether any objects are birds, and can learn to recognise key species of interest such as eagles. If a bird of interest is identified, the system begins to track the target, recording its position, predictive trajectory, and course probability relative to turbines in real time. Curtailment conditions are pre-determined, and if the target is predicted to cross into the rotor swept area of a turbine, the IDF Base Station issues a signal to the wind farm Supervisory Control and Data Acquisition (SCADA) system, which sends control signals to curtail relevant turbines to avert any collision. The system provides the visual and quantitative data needed to reduce or avoid collisions, but does not detect or document the collisions *per se*. This requires a carcass monitoring program, which is detailed in Section 6.2.1.

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Unlike radar and other technological approaches to automated curtailment for birds, what distinguishes the IDF system is its ability to recognise different species and make curtailment decisions based on target species. Assessment of the effectiveness of the IDF system in Australia, at the Cattle Hill Wind Farm in Tasmania (Rogers 2022), concluded that IDF significantly reduced eagle collisions at the site. Furthermore, the data collected from the IDF system has provided detailed monitoring information on avifauna activity, and valuable insights into the understanding of eagle behaviours. The volume and quality of information captured by IDF is considered far more comprehensive than what is possible using traditional bird survey methods conducted by human observers.

For the IDF system to work accurately, it requires a large volume of bird images to be collected and classified to build a convolutional neural network that allows the system to recognise target species accurately, and minimise false triggers. It is therefore not suitable as a reactive management approach, but a means of pre-emptively reducing any potential mortality events. If installed early in the construction phase of the project, by the time wind farm operations commence IDF is likely to have captured enough data to be able to recognize target species such as Wedge-tailed Eagle *Aquila audax* with a high level of confidence, and may also be able to group other bird species that have similar morphological characteristics based on their wingspan and dimensional data. The IDF curtailment prescription relevant to the site could also be adjusted as additional knowledge of eagle populations utilising the site is gained through the IDF system.

The commissioning stage is also likely to be the highest collision risk period for eagles, being the first time they will encounter the operational turbines, therefore having the IDF system (or its more advanced equivalent) tested and validated as fully operational by the time operations commence is almost certainly going to reduce future mortalities.

IDF is one automated detections system that is being used in Australia, but it is far from the only new and innovative technology available to operational wind farms to reduce potential bird and bat collisions. A recent peer-reviewed paper published by Orsted (an offshore wind energy developer) and DHI (a water software development and engineering firm) provides a catalogue and assessment of available monitoring technologies for birds and bats at offshore wind farms, with a focus on managing the risk of collision (Skov et al. 2023). Whilst the focus of the paper relates to offshore wind farms, the technologies reviewed have application potential onshore, and at the wind farm site. The assessment includes a comparison of the multiple applications for the following technologies:

- Radar (2D and 3D).
- Digital camera.
- Accelerometer.
- Acoustic equipment.
- Large-scale survey platform and large-scale telemetry.

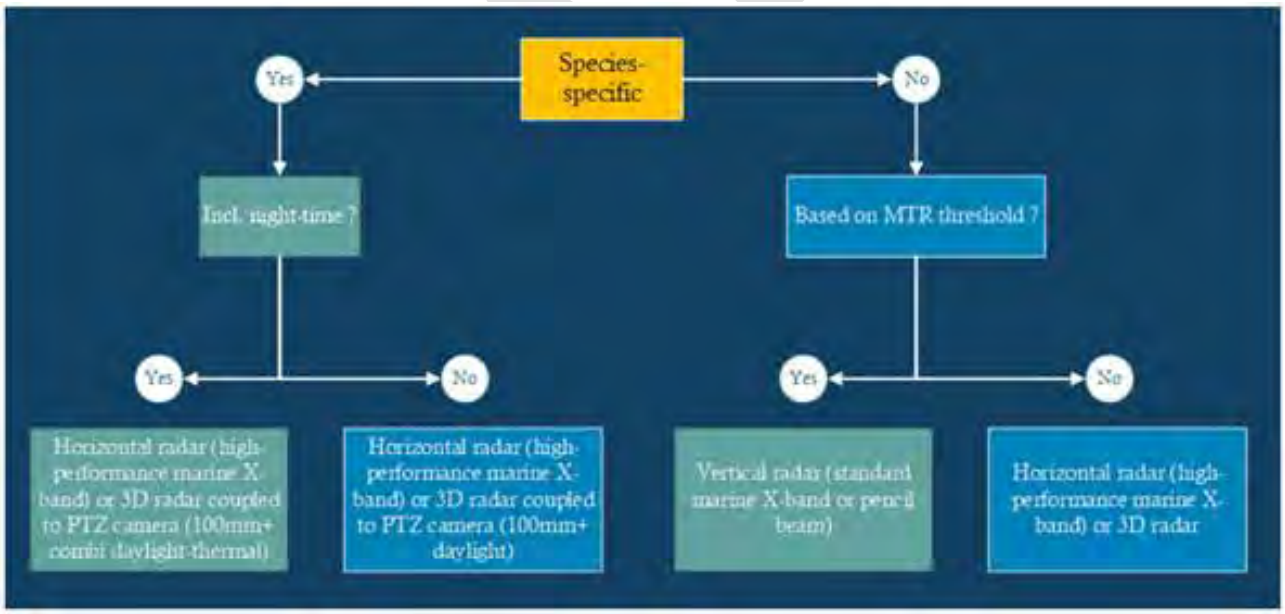
Table 13 below provides an overview of the results of the comparison and provides insight into the suitability of the various technologies available depending on the desired application and mitigation requirements.

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		Implementation			Density		Species				Avoidance			Collision	
Type	Equipment	Retrofit	Installation Complexity	Cost of equipment	Flux outside OWF[1]	Flux inside OWF[1]	Distribution and behaviour	Species id	Flight speed	Flight height	Macro avoidance	Meso avoidance	Micro avoidance	Collision rate	Shutdown
Radar	3D Radar[2]	●	▼	▼	▲▲	▲▲	▲	▼	▲▲	▲▲	▲▲	▲▲	▼	▼	▲
	2D Radar[2]	●	▼	●	▲▲	▲▲	▲	▼	▲▲	-	▲▲	▲▲	▼	▼	▲
	Radar coupled to camera[2]	●	▼	▼	▲▲	▲▲	▲▲	▲▲	▲▲	▲▲	▲▲	▲▲	▲▲	▲▲	▲▲
	Radar with fixed antenna[2]	●	●	●	●	●	▼	▲	●	-	▲	▲	▼	▼	●
Camera	Fixed camera[2]	▲	▲	▲	-	-	▼	▲	▼	-	▼	▼	▲▲	▲▲	●
	Dome with multiple fixed cameras	●	●	▼	-	-	▲▲	▲▲	▼	-	▼	▼	▲▲	▲▲	●
	Moving camera	▲	▲	●	-	-	▲▲	▲▲	▼	-	▼	▼	▲▲	▲▲	●
Other	Accelerometer as single sensor	▼	▼	▼	-	-	-	-	-	-	-	-	-	●	-
	Accelerometer coupled to camera	▼	▼	▼	-	-	-	-	-	-	-	-	-	▲	-
	Microphone[2]	▲	▲	▲▲	-	-	-	▲▲	-	-	-	-	-	-	●
Survey Platform	Ship-based surveys	-	-	▼	●	●	▲	▲▲	-	▲▲	▲▲	●	▼	▼	▼
	Aerial visual surveys	-	-	▼	▼	▼	●	▲▲	-	▲▲	▲▲	●	▼	▼	▼
	Aerial digital surveys	-	-	▼	▼	▼	●	▲▲	-	▲▲	▲▲	●	▼	▼	▼
	UAV/drone surveys	-	-	▼	▼	▼	●	▲▲	-	▲▲	▲▲	●	▼	▼	▼
Telemetry	Radio transmitters	▼	▼	●	▼	▼	▲▲	▲▲	▲▲	▲▲	▲▲	●	▼	▼	▼
	Satellite transmitters	▼	▼	●	▼	▼	▲▲	▲▲	▲▲	▲▲	▲▲	●	▼	▼	▼
	Archival tags	▼	▼	●	▼	▼	▲▲	▲▲	▲▲	▲▲	▲▲	▼	▼	▼	▼
	Acoustic telemetry	▼	▼	●	▼	▼	▲▲	▲▲	▲▲	-	●	▼	▼	▼	▼
	Very good	▲▲													
	Good	▲													
	Average	●													
	Bad	▼													
	Not Available	-													

Table 13 Scoring system applied in the assessment of monitoring technologies (Skov et al. 2023)

The paper goes on to recommend the combination of technologies considered to best met the aims of the mitigation. For example, if the mitigation objective was to remotely shut down a turbine to prevent collision with a certain highly at-risk species, Skov et al (2023) recommend the following combination of technologies (Graph 1).



Graph 1 Recommended solution for turbine shutdowns (MTR is migration traffic rate, and relates to birds flying per hour, per kilometre)

The applicability and use of automated detection systems at the wind farm requires further critical assessment, and will be determined in consultation with regulatory authorities following development consent. The effectiveness of the system is likely to vary between sites and performance will be dependent on topography, vegetation, wind farm layout and the number of IDF towers able to be accommodated within the wind farm footprint. A detailed implementation plan would need to be developed to ensure that the system could work effectively in the BBAMP area.

Assuming the BBAMP area is suitable for installation of such technologies, automated detection systems may be a valuable method to avoid potential collisions for at-risk species. The effectiveness of any installed automated avian detection system would be monitored using carcass search methods as detailed in Section 6.2.1.

5.4 Improving blade and turbine visibility

Bird and bat collisions with turbine blades can occur as a result of poor ability to recognise the presence of turbine blades during motion (motion smear). There is some evidence to show that improving blade and turbine visibility may assist in reducing collisions and therefore fatalities in birds. Visibility could be improved through the application of one turbine blade painted black, painting turbines with ultraviolet reflective covering, or the application of a pattern on the turbine blades.

A study undertaken in Norway on turbines with one of three painted blades found that the annual fatality rate was over 70% lower at painted compared to unpainted turbines for a range of birds (May et al. 2020). Of relevance to birds that fly below RSA, a study that investigated the impact of contrast painting turbine towers in Central Norway, found that there was a 48% reduction in Willow Ptarmigan *Lagopus lagopus* carcasses per search relative to unpainted turbines (Stokke et al. 2020). Conversely, a secondary study in Norway has found no significant difference in the number of fatalities at turbines with one blade painted black in the first year of monitoring (Jeninga et al. 2023, Klop et al. 2024).

A study on the visual acuity of two raptors (American Kestrel *Falco sparverius* and Red-tailed Hawk *Buteo jamaicensis* found that these species are unable to resolve and localise turbine blades under some conditions and that patterns applied to turbine blades may reduce collisions (McIsaac 2000), however this study was limited to comparing the visual conspicuities of humans, rather than using a BACI method. A similar study on applying patterns to turbines to reduce motion smear for American Kestrels found that patterns can increase visibility of blades, which may prevent collisions by improving response time (Hodos et al. 2000).

A review of risk reduction strategies across multiple studies identified that painting turbines with ultraviolet reflective covering may be an effective risk reduction technique (Stickland et al. 2000). When assessed in further a preliminary study, use and fatality rates were lower for small birds and raptors at ultraviolet turbines compared to control turbines, but the risk was higher, and therefore measures should be evaluated further (Stickland et al. 2000).

The cost and resources required to paint turbine blades can be minimised by undertaking it before construction. If implemented, monitoring should be undertaken to determine the effectiveness of this measure.

5.5 Minimising artificial lighting

Some nocturnally migrating birds may be attracted to, or disturbed by, artificial lights. Some species of bats are attracted to concentrations of insect prey that can occur near artificial lights. While lighting on turbines may not increase fatality rates for birds (Kerlinger et al. 2010), turbines at the wind farm should not be lit and should avoid the use of aviation warning lighting, unless required for aviation safety (or other similar) purposes. If artificial lighting is required, the use of synchronising flashing red lights on turbines and other infrastructure within close proximity to turbines may be used, as they have been shown to not increase fatalities for bats in a study at a Texas wind farm (Bennett & Hale 2014). However, the use of blue and green light (containing less or no visible long-wavelength radiation) may be less disruptive to nocturnally migrating birds than red and white light (visible long-wavelength radiation) (Poot et al. 2008).

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5.6 Minimising raptor perch sites

The earliest wind farms used turbines with lattice towers that provided multiple perching opportunities for raptors and this attraction to those turbines was implicated in high rates of turbine collisions. As with all modern turbines, the towers to be used for the project are monopoles that offer no perching opportunities for raptors or other bird species.

Poles and wires of overhead powerlines can also provide perching and nesting sites for raptors. Where overhead powerlines are necessary, consideration will be given during pole selection to restrict opportunities for raptors to use them as perches. This is of value to operation of the wind farm in minimising the risk of birds or their nests resulting in power outages.

Trees and other features provide natural perching sites for raptors. It is not known whether these perches are used more frequently than any others, but from the variety of raptor species identified in the vicinity, there can be no doubt that raptors will use multiple natural sites as perches. It is not considered to be appropriate to remove natural perches or to otherwise actively attempt to discourage birds from using natural perches.

It is possible that raptors of various species may frequent favoured perch locations within 200 metres of a turbine during the operational life of the wind farm. Wind farm operations personnel will be provided with training in the basic identification of raptor species. If a potentially favoured raptor perch site is detected within 200 metres of a turbine, a qualified ecologist will be called in to confirm identity of the species and to ascertain whether the perch location represents heightened risk to a threatened species. If so, NSW DCCEEW will be notified and a strategy to reduce risk will be determined. Removal of the perch site may be considered if it is a dead tree and there is considered to be a reasonable likelihood of reducing risk by doing so.

5.7 Pest animal control

Pest animal control will be undertaken as part of routine environmental management of the wind farm and land managed by the wind farm operator. Species subject to control would include vertebrate pest animals such as feral deer, feral goats, feral pigs, foxes, rabbits, hares and wild dogs. Control of rabbits and hares around wind turbines is a specific action that may minimise collision risk for large raptors, as these are primary prey items. Control of foxes, cats and dogs that are likely to scavenge carcasses would increase the accuracy of carcass search monitoring. Section 5.8 provides detail of the requirements for removal of carcasses, including those of any pest species that may attract large raptors into the close proximity of turbines.

A pest animal control program will be implemented. This plan would be developed in consultation with relevant stakeholders such as the NPWS and LLS and relevant landholders. Details around the timing, effort and methodology of pest control would be included in the BMP for the project, which would be developed prior to turbine commissioning.

Control of all pest species will be carried out in accordance with NSW legislation, policy and strategies administered by the Department of Primary Industries.

All site personnel (staff and contractors) will be inducted into a procedure for reporting the location of pest animals, particularly rabbit warrens or other sites of high rabbit density. The wind farm operator will be responsible for its obligatory requirements for control of pest animals on all land for which it has legal responsibility, in conjunction with the landholder. The wind farm is likely to have legal agreements that cover specific areas including all its infrastructure, roads and hardstand areas. This condition is enforceable on land areas covered by those agreements. The wind farm operator will make all efforts to work collaboratively with

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adjacent land managers, including, where achievable, entry into formal agreements to provide for co-operative and coordinated detection and removal of pest animals from the area within 200 metres of all turbines.

5.8 Large animal carcass removal

The timely removal of carcasses of livestock and other larger animals, such as destroyed feral species, from the wind farm may help reduce the incidence of collision with turbines by raptors that routinely feed on carrion and may be attracted to carcasses. Carcasses of birds and bats that may have resulted from collisions with turbines are not to be removed as part of this process.

A carcass removal program will be implemented for the life of the wind farm and will apply to any carcass other than those of birds and bats, found anywhere within the wind farm site. All site personnel (staff and contractors) will be inducted into a reporting procedure that will apply during all wind farm operations, including collision carcass searches (see below). The wind farm will implement a routine for removal and burial or appropriate disposal of any carcass within 48 hours of its discovery on all land for which it has legal responsibility. Any program of feral animal control on the wind farm will include the removal of all carcasses from the wind farm site. The wind farm has legal agreements that cover specific areas including all its infrastructure, roads and hardstand areas. This condition is enforceable on land areas covered by those agreements. The wind farm operator will make all efforts to work collaboratively with adjacent landholders, land managers, including, where achievable, entry into formal agreements to provide for co-operative and coordinated detection and removal of large animal carcasses from the area within 200 metres of all turbines.

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6 Monitoring strikes and effectiveness of impact minimisation

The effectiveness of impact minimisation strategies can only be assessed through an ongoing operational monitoring program. It is important that bird and bat surveys continue once the wind farm becomes operational and that the survey methods used prior to construction are continued using the same methods so that results from before and after construction are appropriately comparable. The survey and study methods are set out in the BDAR (Biosis 2024).

Assessment against trigger levels will require a program for monitoring collisions in specified years. This will entail a regime of searches for dead or injured birds and bats under turbines as detailed in Section 6.2.

Management actions are summarised in Section 8.1, and compliance against performance criteria are detailed in Section 6.2.

6.1 Ongoing operational monitoring

Ongoing monitoring would mirror the baseline surveys.

6.1.1 Bird surveys

Bird surveys should follow the methodology detailed in the BDAR (Biosis 2024) to ensure consistency with pre-construction surveys.

The BUS points will include a minimum of 16 impact survey points representative and randomised across all associated turbine risks, with a further 10 control sites located between 500 to 1500 metres from the development (and operational) footprint.

Optional interim bird survey program

Construction staging of the wind farm may result in clusters of turbines becoming operational at different times. During this period, bird surveys will be incrementally undertaken as more turbine clusters are fully constructed and commissioned. Where sites are not within turbine clusters, survey will commence once the full bird survey program is completed.

Where access to bird survey sites is not possible due to construction constraints, it is not advisable to replace established bird survey sites with alternative survey locations.

Operational bird survey program

Established survey points should be sampled in specified years after the commencement of all turbines becoming operational. Sampling should occur at a minimum in spring and summer/autumn when bird activity is likely to be highest. Details of the frequency of sampling would be developed in consultation with regulatory authorities.

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6.1.2 Microbat surveys

Microbat surveys will follow the methodology of the baseline surveys detailed in the BDAR (Biosis 2024).

The bat utilisation survey points will include a minimum of eight ultrasonic full-spectrum detectors, replicating existing survey locations in the northern, central and western zones of the development corridor, installed over 10 consecutive nights. Additionally, a further four control sites located between 500 to 1500 metres from the development (and operational) footprint would be installed. Baseline data collection will also include the recording of environmental variables such as wind speed, time, month, temperature, and precipitation to facilitate the development of SMART curtailment strategies for the project, if required.

Operational bat survey program

Bat surveys will be conducted in each season (summer, autumn, winter spring) in specified years after commencement of all turbines becoming operational. Details of the frequency of sampling would be developed in consultation with regulatory authorities.

