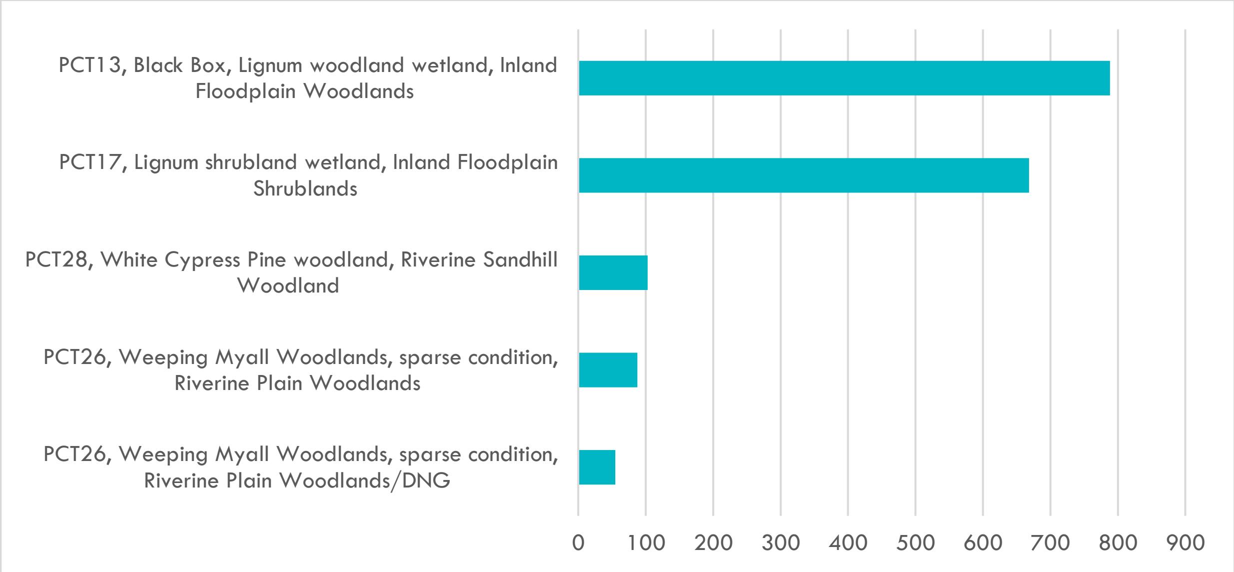


Graph 3 Average bat activity per night per habitat type

Total bat activity each season and number of detector nights is shown in Table 52.

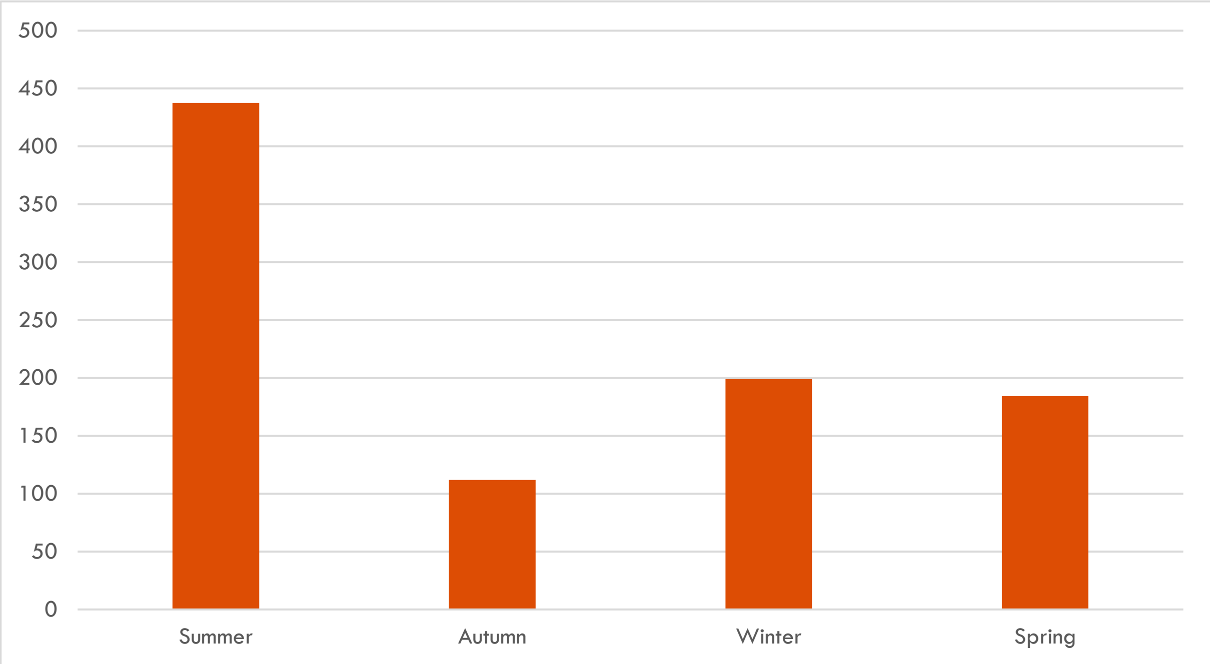
Table 52 Seasonal bat activity and effort (ground level detectors only).

	Summer	Autumn	Winter	Spring
Total activity	25,815	5,934	8,549	14,552
Detector nights	59	53	43	79

The average activity per detector per night is shown for each season in Graph 4. Average activity per detector per night was found to be highest in summer. The peak in summer activity early February coincides with when juvenile bats would be beginning to leave the roost and fly on their own, and may reflect increased numbers of bats and bat activity at this time. The low average activity between 10 - 15 February is likely to be due to only one detector being out at this time, which was located in PCT 26, which did not record high activity overall. This pattern is unlikely to be representative of bat activity across the site during this time, which would presumably be highest in floodplain shrubland and woodlands. Similarly in summer 2024, sampling was only undertaken at paired detectors located on the two met masts, which were both in PCT 26. This may be why the average activity per detector was lower than that observed in summer 2023. Again, this activity level is unlikely to be representative of activity across the site. It does further demonstrate however, that bat activity in this PCT, which is where the majority of turbines are proposed to be located, is consistently low, compared to other PCTs and vegetation classes.

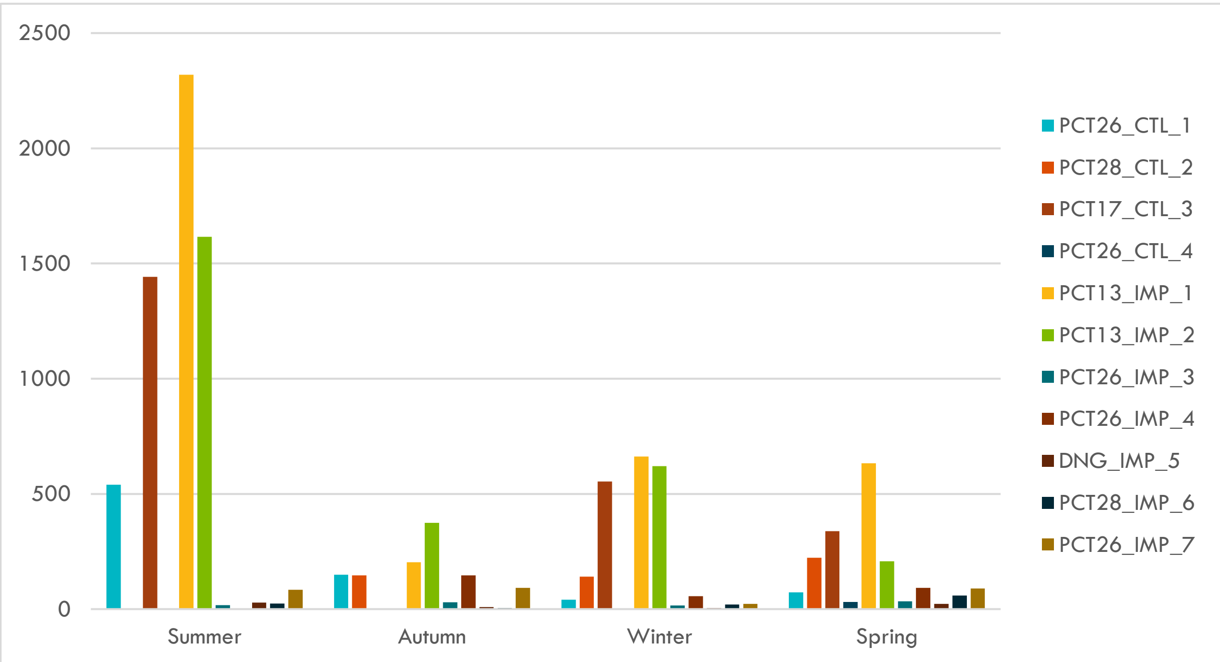
Average bat activity was found to be lowest in autumn. It is unclear why this is the case, and increased replication may be required to further determine why bat activity, particularly in autumn 2024 which occurred in early March, was so much lower than that observed in early February. Similarly, activity in spring was not as high as may be expected, and increased replication may be required to ascertain true activity patterns. Spring 2022 was particularly wet and the site experienced heavy flooding, which may have altered activity patterns.

Activity in winter was unexpectedly higher than in both autumn and spring. Sampling in winter was conducted across four nights only, which may not have been enough to capture nightly variability. When average bat activity is compared per night of sampling, it can be seen that there was a spike in activity during winter on one sampling night (27 July), while the other sampling nights were comparatively much lower.



Graph 4 Average activity (number of calls) per detector per night for each season

The increased activity was associated with three sites in particular, all of which were in floodplain woodland and shrubland habitats where bat activity was found to be highest across all sampling periods. This is consistent with the hypothesis that bat activity is highest in these vegetation communities, such as PCT 13, PCT 15, and most likely PCT 10. It is possible that bat activity temporarily increased at these locations to exploit favourable weather conditions during what is normally a time of reduced activity for microbats due to colder nightly temperatures (Graph 5).