The specific timing of bat surveys is not prescribed, to allow flexibility in targeting surveys around any prevailing weather or other constraints for at-risk species in consultation with NSW DCCEEW. Monitoring will be undertaken for up to 10 nights each survey period.

Ongoing monitoring of paired detectors at height and ground level will also continue for a minimum of two weeks per season. Detectors may also be installed on the hubs of selected turbines as part of the SMART curtailment program detailed in Section 5.2.1, if this is found to be a feasible and useful technology for the site.

6.2 Monitoring of turbine collisions

The following important principles have guided the design of studies described here:

- To the extent possible, they should be simple and minimise extraneous variables.
- In order to maximise their potential to meet stated objectives, they should obtain the largest sample sizes that are practicable.
- They must be able to be implemented safely without significantly compromising the routine operation and management of the wind farm.

The monitoring program set out here is designed to provide information about trigger levels and to inform estimates of total annual numbers of collisions, with associated confidence intervals, for all bird and bat species of concern.

Results of the study are intended to be used in calculating an annual estimate of total fatalities of species recorded, and to initiate adaptive management responses should any of the trigger levels detailed in Section 4.3 be met as a result of routine monitoring.

The results of monitoring will be used to assess the wind farm's annual performance relative to prescribed thresholds. Depending on the number of collisions detected, the study may also be able to provide information about variable usage of the site be different species.

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6.2.1 Carcass search method

Purpose-trained dogs have been shown to be highly efficient at detecting carcasses (Mathews et al. 2013) and have been used for this purpose at a number of wind farms in in Australia. Using purpose-trained dogs obviates the need for formal transects to be established in the search zones, as dogs use scent to detect carcasses and are permitted to roam to do so. Every dog will be fitted with a GPS tracking device while undertaking searches. GPS tracks will be downloaded and maintained for future reference and used for analyses of search effort and coverage. GIS maps showing routes taken by dogs will be made available to NSW DCCEEW on request. The use of trained dogs is the preferred method for searches and will be used, provided appropriately trained dogs and handlers are available and landholders allow dogs onto the wind farm. Dog handler(s) must have demonstrated capacity to identify bird and bat species relevant to the Murrumbidgee region.

However, if the use of dogs is not practicable or are unavailable for the project, the alternative is to engage suitably trained ecologists or environmental officers. Observers will search by walking transects through the search zones, generally equal to double the blade length (i.e., a 200 metre radius), and a repeated 100 metre (single blade length) pulse search of half the searched turbines. Searches will be undertaken by persons with demonstrated capacity to identify bird and bat species of NSW and relevant to the BBAMP area. Transects will be spaced 6 metres apart, or as near to 6 metres as is practical, and observers will thus search the ground for 3 metres either side of each transect. Each observer will carry a hand-held GPS unit and record transects they walk. GPS tracks will be downloaded and maintained for future reference and used for analyses of search effort and coverage. GIS maps showing transects walked will be made available to NSW DCCEEW on request.

A minimum of 50% of carcass searches will be undertaken by purpose-trained dogs, where possible, and authorised by landholders.

6.2.2 Fall zone and estimation for unsearchable zones

Hull and Muir (2010) provide the sizes of likely fall zones for different turbines and sizes of birds and bats based on ballistics theory. They note that distance from the base of a turbine is an important factor in dispersion of carcasses and that with increased distance the density of carcasses decreases. They provide modelled fall zones and radii for percentages of expected distribution for two size classes of birds and one for small bats. Huso and Dalthorp (2014) compared five estimators for the relationship of carcass density to distance from modern wind turbines. For all five estimators evaluated they found that density approached zero at about 70 metres horizontal distance from the turbine base.

The greatest capacity to detect carcasses is obtained from intensive searches of defined areas of the potential fall zones and the most valid estimates of mortality come from distance-based carcass-density models (Huso & Dalthorp 2014). Because the densities of carcasses diminish with horizontal distance from a turbine, searching of large areas including the outer extremities of potential fall zones were shown by those authors to add little to detection rates but to add very substantially and disproportionally to search effort. Hence, intensive searches of the portion of the fall zone in which the majority of carcasses will be found are the most effective and appropriate. The great majority of birds and bats that may be involved in turbine collisions are expected to be found within a radius of 70 metres of the bases of turbines, in this case it is estimated to be 100 metres.

Each turbine in the BBAMP area will have an approach road and a hardstand of approximately 5400 square metre area (90 metres by 60 metres). These clear areas will be readily searchable and searching them under all turbines in a given search regime (see Section 6.2.3, below) will introduce a uniformity to the search regime that would not otherwise be available. Therefore, the search program will be confined to

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coverage of these clear areas out to a distance of 200 m or up to twice the blade length from the base of each turbine. Under the majority of turbines the access road passes alongside the turbine and the searchable zone will thus extend out to a 200-metre distance in two directions along the road. Where a turbine is situated at the end of a road, the 200-metre distance will extend only along that distance of the approach road. The extent of the 200-metre radius from the base of each turbine will be permanently marked on relevant roadsides. Current peer-review methods will be used to extrapolate from the numbers of carcasses detected within the defined searchable areas under turbines to provide an estimate of the number of carcasses likely to have fallen within the entire fall-zone under each turbine.

The search program will include an inner search zone comprised of an area within a 100-metre radius of the turbine base (Figure 2). The outer search zone will encompass the area beyond the inner search zone, up to a 200-metre radius from the turbine base (Figure 2).

6.2.3 Turbines to be searched

All turbines would be subject to the carcass search regime across a two-month cycle. A two-month cycle is the search of all turbines split across a two-month period (i.e., 100 turbines in one month, the remaining 100 the following month).

6.2.4 Search duration and frequency

Interim carcass search program

Construction staging of the wind farm will result in clusters of turbines becoming operational at different times. There is likely to be an increased risk of turbine impacts to avifauna in the timeframe immediately following the commencement of commissioning of wind turbines, therefore incidental carcass searches must be undertaken during this time to monitor for these impacts.

The interim carcass search program will occur following completion of construction of turbine clusters, once all construction activities have been completed and exclusion areas have been removed, to allow safe access to turbines. Once the turbines are operational, an ecologist will undertake monthly inspections of turbines within each cluster, and incidental searches will be undertaken by site personnel and contractors following additional training.

The interim carcass search program will increase as more turbine clusters become operational, and continue until all turbines become operational, and the operational carcass search program below commences.

Although these searches are not as rigorous as the operational carcass search program, it is important that monitoring occurs as turbines are commissioned to ensure impacted fauna are recorded prior to the commencement of the operational carcass search program.

Operational carcass search program

The regime of carcass searching is outlined in Table 14 below and spans five years. Low risk turbines are to be searched for the first two years, with an additional three years for moderate and high risk turbines; commencing when all turbines are commissioned and become operational at the wind farm. It is important that monitoring occurs as turbines are commissioned as there is likely to be an increased risk of turbine impacts to avifauna in the timeframe immediately following the commencement of commissioning of wind turbines.

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At the completion of the first year of the monitoring program results will be collated and an interim report will be prepared. The results will be provided to NSW DCCEEW and in collaboration with NSW DCCEEW a determination will be made about any changes to search duration and/or frequency that might be made to improve effectiveness of the monitoring program.

At the conclusion of the three-year low risk turbine monitoring program and five-year moderate and high risk turbine monitoring program, and after analyses of results including the outcome of any mitigation measures implemented, a review will be undertaken in collaboration with NSW DCCEEW to inform any ongoing search requirements. Sampling frequency thereafter will be informed by a series of scavenger surveys and adaptive management.

A primary purpose of the search regime is to ascertain the frequency at which collisions occur. This is necessary for use in extrapolations to estimate total fatality rates. For this reason, the monthly regime of searches includes a pulse in which two searches are undertaken with a short interval between them. The rationale for this is that there is a high probability that a carcass found on the second search will have collided in the period since the preceding search. This method provides a sound empirical basis for estimation of total collisions from the number of carcasses detected. The recommended pulse search interval is a two-day interval. In each month when a turbine is to be searched, one search will be undertaken followed by a second search two days later.

The search regime will provide increased confidence in the tier alert triggers, to ensure the appropriate mitigation responses are initiated.

Table 14 Monitoring requirements for carcass searches

Turbines	Monitoring schedule
Pre-commissioning	
All operational turbines	• Monthly inspections by the project ecologist. • Incidental inspections by site personnel.
Following completion of construction and commencement of operation	
All	• Monthly for the first six months following commissioning of turbines, however must include the first spring/summer season following commissioning of turbines, and therefore may be extended in duration, including follow up pulse searches*.
Low risk	• Over a two-month cycle**, from six months up to three years following commissioning of relevant turbines, monthly searches in a randomised order including: - 200 m search area (outer search zone) around relevant turbines, with a follow up 100 m pulse search (inner search zone) of half the searched turbines (randomly selected) from October to March (6 events in total). - 200 m search area around relevant turbines, with no pulse searches required from April to September (6 events in total). • Two years following commissioning of relevant turbines, a review of sampling frequency will be undertaken to inform adaptive management.
Moderate and High risk	• Over a two-month cycle**, from six months to a minimum of five years following commissioning of relevant turbines, monthly searches in a randomised order including: - 200 m search area (outer search zone) around relevant turbines, with 100 m pulse searches* (inner search zone) of half the searched turbines (randomly selected). • From five years following commissioning of relevant turbines, sampling frequency thereafter will be informed by a series of scavenger surveys and adaptive management.

*A pulse search is a secondary search undertaken from three to seven days following the primary search to detect additional mortality of bats and birds.
** A two-month cycle is the search of all turbines split across a two-month period, prioritising moderate and high risk turbines

6.2.5 Carcass data collection and management

During all searches, all species of birds and bats detected as carcasses or as bird featherspots, will be recorded on a data pro forma designed for the purpose (see Appendix 3 and Appendix 4). A featherspot is any collection of five or more feathers found grouped together in a manner that suggests a bird has died at the location.

Ideally, data will be collected on-site using electronic tablets which will maximise efficiency in data management. All information, including metadata for each turbine search will also be recorded irrespective of whether a carcass is found during a given search. All data will be entered into a single (backed-up) database to be maintained by the wind farm operator. Raw data will be available to relevant regulatory authorities on request. The database must include information on carcasses collected during the search program as well as pertaining to incidental findings or injured fauna. Records of whether carcasses have been retained, disposed of or sent-off site would also be included.

On finding a carcass, it will be photographed in situ and its location will be logged using a portable GPS device. Carcasses of all taxa, whether species of concern or not, will be collected, labelled with relevant data details and frozen to permit any necessary investigations of cause of death and/or for use in future searcher efficiency or persistence trials. A freezer for this purpose will be available on-site. At the conclusion of the overall investigation, all specimens will be made available to the Australian Museum.

Retrieved carcasses of common species may be used later for scavenger trials and as the presence of human scent may influence scavenging rates, it is best to avoid direct human contact. Therefore, to avoid human scent being imparted to a carcass, and for WHS reasons, gloves must be worn when handling bird and bat carcasses.

Handling and collection of carcasses will be undertaken as follows:

- The carcass must be photographed *in situ* upon discovery.
- Following collection, the carcass must also be photographed in such a way that it can be further identified such as on a white background, adequate lighting, and an indication of scale. For bats, images taken dorsally, ventrally and laterally as well as images showing the outstretched wing, tail, feet, face and male genitalia will assist identification.
- The carcass must be removed from the site by a person wearing rubber gloves.
- The carcass must be placed in a plastic bag and clearly labelled with the date, turbine number, species name (if known) and a unique specimen code.
- The bagged specimen must be placed in a second bag containing the completed dead or injured bat data sheet (Appendix 4).
- The specimen will be transported to a freezer for further identification or storage for carcass persistence trials.

If featherspots or carcasses are not able to be identified by the field surveyor, additional confirmation should be sought if there is potential it could be a threatened species or would trigger a non-threatened species impact trigger. This may include sending photos or the carcass to a species specialist or museum, or DNA testing. If the uncertain carcass can be readily dismissed as a threatened species, a confidence level for the identification could be assigned such as 'likely' or 'probable'.

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At the conclusion of the carcass search program any carcasses of interest may be made available to a museum, used for carcass persistence trials at another location, or disposed of if deemed appropriate in consultation with NSW DCCEEW.

6.2.6 Carcass persistence trials

Carcasses of birds and bats that collide with turbines may be removed by scavengers or will ultimately disappear due to decomposition. Carcass persistence affects the detection of dead bats that collide with turbines and consequently influences estimation of the total number of fatalities for each species.

Trials to determine persistence time of carcasses are required to derive correction factors necessary to estimate total fatalities from the results of the carcass searches. Two persistence trials will be undertaken in each year of the monitoring regime (minimum of three years), one in spring and one in summer/autumn.

Remote cameras will be used to record persistence of carcasses placed on-site for the purpose. Carcasses for the trials will be sourced from bird and bat carcasses found at the site or from other local sources, where possible, such as road kills or other wind farms in the locality. It is vital that species used are representative of the bird and bat fauna of the BBAMP area, however, if the collection of carcasses is lower than the requirement for scavenger trial, carcasses will be supplemented with proxies in accordance with approval to be obtained from NPWS (Appendix 5) – **HOLD POINT**.

Carcasses used for trials will be individually marked to ensure they are not confused with collision carcasses. Data collected during carcass efficiency trials is to include:

- At the start of the trial period:
  - Carcass unique identification number.
  - Species.
  - Carcass size class.
  - Date and time of placement.
  - GPS coordinates.
  - Distance and direction to associated turbine.
  - Vegetation formation surrounding the potential fall zone.
- Throughout the trial period:
  - Date and time of the scavenger visit(s).
  - Presence or absence of the carcass.
  - Carcass condition (intact, partially scavenged, heavily scavenged).
  - Scavenger species (or probable scavenger).
  - Signs of scavengers in the area (e.g., tracks, scat).
  - Any changes to habitat or visibility.

An example data sheet is provided in Appendix 6.

Individual marking allows trial carcasses to be identified if they are simply moved by scavengers. Radio-frequency identification (RFID) microchips inserted into carcasses will be used to provide individual identification. Cameras used for the purpose will be set to take a photograph every hour (day and night) and also when triggered by movement and infrared. This method has been demonstrated in Victoria to be highly efficient and substantially reduces potential influence on scavengers, as may occur when human observers visit frequently to check carcasses. Cameras are deployed and left to operate for the duration of the trial as this entails substantially less effort than having people check carcasses daily. Cameras have the additional advantage of recording the precise time of carcass removal and the species of scavenger that removes a

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carcass. As a result of the precise documentation of the time of carcass removal there is no need to estimate the period of carcass persistence which is required when carcasses are checked only at an intervals of several days. Censored analysis will be required when carcasses persist beyond the trial period (Klein & Moeschberger 2010).

The field of view for the cameras is limited and scavengers can simply move a carcass out of that view. To check for this, each trial will commence approximately one week before the next routine search for carcasses.

In each trial, a total of 10 carcasses of birds and 10 carcasses of bats will be distributed under 20 randomly chosen turbines across the wind farm. Each trial will run for up to one month, but cameras will be checked after two weeks to confirm their operation and at that point the trial may be terminated if the carcass has been removed or a second carcass may be placed to increase the sample size of the trial.

The results of these trials will permit average carcass persistence times to be determined. The resulting persistence rates will be used in analyses to estimate total numbers of collisions.

6.2.7 Searcher efficiency trials

Searchers do not routinely find all carcasses, so it is necessary to ascertain the efficiency of searches to determine and apply appropriate correction factors for carcasses missed and therefore inform estimation of total collision mortality for species of concern.

Searcher efficiency trials will be conducted prior to construction and operation to ensure a suitable search efficiency can be achieved for ongoing searches.

The efficiency of each dog or person undertaking searches will be determined by the use of blind trials. Without the prior knowledge of searchers, a known number of bat carcasses will be placed within search plots prior to routine searches. Carcasses will be placed in sufficient numbers, at a range of turbines and over sufficient time to permit the rate of carcass detection to be adequately determined. After the trial, the person who placed the carcasses will collect any that have not been detected and document whether any carcasses have been scavenged to ensure accuracy of the searcher efficiency trial. The number and type of carcasses found during the searcher efficiency trials will be compared with the known number and type of carcasses placed under the turbines.

Data collected during carcass efficiency trials is to include:

- Date, time and duration of survey.
- Name and description of searcher(s) (dog and/or human).
- GPS tracklog of search path.
- Prevailing weather conditions (e.g., temperature, wind speed and direction).
- For each trial carcass used:
    - Carcass unique identification number.
    - Species (genus and species).
    - Carcass size class.
    - Carcass condition at placement (intact, partially scavenged and/or decomposed).
    - Date and time of placement.
    - GPS coordinates.
    - Distance and direction to associated wind turbine.
    - Vegetation formation within the potential fall zone.

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- Found or missed by the searcher.

An example data sheet for searcher efficiency trials is provided in Appendix 7.

Searcher efficiency trials will be undertaken in each year of the monitoring regime where search personnel change.

Carcasses for the trials will be sourced from bird and bat carcasses found at the site or from other local sources, where possible, such as road kills or other wind farms in the locality. It is vital that species used are representative of the bird and bat fauna of BBAMP area. Carcasses used for the purpose should be marked to ensure they are not confused with previously undetected collision carcasses, but in a manner that does not draw the attention of the searcher.

At any time that new search personnel or dogs are employed to undertake searches the rate of their detection ability must also be evaluated by a searcher efficiency trial as detailed herein.

6.2.8 Incidental finds of bird and bat carcasses

It is possible that during the life of the wind farm, bird and bat carcasses will be discovered incidentally by site personnel. Therefore, all site personnel will be trained on procedures for the event in which they encounter dead or injured birds and bats. Upon incidental discovery, carcasses and featherspots must be photographed in situ, however, the carcass or featherspot must be left where it was found to eliminate bias to detection rates of the official search regime. Any member of the site personnel who finds a carcass of a bird or bat must complete the relevant carcass data sheet (Appendix 4). Copies of carcass data sheets must be available on site for use by all site staff.

6.3 Injured birds and bats

Injured birds and bats may be encountered during carcass searches or incidentally. Handling injured birds and bats requires specialist skill as there is the risk of injury to both animals and people and there is potential for disease transmission in some cases. Injured birds and bats will only be handled by person(s) authorised under the BC Act. To reduce the risk associated with Australian Bat Lyssavirus, any injured bats must be handled only by people who have up-to-date rabies vaccination (an appropriate level of antibodies for the rabies virus, based on vaccination, is considered to offer the best available protection against Australian Bat Lyssavirus). The details of any injured birds and bats found will be recorded on a dead or injured bird and bat data sheet (Appendix 3 and Appendix 4).

Assistance with injured wildlife may be required from local wildlife carers and local relevant veterinarians. This ensures that arrangements are in place for acceptance and treatment of any injured birds or bats. Arrangement must be kept current and current telephone numbers for local carers must be readily available to all site personnel (e.g., on their mobile phones). Where an injured animal can be readily captured it should be placed into a tied calico bag or a box and kept in a quiet and dark location while it is transported to a veterinarian for treatment. No staff are to handle injured bats. In the event that an injured animal cannot be readily captured site personnel should telephone relevant local carers or suitably qualified ecologists for assistance.

A data sheet must be completed as per Section 6.2.8 for any bird or bat suspected to have collided with a wind turbine (see Appendix 3 and Appendix 4).

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6.4 Analyses of results

Trigger levels for management responses as defined in Section 4.3 for all species of concern will be determined directly from results of collision mortality searches.

Estimates of the annual total number of collision mortalities for all species of concern under Tier 2 and Tier 3 trigger levels will be undertaken using current best-practice science to account for searched areas; carcass persistence times and searcher efficiency rates. Along with the estimates, 95% CIs will be determined as a measure of variance around the estimates. Current best-practice for these analyses are provided by Huso et al. (2017) (see also Huso & Dalthorp (2014) and Dalthorp, Huso, & Dail (2017)). The analyses will be undertaken by a biometrician with a thorough understanding of the relevant science.

A report, including results and analyses, for each year of the study will be prepared and provided to NSW DCCEEW using the below calculation.

Trigger levels will be quantified as the:

- Mean number of detected strikes per species per turbine per annum.
- Total estimated number of strikes per species per turbine per annum, with 95% CI. Values will be calculated using all the necessary factors such as:
  - Proportion of turbines searched.
  - Portion of fall-zones searched.
  - Search frequency.
  - Average carcass persistence time.
  - Searcher efficiency rates.

The need for adjustments to the curtailment strategy will be determined through regular monitoring on the efficacy of the current strategy as set out in the methods above.

Potential updates include the adaptive management measures described in Section 7.

6.5 Reporting

Requirements for reporting of results and actions pertaining to this BBAMP are as set out in relevant sections above and summarised in Section 6.5. The Applicant will be responsible for submission of all relevant reports.

The Applicant is committed to sharing all monitoring data with NSW DCCEEW and Cth DCCEEW annually and for this information to be made publicly available on the project's website. The Applicant will do the following to ensure transparency in its operations including:

- Maintain a dedicated website about the project's compliance with the project's conditions of approval that is publicly available for the life of the approval. The webpage will include a copy of this plan, all monitoring results and documentation required under the conditions of approval and any other relevant information as directed by the approval authorities.
- Provide a copy of the documents published on the dedicated webpage to members of the public on request, within a reasonable timeframe.
- Maintain accurate records substantiating all activities associated with conditions of approval and this plan, including measures taken to implement the plan.
- Within three months of annual report approval, the report will be published on the project webpage.

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6.5.1 Impact trigger reporting

NSW DCCEEW and/or Cth DCCEEW must be notified within two working days when impact triggers are met (Section 7.2) where the species is threatened under the BC Act or EPBC Act or considered at-risk (Section 3.2). The qualified ecologist in collaboration with the Applicant would complete an investigation into likely causes of the trigger-level mortalities within 10 business days, and submit the results of this investigation to NSW DCCEEW within 10 business days of the investigation report being completed by the qualified ecologist. This would include:

- The impact trigger level that was reached and the relevant turbines at which it occurred.
- Details regarding the incident, including:
  - Type of find (incidental or formal monitoring, human, dog).
  - Detection date.
  - Turbine number.
  - Distance from tower base.
  - GPS Coordinates.
  - Species.
  - Age (juvenile or adult) and sex.
  - Number of carcasses detected.
  - Map showing the strike location in relation to turbine.
  - Photographs of the carcass/featherspots.
- A discussion of the identified operational, land management, or ecological factors (environmental and seasonal) contributing to the impact trigger and an assessment on whether the event is likely to be rare or regular and the risk of the event constituting an adverse impact on the species at either a local or total population scale.
- A discussion on any proposed management interventions including rationale for selection of mitigation measures, timing and duration of implementation, and any monitoring that will be implemented to measure their effectiveness.
- Where no management interventions are proposed, justification for this must be provided.

6.5.2 Annual reports

Following each year of the monitoring program described in Section 6, the program findings will be compiled into an annual report and submitted to the Planning Secretary and NSW DCCEEW, and/or the Environment Minster and Cth DCCEEW within three months of survey completion. The report will include, but not be limited to:

- Results of the ongoing operational monitoring program for birds and microbats (Section 6.1). This will include a summary of survey effort and methodology, data analysis and a discussion of the findings of the surveys including comparisons with baseline data and interpretation of the findings in the context of prevailing environmental conditions.
- Results of carcass persistence trials (Section 6.2.6) or searcher efficiency trials (Section 6.2.7) undertaken and commentary on the implications for the carcass search monitoring program (Section 6.2).
- Results of the carcass search monitoring program (Section 6.2) including:
  - Total number, dates recorded and locations of carcasses/featherspots detected of each species.
  - Details of any carcass/featherspot detections that triggered Tier 1, Tier 2 and Tier 3 alerts.

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    - Statistical analysis that provides estimates of the annual total number of collisions for each species, taking into account search area, effort, persistence times and detectability rates.
- Summary of any injured wildlife recorded (Section 6.3) and outcomes.
- Maps showing mortality monitoring undertaken (Section 6.2), turbine layout, associated risk category, turbines monitored (including areas subject to higher frequency monitoring), and searcher coverage of all fall zones (GPS tracks).
- If implemented, description of any mitigation measures (Section 7.1) including the nature, timing and duration of these measures and the results of any monitoring to determine their effectiveness, and commentary on their success or otherwise.
- Summary of any correspondence with NSW DCCEEW and/or Cth DCCEEW including any directions issued by either department on mitigation measures to be implemented.
- Discussion of environmental factors or significant events that may have influenced data collection (e.g., significant weather events such as drought or flooding).
- A record of all activities associated with conditions of approval and this plan, including measures taken to implement the plan.
- Information about whether the outcomes of this plan have been or are on track to being met.

6.5.3 BBAMP review

The BBAMP will be in accordance with any conditions of development consent.

The BBAMP will be reviewed in response to:

- Submission of relevant reporting (Section 6.5.1 and 6.5.2).
- Modification to the conditions of the Development Consent.

BBAMP reviews should consider the following:

- Ongoing process improvement and incorporation of new technology.
- Target species risk assessment updates based on actual turbine strike impacts, including monitoring data and incidental species sightings.
- Analysis of flight paths and habitat predictions and collisions to date compared against actual turbine strike impacts to date, including monitoring data and incidental species sightings.
- Re-analysis of individual turbine strike risk, including justification for any proposed changes to risk ratings.
- Improvements to the monitoring program including methods.
- Adjustments to impact thresholds and adaptive management plans.
- Unforeseen limitations and issues during operation.
- The results from event-based monitoring (i.e., after floods or wet periods where increased bird and bat activity may be observed).

Where the review results in the revision to the BBAMP, consultation with NSW DCCEEW and Cth DCCEEW will be undertaken as relevant and the revised document will be submitted to the Planning Secretary and Cth DCCEEW for approval prior to its implementation.

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Once approved, a copy of the revised document will be published on the project website.

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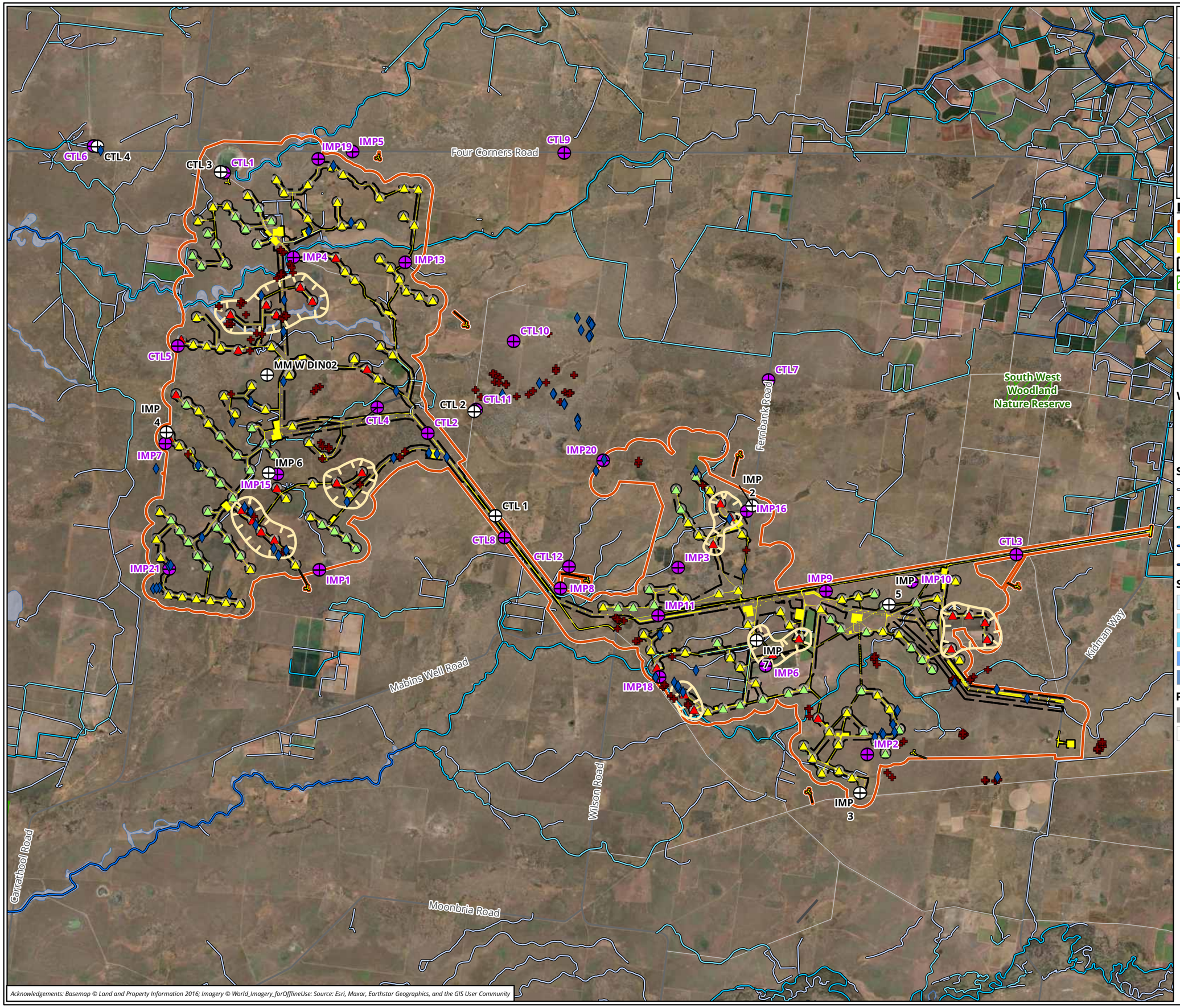


Figure 2.1 BBAMP area monitoring and management

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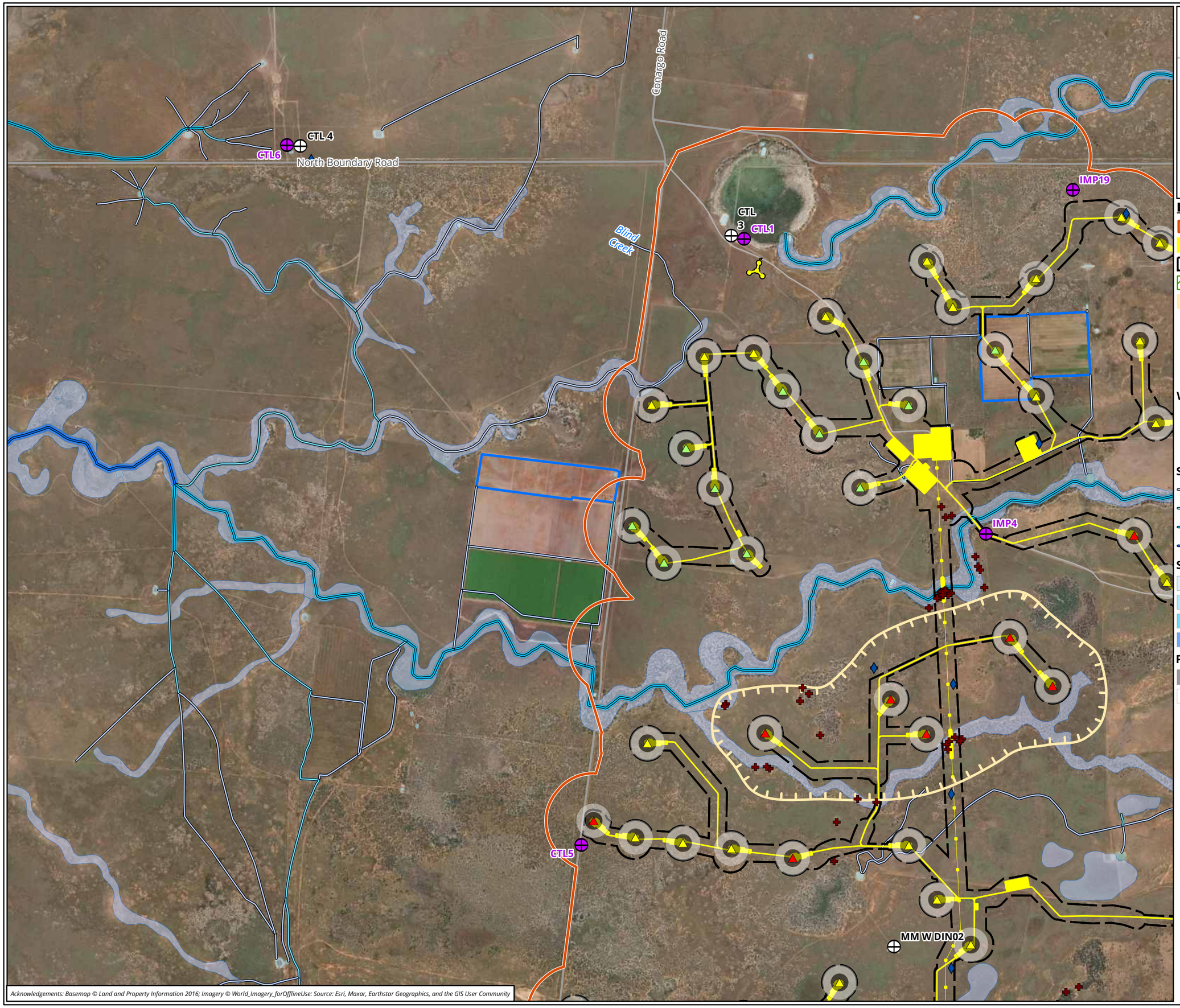
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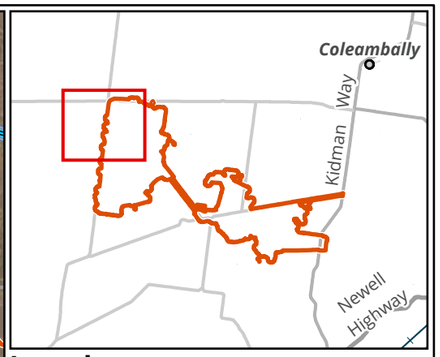
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Layout: 41170_BBAMP_F2_BBAMPArea_Monitoring

Acknowledgements: Basemap © Land and Property Information 2016; Imagery © World_Imagery_forOfflineUse: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community





Legend

- Subject land
- Development footprint
- Development corridor
- National Park/Reserve
- Turbine management clusters
- Stick nest
- Hollow-bearing trees
- Bat utilisation survey point
- Bird utilisation survey point

Wind turbine constraint

- High
- Moderate
- Low

Strahler stream order

- 1
- 2
- 3
- 4

Strahler stream order buffers

- 1
- 2
- 3
- 4

Potential fall zone

- Inner search zone
- Outer search zone

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Figure 2.2 BBAMP area monitoring and management

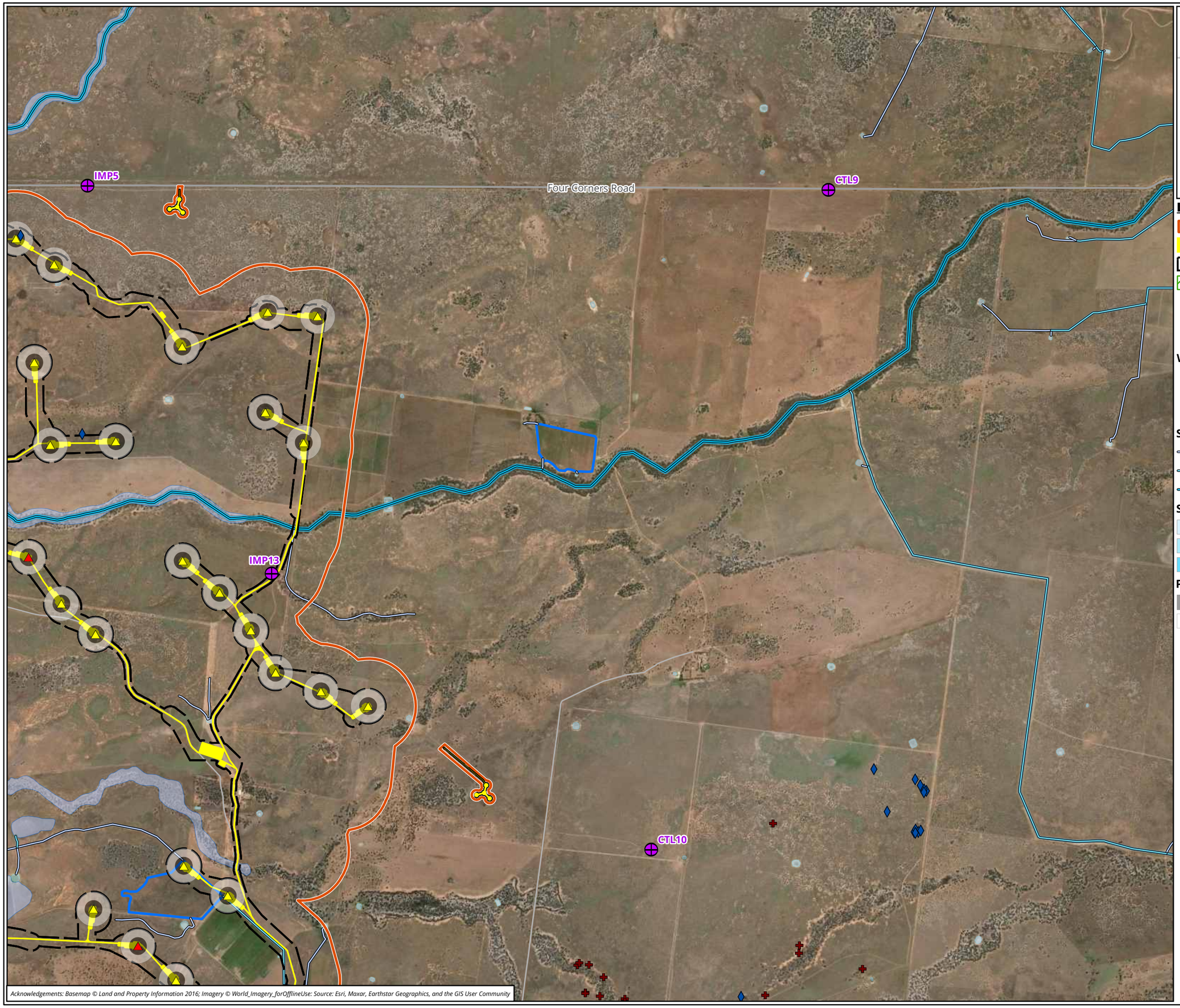
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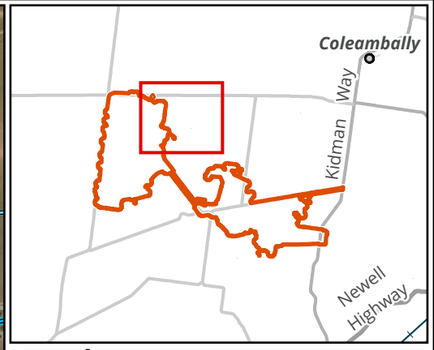
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Legend