Graph 5 Average bat activity per night per site each season

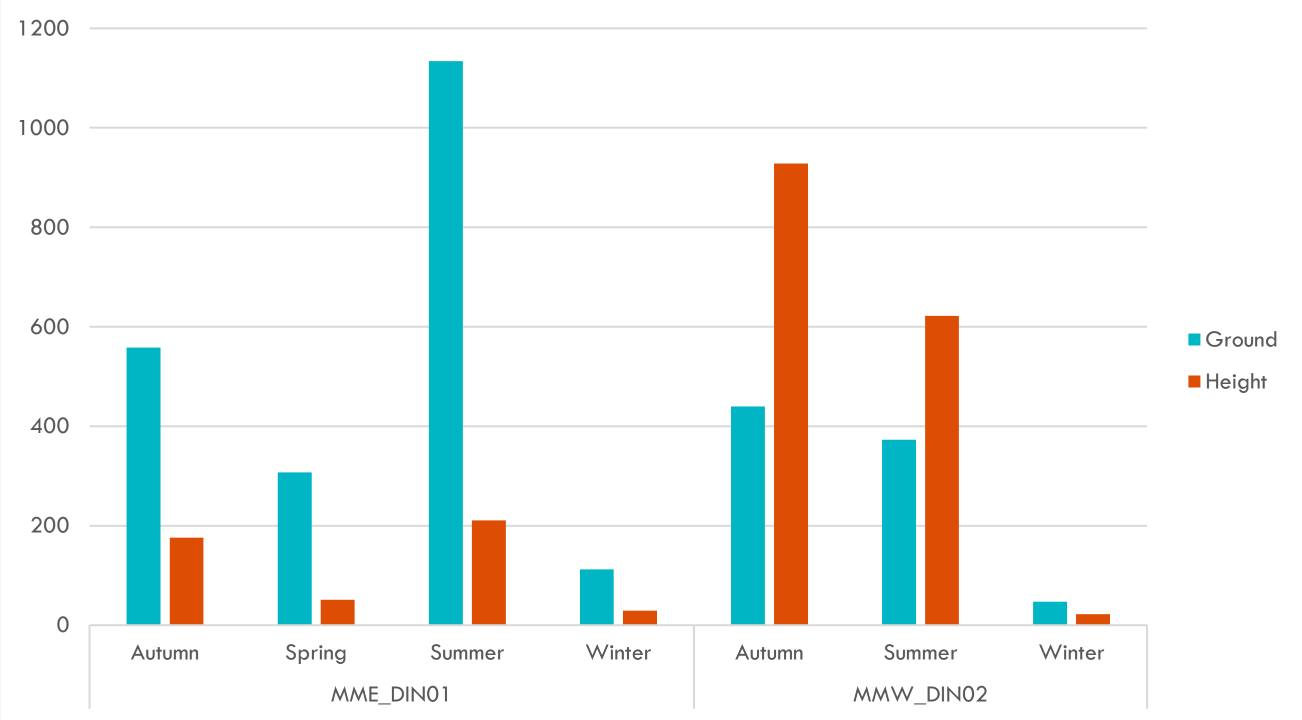
Additionally, bat activity was compared between paired detectors located at MME_DIN_01(eastern Met Mast) in summer, autumn, winter and spring 2023, and paired detectors at both MME_DIN_01 and MMW_DIN_02 (western Met Mast) in summer 2024 and Winter 2024. Species diversity at height was lower than that recorded at ground level. The majority of activity at height could be attributed to known high-flying and aerial foraging bat species such as White-striped Free-tailed Bat, Free-tailed Bats (*Ozimops* spp.) and Gould's Wattled Bat.

When all data is pooled, activity at height was seen to be lower than the activity recorded at ground level in all seasons except autumn. It appears that this pattern was mostly a result of activity at MMW_DIN_02, where activity of bats was higher overall than at MME_DIN_01. Comparing the pattern at each met mast, it can be seen that the activity at height was consistently lower than at ground level at MME_DIN_01 but this was not the same at MMW_DIN_02 (Table 53, Graph 6). Although both Met Masts are located in PCT 26, the habitat surrounding MMW_DIN_02 is higher quality bat habitat compared to that at MME_DIN_01. The eastern met mast (MME_DIN_01) is surrounded by PCT 26 sparse woodland and cropping areas, subject to more frequent agricultural use in the form of cropping and grazing. The western met mast (MMW_DIN_02) is located amongst larger, more intact patches of native vegetation including PCT 26 Intact and PCT 13 moderate, the latter is more likely to represent a focal point in the landscape for bat activity (Graph 6). Data from MMW-DIN_02 also has a smaller sample size compared to MMW_DIN_001.

Table 53 Activity at ground level vs height data

	Detector nights	Total activity (ground)	Total activity (height)
Summer*	26	1507	833
Autumn*	10	998	1104
Winter	22	159	51
Spring	4	307	51
TOTAL	62	2971	2039

*** includes data from paired detectors at DIN_01 in summer 2023, and paired detectors at both DIN_01 and DIN_02 in summer 2024.**



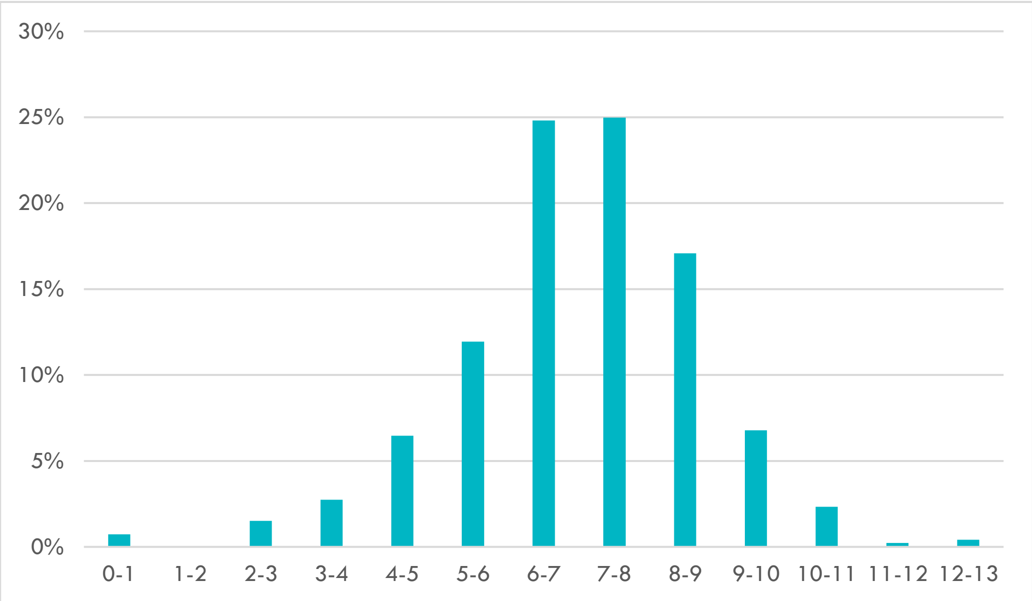
Graph 6 Comparison of activity at height versus ground level at each met mast

Wind speed data was recorded at 10 minute intervals from an anemometer mounted at approximately 50 metres on MME_DIN_01 for the duration of each detector deployment. Data was compared for each season during the times when the detectors were deployed between 6pm and 6am when bats are likely to be active. The percentage of 10 minute intervals for each wind speed each season is shown in Graph 7.

Graph 7 Percentage of 10-minute intervals per windspeed during each night (6pm-6am) of each deployment period

Average bat activity per detector per night was plotted against average nightly temperature and wind speed collected from MME_DIN_01 during each deployment. This data does not show a clear correlation between temperature, wind speed and bat activity. It is likely that more detailed analysis is needed to interpret the influence of these variables on bat activity within the subject land. Each bat call was assigned a wind speed value based on the nearest 10 minute interval. The percentage of calls for each wind speed is shown in Graph 8. This shows that 73% of bat activity occurred when wind speeds were 8m/s or less. Conversely, only 27% of bat activity occurred at wind speeds greater than 8 m/s. However it must be noted that the low percentage of bat activity at low wind speeds is likely due to the absence or lack of 10-minute intervals during the night that recorded low wind speeds, as shown on Graph 6. That being, the wind data suggests there are very limited times where the wind speed it is actually around the ≤3m/s mark. In summary, the data suggests that bat activity is generally highest up until around 8 m/s before activity begins to taper off.

Overall, data regarding the relationship between bat activity and wind speed or temperature was not conclusive for the project. The strongest predictor of bat activity appears to be habitat type, with inland floodplain woodland (PCT 13 and PCT 15) and shrubland (PCT 17 and PCT 160) consistently recording higher bat activity than other habitat types. These areas are largely being avoided by the project.



Graph 8 Percentage of bat activity per wind speed

5.2.3. Identification of resident, nomadic and migratory species and flight paths

Section 6.1.5 of the BAM dictates that wind farm developments must identify resident threatened aerial species, resident raptor species and nomadic/migratory species likely to fly over the proposed development site as a flyway or migration route. These species are summarised below in their respective categories.

Resident raptor species

The following resident raptor species were identified as being present within the subject land during BUS:

- Brown Goshawk *Accipiter fasciatus*.
- Wedge-tailed Eagle *Aquila audax*.
- Spotted Harrier *Circus assimilis* (Vulnerable, BC Act).
- Swamp Harrier *Circus approximans.*
- Black-shouldered Kite *Elanus axillaris*.

- Brown Falcon *Falco berigora*.
- Nankeen Kestrel *Falco cenchroides cenchroides*.
- Australian Hobby *Falco longipennis.*
- Black Falcon *Falco subniger* (Vulnerable, BC Act).
- Whistling Kite *Haliastur sphenurus.*
- Black Kite *Milvus migrans*.

Many of these species are considered common/widespread and likely to occur as resident raptor species, with dispersing juveniles, with Spotted Harrier and Black Falcon both listed as Vulnerable under the BC Act.

Threatened woodland aerial species

Threatened woodland aerial species recorded during BBUS include the following species:

- Southern Whiteface *Aphelocephala leucopsis* (Vulnerable EPBC Act and BC Act), credit type not yet assigned.
- Painted Honeyeater *Grantiella picta* (Vulnerable EPBC Act and BC Act).
- Pied Honeyeater Certhionyx variegatus (Vulnerable, BC Act).
- Spotted Harrier *Circus assimilis (Vulnerable, BC Act).*
- White-fronted Chat *Epthianura albifrons (Vulnerable, BC Act).*
- Black Falcon *Falco subniger* (Vulnerable, BC Act).
- Superb Parrot *Polytelis swainsonii* (Vulnerable EPBC Act and BC Act).
- Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris* (Vulnerable, BC Act).

Of these species, all but Painted Honeyeater, Southern Whiteface and White-fronted Chat are considered at risk of collision based on known behaviours and flight heights recorded from BBUS.