- Subject land
- Development footprint
- Development corridor
- National Park/Reserve
- Stick nest
- Hollow-bearing trees
- Bird utilisation survey point

Wind turbine constraint

- High
- Moderate
- Low

Strahler stream order

- 1
- 2
- 3

Strahler stream order buffers

- 1
- 2
- 3

Potential fall zone

- Inner search zone
- Outer search zone

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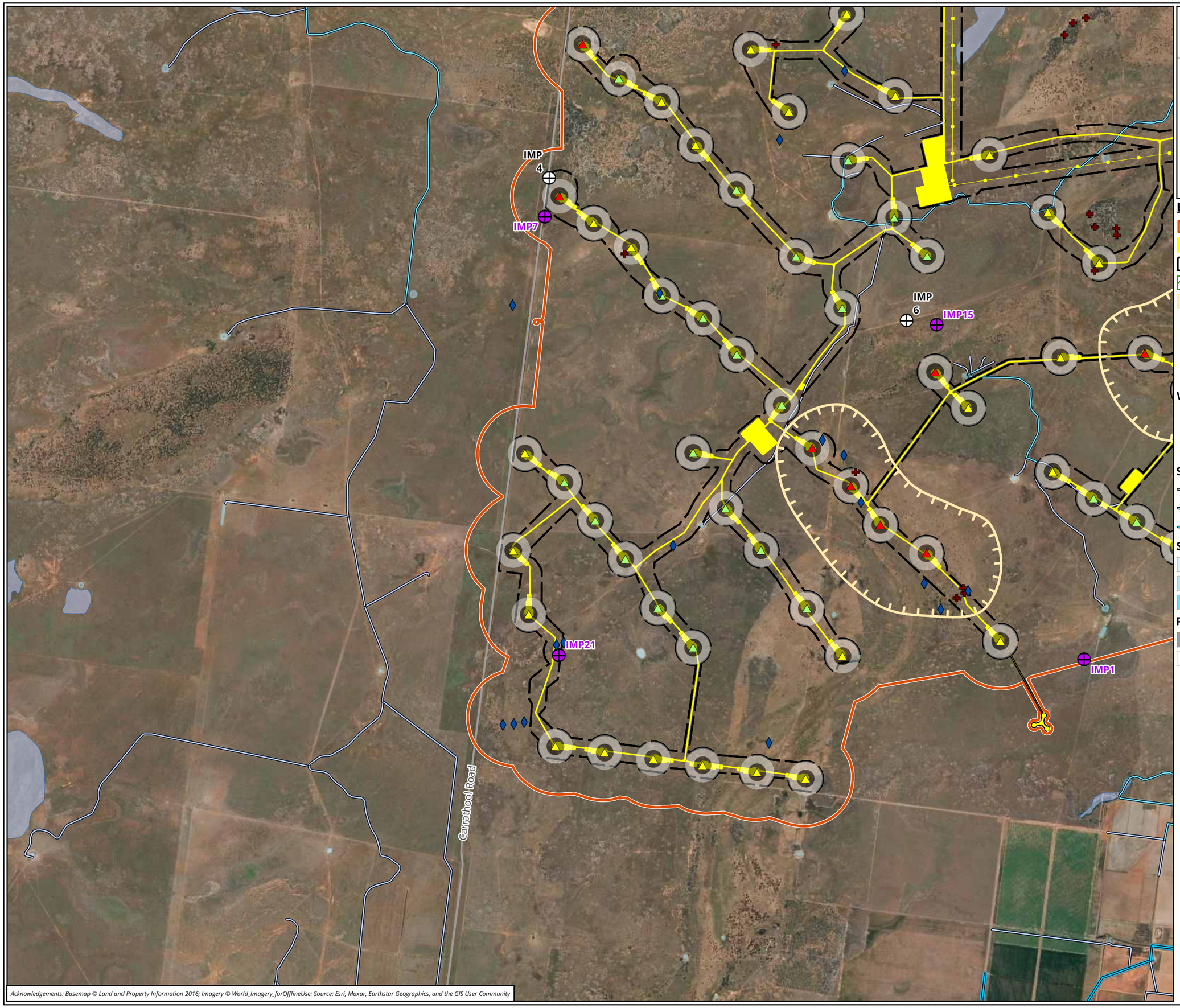
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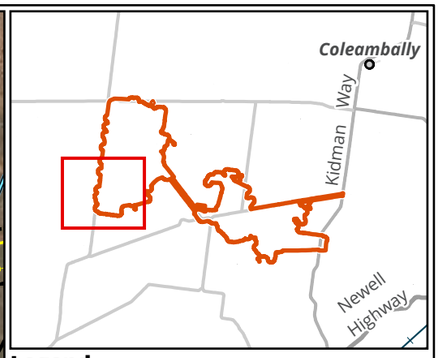
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Legend

- Subject land
- Development footprint
- Development corridor
- National Park/Reserve
- Turbine management clusters
- Stick nest
- Hollow-bearing trees
- Bat utilisation survey point
- Bird utilisation survey point

Wind turbine constraint

- High
- Moderate
- Low

Strahler stream order

- 1
- 2
- 3

Strahler stream order buffers

- 1
- 2
- 3

Potential fall zone

- Inner search zone
- Outer search zone

Figure 2.4 BBAMP area monitoring and management

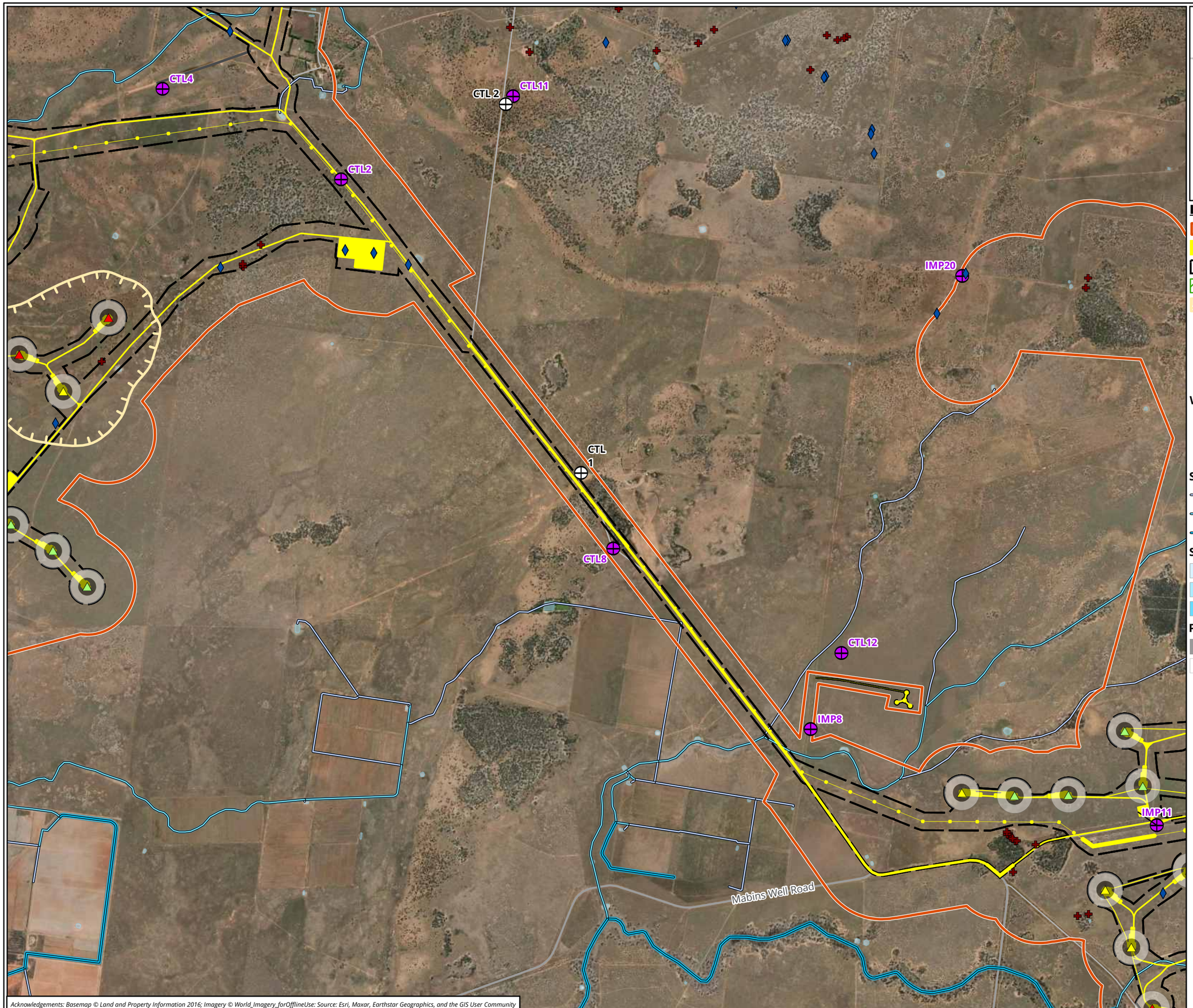
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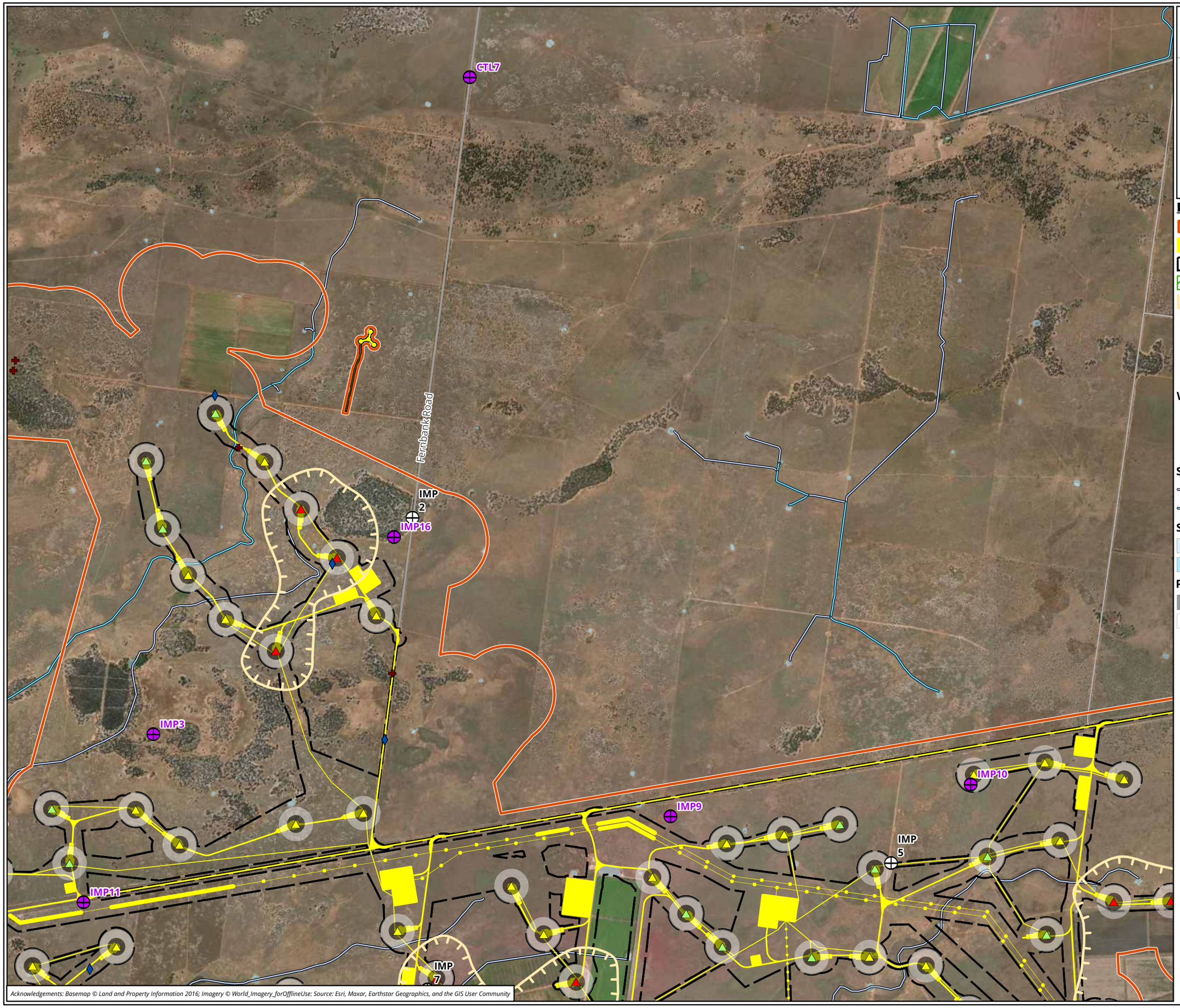
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Figure 2.5 BBAMP area monitoring and management

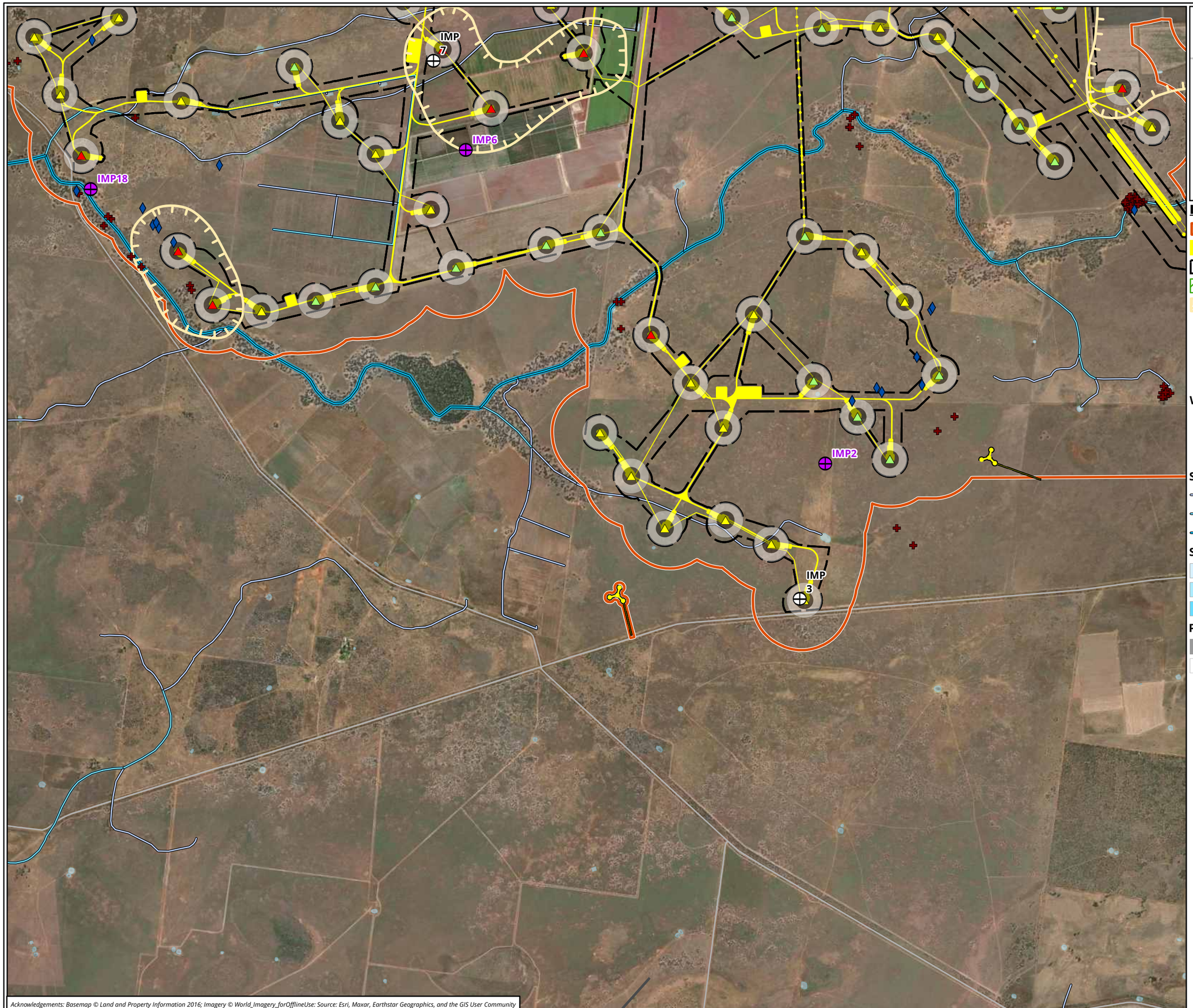
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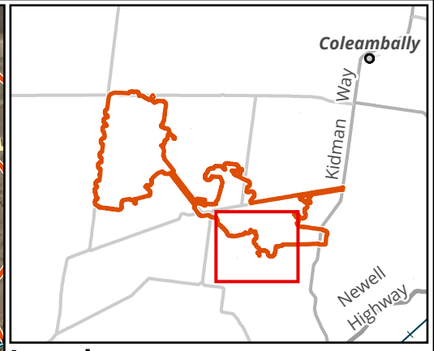


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Figure 2.6 BBAMP area monitoring and management

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Legend

- Subject land
- Development footprint
- Development corridor
- National Park/Reserve
- Turbine management clusters
- Stick nest
- Hollow-bearing trees
- Bat utilisation survey point
- Bird utilisation survey point

Wind turbine constraint

- High
- Moderate
- Low

Strahler stream order

- 1
- 2
- 3

Strahler stream order buffers

- 1
- 2
- 3

Potential fall zone

- Inner search zone
- Outer search zone

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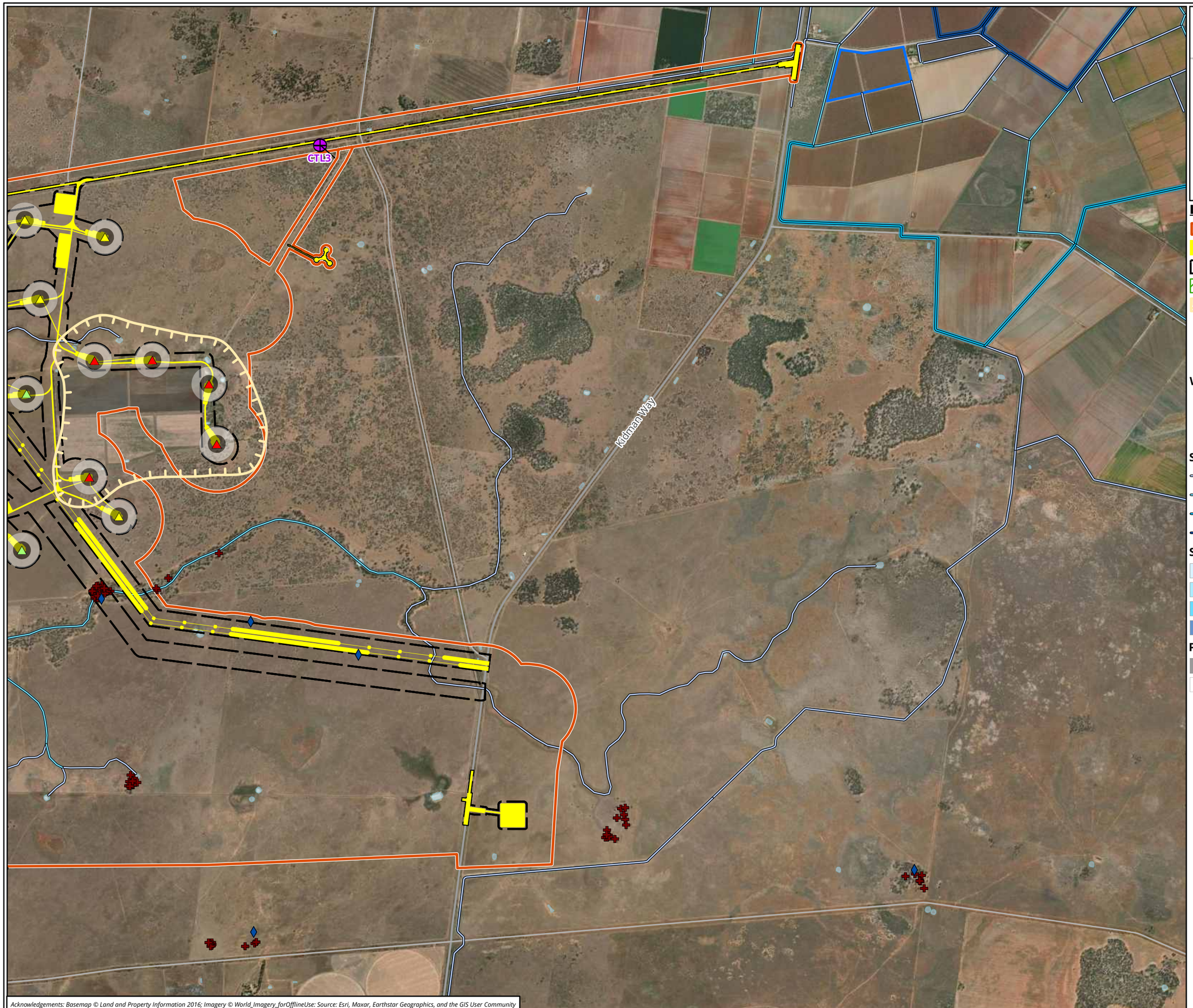
Figure 2.7 BBAMP area monitoring and management

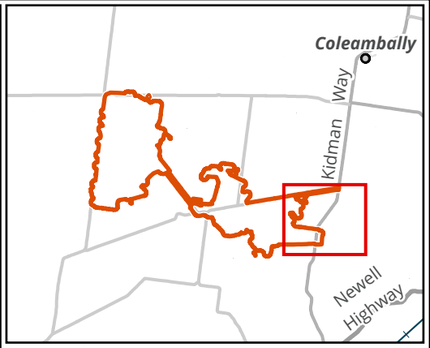
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Legend

- Subject land
- Development footprint
- Development corridor
- National Park/Reserve
- Turbine management clusters
- Stick nest
- Hollow-bearing trees
- Bird utilisation survey point

Wind turbine constraint

- High
- Moderate
- Low

Strahler stream order

- 1
- 2
- 3
- 5

Strahler stream order buffers

- 1
- 2
- 3
- 5

Potential fall zone

- Inner search zone
- Outer search zone

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Figure 2.8 BBAMP area monitoring and management

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7 Adaptive management measures and corrective actions

A detailed decision framework has been developed for triggers and mitigation (in conjunction with the below mitigation framework) associated with both the threatened and non-threatened at-risk species, which will be finalised prior to commissioning of turbines.

It is not feasible to foresee all potential factors that might lead to an unexpectedly high level of collisions by any species, and therefore appropriate mitigation measures can be prepared only if a cause, or causes, of ecologically significant impacts on the relevant species is known. Additionally, flexibility in mitigation shall be designed to encourage innovative and new technologies be implemented over the operational life of the wind farm where appropriate.

Broad categories of potential causes of heightened collision risk may include the following:

- Agricultural practices, such as feeding of grain to stock, burning stubble that attracts raptors, that may result in concentrations of birds in proximity of turbines.
- Control of pest animals and management of stock and large animal carcasses.
- Seasonal nesting or roosting in proximity of turbines.
- Periodic environmental conditions such as localised high densities of natural food sources or availability of surface water and wetland filling from flooding or local rainfall.

If a trigger level of collisions is detected and it can be attributed to a cause such as one of these, then an appropriate management action may be feasible. Shut-down of turbines will be last resort, but may be used in the short-term if a particular turbine is involved and the cause is likely to resolve itself, for example once a nesting event finishes. If a cause is not readily apparent, then investigation of the reason(s) for the impact must be undertaken prior to proposal of a mitigation strategy. Advice from NSW DCCEEW will be sought with regard to design and implementation of any such investigations and of an ultimate mitigation strategy, if required. NSW DCCEEW will be notified within two working days of determination by the Applicant or the contracted qualified ecologist that a trigger level or unacceptable impact for any species of concern is detected, as described in Section 4.3.

There is a range of management options that could be considered depending on the species involved, whether the cause of the collision can be identified, and the likely duration of the heightened collision risk. To allow maximum flexibility of management responses, consistent with an adaptive management approach, a suite of potential mitigation and management options have been detailed below. The feasibility of each option would be considered in consultation with the project ecologist, the Applicant, NSW DCCEEW and/or Cth DCCCEEW. Technological advances during the lifetime of the wind farm may also provide additional mitigation measures not listed below, and the BBAMP does not limit the consideration of such mitigation measures. Novel measures should be considered in response to specific requirements and based on the current technologies at the time of the impact.

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7.1 Mitigation and adaptive management measures

Increased monitoring (daily carcass searches) of relevant turbines would be implemented for a seven-day period following a Tier 1 alert to determine if the event was a one-off event, or a potential ongoing event.

Increased daily carcass searches for 14 days following discovery of a Tier 2 or Tier 3 trigger, would be implemented for a four-week period following a Tier 2 or Tier 3 alert to determine if the event was a one-off event, or a potential ongoing event. This would be undertaken by a suitably trained ecologist, environmental advisor and/or detector dog services. Additional search effort should occur across the wind farm, not just at the turbine relevant to a trigger, to determine if the event is likely to be a localised impact or more widespread.

Increased monitoring and carcass searches may also be appropriate as part of a testing and monitoring program in response to the implementation of any of the below management measures to determine their effectiveness in reducing collisions. The timing, frequency and duration of increased monitoring would be determined in response to the species of concern and proposed mitigation measure.

Mitigation and adaptive management options could include one or several of the following.

7.1.1 Acoustic and ultrasonic deterrents

Methods intended to deter birds and bats from approaching wind turbines have been trialled overseas. Due to the experimental nature of these possible deterrent techniques, details of their implementation are difficult to prescribe. Particular technology and devices to be used would be assessed at the time of impact, and the appropriateness of current technology would be made in consultation with NSW DCCEEW and/or Cth DCCEEW. A testing, implementation and monitoring program for the use of acoustic and/or ultrasonic deterrents would be developed.

7.1.2 Transmission line warning markers

Transmission line warning markers allow birds to visualise transmission lines during flight. Installation of marker balls, flags or rotating markers would be considered along sections of the transmission lines where avian impact triggers are recorded.

7.1.3 Installation of additional IDF units

The feasibility for installation of IDF units will be investigated as part of the preventative mitigation measures in Section 5. If installed successfully at the site, additional units could be considered in areas determined to have a higher collision risk as a result of carcass searches to improve options for curtailment in response to the presence of species at risk.

7.1.4 Installation of additional SMART curtailment systems

The feasibility for installation of SMART curtailment systems will be investigated as part of the preventative mitigation measures in Section 5. If installed successfully at the site, additional units could be considered in areas determined to have a higher collision risk as a result of carcass searches to improve options for curtailment in response to the presence of species or activity levels presenting increased risk.

7.1.5 Altered land management practices

Land management practices could be modified to reduce attraction of species to the wind farm area. A review of land management practices in close proximity to wind turbines (within 200 metres) could include

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removing lambs and lambing ewes, raptor perch management, prompt carcass removal, reduction of grain stock feeding, exclude stubble burning that attracts raptors and relocation of farm dams/watering points. Consultation with and agreement from landowners would need to be sought.

7.1.6 Altering wind turbine cut-in speeds

A testing and monitoring program to alter cut-in speeds could be implemented to assess whether increased cut-in speeds are a useful means of reducing collisions and subsequent impacts to fauna. This program would be specific to turbines where Tier 2 or Tier 3 alerts are recorded, but would be designed to be scalable if required. The program would be prepared in consultation with NSW DCCEEW and/or Cth DCCEEW. Adjusting the risk-rating of turbines could be considered if appropriate.

7.1.7 Lighting management

Lighting may play a role in both attracting and/or deterring various species (Section 5.5). Lighting management could be investigated as a mitigation response to managing collision risk on a species-specific basis.

7.1.8 Modification of SMART curtailment system

The triggers for the SMART curtailment system have been developed based on pre-construction site-specific baseline data collection. If during operation, it is found that the prescribed triggers are not suitable for reducing incidence of collisions, these could be adjusted. A testing and monitoring program could be implemented to assess whether changes to the thresholds for bat activity, temperature and/or wind speed are a useful means of reducing collisions and subsequent impacts to fauna. This program would be specific to turbines where Tier 2 or Tier 3 alerts are recorded but would be designed to be scalable if required. The program would be prepared in consultation with NSW DCCEEW and/or Cth DCCEEW.

7.1.9 Temporary shutdown of turbines

Temporary wind turbine shutdowns would be utilised under the following circumstances:

- Periods of low visibility (fog), if it were suspected that fog was the cause of documented collisions.
- Short-term seasonal shutdowns based on migratory periods, ephemeral wetland flood events / wetland filling, or nesting events (for example in the case of at-risk species or threatened species nesting within 200 m of a turbine, the nesting event will be allowed to occur, with increased monitoring and/or temporary curtailment).
- Following a Tier 2 or Tier 3 alert where there is a delay in getting the necessary personnel to site to undertake increased turbine monitoring.

Longer periods of turbine shutdown would be considered and implemented as a last resort option if implementation of the above or other mitigation measures do not result in a reduction to the occurrence of Tier 2 or Tier 3 impact triggers at a particular turbine such that there was a risk of unacceptable impact to a particular species considered likely.

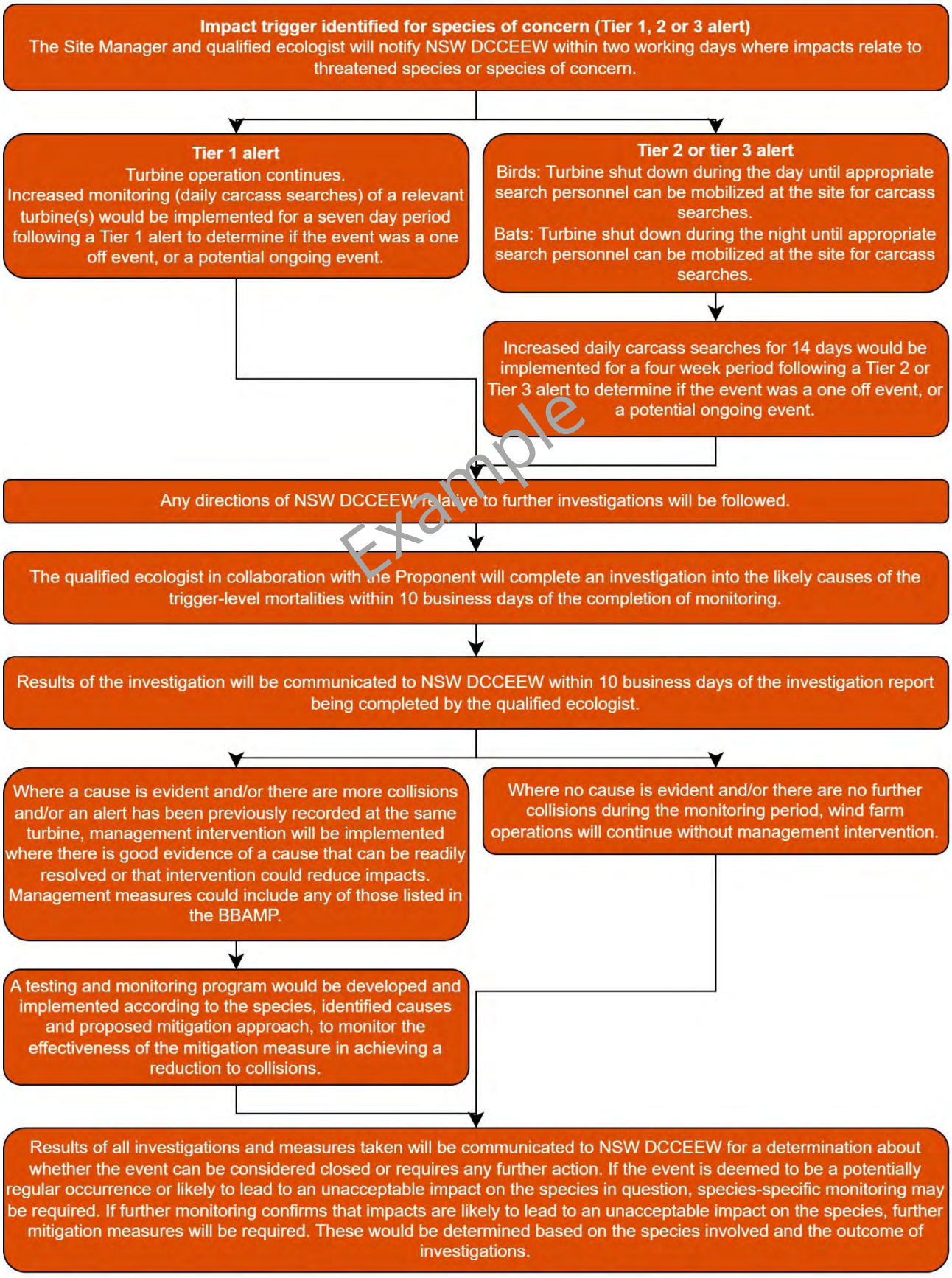
7.2 Trigger Action Response Plan

The diagram below (Graph 2) sets out an example adaptive response process that could be implemented in the event that detected mortality exceeds the trigger levels in Section 4. The adaptive response process for

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responding to impact triggers must be adhered to for the operational life of the wind farm, unless otherwise determined through the BBAMP review process or consultation with NSW DCCEEW and/or Cth DCCEEW.

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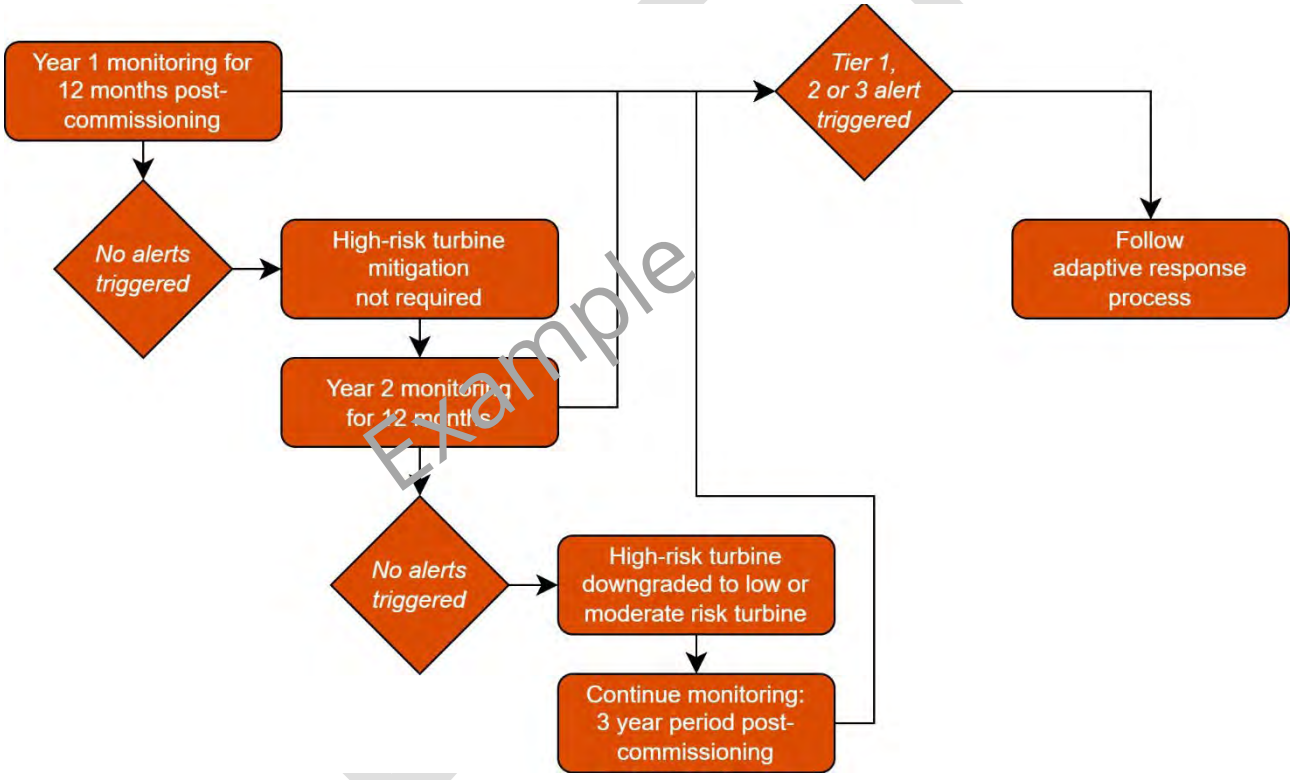


Graph 2 An example adaptive management plan in the event of reaching a trigger-level

7.3 Adaptive management for decreasing mitigation and monitoring

The BBAMP makes provisions for the turbine risk ratings determined during the turbine risk assessment (Section 3.3) to be reviewed, and the mitigation and monitoring requirements adjusted depending on the actual impacts recorded at each turbine.