Nomadic/Migratory species

The following species considered as nomadic/migratory that were recorded during BUS, or are known to move through the subject land during nomadic movements, such as the Australasian Bittern, within the locality include:

- Australasian Bittern *Botaurus poiciloptilus* (Endangered, BC Act and EPBC Act).
- Australian Pelican *Pelecanus conspicillatus.*
- Australian White Ibis *Threskiornis Molucca.*
- Black Falcon *Falco berigora* (Vulnerable, BC Act).
- Cockatiel *Nymphicus hollandicus.*
- Fairy Martin *Petrochelidon ariel.*
- Fork-tailed Swift *Apus pacificus*
- Great Egret *Ardea alba*
- Grey Teal *Anas gracilis*
- Gull-billed Tern *Gelochelidon nilotica*
- Little Black Cormorant *Phalacrocorax sulcirostris*

- Little Egret *Egretta garzetta.*
- Little Pied Cormorant *Microcarbo melanoleucos.*
- Masked Woodswallow *Artamus personatus.*
- Mulga Parrot *Psephotus varius.*
- Pacific Black Duck *Anas superciliosa.*
- Plumed Whistling Duck *Dendrocygna eytoni.*
- Pink-eared Duck *Malacorhynchus membranaceus*
- Rainbow-Bee-eater *Merops ornatus.*
- Straw-Necked Ibis *Threskiornis spinicollis.*
- Superb Parrot *Polytelis swainsonii* (Vulnerable EPBC Act and BC Act).
- White-necked Heron *Ardea pacifica.*
- Yellow Spoonbill *Platalea flavipes.*

An assessment of habitat, movements and flight paths of nomadic and migratory species identified was completed. The nomadic/migratory movements within Australia of the non-threatened and threatened species are summarised below in Table 54. The migratory movement of species outside Australia are summarised below in Table 55 that may occur on a rare occurrence or low likelihood.

Table 54 Nomadic/migratory avian species movements within Australia

Species	Nomadic/Migratory movement description	Movement trigger	Habitat in subject land
Threatened species			
Australasian Bittern	Partially nocturnal, cryptic. Not considered highly nomadic, meaning they inhabit a particular area for an extended period but may move within that range in response to changing conditions. Recent satellite tracking work indicates that a large portion of the Riverina rice crop breeding population disperses to coastal wetlands after harvest, whilst other stay local (Bitterns in Rice, 2024).	In response to changes in environmental conditions, such as food availability or weather patterns, searching for suitable breeding habitat or better foraging opportunities.	Sub optimal habitat occurs within the subject land, but may occur transiently in PCT 160 during optimal flooding years, such as the spring /summer 2022/2023 flooding events. Primarily though, the subject land occurs within the flight path between Victoria and Coleambally, with tracking data indicating the movement of Bitterns on occasion through the subject land.
Australian Painted Snipe	Poorly known, but dynamic and highly mobile. Potential for north south migration in eastern Australia, and not often seen in winter in southern eastern Australia.	Responds to flooding of ephemeral inland wetlands, but vanishes for years from key sites even when suitable habitat is available.	Sub optimal habitat occurs within the subject land, but may occur transiently in ephemeral waterways and swamps such as PCT 13, PCT 17 or PCT 160 during optimal flooding years.

Species	Nomadic/Migratory movement description	Movement trigger	Habitat in subject land
Black Falcon	Partially nomadic following rain and the consequent increase in prey numbers.	Inland movements are influenced by rainfall and seasonal factors, as well as prey abundance.	Observed within PCT 28, PCT 10 and fringing PCT 26 sparse woodlands.
Superb Parrot	In the Riverina, mostly sedentary, but can become nomadic or dispersive in winter or based on environmental conditions.	Overwintering or based on foraging resources available.	Observed within PCT 26 intact Myall and PCT 13 riparian areas.
Non-threatened species			
Australian Pelican	Pelicans sometimes flock in large number to breed in inland areas. As waters recede, they head for more permanent wetlands or the coast.	Inland movements are influenced by rainfall and seasonal factors.	Observed in flooded riparian areas such as PCT 13. May also use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.
Australian White Ibis	Highly nomadic, moving in search of suitable habitat, often with Straw-necked Ibis.	Inland movements are influenced by rainfall and seasonal factors.	Open PCT 26 DNG areas and may use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.
Cockatiel	Highly dispersive and nomadic species.	Based on food and water sources become more or less prevalent.	Observed in PCT 13 and PCT 26 woodland.
Fairy Martin	Seasonally migratory, moving north for winter.	Breeding and over wintering. Seasonally common and locally abundant across most of its range.	Observed in PCT 13 and PCT 26 woodland.
Fork-tailed Swift	Breeding occurs April – July in Siberia. Migration starts around August-September with birds moving south, arriving in Australia September/October. Once in Australia this species disperses across most of Australia, often following low pressure systems (Cth DCCEEW 2024e).	Species departs from Australia April/May returning to breeding grounds in Siberia. Return migration triggered by temperatures in Australia (Cth DCCEEW 2024e).	Species is almost exclusively aerial, foraging from 1 to 300m above ground. Foraging usually occurs along the edge of low pressure systems occurring over inland plains, above foothills and coastal areas. Roosting can occur in woodland areas but also aerially. Woodland areas may be used for roosting within the subject land.
Grey Teal	Highly dispersive and nomadic species.	Rainfall and/or flooding events that occurred up to 10 km from resident location.	Observed in flooded riparian areas such as PCT 13. May also use dams and irrigated crop areas in the subject land and areas of

Species	Nomadic/Migratory movement description	Movement trigger	Habitat in subject land
			PCT 160 or PCT 17 during optimal years.
Little Black Cormorant	Partially nomadic. Mostly sedentary, but can become nomadic during above average rainfall and flooding events.	Inland movements are influenced by rainfall and seasonal factors.	Observed in flooded riparian areas such as PCT 13. May also use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.
Little Egret	Dispersive and, in parts of its range, with multi-directional post-breeding movements of up to 280 km recorded. Undertakes regular seasonal movements, mostly to and from breeding colonies, and towards the coast in the dry season.	There is circumstantial evidence of long-distance migration, with regional differences in reporting rates suggesting that individuals migrate north to winter in tropical northern Australia, consistent with changes in the availability of suitable wetland habitat.	Observed in flooded riparian areas such as PCT 13. May also use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.
Little Pied Cormorant	Partially nomadic. Mostly sedentary, but can become nomadic during above average rainfall and flooding events.	Inland movements are influenced by rainfall and seasonal factors.	Observed in flooded riparian areas such as PCT 13. May also use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.
Masked Woodswallow	Post-breeding movement to northern Australia over winter months, and returning to southern areas to breed in spring and early summer.	Breeding and over wintering. Seasonally common and locally abundant across most of its range.	Observed commonly in PCT 28 White Cypress Pine communities.
Mulga Parrot	Seasonal movements of the Mulga Parrot are not well known, but it is usually considered to be either nomadic or to stay in much the same area all year.	Based on foraging resource and response to drought .	PCT 26 Weeping Myall Woodlands
Pacific Black Duck	Mostly sedentary, but can become nomadic during above average rainfall and flooding events.	Inland movements are influenced by rainfall and seasonal factors.	May use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.
Plumed Whistling Duck	Highly dispersive and nomadic species. Prefers margins of shallow, temporary waters and swamps. Feeds in adjacent grassland areas.	Inland movements are influenced by rainfall and seasonal factors.	May use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.

Species	Nomadic/Migratory movement description	Movement trigger	Habitat in subject land
Pink-eared Duck	Highly dispersive and nomadic species. Prefers shallow, temporary waters, however, open wetlands support large flocks.	Inland movements are influenced by rainfall and seasonal factors.	Observed in flooded riparian areas such as PCT 13. May also use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.
Rainbow-Bee-eater	Majority of global population breeds in Australia. Breeding has also been recorded in Papua New Guinea and may occur in the Lesser Sundas Island, Indonesia. (Cth DCCEEW 2023c).	Seasonally common and locally abundant across most of its range. In Australia, breeding season occurs August – January. Moves north across Australian winter.	Observed commonly in PCT 28 White Cypress Pine communities.
Straw-necked Ibis	Highly nomadic, moving in search of suitable habitat, often with Australian White Ibis.	Inland movements are influenced by rainfall and seasonal factors.	Open PCT 26 DNG areas and may use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.
White-necked Heron	Highly mobile, moving around in response to seasonally and annually varying rainfall patterns.	Inland movements are influenced by rainfall and seasonal factors.	May use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.
Yellow Spoonbill	Nomadic across the north and well-watered inland areas in response to water and habitat.	Inland movements are influenced by rainfall and seasonal factors.	May use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.

Table 55 Migratory avian species movements within and outside of Australia relevant to subject land

Species	Migratory movement description	Movement trigger	Habitat in subject land
Curlew Sandpiper	Nesting occurs in Siberia in June/July. Migration between nesting grounds and Australia occurs from July/August, with birds arriving in northern Australia from August – September. Once in Australia, birds move across Australia from August – December (Cth DCCEEW 2024a) .	Return migration triggered by temperatures in Australia. Foraging in Australia occurs until January – April, where birds begin migration back to breeding grounds in Siberia. Some non-breeding individuals (mostly juveniles) stay in Australia until the following season, when they return to Siberia to breed (Cth DCCEEW 2024a).	Sub-optimal. May use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.

Species	Migratory movement description	Movement trigger	Habitat in subject land
White-throated Needletail	Breeding and nesting occurs in Asia around May – June, with most birds migrating August – October arriving to Australia September/October (Cth DCCEEW 2024b).	Return migration triggered by temperatures in Australia. Foraging in Australia occurs until January – April, where birds begin migration back to breeding grounds in Siberia. Some non-breeding individuals (mostly juveniles) stay in Australia until the following season, when they return to Siberia to breed (Cth DCCEEW 2024a).	Subject land is at this species' most 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 (Cth DCCEEW 2024b).
Common Greenshank	Nesting occurs in Palaearctic in the northern hemisphere April – June, with migration to the southern hemisphere occurring from July – September. Birds arrive in Australia from August, and disperse throughout Australia to late December (Cwth DCCEEW 2024b).	Return migration triggered by temperatures in Australia. Foraging occurs in Australia until around February, with birds departing March – April to return to breeding grounds (Cwth DCCEEW 2024b).	Sub-optimal. May use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.
Latham's Snipe	Breeding/Nesting occurs in Japan and far eastern Russia departing breeding grounds July – November in migration to eastern Australia, arriving in Australia July-November. Once in Australia individuals slowly move south along the coast and inland. Within Australia the species is dispersive, with foraging movements triggered by rainfall and availability of food (Cth DCCEEW 2024d).	Foraging occurs in eastern Australia until around February – March, where individuals, likely triggered by temperature, return to breeding grounds in the northern hemisphere (Cth DCCEEW 2024d).	Sub-optimal. May use dams and irrigated crop areas in the subject land and areas of PCT 160 or PCT 17 during optimal years.
Caspian Tern	Within Australia, this species is resident with breeding occurring year-round subject to seasonal conditions. Migration between foraging and breeding areas occurs between coastal and inland sites (Cwth DCCEEW 2024c).	Migration between foraging and breeding areas occurs between coastal and inland sites based on seasonal conditions (Cwth DCCEEW 2024c).	Sub-optimal. May also use dams and irrigated crop areas in the subject land.
Pectoral Sandpiper	Nesting occurs in northern Russia and North America arriving in Australia August –	Species departs Australia generally March-April, with temperature as the likely	Sub-optimal. May use dams and irrigated crop areas in the subject land and areas of PCT

Species	Migratory movement description	Movement trigger	Habitat in subject land
	September. Noted as an uncommon migrant to Australia, mostly sighted in south-eastern Australia, the Murray Darling Basin and western Victoria. Individuals generally arrive in coastal areas before dispersing inland (Birds in Backyards 2024).	trigger (Birds in Backyards 2024).	160 or PCT 17 during optimal years.

Flyways and nomadic movements

Flyways and movements of aerial taxa likely to occur, or recorded within the subject land are described below in the following guilds: Microbats, raptors, waterbirds, woodland and shrubland birds and ground dwelling birds. Within the subject land, and broader landscape, the vast majority of flights observed were between more intact patches of woody vegetation, roadside corridors and along riparian waterways dominated by PCT 13 and PCT 15, patches of fragmented sandhill vegetation dominated by PCT 28, and more intact areas of PCT 26 Weeping Myall. Raptor species and more common disturbance tolerant woodland species, such as Ravens and Galahs, as well as common parrots such as Blue Bonnets, were also observed transiting or foraging across more open grassland and sparse woodland landscapes.

Raptors

A total of 11 raptor species, including the Black Falcon and Spotted Harrier, were identified during the BUS survey effort by Biosis within the subject land. Raptor presence varied between seasons, however presence of identified raptor species are considered resident, with dispersing juveniles, within the subject land. Predominately raptor movement is influenced by a complex interplay of ecological factors, and specific patterns that can vary greatly between species. Within the subject land, raptors utilise woodland and scattered trees within PCT 13, PCT 15 and PCT 28 for roosting and nesting whilst foraging was observed within the more open grasslands and sparse woodlands. Raptor species move throughout the day and covering larger distances between nesting, roosting and foraging locations, particularly Wedge-tailed Eagles. Table 61 demonstrates a review of the risks associated with collisions for raptors known to occur within the subject land, or predicted to occur on occasion.

Waterbirds

A total of 21 waterbirds were observed during BUS surveys. Movements of waterbird species are likely to occur as a mixture of resident day or nightly movement, nomadic movements subject to climatic conditions and for some species, seasonal migration movements during warm and cold months. Flight paths are likely to occur through the subject land and across into the broader landscape. During wetter seasons and flooding events, such as in spring 2022, larger numbers of waterbirds were observed then on average due to optimal foraging conditions and more permanent water.

Satellite tracking of Australasian Bitterns has record flights through the subject land between Coleambally and Victora (Bitterns in Rice, 2024). The potential flight heights for Australasian Bitterns can vary depending on several factors, including habitat type, weather conditions, and behavioural patterns. Generally, Australasian 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. During normal flight activity, Australasian Bitterns typically fly just above the surface of the water or wetland vegetation, often staying within a few meters above ground level. However, they may occasionally ascend to slightly higher elevations, particularly during certain behaviours such as territorial displays or courtship flights, which may involve flights up to several meters above the ground. Overall, while the precise flight heights of Australasian Bitterns may vary depending on specific circumstances, they generally exhibit a low-level flight behaviour, closely associated with the wetland habitats they inhabit and the hunting strategies they employ. However, 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 flies at 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).

Woodland, grassland and shrubland birds

A total of 67 woodland, grassland and shrubland bird species, including parrots, robins and honeyeaters, were recorded within the subject land during the BUS survey effort by Biosis. The collective sum of these species utilises almost all the habitat within the subject land for foraging, roosting or nesting, however, generally stick to flights within or just above canopy heights. Resident species complete daily movements, moving from roosting habitat across foraging areas. Movements of many species are centred on abundance and availability of food, or occur seasonally with temperature changes and seasonal conditions. Breeding is likely to occur year-round across the species identified. Resident species are likely to hunt and or forage and roost in patches of preferred habitat, with minimal dispersal outside of breeding seasons. Species subject to nomadic movements are likely to use both riparian and terrestrial woodland corridors, and for smaller species, such as the threatened White-fronted Chat and Southern Whiteface, areas of shrubland habitat throughout the landscape. Terrestrial movement corridors have been identified within Figure 13 and Figure 14. Threatened woodland and shrubland bird species identified within the subject land include White-fronted Chat, Grey-crowned Babbler (eastern subspecies), Southern Whiteface and Superb Parrot. Areas of identified habitat that may support the threatened Plains-wanderer were also identified within the subject land, however this species is considered predominately as sedentary, with occasional dispersal movements due to the dynamic nature of grassland habitats.

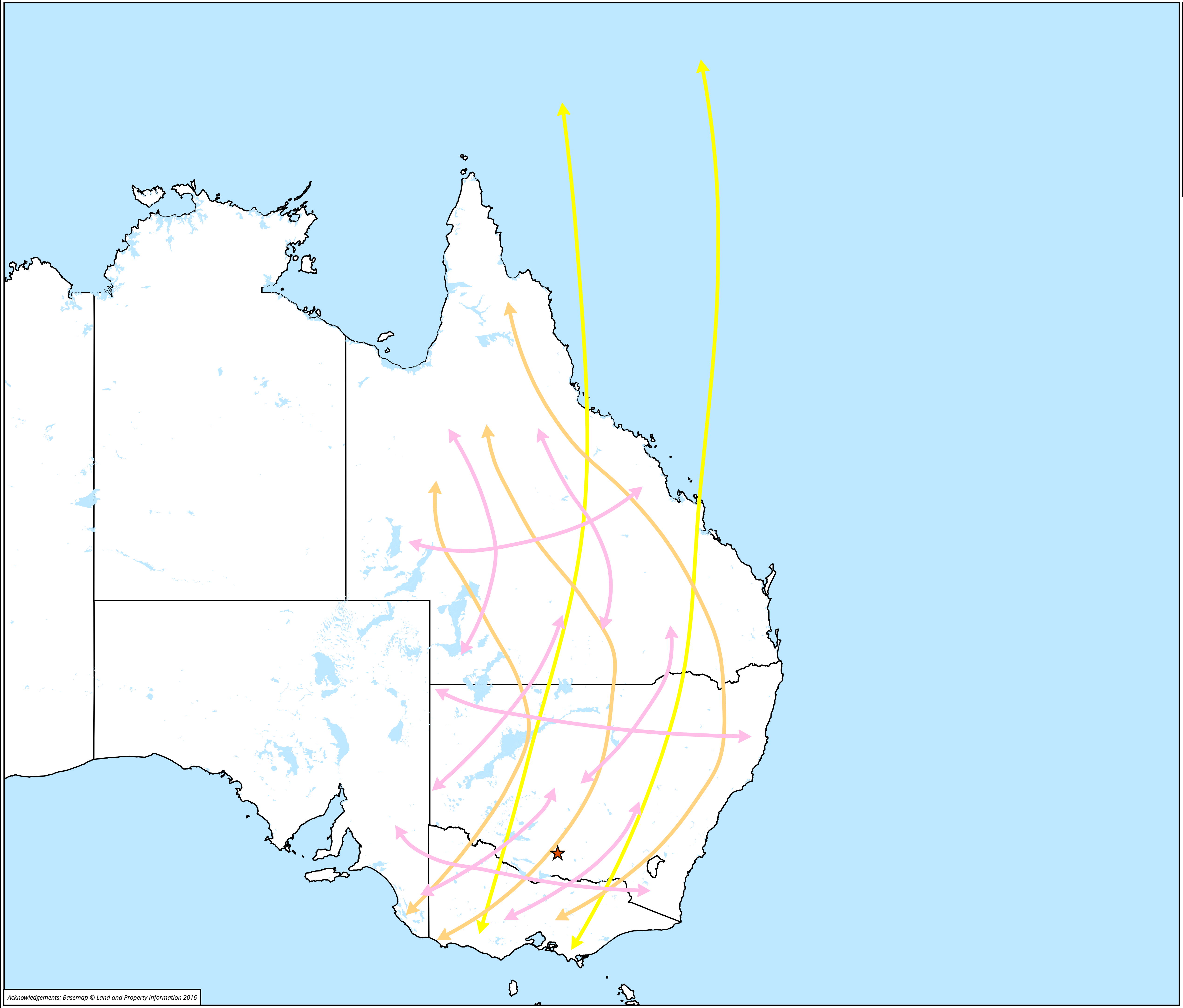
Microbats

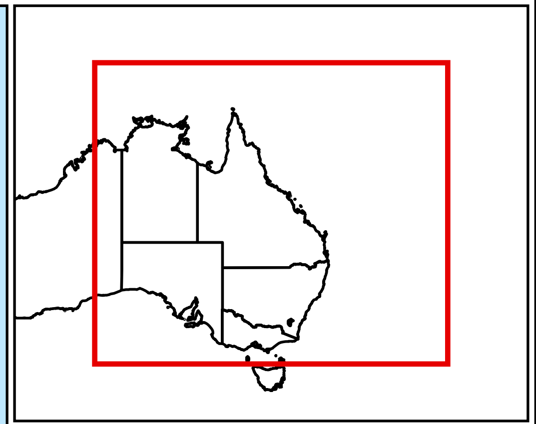
As previously mentioned, 14 species were positively identified of the 20 species that are known or predicted to occur within the subject land (Australasian Bat Society 2022). Up to four additional species may also have been recorded however reliable identification to species level was not possible due to similarity of call characteristics between species. Bat activity was found to be higher in wetter areas within the study area such as floodplain woodland and shrublands. This is consistent with what would be expected in dry, open landscapes. Foraging resources are likely to be concentrated in wetter areas, where insect abundance and diversity is also likely to be higher. Structural vegetation diversity is also likely to be associated with increased foraging opportunities for a greater diversity of bats. Table 56 and Table 62 provides a review of behaviour and flight characteristics of microbat species recorded within the subject land and collision risk.