The BBAMP provides a mechanism allowing a reduction in the level of mitigation and monitoring if sufficient evidence can be provided that it is safe to do so. Such evidence may include few, to no, recorded bird/bat strikes at a given turbine, combined with a comparison to the results of a trial period of reduced mitigation but continued monitoring to measure impacts. As such, turbines currently assessed as low risk of impact may have their risk upgraded in the future if impacts are above expected based on monitoring results, or those turbines currently considered to present a high to very-high risk of impacts may have mitigation and monitoring requirements reduced. All such changes would be guided by the monitoring and adaptive management processes outlined in the BBAMP. Graph 3 below provides a framework for adjusting the turbine risk ratings according to the alerts recorded during the first three years of monitoring described in Section 6.2.



Example

Graph 3 Framework for adjusting the turbine risk ratings according to the alerts recorded during monitoring

7.4 Residual prescribed impacts and compensatory measures

Following implementation of required mitigation, additional offset requirements for prescribed impacts may be required to offset residual impacts in accordance with the BAM (DPIE 2020). This may be achieved via the retiring of credits or payment to the NSW Biodiversity Conservation Fund. The amount of credits required to be offset would be calculated by the number of actual and modelled impacts, accounting for scavenger impacts, to individual species in a given year, multiplied by the biodiversity risk weighting (BRW) for the

relevant species. This method is commensurate with the Equation 3 (Section 10.1.3) of the BAM (DPIE 2020) for calculating species credit requirements for flora species assessed by a count of the number of individuals, which is aligned with the calculation of offsets required for impacts to individual bird and bat strikes. This method also captures the relevance of a current threatened listing for a species, and is in accordance with the expectations of BAM (DPIE 2020) for implementation for prescribed impacts (Section 8.6 of the BAM).

Where an unacceptable impact to a non-threatened 'at risk' species be encountered or estimated, following mitigation, then a like for like risk weighting may be applied from a similar threatened species (i.e., Wedge-tailed Eagle to Little Eagle *Hieraaetus morphnoides*) following consultation with NSW DCCEEW. Any credit generation required to offset residual prescribed impacts would be calculated during the annual reporting, which will also demonstrate that credits required for the preceding 12 months have been retired under the NSW Biodiversity Offsets Scheme (BOS). Credits would be retired or payments made within three months of submission of the annual report.

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8 Management actions

8.1 Summary of management actions

Management actions required under the BBAMP are summarised in Appendix 8.

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Appendices

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Appendix 1 Qualitative assessment of turbine collision risk

Appendix 1.1 Qualitative assessment of turbine collision risk for birds

Table A 1 Qualitative assessment of turbine collision risk and indirect / barrier effect for birds

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Collared Sparrowhawk	*Accipiter cirrocephalus*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
Brown Goshawk	*Accipiter fasciatus*	-	-	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is not listed as threatened under the EPBC Act or BC Act.	Likely	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Common Sandpiper	*Actitis hypoleucos*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Australian Owlet-nightjar	*Aegotheles cristatus*	-	-	This species has been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Grey Teal	*Anas gracilis*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
Pacific Black Duck	*Anas superciliosa*	-	-	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly	Unlikely	Negligible	Negligible	Negligible

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Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				at RSA height. No flights within RSA have been recorded within the BBAMP area for this species, however flights above RSA have been recorded and therefore there is potential for the species to move between RSA. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Magpie Goose	*Anseranas semipalmata*	-	VU	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the BC Act.	Rare	Minimal	Negligible	Negligible
Fork-tailed Swift	*Apus pacificus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is a listed migratory species under the EPBC Act. This species is not listed as threatened under the EPBC Act or BC Act.	Possible	Minimal	Low	Low
Wedge-tailed Eagle	*Aquila audax*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying	Probable	Moderate	High	Low

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				at RSA height during BUS for the project. Turbine collisions have been reported for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is not listed as threatened under the EPBC Act or BC Act.				
Eastern Great Egret	*Ardea alba modesta*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
Intermediate Egret	*Ardea intermedia*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
White-necked Heron	*Ardea pacifica*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. There have been no recorded collisions with wind turbines for	Likely	Minimal	Low	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Australian Bustard	*Ardeotis australis*	-	EN	This species has not been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the BC Act.	Rare	Negligible	Negligible	Negligible
Black-faced Woodswallow	*Artamus cinereus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Dusky Woodswallow	*Artamus cyanopterus cyanopterus*	-	VU	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the BC Act.	Unlikely	Minimal	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
White-breasted Woodswallow	*Artamus leucorynchus*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Masked Woodswallow	*Artamus personatus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Likely	Negligible	Negligible	Negligible
White-browed Woodswallow	*Artamus superciliosus*	-	-	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Hardhead	*Aythya australis*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly	Unlikely	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Australian Ringneck	*Barnardius zonarius*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
Musk Duck	*Biziura lobata*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Australasian Bittern	*Botaurus poiciloptilus*	EN	EN	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind	Unlikely	Moderate	Low	Low

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				turbines for this species in NSW. This species is listed as threatened under the EPBC Act and BC Act.				
Eastern Cattle Egret	*Bubulcus coromandus*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Likely	Negligible	Negligible	Negligible
Sulphur-crested Cockatoo	*Cacatua galerita*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Little Corella	*Cacatua sanguinea*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Long-billed Corella	*Cacatua tenuirostris*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
Sharp-tailed Sandpiper	*Calidris acuminata*	VU	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is a listed migratory species under the EPBC Act. This species is listed as threatened under the EPBC Act.	Rare	Negligible	Negligible	Negligible
Curlew Sandpiper	*Calidris ferruginea*	CE	CE	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is a listed migratory species under the EPBC Act. This species is listed as threatened under the EPBC Act and BC Act.	Rare	Negligible	Negligible	Negligible
Pectoral Sandpiper	*Calidris melanotos*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species.	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
South-eastern Glossy Black-Cockatoo	*Calyptorhynchus lathami*	VU	VU, E2	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the EPBC Act and BC Act.	Rare	Minimal	Negligible	Negligible
Red-capped Plover	*Charadrius ruficapillus*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Australian Wood Duck	*Chenonetta jubata*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Likely	Minimal	Low	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Whiskered Tern	*Chlidonias hybrida*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
Swamp Harrier	*Circus approximans*	-	-	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Spotted Harrier	*Circus assimilis*	-	VU	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. Turbine collisions have been reported for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is listed as threatened under the BC Act.	Possible	Minimal	Low	Low

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Australian Raven	*Corvus coronoides*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Probable	Minimal	Low	Negligible
Little Raven	*Corvus mellori*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
Black Swan	*Cygnus atratus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Laughing Kookaburra	*Dacelo novaeguineae*	-	-	This species has been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been	Rare	Negligible	Negligible	Negligible

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Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Wandering Whistling-Duck	*Dendrocygna arcuata*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
Plumed Whistling-Duck	*Dendrocygna eytoni*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Possible	Minimal	Low	Negligible
Little Egret	*Egretta garzetta*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread	Likely	Minimal	Low	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
White-faced Heron	*Egretta novaehollandiae*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Likely	Minimal	Low	Negligible
Black-shouldered Kite	*Elanus axillaris*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. Turbine collisions have been reported for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is not listed as threatened under the EPBC Act or BC Act.	Probable	Moderate	High	Low
Letter-winged Kite	*Elanus scriptus*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern	Rare	Moderate	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				Australia. This species is not listed as threatened under the EPBC Act or BC Act.				
Galah	*Eolophus roseicapilla*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Possible	Minimal	Low	Negligible
White-fronted Chat	*Epthianura albifrons*	-	VU, E2	This species has been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the BC Act.	Unlikely	Minimal	Negligible	Negligible
Dollarbird	*Eurystomus orientalis*	-	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Brown Falcon	*Falco berigora*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly	Probable	Minimal	Low	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				at RSA height. This species has been recorded flying at RSA height during BUS for the project. Turbine collisions have been reported for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is not listed as threatened under the EPBC Act or BC Act.				
Nankeen Kestrel	*Falco cenchroides*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. Turbine collisions have been reported for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is not listed as threatened under the EPBC Act or BC Act.	Probable	Moderate	High	Low
Grey Falcon	*Falco hypoleucos*	VU	VU	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is listed as threatened under the EPBC Act and BC Act.	Rare	Moderate	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Australian Hobby	*Falco longipennis*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Peregrine Falcon	*Falco peregrinus*	-	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Black Falcon	*Falco subniger*	-	VU	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. Turbine collisions have been reported for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is listed as threatened under the BC Act.	Likely	Moderate	Moderate	Low

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Latham's Snipe	*Gallinago hardwickii*	VU	VU	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is a listed migratory species under the EPBC Act. This species is listed as threatened under the EPBC Act and BC Act.	Rare	Negligible	Negligible	Negligible
Dusky Moorhen	*Gallinula tenebrosa*	-	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Gull-billed Tern	*Gelochelidon nilotica*	-	-	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is a listed migratory species under the EPBC Act. This species	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				is not listed as threatened under the EPBC Act or BC Act.				
Little Lorikeet	*Glossopsitta pusilla*	-	VU	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the BC Act.	Rare	Negligible	Negligible	Negligible
Painted Honeyeater	*Grantiella picta*	VU	VU	This species has been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the EPBC Act and BC Act.	Unlikely	Minimal	Negligible	Negligible
Brolga	*Grus rubicunda*	-	VU	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the BC Act.	Unlikely	Minimal	Negligible	Negligible
Australian Magpie	*Gymnorhina tibicen*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this	Probable	Minimal	Low	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	-	VU	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is listed as threatened under the BC Act.	Unlikely	Negligible	Negligible	Negligible
Whistling Kite	*Haliastur sphenurus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. Turbine collisions have been reported for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is not listed as threatened under the EPBC Act or BC Act.	Possible	Minimal	Low	Negligible
Little Eagle	*Hieraaetus morphnoides*	-	VU	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species.	Unlikely	Minimal	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				There have been no recorded collisions with wind turbines for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is listed as threatened under the BC Act.				
Black-winged Stilt	*Himantopus himantopus*	-	-	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
White-throated Needletail	*Hirundapus caudacutus*	VU	VU	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. This species is a listed migratory species under the EPBC Act. This species is listed as threatened under the EPBC Act and BC Act.	Rare	Negligible	Negligible	Negligible
Welcome Swallow	*Hirundo neoxena neoxena*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind	Unlikely	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Caspian Tern	*Hydroprogne caspia*	-	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is a listed migratory species under the EPBC Act. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
Swift Parrot	*Lathamus discolor*	CE	EN	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the EPBC Act and BC Act.	Rare	Negligible	Negligible	Negligible
Black-tailed Godwit	*Limosa limosa*	EN	VU	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind	Rare	Minimal	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				turbines for this species in NSW. This species is a listed migratory species under the EPBC Act. This species is listed as threatened under the EPBC Act and BC Act.				
Pink Cockatoo	*Lophochroa leadbeateri*	-	VU	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the BC Act.	Unlikely	Minimal	Negligible	Negligible
Square-tailed Kite	*Lophoictinia isura*	-	VU	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is listed as threatened under the BC Act.	Unlikely	Minimal	Negligible	Negligible
Pink-eared Duck	*Malacorhynchus membranaceus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes	Unlikely	Minimal	Negligible	Negligible

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Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Budgerigar	*Melopsittacus undulatus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Rainbow Bee-eater	*Merops ornatus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is a listed migratory species under the EPBC Act. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Little Pied Cormorant	*Microcarbo melanoleucos*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts	Likely	Minimal	Low	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Black Kite	*Milvus migrans*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. There have been no recorded collisions with wind turbines for this species in NSW. Turbine strikes by commonly occurring raptors are likely, based on experience at other wind farms in south-eastern Australia. This species is not listed as threatened under the EPBC Act or BC Act.	Likely	Minimal	Low	Negligible
Blue-winged Parrot	*Neophema chrysostoma*	VU	VU	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the EPBC Act and BC Act.	Rare	Negligible	Negligible	Negligible
Barking Owl	*Ninox connivens*	-	VU	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the BC Act.	Rare	Negligible	Negligible	Negligible

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Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Southern Boobook	*Ninox novaeseelandiae*	-	-	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Blue Bonnet	*Northiella haematogaster*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Eastern Curlew	*Numenius madagascariensis*	CE	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is a listed migratory species under the EPBC Act. This species is listed as threatened under the EPBC Act.	Rare	Negligible	Negligible	Negligible
Whimbrel	*Numenius phaeopus*	-	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is a listed migratory species under the EPBC Act. This species is not listed as threatened under the EPBC Act or BC Act.				
Nankeen Night Heron	*Nycticorax caledonicus*	-	-	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Cockatiel	*Nymphicus hollandicus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Plains-wanderer	*Pedionomus torquatus*	CE	EN	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the EPBC Act and BC Act.	Rare	Negligible	Negligible	Negligible
Australian Pelican	*Pelecanus conspicillatus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species, however flights above RSA have been recorded and therefore there is potential for the species to move between RSA. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Fairy Martin	*Petrochelidon ariel*	-	-	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Tree Martin	*Petrochelidon nigricans*	-	-	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Great Cormorant	*Phalacrocorax carbo*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
Little Black Cormorant	*Phalacrocorax sulcirostris*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
Pied Cormorant	*Phalacrocorax varius*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly	Unlikely	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				at RSA height. This species has been recorded flying at RSA height during BUS for the project. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Yellow-billed Spoonbill	*Platalea flavipes*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Likely	Minimal	Low	Negligible
Royal Spoonbill	*Platalea regia*	-	-	There are BioNet records within the locality. This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Negligible	Negligible	Negligible
Crimson Rosella	*Platycercus elegans*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species.	Likely	Minimal	Low	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Eastern Rosella	*Platycercus eximius*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Glossy Ibis	*Plegadis falcinellus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is a listed migratory species under the EPBC Act. This species is not listed as threatened under the EPBC Act or BC Act.	Unlikely	Minimal	Negligible	Negligible
Tawny Frogmouth	*Podargus strigoides*	-	-	This species has been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this	Likely	Negligible	Negligible	Negligible

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Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Great Crested Grebe	*Podiceps cristatus*	-	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Hoary-headed Grebe	*Poliocephalus poliocephalus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Superb Parrot	*Polytelis swainsonii*	VU	VU	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the EPBC Act and BC Act.	Likely	Moderate	Moderate	Low

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Australian Spotted Crake	*Porzana fluminea*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Spotless Crake	*Porzana tabuensis*	-	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Red-rumped Parrot	*Psephotus haematonotus*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Minimal	Negligible	Negligible
Mulga Parrot	*Psephotus varius*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly	Unlikely	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Red-necked Avocet	*Recurvirostra novaehollandiae*	-	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Australian Painted Snipe	*Rostratula australis*	EN	EN	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the EPBC Act and BC Act.	Rare	Moderate	Negligible	Low
Tern	*Sterna sp.*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these	Unlikely	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Australian Pratincole	*Stiltia isabella*	-	-	This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Australasian Grebe	*Tachybaptus novaehollandiae*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Australian White Ibis	*Threskiornis molucca*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. Turbine collisions have been reported for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Likely	Minimal	Low	Negligible

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Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Straw-necked Ibis	*Threskiornis spinicollis*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. This species has been recorded flying at RSA height during BUS for the project. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Possible	Minimal	Low	Negligible
Black-tailed Native-hen	*Tribonyx ventralis*	-	-	This species has been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Wood Sandpiper	*Tringa glareola*	-	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is a listed migratory species under the EPBC Act. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
Common Greenshank	*Tringa nebularia*	EN	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is a listed migratory species under the EPBC Act. This species is listed as threatened under the EPBC Act.	Rare	Negligible	Negligible	Negligible
Marsh Sandpiper	*Tringa stagnatilis*	-	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is a listed migratory species under the EPBC Act. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible
Eastern Barn Owl	*Tyto javanica*	-	-	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning, habitat values and behavioural considerations	Collision risk			Indirect / barrier effect
		EPBC	BC		Likelihood	Consequence	Risk	Risk
				population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.				
Masked Owl	*Tyto novaehollandiae*	-	VU	There are BioNet records within the locality. This species has not been recorded by Biosis within the BBAMP area. This species has a low likelihood of flying at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. This species is listed as threatened under the BC Act.	Rare	Negligible	Negligible	Negligible
Banded Lapwing	*Vanellus tricolor*	-	-	This species has been recorded by Biosis within the BBAMP area. There is potential for this species to fly at RSA height. No flights within RSA have been recorded within the BBAMP area for this species. There have been no recorded collisions with wind turbines for this species in NSW. The widespread and common status of these species makes population impacts unlikely. This species is not listed as threatened under the EPBC Act or BC Act.	Rare	Negligible	Negligible	Negligible

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Appendix 1.2 Qualitative assessment of turbine collision risk for bats

Table A 2 Qualitative assessment of turbine collision risk and indirect / barrier effect for bats

Scientific name	Common name	Status		Reasoning	Habitat values and behavioural considerations	Indirect impact – collision risk			Indirect / barrier effect
		EPBC	BC			Likelihood	Consequence	Risk	Risk
Austronomus australis	White-striped Free-tailed Bat	-	-	Recorded via ultrasonic detection in RSA	Prefers open foraging areas above canopy. A very common widespread species recorded in high numbers during site surveys. Recognised as an at-risk bat species in relation to wind farm developments due to their foraging and flight behaviour. Due to its poor ability to detect and avoid obstacles, particularly mobile ones, such as turbine blades, White-striped Free-tail Bats are one of the most commonly recorded species in carcass monitoring at Australian wind farms. Highly susceptible to collision mortality regularly, however, populations generally secure and dense to withstand moderate instances of mortality should it occur.	Probable	Minimal	Low	Low
Chalinolobus gouldii	Gould's Wattled Bat	-	-	Recorded via ultrasonic detection on ground-based detectors only	A common and widespread large microbat that is fast, high-flier with restricted manoeuvrability. Like the White-striped Freetail Bat, this species has a poor ability to detect and avoid obstacles while pursuing prey, particularly mobile	Possible	Minimal	Low	Low