Table 56 Microbat behaviour overview

Species	Foraging space	Flight characteristics	Canopy	Overview
White-striped free-tailed bat *Austronomus australis*	Open	Fast, not designed for manoeuvrability	Above canopy	Fast-flying species intercepting their prey 50 m or more above the ground. (Churchill 2008).
Gould's Wattled Bat *Chalinolobus gouldi*	Edge	Fast, agile	Generally, within the lower level of the tree canopy and along forest edges, creek lines and isolated paddock trees. Can fly at height and open areas on occasion	Feeds on a wide variety of prey, regularly foraging 5 - 10 km from their roost site. They fly just below or within the lower level of the tree canopy and along the forest edges, creek lines and around isolated paddock tree with fast, agile flight (Churchill 2008).
Chocolate Wattled Bat *Chalinolobus morio*	Edge	Fast, agile, direct	Below canopy	In inland areas their distribution is associated with water courses that provide large trees for roosts. They prefer forests to small forest patches (Churchill 2008). They forage up to 5 km from their roost site, their flight is usually fast and direct with considerable agility (Churchill 2008). They mostly forage in the zone between the top of the understorey and the canopy, although sometimes fly low along forest trails.
Long-eared Bat *Nyctophilus sp*	Closed	Slower, more manoeuvrable.	Below canopy, in and around vegetation.	Highly manoeuvrable and able to change direction often and quickly (Churchill 2008). Fly very close to vegetation, usually at canopy height, where they weave between gaps in the canopy (Churchill 2008).
Inland Free-tailed Bat *Ozimops petersi*	Open/ Edge	Fast, direct	Above canopy	Forage in open unobstructed areas. They fly fast above the canopy. They are not very manoeuvrable in flight.
South-eastern Free-Tailed Bat *Ozimops planiceps*	Open/Edg e	Fast, agile	Below canopy on ground, edge of canopy and above canopy.	Forage up to 12 km from their roost site. Roost in tree hollows with narrow entrances and cavities. Forage in spaces between trees, at edge of canopy of remnant vegetation and above canopy. Can also forage on the ground due to their agility (Australian Museum 2020).
Ride's Free-tailed Bat *Ozimops ridei*	Open/ Edge	Fast, direct	Above canopy	Fly predominantly in the spaces between trees.

Species	Foraging space	Flight characteristics	Canopy	Overview
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	Open	Fast, direct, not manoeuvrable	Above canopy	Almost all habitats, migratory, probably fly high. Long, narrow wings.
Inland Broad nosed Bat *Scotorepens balstoni*	Edge	Moderately fast, agile	Below canopy	Flight is continuous with sudden rapid diversions. Forage mostly between trees but also at the edges of forests, and out in open areas. (Churchill 2008). They stay within 15 m of the ground and do not forage above the canopy.
Little Broad-nosed Bat *Scotorepens greyii*	Edge	Moderately fast, agile	Below canopy	Flight is continuous, moderately fast, agile. Search for insects close to the tree tops but not above them, flying in the open spaces along the contour of the vegetation within 2 m of the foliage. Forage over water, grasslands and other open habitat. (Churchill 2008).
Large Forest Bat *Vespadelus darlingtoni*	Edge	Fast, less manoeuvrable.	Below canopy	Fast-flying bat that is less manoeuvrable than most *Vespadelus*. Avoid cluttered regrowth and rainforest by foraging mainly within the spaces among trees and between the canopy and the understorey.
Southern Forest Bat *Vespadelus regulus*	Edge	Fast, agile, manoeuvrable	Below canopy	Highly manoeuvrable, moderately fast insectivores. Fly with great agility very close to vegetation and readily enter gaps in the understorey, usually foraging at less than half the canopy height. Small foraging range of less than 10 ha.
Little Forest Bat *Vespadelus vulturnus*	Edge			
Inland Forest Bat ***Vespadelus baverstocki***	Edge	Fast, agile, manoeuvrable	Below canopy	Highly manoeuvrable, moderately fast insectivores. Fly with great agility very close to vegetation and readily enter gaps in the understorey, usually foraging at less than half the canopy height. Small foraging range of less than 10 ha.
In general:				
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.				





Legend

Location of proposed Dinawan wind farm

Migratory bird flight paths

Indicative international migratory flight path

Indicative mainland migratory movements

Indicative nomadic movements

Figure 13 Indicative nomadic and migratory flight paths

0 100 200 300 400 500 600

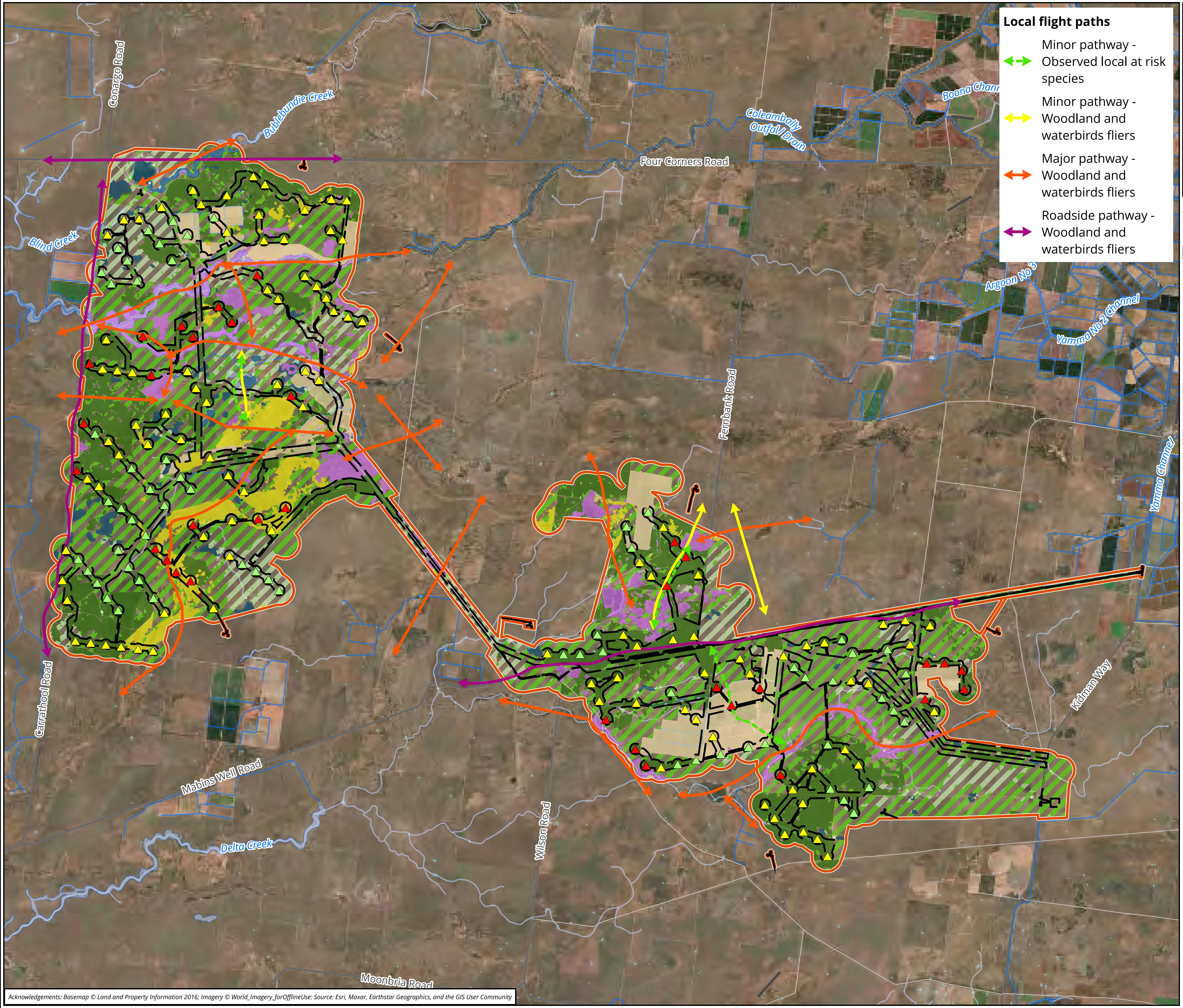
Kilometers

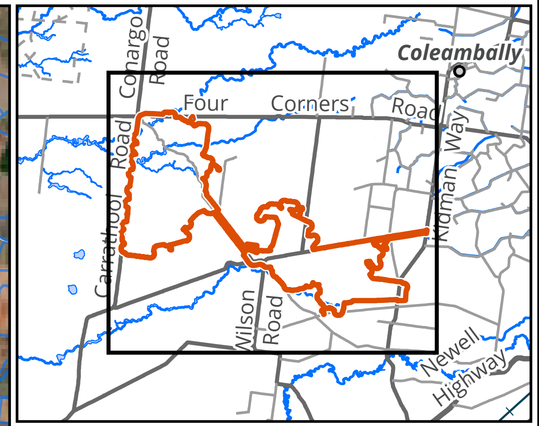
Scale: 1:14,000,000 @ A3

Coordinate System: GDA2020

N

Matter: 37263, Date: 12 April 2024,
GIS: JB, Checked by: MP, Last edited by: jbeckius
Location: P:\37200s\37263\Mapping\
37263_Dinawan_BDAR_Wind_F11-16.aprx
Layout: 37263_Wind_F13_MigrFlightPath





Legend

- Subject land
- Development corridor

Wind turbine constraint

- High
- Moderate
- Low

Vegetation class

- Inland Floodplain Shrublands
- Inland Floodplain Woodlands
- Inland Riverine Forest
- Riverine Derived Grasslands
- Riverine Plain Grasslands
- Riverine Plain Woodlands
- Riverine Sandhill Woodlands
- Non-native vegetation