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Scientific name	Common name	Status		Reasoning	Habitat values and behavioural considerations	Indirect impact – collision risk			Indirect / barrier effect
		EPBC	BC			Likelihood	Consequence	Risk	Risk
					ones such as turbine blades. Highly susceptible to collision mortality regularly, however populations generally secure and dense to withstand moderate instances of mortality should it occur.				
Chalinolobus morio	Chocolate Wattled Bat	-	-	Recorded via ultrasonic detection on ground-based detectors only	A relatively common and widespread microbat that is fast with increased manoeuvrability than the Gould's Wattled Bat. Generally restricted to canopies and fringing vegetation, may be susceptible to collision mortality on occasion, however populations generally secure and dense to withstand low instances of mortality should it occur.	Unlikely	Negligible	Negligible	Negligible
Chalinolobus picatus	Little Pied Bat	-	VU	BioNet records	A declining species that occurs in dry open forest and woodlands. The subject land is within its most easterly distribution limit. Roosts in cave and occasionally within trees hollows and other structures. Relatively confined to canopies and timbered areas but may fly within RSA on occasion. Should a collision occur, its likely only to occur to a very small number of individuals that would be impacted	Unlikely	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning	Habitat values and behavioural considerations	Indirect impact – collision risk			Indirect / barrier effect
		EPBC	BC			Likelihood	Consequence	Risk	Risk
Myotis macropus	Southern Myotis	-	VU	Species group recorded via ultrasonic detection on ground-based detectors only	Generally found around riparian areas. Not known to fly within RSA and not considered to be at risk of collision due to their favoured foraging and roosting preferences in gullies and surrounding waterways	Rare	Negligible	Negligible	Negligible
Nyctophilus corbeni	Corben's Long-eared Bat	VU	VU	Species group recorded via ultrasonic detection on ground-based detectors only	Generally restricted to foraging within or beneath the canopy however may forage within open areas, in conjunction with White Cypress Pine communities. This species is a slow flying agile bat that roosts in tree hollows, crevices and under loose bark. Unlikely to fly within RSA. Should a collision occur, it is likely only to occur to a very small number of individuals that would be impacted.	Unlikely	Minimal	Negligible	Negligible
Nyctophilus geoffroyi	Lesser Long-eared Bat	-	-	Species group recorded via ultrasonic detection on ground-based detectors only	A relatively common and widespread microbat that is fast with high manoeuvrability. Generally restricted to foraging within or beneath the canopy however may forage within open areas, especially where lights have attracted large insect numbers. Should a collision occur, it is likely	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning	Habitat values and behavioural considerations	Indirect impact – collision risk			Indirect / barrier effect
		EPBC	BC			Likelihood	Consequence	Risk	Risk
					only to occur to a very small number of individuals that would be impacted.				
Nyctophilus gouldi	Gould's Long-eared Bat	-	-	Species group recorded via ultrasonic detection on ground-based detectors only	A relatively common and widespread microbat that is fast with high manoeuvrability. Generally restricted to foraging within or beneath the canopy however may forage within open areas or within areas fringing remnant vegetation. Should a collision occur, it is likely only to occur to a very small number of individuals that would be impacted.	Unlikely	Negligible	Negligible	Negligible
Ozimops petersi	Inland Free-tailed Bat	-	-	Recorded via ultrasonic detection in RSA	Widespread species of varying habitats, but rare within the locality. Fast and direct fliers of unobstructed air-spaces from just above to well above the canopy as well as above grasslands. All three species were recorded in low numbers within RSA at the site. Should a collision occur, it's likely only to occur to a very small number of individuals that would be impacted.	Possible	Minimal	Low	Negligible
Ozimops planiceps	South-eastern Free-tailed Bat	-	-	Recorded via ultrasonic detection in RSA		Possible	Minimal	Low	Negligible

Scientific name	Common name	Status		Reasoning	Habitat values and behavioural considerations	Indirect impact – collision risk			Indirect / barrier effect
		EPBC	BC			Likelihood	Consequence	Risk	Risk
Ozimops ridei	Ride's Free-tailed Bat	-	-	Recorded via ultrasonic detection in RSA		Possible	Minimal	Low	Negligible
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	-	VU	Recorded via ultrasonic detection in RSA	Widespread species within a range of habitats including rainforest, woodland and grassland. High and fast flier over the forest canopy, but lower in more open areas and fringing vegetation. Roosts within tree hollows. Has potential to fly and was within RSA. In the unlikely event that collisions occur, impacts to the local population of the species may eventuate.	Likely	Minimal	Low	Low
Scotorepens balstoni	Inland Broad-nosed Bat	-	-	Recorded via ultrasonic detection on ground-based detectors only	A widespread species that generally fly within riparian areas but may also fly above canopies and RSA on occasion. Highly mobile, however, not recorded within RSA and not considered to be at risk of collision due to their favoured foraging and roosting preferences. In the unlikely event a collision occurs, populations generally secure and dense to withstand low instances of mortality should it occur.	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning	Habitat values and behavioural considerations	Indirect impact – collision risk			Indirect / barrier effect
		EPBC	BC			Likelihood	Consequence	Risk	Risk
Scotorepens greyii	Little Broad-nosed Bat	-	-	Recorded via ultrasonic detection on ground-based detectors only	A common widespread species recorded regularly during site surveys. Generally, fly within riparian areas and woodland along the fringing areas of vegetation, but may also fly above canopies and RSA on occasion. Highly mobile and susceptible to collision mortality, however populations generally secure and dense to withstand moderate instances of mortality should it occur.	Unlikely	Negligible	Negligible	Negligible
Vespadelus baverstocki	Inland Forest Bat	-	VU	Recorded via ultrasonic detection on ground-based detectors only	A poorly known species and may cover an extensive foraging area. Like other Vespadelus, is not considered to be at risk of collision due to their favoured foraging and roosting preferences in drier woodland habitats with bias towards riparian areas in conjunction with Vespadelus vulturnus.	Unlikely	Negligible	Negligible	Negligible
Vespadelus darlingtoni	Large Forest Bat	-	-	Recorded via ultrasonic detection on ground-based detectors only	A large widespread bat with restricted manoeuvrability due to its size. Not known to fly within RSA and not considered to be at risk of collision due to their favoured foraging and roosting preferences. In the unlikely event a collision occurs, populations	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status		Reasoning	Habitat values and behavioural considerations	Indirect impact – collision risk			Indirect / barrier effect
		EPBC	BC			Likelihood	Consequence	Risk	Risk
					generally secure and dense to withstand low instances of mortality should it occur				
Vespadelus regulus	Southern Forest Bat	-	-	Recorded via ultrasonic detection on ground-based detectors only	A moderate sized widespread bat. Not known to fly within RSA and not considered to be at risk of collision due to their favoured foraging and roosting preferences. In the unlikely event a collision occurs, populations generally secure and dense to withstand low instances of mortality should it occur.	Rare	Negligible	Negligible	Negligible
Vespadelus vulturnus	Little Forest Bat	-	-	Recorded via ultrasonic detection on ground-based detectors only	A small sized, very common and widespread bat. They are highly agile fast fliers with high manoeuvrability. May fly beneath and above canopy height and on occasion within RSA. Should a collision occur, its likely only to occur to a very small number of individuals that would be impacted	Unlikely	Negligible	Negligible	Negligible
Pteropus poliocephalus	Grey-headed Flying-fox	VU	VU	BioNet records	A declining species that inhabits wide ranging habitats and moves large distances foraging, however generally roosts/breeds close to or near riparian areas. May occur on an intermittent bases transiting through the landscape, however the occurrence of known	Unlikely	Minimal	Negligible	Negligible

Scientific name	Common name	Status		Reasoning	Habitat values and behavioural considerations	Indirect impact – collision risk			Indirect / barrier effect
		EPBC	BC			Likelihood	Consequence	Risk	Risk
					camps and forage resources mean regular flights through the development footprint are considered unlikely. Recent instances in Victoria have seen an increased rate of collision mortality. Should a collision occur, it is likely only to occur to a very small number of individuals that would be impacted.				
Pteropus scapulatus	Little Red Flying Fox	-	-	BioNet records	May occur on an intermittent bases transiting through the landscape, however the occurrence of known camps and forage resources mean regular flights through the development footprint are considered unlikely. Should a collision occur, it is likely only to occur to a very small number of individuals that would be impacted.	Unlikely	Minimal	Negligible	Negligible

Open space / aerial = typically free-tail and sheath-tail bats. Fly fast. Long, narrow wings, not manoeuvrable.

Edge space = most bats (Vespertilionids and Myotis). Fly fast to moderately slow. Moderately long and broad wings.

Closed = gleaning bats (Phoniscus, Nyctophilus, Rhinolophus) = slow, but able to manoeuvre and hover in cluttered places. Broad, shorter wings, rounded tip, large tail membrane.

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Appendix 2 Qualitative risk assessment for turbines prior to implementation of safeguards

Table A 3 Qualitative risk assessment for turbines prior to implementation of safeguards (approvals phase risk assessment)

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk
ET10	Unlikely	Moderate	Moderate
ET100	Rare	Moderate	Low
ET101	Unlikely	Moderate	Moderate
ET103	Rare	Moderate	Low
ET104	Rare	Moderate	Low
ET105	Unlikely	Moderate	Moderate
ET106	Unlikely	Moderate	Moderate
ET107	Rare	Moderate	Low
ET108	Unlikely	Moderate	Moderate
ET109	Rare	Moderate	Low
ET11	Rare	Moderate	Low
ET110	Rare	Moderate	Low
ET111	Rare	Moderate	Low
ET112	Rare	Moderate	Low
ET113	Rare	Moderate	Low
ET114	Unlikely	Moderate	Moderate
ET115	Unlikely	Moderate	Moderate
ET116	Probable	Moderate	High
ET117	Unlikely	Moderate	Moderate
ET118	Possible	Moderate	High
ET119	Unlikely	Moderate	Moderate
ET12	Unlikely	Moderate	Moderate
ET120	Possible	Moderate	High
ET123	Possible	Moderate	High
ET125	Possible	Moderate	High
ET14	Rare	Moderate	Low
ET15	Possible	Moderate	High
ET17	Rare	Moderate	Low
ET18	Unlikely	Moderate	Moderate
ET20	Unlikely	Moderate	Moderate

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk
ET22	Rare	Moderate	Low
ET24	Unlikely	Moderate	Moderate
ET25	Unlikely	Moderate	Moderate
ET27	Possible	Moderate	High
ET28	Unlikely	Moderate	Moderate
ET3	Unlikely	Moderate	Moderate
ET30	Possible	Moderate	High
ET31	Rare	Moderate	Low
ET33	Unlikely	Moderate	Moderate
ET36	Unlikely	Moderate	Moderate
ET37	Unlikely	Moderate	Moderate
ET38	Possible	Moderate	High
ET41	Unlikely	Moderate	Moderate
ET42	Rare	Moderate	Low
ET43	Possible	Moderate	High
ET44	Rare	Moderate	Low
ET45	Unlikely	Moderate	Moderate
ET48	Possible	Moderate	High
ET49	Unlikely	Moderate	Moderate
ET5	Rare	Moderate	Low
ET50	Unlikely	Moderate	Moderate
ET51	Rare	Moderate	Low
ET52	Unlikely	Moderate	Moderate
ET54	Unlikely	Moderate	Moderate
ET56	Unlikely	Moderate	Moderate
ET58	Possible	Moderate	High
ET61	Rare	Moderate	Low
ET64	Possible	Moderate	High
ET69	Unlikely	Moderate	Moderate
ET70	Rare	Moderate	Low
ET71	Unlikely	Moderate	Moderate
ET72	Possible	Moderate	High
ET73	Unlikely	Moderate	Moderate
ET74	Rare	Moderate	Low
ET77	Unlikely	Moderate	Moderate
ET78	Possible	Moderate	High

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk
ET79	Unlikely	Moderate	Moderate
ET8	Rare	Moderate	Low
ET81	Unlikely	Moderate	Moderate
ET82	Unlikely	Moderate	Moderate
ET83	Rare	Moderate	Low
ET85	Unlikely	Moderate	Moderate
ET86	Unlikely	Moderate	Moderate
ET87	Rare	Moderate	Low
ET88	Unlikely	Moderate	Moderate
ET89	Unlikely	Moderate	Moderate
ET91	Unlikely	Moderate	Moderate
ET92	Unlikely	Moderate	Moderate
ET93	Rare	Moderate	Low
ET94	Rare	Moderate	Low
ET95	Unlikely	Moderate	Moderate
ET97	Rare	Moderate	Low
ET98	Unlikely	Moderate	Moderate
ET99	Rare	Moderate	Low
WT1	Unlikely	Moderate	Moderate
WT10	Possible	Moderate	High
WT101	Unlikely	Moderate	Moderate
WT102	Unlikely	Moderate	Moderate
WT103	Unlikely	Moderate	Moderate
WT104	Unlikely	Moderate	Moderate
WT105	Unlikely	Moderate	Moderate
WT106	Possible	Moderate	High
WT11	Unlikely	Moderate	Moderate
WT111	Rare	Moderate	Low
WT113	Unlikely	Moderate	Moderate
WT119	Unlikely	Moderate	Moderate
WT12	Rare	Moderate	Low
WT120	Rare	Moderate	Low
WT121	Possible	Moderate	High
WT122	Unlikely	Moderate	Moderate
WT123	Possible	Moderate	High
WT127	Unlikely	Moderate	Moderate

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk
WT128	Unlikely	Moderate	Moderate
WT129	Unlikely	Moderate	Moderate
WT13	Possible	Moderate	High
WT130	Rare	Moderate	Low
WT131	Unlikely	Moderate	Moderate
WT133	Unlikely	Moderate	Moderate
WT134	Unlikely	Moderate	Moderate
WT137	Rare	Moderate	Low
WT139	Unlikely	Moderate	Moderate
WT14	Unlikely	Moderate	Moderate
WT141	Possible	Moderate	High
WT142	Possible	Moderate	High
WT145	Unlikely	Moderate	Moderate
WT147	Unlikely	Moderate	Moderate
WT148	Rare	Moderate	Moderate
WT149	Unlikely	Moderate	Moderate
WT15	Rare	Moderate	Low
WT150	Unlikely	Moderate	Moderate
WT152	Unlikely	Moderate	Moderate
WT153	Unlikely	Moderate	Moderate
WT155	Unlikely	Moderate	Moderate
WT156	Unlikely	Moderate	Moderate
WT158	Unlikely	Moderate	Moderate
WT160	Unlikely	Moderate	Moderate
WT161	Unlikely	Moderate	Moderate
WT162	Unlikely	Moderate	Moderate
WT164	Unlikely	Moderate	Moderate
WT17	Unlikely	Moderate	Moderate
WT18	Rare	Moderate	Low
WT19	Rare	Moderate	Low
WT20	Unlikely	Moderate	Moderate
WT21	Unlikely	Moderate	Moderate
WT22	Unlikely	Moderate	Moderate
WT23	Unlikely	Moderate	Moderate
WT24	Rare	Moderate	Low
WT25	Rare	Moderate	Low

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk
WT26	Unlikely	Moderate	Moderate
WT27	Rare	Moderate	Low
WT28	Rare	Moderate	Low
WT29	Unlikely	Moderate	Moderate
WT3	Unlikely	Moderate	Moderate
WT31	Rare	Moderate	Low
WT32	Rare	Moderate	Low
WT33	Unlikely	Moderate	Moderate
WT34	Unlikely	Moderate	Moderate
WT35	Rare	Moderate	Low
WT36	Unlikely	Moderate	Moderate
WT37	Rare	Moderate	Low
WT38	Rare	Moderate	Low
WT39	Rare	Moderate	Low
WT4	Unlikely	Moderate	Moderate
WT40	Rare	Moderate	Low
WT41	Unlikely	Moderate	Moderate
WT42	Unlikely	Moderate	Moderate
WT43	Rare	Moderate	Low
WT44	Unlikely	Moderate	Moderate
WT45	Unlikely	Moderate	Moderate
WT46	Rare	Moderate	Low
WT47	Possible	Moderate	High
WT48	Rare	Moderate	Low
WT49	Rare	Moderate	Low
WT51	Unlikely	Moderate	Moderate
WT52	Rare	Moderate	Low
WT53	Possible	Moderate	High
WT54	Unlikely	Moderate	Moderate
WT55	Rare	Moderate	Low
WT56	Possible	Moderate	High
WT57	Unlikely	Moderate	Moderate
WT58	Unlikely	Moderate	Moderate
WT6	Unlikely	Moderate	Moderate
WT60	Rare	Moderate	Low
WT61	Unlikely	Moderate	Moderate

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk
WT62	Rare	Moderate	Low
WT63	Possible	Moderate	High
WT64	Unlikely	Moderate	Moderate
WT67	Rare	Moderate	Low
WT68	Rare	Moderate	Low
WT69	Possible	Moderate	High
WT7	Possible	Moderate	High
WT71	Rare	Moderate	Low
WT72	Unlikely	Moderate	Moderate
WT73	Possible	Moderate	High
WT75	Rare	Moderate	Low
WT76	Unlikely	Moderate	Moderate
WT78	Rare	Moderate	Low
WT79	Possible	Moderate	High
WT80	Possible	Moderate	High
WT81	Possible	Moderate	High
WT82	Unlikely	Moderate	Moderate
WT83	Unlikely	Moderate	Moderate
WT87	Unlikely	Moderate	Moderate
WT88	Unlikely	Moderate	Moderate
WT89	Unlikely	Moderate	Moderate
WT9	Rare	Moderate	Low
WT90	Unlikely	Moderate	Moderate
WT92	Unlikely	Moderate	Moderate
WT94	Rare	Moderate	Low
WT97	Possible	Moderate	High

Appendix 3 Turbine mortality survey data sheet

DRAFT

Turbine mortality survey data sheet

Survey details:	
Date:	Observers:
Start time:	Finish time:
Turbine ID:	
Survey methodology (please tick):	
Dog ID	
Human observers	
Incidental (Any bird or bat turbine mortality observed outside a routine survey)	
Ground visibility (circle): *High* *Moderate* *Poor*	
Was entire search area covered? *Yes / No*	NOTE: If not, estimate area covered as a percentage (%) of total search area:
Survey limitations (e.g. long grass, any areas that were inaccessible/not surveyed and why):	
Weather details (please circle):	
Temperature:	
Precipitation: *Fine* *Showers* *Rain*	
Wind strength: *Calm* *Breeze* *Moderate* *Strong*	
Wind direction:	Cloud cover (%):

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Turbine bird and bat mortality record:			
Dead/injured bird or bat recorded? *Yes / No*	If yes, record total number:	Bird and Bat carcass / injury datasheet completed? *Yes / No*	Photographs taken? *Yes / No*
Additional notes:			

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Appendix 4 Dead or injured bird/bat data sheet

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Dead or injured bird/bat – data sheet

This datasheet must be completed for every dead / injured bird or bat found during high- and general-intensity turbine mortality surveys. This datasheet should also be completed for any dead /injured bird or bar recorded incidentally (i.e., not during routine surveys).