Figure 14 Indicative local flight movements - Overview

0 1 2 3 4 5
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
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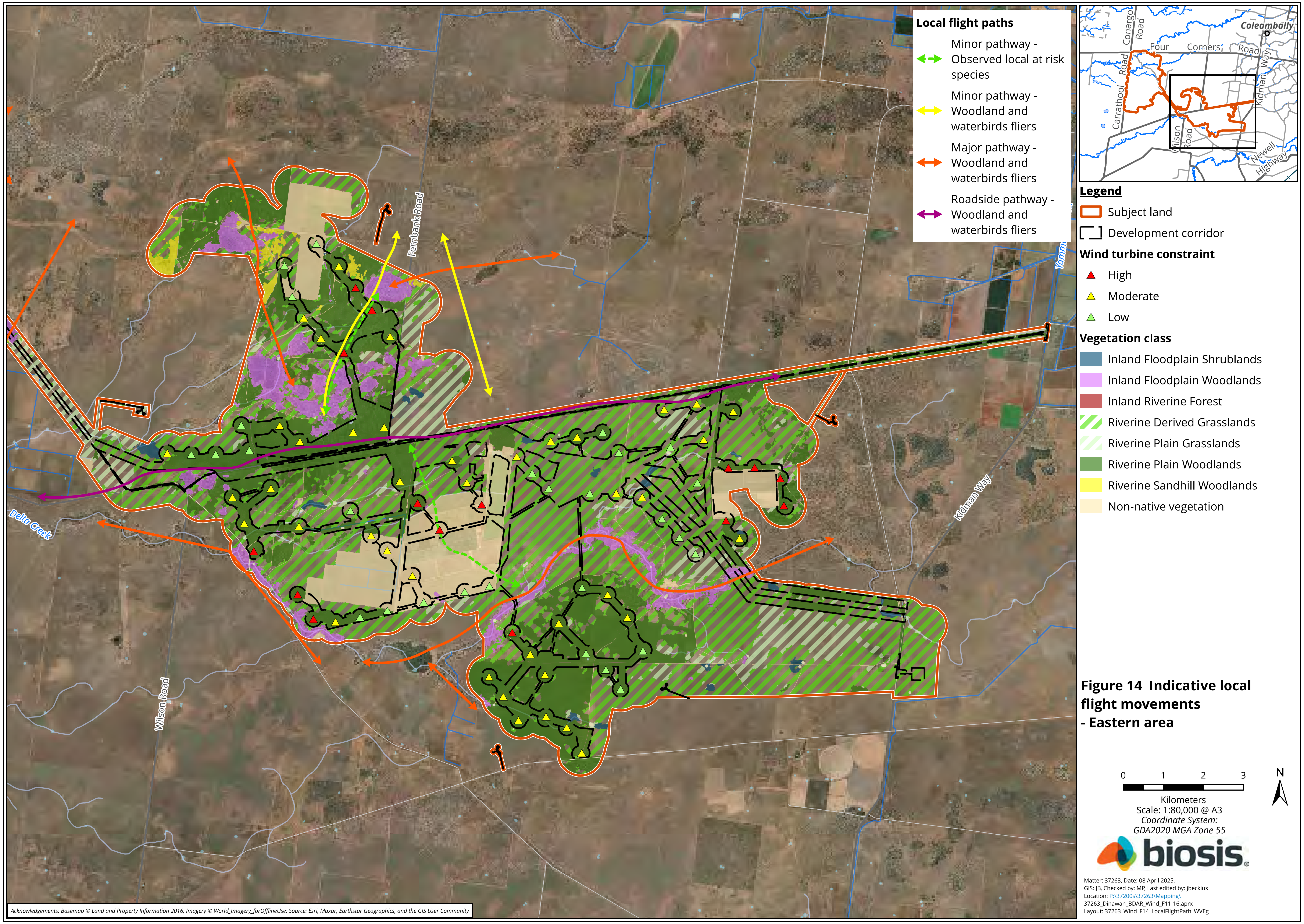

Figure 14 Indicative local flight movements - Eastern area

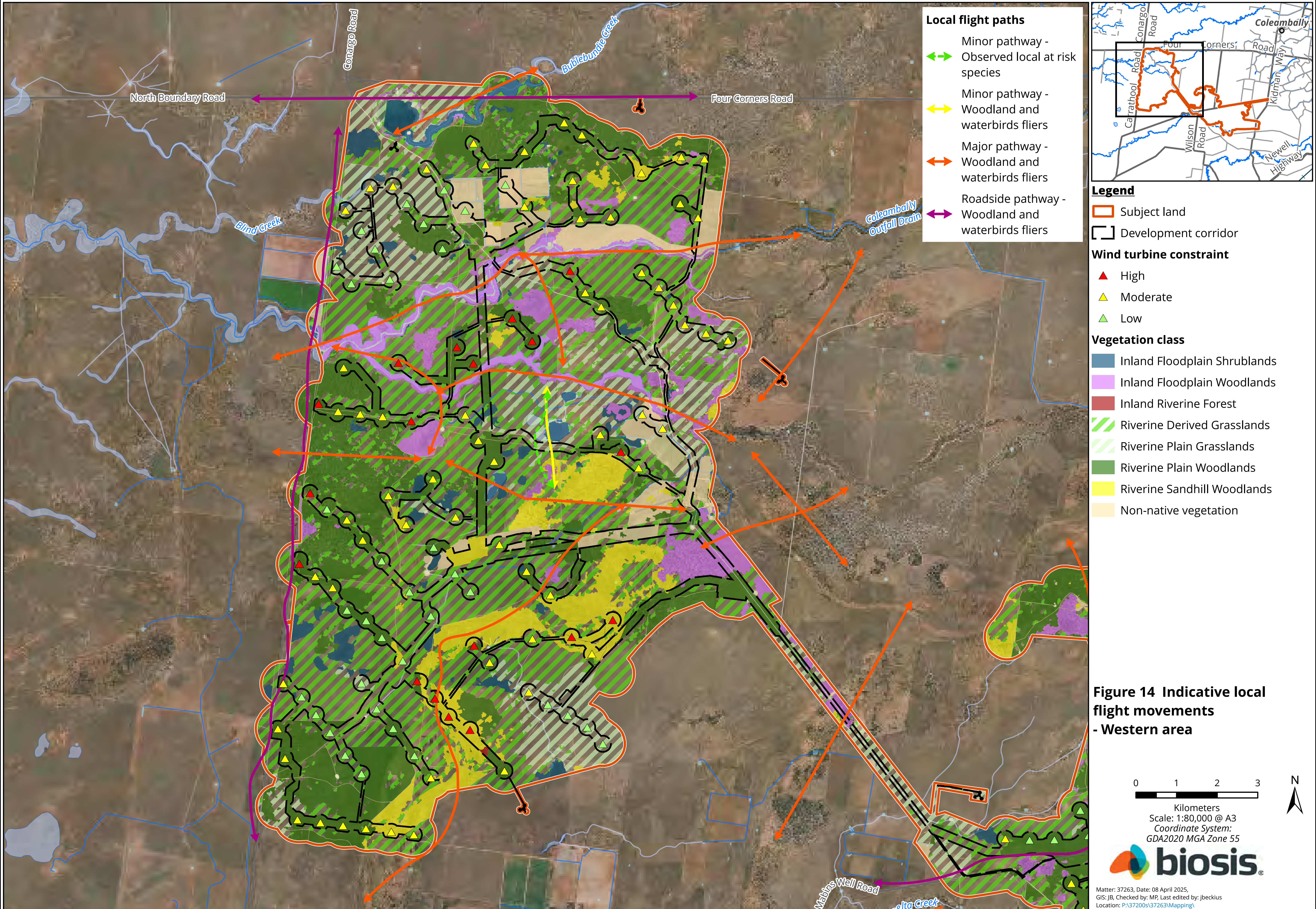

Figure 14 Indicative local flight movements - Western area

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_F11-16.aprx
Layout: 37263_Wind_F14_LocalFlightPath_WVEg

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

6. Collision and barrier effect risk assessments

Biosis undertook collision risk modelling and bird and bat risk assessment to inform the overall biodiversity impact assessment for the project. This assessment identified species or groups of birds and bats considered at potential risk of collision with turbines, and the potential impact on bird and bats subject to disturbance and/or barrier effects posed by constructed wind turbines. The outcome of these assessments enables the targeted assessment of key species to be considered in the preparation of the impact assessment for the wind farm. In addition to direct loss of habitat from the construction of a wind farm, indirect impacts on birds and bats can arise from three potential pathways, including:

- Turbine strike (and possibly barotrauma) with towers and/or operating wind turbine blades at RSA heights.
- Loss of habitat connectivity (barrier effects) between essential resources, such as foraging and roosting areas.
- Avoidance of areas of habitat due to air disturbance surrounding operational turbines (habitat sterilisation).

6.1. Collison Risk Model (CRM)

6.1.1. Background

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 collision risk models to evaluate such impacts, but population modelling would be a separate exercise to the collision risk modelling 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 bats. The modelling presented here is therefore confined to diurnal birds. 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 Dinawan Wind Farm on relevant species of birds. 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 collision risk model can be found in Smales et al. (2013), provided in Appendix 8.

6.1.2. Overview

The collision risk model takes account of bird flights that occur within the height zone that will be occupied by turbines. Data for the number of flights and their heights was documented by a regime of fixed-time point counts at locations representative of future turbine locations across the subject land. The model uses the empirical sample of flight data for each species and extrapolates that to determine a potential number of such flights that might occur over an entire 12 month period. This factor takes into account what is known about seasonal presence of particular species that may be migratory or may be present only for part of the year for other reasons.

In the 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 the species of interest to pass across the depth of the rotor-swept disk.

Since the turbine tower below rotor swept height is always a static component and poses minimal collision risk, the model takes this into account by dividing flights into those below turbine rotor height, and those within the height zone swept by turbine rotors and allocating different risk rates to these height classes.

The risk assessment accounts for a combination of variables that are specific to the project and to data for birds from within the vicinity of the project. They include the following:

- The numbers of flights of each species below rotor height, and for which just the lower portion of turbine towers present a collision risk.
- The numbers of flights at heights within the zone swept by turbine rotors, and for which the upper portion of towers, nacelles and rotors present a collision risk.
- The numbers of bird movements-at-risk, as recorded during timed point counts, extrapolated to determine an estimated number of movements-at-risk the species makes in an entire year. Account is taken of the portion of the year that birds are within proximity of the subject land and that they may thus be at risk.
- The mean area (m2 per turbine), of tower, nacelle and stationary rotor blades of a wind generator that present a risk to birds. Thus, the mean area presented by a turbine is between the maximum (where the direction of the bird is perpendicular to the plane of the rotor sweep) and the minimum (where the direction of the bird is parallel to the plane of the rotor sweep). The mean presented area is determined from turbine specifications supplied to Biosis for specific make and model of a turbine. It represents the average area presented to an incoming flight from any direction.

- The additional area (m2 per turbine) presented by the movement of rotors during the potential flight of a bird through a turbine. This information is determined via a calculation involving species-specific, independent parameters of the flight speed and body length of the bird and supplied specifications for speed and dimensions of the turbine rotor.
- The model assumes that all turbines represent equal risk.
- A calculation of the average number of turbines a bird is likely to encounter in a given flight through the subject land. This is based on the scattered configuration of turbines in the landscape and the total number of turbines proposed for the project.

6.1.3. Avoidance rates

Results are provided for various avoidance rates. Avoidance rate is the capacity for a bird to avoid a collision, whether that occurs due to a cognitive response on the part of a bird or not. Thus at the extremes of the rates applied, a 0.90 avoidance rate equates to one flight in 10 in which a bird does not avoid a turbine and a 0.99 avoidance rate equates to one flight in 100 in which it does not avoid a turbine. Based on experience with a wide range of bird species, it is certain that virtually all species have high capacity to avoid collision with the static components of turbines. Avoidance rate for these components is thus consistently considered to be 0.99 in the modelling (i.e. one flight in 1,000 in which it does not avoid a static turbine component). Various avoidance rates are modelled for the dynamic turbine components because it is not certain how adept various species may be at evading collision with the moving rotor. For this reason, results are provided for 0.90, 0.95, 0.98 and 0.99 avoidance rates for the dynamic components (moving rotor) of turbines.

It should be noted that internationally there is very little empirical evidence for the actual avoidance rate for any bird species and for this reason it is prudent to provide a range of estimates that are considered to be reasonable. The evidence that is available suggests that avoidance capacity is species-specific and that the great majority of birds have a very high avoidance capability that is higher than 0.98. Nonetheless, the avoidance rate for Wedge-tailed Eagles appears to differ somewhat between wind farms. For three operational wind farms it has been between 0.95 and 0.97, while for a fourth it has been slightly lower than 0.90 (Smales 2023).

6.1.4. Results metrics

Generally, the model's results are expressed as the number of flights at risk of collision per annum for each species. This is a relative measure that permits comparison of risk rates associated with various turbines or turbine configurations. It does not necessarily equate to the number of collisions that might occur because we do not know how many individual birds of each species use the site and may thus be at risk. The difference between flights at risk of collision and number of actual collisions can be simply explained by way of an example. If there are just two individuals of a given species occupying the wind farm, they may make multiple flights that could result in collisions, however the maximum number of fatalities that could occur is two. As can be seen from this example, the number of actual fatalities due to collisions can be no greater than the number of individual birds, but it can also be no more than the number of flights at risk, and if the site-population is small but the birds fly actively within the site, the number of collisions will always be considerably lower than the number of flights at risk.

In cases where a good estimate or estimate of higher confidence for a site-population for particular species can be made, this can be incorporated into the model to provide results and expressed as an annual estimate of collisions.

Existing knowledge of the population dynamics for most of the species within the subject land is not sufficient to allow an estimate to be made for their site-populations. However, for three resident raptors (Nankeen Kestrel, Wedge-tailed Eagle and Black-shouldered Kite), an estimate of their possible site-populations has been made and the model has been run to provide a projection of results for them as an annual estimate of collisions.

The model cannot forecast the frequency of collisions around the predicted annual average and it is important to recognise that the number of any actual collisions that might occur can be expected to vary from year to year in a distribution around the average.

All results are provided to two significant figures, however they represent annual 'average' results and, of course actual bird fatalities will always be measured in numbers of individuals and the average results of modelling must represent a distribution that can be expected to vary from year-to-year around the mean.

6.1.5. Wind farm turbine parameters

The Biosis CRM requires a range of numeric inputs, to quantify the number of turbines, key dimensions of turbines, and to estimate bird utilisation characteristics, including the number of flights within and outside of rotor swept height for species to be included in the model. Following the results of the preliminary evaluation, the CRM used the following Key parameters:

- Number of turbines: *200*
- Turbine type: *Vestas V172-7.2 HH 150*
- Turbine tower hub height: *150 m, with 2% nominal variation*
- Rotor diameter: *172 m*
- Rotational speed: *12.1 rpm*
- The 172 metre diameter blades have a length of 86 metres, resulting in rotor swept height between 61and 239 (worse case) metres above the ground.

It is considered that the updated CRM captures the most conservative scenario in terms of potential collision risk. During consultation with CPHR, there was concurrence that as long as a conservative approach is adopted then it would be acceptable, noting distance above ground is a key parameter. CPHR agreed that post approval plans can address hub height increases. 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 prior to construction.

In the scattered or 'clustered' array of turbines such as those within the development corridor, a bird has a high probability of encountering multiple turbines in a given flight. The CRM has a built-in function to account for any difference whereby the turbine array can have any setting from 100% of turbines fully clustered to 0% in which turbines are entirely linearly configured.

6.1.6. Bird species data

Following the results of the BUS, undertaken across eight seasons and two years, the CRM was run for all species for which there were any flights recorded at RSA height. That included all flights documented from between 61 and 239 metres above the ground.

A total of 110 species of birds were recorded during BUS. While many of them may have capacity to fly at rotor swept height, 21 species were recorded doing so, of which 19 were at sites included in the CRM, and thus have data available for use in the model. For those species not recorded within RSA, but have potential to fly within RSA on occasion, or not recorded during BUS due to their cryptic nature, are covered further in risk assessments presented in Section 6.2.2. All modelled species are predicted to be present all year round, despite some aspects of nomadic and seasonal migration behaviours for some.

Many resident raptors and other woodland birds tend to occupy territories that remain stable over periods of several years and, because they are apex predators they occur at relatively low densities. In light of published studies for those species, Biosis undertook a process to estimate the sizes of their potential populations for the subject land. Additional population estimates were based on the number of birds recorded during BUS.

Table 57 Bird utilisation surveys included in the CRM

Site	Summer	Autumn	Winter	Spring	Total
Control sites (included in CRM for assessment)					
CTL1	7	7	7	5	**26**
CTL3	7	7	8	7	**29**
CTL7	7	7	6	7	**27**
CTL11	7	7	6	5	**25**
Impact sites					
IMP1	7	4	9	5	**25**
IMP2	7	8	9	6	**30**
IMP3/18	7	10	9	6	**32**
IMP4	7	8	9	5	**29**
IMP5/19	7	4	10	5	**26**
IMP6	7	8	10	7	**32**
IMP7	7	8	10	5	**30**
IMP9	7	8	12	7	**34**
IMP10	7	8	9	5	**29**
IMP11	7	9	10	6	**32**
IMP13	7	8	10	5	**30**
IMP15	7	8	10	6	**31**
IMP16	7	8	10	7	**32**
IMP20	7	4	9	3	**23**
IMP21	7	4	10	2	**23**
IMP22	7	7	10	5	**29**

6.1.7. Population estimates

Wedge-tailed Eagle

Cherriman (2007) provided an overview of studies, including his own, that have investigated the size of Wedge-tailed Eagle territories in temperate regions. Territory sizes in studies near Perth (Cherriman 2007); at two other sites in the south-east of Western Australia (Ridpath & Brooker 1987); near Canberra in south-eastern Australia (Leopole & Wolfe n.d.); and, in South Australia (Rowe et al. 2017) were all between 31 km^2 and 42 square kilometres. Foster and Wallis (2010) studied the species west of Melbourne and recorded nearest-neighbour distances averaged 4.7 kilometres. In a study in western NSW, Sharp et al. (2001) found the mean distance to nearest neighbour between Wedge-tailed Eagle nests was in the order of one pair per 3–9 square kilometres. They noted this was considerably higher than that noted in other semi-arid zone studies (1 pair per 40–48 square kilometres).

Using a conservative mean Wedge-tailed Eagle territory size of 30 square kilometres, the average diameter of a territory would be slightly greater than 12 kilometres. As a consequence, we have based the modelling exercise for Wedge-tailed Eagles on the assumption that the 313 kilometre square array within the subject land may intersect with several territories, occupied by 21 adult birds.

Cherriman (2013) reported that breeding productivity (number of chicks fledged) was 0.73 young per pair, across 15 occupied territory-years. Debus et al. (2007) recorded very similar results with 10 young produced in 12 pair-years, equating to 0.8 young fledged per pair per year. On the basis of those studies, we have conservatively assumed that, on average, three pairs will be accompanied by a total of three flying juveniles, bringing the average site-population of Wedge-tailed Eagles to a total of 31. Hence we have modelled for this number of birds as being at potential risk of collision.

During BUS, Biosis staff documented a number of instances in which three, four and five, and up to eight Wedge-tailed Eagles were observed simultaneously.

Nankeen Kestrel and Black-shouldered Kite

Near Armidale, NSW, one pair of Nankeen Kestrels occupied at least 200 hectares (2 square kilometres) (Genelly 1978) and active nests were recorded approximately 1 kilometre apart (Baker-Gabb 1985). Near Mildura, Victoria, 12 pairs were documented from an area with a 10 kilometre radius (i.e., approx. 314 square kilometres), and 25 nests averaged 1-3.6 kilometre apart equating to 1 pair per 5.4 square kilometres (Baker-Gabb 1984). At Millewa, Victoria, Campbell (1986) reported an average of 1 active pair per 5.3 square kilometres (all references in HANZAB (Marchant et al. 1990)).

Using a conservative mean Nankeen Kestrel territory size of 5.3 km², the average diameter of a territory would be approximately 2.6 kilometres. As a consequence, we have based the modelling exercise for Nankeen Kestrel and Black-shouldered Kites on the assumption that the 313 kilometre square array within the subject land may intersect with several territories, occupied by 118 adult birds.

Baker-Gabb (1984) reported a mean number of 1.3 fledglings per territorial pair. On the basis of that study, we have assumed that, on average, 10 pairs will be accompanied by a total of 13 flying juveniles, bringing the average site-population of Nankeen Kestrels and Black-shouldered Kites to a total of 194 and we have modelled for 200 birds as being at potential risk of collision.

White-necked Heron

The site population for this species was derived from the BUS data, based on the highest count of birds per site within a survey across all sites, which is 17. It is reasonable to assume a total of 20 for the site as a conservative estimate. Flocks are generally small but sometimes include up to 200 individuals according to HANZAB (Marchant et al. 1990).

Australian Wood Duck

The site population for this species was derived from the BUS data, based on the highest count of birds per site within a survey across all sites, which is 56. It is reasonable to assume a total of 60 for the site as a conservative estimate. Flocks are generally of less than 100 individuals but sometimes up to 2000 according to HANZAB (Marchant et al. 1990).

Spotted Harrier

The site population for this species was derived from the BUS data, based on the highest count of birds per site within a survey across all sites, which is five. It is reasonable to assume a total of five for the site as a conservative estimate. This species is not considered to form flocks (Marchant et al. 1990).

Australian Raven

The site population for this species was derived from the BUS data, based on the highest count of birds per site within a survey across all sites, which is 133. It is reasonable to assume a total of 130 for the site as a conservative estimate. Flocks are generally of less than 30 individuals but sometimes up to 300 according to HANZAB (Marchant et al. 1990).