Each dead bird or bat (including feather spots) must be removed upon discovery and placed into a clearly labelled plastic bag with the date, time, location (GPS coordinates) and turbine number, as required for species identification.

Date and location:				
Date:			Observer/s:	
Time animal was found:				
Turbine ID:			Easting/Northing of carcass:	
Detection:				
Survey method (circle):	*Dog search*	*Human search intensity*	*Incidental*	NOTE: turbine survey datasheet must also be completed.
Distance of carcass / injured animal from observer when first detected:				
Describe ground visibility within a 1 m radius of where carcass / injured animal was found:				
Carcass / injured animal photographed? *Yes / No*			Photo and camera details (e.g. camera number, photo numbers, location of saved photos):	
Weather details at time of detection (please circle):				
Temperature:				
Precipitation:	*Fine*	*Showers*	*Rain*	
Wind strength:	*Calm*	*Breeze*	*Moderate*	*Strong*
Wind direction:			Cloud cover (%):	

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Carcass / injured animal information and condition:			
Species (if unknown closest taxonomic group, e.g. raptor, bat):			
Age (circle):	*Unknown*	*Adult*	*Juvenile*
Sex (circle):	*Unknown*	*Male*	*Female*
Condition (circle):	*Dead (carcass)*	*Injured but alive*	*Feather spot (≥ 10 feathers)*
Degree of decay (circle):	*Fresh*	*More than a week old*	*Very old or highly decayed*
Describe location and type of any injuries evident:			
Describe evidence of scavenging, if any:			
Notes / additional information:			

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Appendix 5 Approval to use proxy carcasses – HOLD POINT

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Appendix 6 Carcass persistence trial data sheet

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Carcass persistence trial – carcass deployment data sheet

This carcass deployment sheet must be completed for each turbine used in the scavenger trial.

Survey and turbine details:					
Date:			Observers:		
Time:					
Turbine ID:					
Ground visibility (circle): *High* *Moderate* *Poor*					
Description of ground visibility (e.g. grass height, rock cover):					
Carcass deployment record:					
Carcass type	Unique carcass identifier:	Direction from turbine base:	Distance from turbine base:	Easting / northing:	Notes:
Additional notes:					

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Appendix 7 Searcher efficiency trial data sheet

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Searcher efficiency trial – carcass data sheet

Survey details:	
Date:	Observers:
Time commenced:	Time completed:
Turbine ID:	
Ground visibility (circle): *High* *Moderate* *Poor*	
Description of ground visibility (e.g., grass height, rock cover):	

Carcass deployment record:					
Carcass type (Species, size class)	Unique carcass identifier:	Direction from turbine base:	Distance from turbine base:	Easting / northing:	Notes:

Additional notes:

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Appendix 8 Management actions

Table A 4 Summary of management actions and performance criteria

No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing/ frequency
Proactive low wind-speed curtailment (Section 5.2.1)							
BBAMP.1.1	Low-wind speed curtailment	Reduce collision risk for microbats	All high-risk turbines are feathered to prevent free-wheeling prior to predetermined cut-in speeds	Annual report	Tier alert mitigation and response	• Applicant • Contracted qualified ecologist	Operational lifetime of the wind farm
Minimising raptor perch sites (Section 5.6)							
BBAMP.2.1	If a potentially favoured raptor perch site is detected within 200 m of a turbine, a qualified ecologist will be called in to confirm identity of the species and to ascertain whether the perch location represents a heightened risk to a threatened species.	Minimising raptor perch sites	If perch represents a heightened risk, NSW DCCEEW will be notified and a strategy to reduce risk will be determined. Removal of the perch site may be considered if it is a dead tree and there is considered to be a reasonable likelihood of reducing risk by doing so.	NSW DCCEEW notified Perch removed, if appropriate	N/A	• Applicant • Contracted qualified ecologist	Triggered on discovery of a raptor perch within 200 m of a turbine

No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing/ frequency
Pest animal control (Section 5.7)							
BBAMP.3.1	Implement a program of pest control Pest animal contractor engaged as required	Work with leaseholders to reduce the incidence of European Rabbits and other pests	Documented correspondence with leaseholders and land managers	Documentation of timing, location and type of works implemented	Specific or increased control measures will be instigated as required according to fluctuating densities of pest animals	• Applicant • Pest animal control contractor	Inductions completed annually Management to be implemented during all wind farm operations
BBAMP.3.2	The wind farm operator will inform all personnel and contractors of the procedure to follow on detection of a European Rabbit warren or high density of European Rabbits on wind farm land	Site personnel are inducted to understand the procedures regarding pest control and the possible ramifications for not following this procedure	Inductions have been completed for all site personnel and date of attendance has been recorded	Signed induction sheets completed and submitted	Specific or increased control measures will be instigated as required according to fluctuating densities of pest animals	• Applicant	Inductions completed annually
Large animal carcass removal requirements (Section 5.8)							
BBAMP.4.1	Provide information to all staff and contractors on the procedure to follow after discovering a large carcass (e.g., Kangaroo *Macropus* sp. or Feral Goats *Capra hircus*) All bird and bat carcasses (turbine collision fatalities) are	Site Personnel are inducted to understand the procedures regarding carcass removal and the possible ramifications for not following this procedure	Inductions have been completed for all site personnel and date of attendance has been recorded	Signed induction sheets completed and submitted	N/A	• Applicant	Inductions completed annually

No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing/ frequency
	to remain in situ or moved to road edge if it poses a driving hazard						
BBAMP.4.2	Implement a program of carcass removal and burial or appropriate disposal, including following feral animal control	Remove carcasses within 48 hours of discovery/ feral animal control action to reduce the incidence of feeding on carrion by raptors	Detailed carrion removal program including timing, responsibilities, procedures Carcasses removed as soon as possible and investigated if not removed within 48 hours of discovery – burial or other appropriate disposal of carcass	Date of discovery/ feral animal control action and date of removal are recorded in an appropriate database Any exceedance of 48 hours is investigated via incident report and internal audit and these data logs are included in the report to NSW DCCEEW Annual summary of carcass detection and removal will be provided in annual reports	Specific livestock carcass search and removal may need to be implemented in the event that a high concentration of raptor activity near a turbine indicates they may be at heightened risk Review of the program undertaken after two years and any adjustments required in consultation with NSW DCCEEW and/or Cth DCCEEW	• Applicant • Pest animal control contractor	Triggered on discovery of a large animal carcass within 200 m of a turbine hardstand Undertaken within 48 hours of discovery Ongoing
Ongoing operational monitoring (Section 6.1)							
BBAMP.5.1	Collection of baseline data and seasonal bird and bat monitoring	Seasonal bird and bat utilisation survey using the timing and methodology established in the BDAR	12 months baseline surveys prior to turbine commissioning Bird and bat surveys conducted seasonally	Data collated for inclusion in the annual report following one and two years of operation	N/A	• Applicant	Collection of additional baseline data prior to turbine commissioning Seasonal bird and bat monitoring (Schedule and

No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing/ frequency
							timeframes to be determined)
Monitoring of turbine collisions (Section 6.2)							
BBAMP.6.1	Engage dog-handler or human observer team(s) with experience at undertaking carcass searches at wind farms	Determine the best method for conducting carcass searches in the BBAMP environment	Demonstrate consideration of both dog handler or human observer search options	Provide the company details and names of contractors to NSW DCCEEW	Use human observers where a dog handler team is not available	• Applicant • Contracted qualified ecologist	Prior to the commissioning of the wind farm Ongoing
BBAMP.6.2	Train dog-handler/human observer teams on how to undertake the carcass searches and collect the requisite information	Ensure the search team is inducted and qualified to conduct carcass searches in the BBAMP environment	Record the date of induction	Signed induction sheets completed and submitted	N/A	• Applicant • Contracted qualified ecologist	Prior to the commissioning of the wind farm Ongoing
BBAMP.6.3	Undertake turbine collision carcass searches on a two - month cycle using a dog-handler team or human observers, prioritising moderate to high risk turbines	Determine the number of carcasses found (to be used in conjunction with the results of the carcass persistence trials to determine estimated annual strike rate)	Documented number of carcasses detected for each species, search frequency and effort	Carcass search/mortality raw data will be provided with annual reports	Use human observers where a dog handler team is not available	• Applicant to appoint search team • Qualified ecologist to oversee searches • Applicant and qualified ecologist to prepare and submit reports	Monthly

No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing/ frequency
BBAMP.6.4	Collection, recording, storage and carcass disposal during routine monthly collision searches	Reduce the instance of carcasses attracting raptors by disposal or storage of carrion for further investigation	Using turbine mortality data sheet	Carcass search/mortality raw data will be provided with annual reports	N/A	• All personnel who detect carcasses	Triggered on discovery of any featherspot or collision carcass using tiered system
BBAMP.6.5	Review carcass search regime	Documentation and analysis of findings from carcass searches in annual report	Document all findings in annual report and review with NSW DCCEEW and ecologist	Submission of report to NSW DCCEEW	Refine program if necessary in light of first year results	• Applicant • Contracted qualified ecologist	After first full year of operation
BBAMP.6.6	A freezer will be available for the purpose of storing bird and bat carcasses	Allow the Australian Museum the opportunity to conduct an autopsy of the carcasses as required	Correspondence with Australia Museum	Correspondence with Australia Museum	Freezer must be large enough to accommodate large birds such as eagles	• Applicant	Prior to the commissioning of the wind farm Ongoing
BBAMP.6.7	Apply for a permit under the BC Act to collect and store bird and bat carcasses	Permission to collect and store carcasses in order to reduce the instance of carcasses attracting raptors by disposal or storage of carrion for further investigation and determine strike rates	Timely permit application to NSW DCCEEW under the BC Act	Any reporting conditions attached to the permit must be followed	Permit must be updated regularly to include all searchers, qualified ecologist(s) and wind farm personnel who find carcasses while on site	• Applicant • Contracted qualified ecologist	Prior to the commissioning of the wind farm Ongoing
BBAMP.6.8	Identify and collect all dead bird and bat carcasses upon discovery and complete data sheets for each carcass collected	Document all bird and bat carcass discoveries for the purpose of further investigation and to determine whether	Completed turbine mortality data sheets for all collected bird and bat carcasses, logged in the annual report	A carcass search/mortality report will be provided annually to NSW DCCEEW as part of annual reporting	Any species that cannot be identified on site will be lodged with the Australian Museum for identification using reference specimens –	• Applicant • Contracted qualified ecologist	Triggered on discovery of any featherspot or collision carcass using tiered system

No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing/ frequency
		trigger levels have been reached			This may be particularly applicable to feather spots		
BBAMP.6.9	Appropriately label and store bird and bat carcasses	Allow for species identification, review by NSW DCCEEW and the Australian Museum the opportunity to conduct an autopsy of the carcasses as required prior to disposal	Documented notification correspondence to NSW DCCEEW and the Australian Museum	Develop a database of carcasses collected on the wind farm site, noting whether they have been retained, disposed of or donation	Specimens must be kept until positively identified to species and be made available for NSW DCCEEW officers on request and be made available to the Australian Museum prior to disposal	• Applicant • Contracted qualified ecologist	Triggered on discovery of any featherspot or collision carcass using tiered system
Carcass persistence trials (Section 6.2.6)							
BBAMP.7.1	Implement scavenger trials	To determine the rate that bird and bat carcasses are being scavenged by predators – These will be used in conjunction with the results of the carcass searches in order to calculate the estimated number of collisions	Completed carcass persistence trial data sheets, calculation of average persistence times and estimated total number of collisions	Collect and maintain all data associated with the persistence trials	Scavenger trial may need to be adjusted/adapted following field trials	• Applicant • Contracted qualified ecologist	One trial in each of spring and autumn in each of two years Each trial to run for 30 days
Searcher efficiency trials (Section 6.2.7)							
BBAMP.8.1	Undertake searcher efficiency trials	Determine the efficiency of searchers in order to confirm the validity of the	Trial dates and findings are recorded and reported in the annual report, and used to assist in the	Collect and maintain all data associated with the searcher efficiency trials	As required when any new people or dogs are employed for searches	• Contracted qualified ecologist	One trial in each of spring and autumn in each of two years

No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing/ frequency
		turbine carcass search regime	review of the monitoring program				
Requirements for incidental discovery of carcasses (Section 6.2.8)							
BBAMP.9.1	Training of site personnel on procedures for bird and bat carcasses found incidentally	Site personnel are inducted to understand the procedures regarding carcass discovery and the possible ramifications for not following this procedure	Inductions have been completed for all site personnel and date of attendance has been recorded	Signed induction sheets completed and submitted; all incidentally found carcasses and featherspots will be reported to NSW DCCEEW as part of annual reporting	N/A	• All site personnel • Contracted qualified ecologist	Prior to the commissioning of the wind farm
BBAMP.9.2	Photography of incidentally encountered bird and bat carcasses Completion of relevant data form	Ensure detailed data and photos are captured and recorded	Completed dead or injured bird/bat data sheet, also recorded in the annual report	All incidentally found carcasses and featherspots will be reported to NSW DCCEEW as part of annual reporting	N/A	• All personnel who incidentally detect carcasses	Triggered on discovery of any featherspot or collision carcass using tiered system
Injured birds and bats (Section 6.3)							
BBAMP.10.1	Ensure only appropriately competent or trained personnel are to handle injured birds; appropriately vaccinated personnel only may handle injured bats	Ensure injured wildlife is appropriately care for by qualified staff or contractors by appointing a contractor or inducting staff appropriately	Appropriate trained staff or contractor engaged	Provide a list of qualified staff and contractors to NSW DCCEEW	N/A	• Contracted qualified ecologist • Person(s) authorised under BC Act	Prior to the commissioning of the wind farm Ongoing
BBAMP.10.2	Liaise with local veterinary practitioner in preparation for	Ensure injured wildlife is appropriately care	Local veterinary practitioners contacted	Provide a list of engaged veterinarians to NSW DCCEEW	N/A	• Applicant	Prior to the commissioning of the wind farm

No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing/ frequency
	incidence of injured wildlife	for a veterinarian as required Veterinarian may be required to euthanise some injured birds and bats				• Contracted qualified ecologist • Veterinarian	Ongoing
BBAMP.10.3	Train site personnel on procedures for dealing with injured birds and bats found incidentally	Site Personnel are inducted to understand the procedures regarding injured wildlife and the possible ramifications for not following this procedure	Inductions have been completed for all site personnel and date of attendance has been recorded	Signed induction sheets completed and submitted A list of qualified staff has been provided to NSW DCCEEW	N/A	• Contracted qualified ecologist to provide appropriate training	Prior to the commissioning of the wind farm
BBAMP.10.4	Complete data sheets for any injured birds and bats found	Ensure all injured birds and bats are reported and action taken is recorded using the dead or injured bat/bird data sheet	All injured birds and bats are reported, and action taken is recorded	Provide a log of all complete data sheets in the annual report	N/A	• All personnel who detect injured bats or birds	Triggered on any finds of injured bats or birds
Analysis of results (Section 6.4)							
BBAMP.11.1	Maintain month-to-month rolling assessment to determine collision trigger levels for all relevant species	Determine whether a trigger level has been reached, and if so, initiate the Decision Making Framework process (Section 7.2)	Results exceed trigger level for any threatened species	Report to NSW DCCEEW within two working days	N/A	• Applicant • Contracted qualified ecologist	Following each search cycle
			Results exceed trigger level for any non-threatened species	Report to NSW DCCEEW within 10 working days			

No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing/ frequency
BBAMP.11.2	Calculate mean rates of searcher efficiency and carcass persistence, relevant for all species of concern	Determine mean searcher efficiency and carcass persistence rates for use in calculations of overall collision estimates	Results have been reported to NSW DCCEEW within 10 business days of finalising report	Provide as inputs to subsequent analyses	N/A	• Contracted qualified ecologist • Statistician to analyse data	Annually, within three months of the completion of monitoring, including trials for the year, in year of the monitoring program
BBAMP.11.3	Use mean scavenge and searcher efficiency rates in combination with the results of mortality searches to estimate total mortality of all species of concern detected in carcass searches at the wind farm, along with associated 95% CI.	Determine whether a trigger level has been reached, and if so, initiate the Decision Making Framework process (Section 7.2)	Results exceeded trigger levels have been reported to NSW DCCEEW within 48 hours. Other results have been reported within 10 business days	Results to be provided to NSW DCCEEW in annual report	N/A	• Applicant • Contracted qualified ecologist	Annually, within three months of the completion of monitoring, including trials for the year, in year of the monitoring program
Reporting (Section 6.5)							
BBAMP.12.1	Impact trigger reporting	Communicate any trigger alerts to NSW DCCEEW and/or Cth DCCEEW	Contracted qualified ecologist to complete impact trigger reporting within 10 days of completion of investigations into a trigger alert	Impact trigger report consistent with requirements in Section 6.5.1	Alterations to reporting requirements subject to advice from NSW DCCEEW/ Cth DCCEEW	• Applicant • Contracted qualified ecologist	Following any trigger events; within 10 days of investigation being completed
BBAMP.12.2	Annual report	Summarise results of BBAMP monitoring, including:	Annual report completed in accordance with the	Annual report prepared, consistent	Alterations to reporting requirements,	• Applicant	Annually for the duration of the

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No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing/ frequency
		• Results of monitoring: - Collision monitoring data collected in the interim phase during commissioning of the wind farm • Impacts associated with the wind farm • Effectiveness of mitigation measures • Compliance with BBAMP performance criteria • Inform adaptive management	BBAMP and submitted to Applicant and NSW DCCEEW	with requirements in Section 6.5.2	processes or management actions subject to advice from NSW DCCEEW/ Cth DCCEEW	• Contracted qualified ecologist	monitoring program Within three months of yearly activities set out in this BBAMP
BBAMP.12.3	Monitoring data shared with NSW DCCEEW and Cth DCCEEW annually	Project impact transparency with regulators	Monitoring data compiled in annual report	Annual report	Alterations to reporting requirements subject to advice from NSW DCCEEW/ Cth DCCEEW.	• Applicant	Annually

No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing/ frequency
BBAMP.12.4	Monitoring data made publicly available on the project's website	Project impact transparency with the public	Monitoring data compiled in annual report	Annual report published on project website	Alterations to reporting requirements subject to advice from NSW DCCEEW/ Cth DCCEEW	• Applicant	Annually within three months of annual report approval

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