Plumed Whistling-Duck

The site population for this species was derived from the BUS data, based on the highest count of birds per site within a survey across all sites, which is 35. It is reasonable to assume a total of 35 for the site as a conservative estimate. Flocks are generally of less than 50 individuals but sometimes up to 200 according to HANZAB (Marchant et al. 1990).

Galah

The site population for Galah was based on:

- Breeding pairs occupying approximately 1 km^2 territories for a woodland area of 313 km^2. This area would support 313 territories, equalling a total 626 adult birds.
- Average clutch size of 3.7, with a 48% fledging success (Marchant et al. 1990), equalling 556 flying juveniles.

This provides a site population estimate of 1182, which we have rounded to 1000. During the BUS, the highest count of birds per site within a survey across all sites is 542, and it is feasible that up to 1000 can occur in the subject land. Published literature indicates that flocks of 500 to 1000 can occur, and based on the available woodland habitat for nesting and roosting and the territory size, a total estimate oof 1000 is realistic for the proposed wind farm site (Marchant et al. 1990).

Brown Falcon

The site population estimate for Brown Falcon was based on:

- Wooded and non-wooded habitats within the subject land supporting stick nests being approximately 313 km^2 to support the resident population.
- Breeding pairs occupying 2 km^2 territories (Debus 2022) within the habitat, based on an average density or territory size reported in the literature. This area would support 156 territories, equalling a total 313 adult birds.
- Average 1.77 fledged chicks per successful breeding attempt, with a 69% breeding success (HANZAB) (Marchant et al. 1990) from 156 territories. This totals 192 flying juveniles. Young birds likely to remain floaters for part of the year.

Thus the total estimated number of individuals on site is 505, which has been rounded to 500. During the BUS, the highest count of birds per site within a survey across all sites is 22, however it is feasible that up to 500 can occur in the project area.

Black Falcon

The site population for this species was derived from the BUS data, based on the highest count of birds per site within a survey across all sites, which is five. It is reasonable to assume a total of five for the site as a conservative estimate. This species is not considered to form flocks (Marchant et al. 1990).

Whistling Kite

The site population estimate for Whistling Kite was based on:

- Wooded and non-wooded habitats within the subject land supporting stick nests being approximately 313 km^2 to support the resident population.
- Breeding pairs occupying 3.25 km^2 territories, based on an average density or territory size reported in the literature (Marchant et al. 1990). This area would support 97 territories, equalling a total 193 adult birds.
- Average 1.5 young per pair/territory with 60% fledging success from 97 territories, equalling 87 juveniles (Marchant et al. 1990). Young birds are likely to remain floaters for part of the year.

Thus, the total estimated number of individuals on site is 280 (193 adults and 87 juveniles). During the BUS, the highest count of birds per site within a survey across all sites is 10, and it is feasible that up to 280 can occur in the project area.

Black Kite

The site population estimate for Black Kite was based on:

- Breeding pairs occupying 2.33 km^2 territories ((Marchant et al. 1990); Mildura and Strzelecki floodplain) within 313 km^2 woodland area, based on an average density or territory size reported in the literature. This area would support 135 territories, equalling a total 269 adult birds.
- Average 1.5 young per pair/territory, with a 64% fledging success from 135 territories, equalling 130 flying juveniles (Marchant et al. 1990). Young birds are likely to remain floaters for part of the year.

Thus the total estimated number of individuals on site is 399 (269 adults and 130 juveniles), which has been rounded to 400 birds. During the BUS, the highest count of birds per site within a survey across all sites is 23, and it is feasible that up to 400 can occur in the project area.

Cockatiel

The site population for this species was derived from the BUS data, based on the highest count of birds per site within a survey across all sites, which is 7. It is reasonable to assume a total of 10 for the site as a conservative estimate. Flocks are generally of less than 30 individuals but sometimes up to 500 according to HANZAB (Marchant et al. 1990).

Pied Cormorant

The site population for this species was derived from the BUS data, based on the highest count of birds per site within a survey across all sites, which is four. It is reasonable to assume a total of ten for the site as a conservative estimate. Flocks are generally of less than six individuals but sometimes up to 10,000 according to HANZAB (Marchant et al. 1990).

Yellow-billed Spoonbill

The site population for this species was derived from the BUS data, based on the highest count of birds per site within a survey across all sites, which is five. It is reasonable to assume a total of five for the site as a conservative estimate. Flocks are generally of a few individuals according to HANZAB (Marchant et al. 1990).

Superb Parrot

The site population for this species was derived from the BUS data, based on the highest count of birds per site within a survey across all sites, which is 21. It is reasonable to assume a total of 25 for the site as a conservative estimate. Flocks are generally of less than ten individuals but sometimes up to 60 according to HANZAB (Marchant et al. 1990).

Common Starling

The site population for this species was derived from the BUS data, based on the highest count of birds per site within a survey across all sites, which is 944. It is reasonable to assume a total of 950 for the site as a conservative estimate. Flocks can be up to thousands according to HANZAB (Marchant et al. 1990).

Straw-necked Ibis

The site population for this species was derived from the BUS data, based on the highest count of birds per site within a survey across all sites, which is 136. It is reasonable to assume a total of 140 for the site as a conservative estimate. Flocks are generally of less than ten individuals but sometimes up to 350 according to HANZAB (Marchant et al. 1990).

6.1.8. Model results

CRM results for Nankeen Kestrel, Black-shouldered Kite and Wedge-tailed Eagle are shown in Table 58. As detailed above, informed assumptions have been made for the possible site-population sizes of these three species, and results for them are provided here expressed as projected numbers of annual average collisions. Results are provided for four potential avoidance rates.

Experience with these species at wind energy facilities in south-eastern Australia demonstrates that raptors often collide with wind turbines (Moloney et al. 2019). For Wedge-tailed Eagles, there is some published empirical data (Smales 2023) where evidence suggests that the model's projections accurately equate to avoidance capacity of between 0.90 and 0.97. As with any forward-projection modelling, the accuracy of the results presented here for the project, will depend upon the precision of all assumptions used for the modelling process. The modelling indicates that between a 95% and 98% avoidance rate, it is estimated that:

- Between six to three Wedge-tailed Eagles respectively may collide with a turbine annually.
- Between five and three Nankeen Kestrels respectively may collide with a turbine annually.

- Approximately one Black-shouldered Kite may collied with a turbine annually.

Table 58 Total CRM results based on two years of data for movements at risk for species within RSA

Scientific name	Common name	Movements at risk				Mortality (Collisions/Year)			
Dynamic avoidance		0%	95%	98%	99%	0%	95%	98%	99%
Aquila audax	Wedge-tailed Eagle	126.33	3.90	1.92	1.26	31.42	3.67	1.87	1.24
Ardea pacifica	White-necked Heron	54.79	1.40	0.76	0.55	18.78	1.35	0.75	0.54
Chenonetta jubata	Australian Wood Duck	55.61	0.67	0.58	0.56	36.57	0.66	0.58	0.55
Circus assimilis	Spotted Harrier	10.53	0.27	0.15	0.11	4.45	0.27	0.15	0.10
Corvus coronoides	Australian Raven	137.61	1.64	1.44	1.38	85.06	1.63	1.43	1.37
Dendrocygna eytoni	Plumed Whistling-Duck	222.35	4.49	2.79	2.22	34.97	4.22	2.69	2.16
Elanus axillaris	Black-shouldered Kite	115.47	1.34	1.20	1.15	88.52	1.34	1.20	1.15
Eolophus roseicapilla	Galah	765.65	7.83	7.70	7.66	537.45	7.80	7.67	7.63
Falco berigora	Brown Falcon	49.52	0.72	0.55	0.50	47.86	0.72	0.55	0.50
Falco cenchroides	Nankeen Kestrel	192.19	2.76	2.13	1.92	124.26	2.74	2.12	1.91
Falco subniger	Black Falcon	40.44	0.86	0.52	0.40	5.00	0.79	0.49	0.39
Haliastur sphenurus	Whistling Kite	23.94	0.52	0.31	0.24	23.35	0.52	0.31	0.24
Milvus migrans	Black Kite	36.75	0.65	0.44	0.37	35.42	0.65	0.44	0.37
Nymphicus hollandicus	Cockatiel	100.34	2.79	1.45	1.00	10.00	2.46	1.36	0.96
Phalacrocorax varius	Pied Cormorant	11.39	0.29	0.16	0.11	6.89	0.29	0.16	0.11
Platalea flavipes	Yellow-billed Spoonbill	19.45	0.65	0.31	0.19	4.93	0.62	0.30	0.19
Polytelis swainsonii	Superb Parrot	225.61	3.51	2.57	2.26	25.00	3.28	2.44	2.16
Sturnus vulgaris*	Common Starling*	1918.26	19.97	19.38	19.18	826.55	19.77	19.19	18.99
Threskiornis spinicollis	Straw-necked Ibis	101.91	1.32	1.09	1.02	72.96	1.31	1.09	1.02

On the assumption that the collision avoidance capacity of the species in Table 58 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 terms of threatened species:

- The Superb Parrot has three to four 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.

The CRM captures the most conservative scenario in terms of potential collision risk. 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.

6.2. Qualitative risk assessment

6.2.1. Risk matrix methodology

Assessment of potential impacts to avian fauna including microbats as a result of turbine strike has 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. A risk matrix was applied for individual species of birds and bats that incorporates probability that the wind farm might impact birds or bats from habitats at the wind farm. The risk assessment has also been applied to non-threatened species of birds and bats recorded in the locality, where it is considered that their flight behaviours may put them at a risk of collision, outside of those species used within the CRM.

The species that have been the subject of this risk assessment include bird and bat species recorded or predicted to occur within 50 kilometres of the subject land, based on database searches, including:

- Species listed as threatened under both EPBC Act and/or BC Act.
- Birdlife Australia, the New Atlas of Australian Birds 1998-2015.
- Australasian Bat Society Bat map https://www.ausbats.org.au/batmap.html, accessed 15 March 2024.
- Species known to have documented collisions with turbines based on collision data from other operating wind farms in New South Wales.
- Species that may exhibit risk behaviour and potentially interact with the operation of wind turbines.

The criteria used to establish the likelihood of impact and potential consequences of turbine strike are provided in Table 59. The matrix used to qualify the risk associated with the significance of a collision impact as outlined in Table 59 and Table 60, with results per species provided in Table 61.

Table 59 Qualitative risk assessment criteria for likelihood and consequences of the impacts of turbine strike and barrier effect 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.

Likelihood	Criteria	Consequence	Criteria
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.
Probable	It is very probable that the risk event 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.

Table 60 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

6.2.2. Risk matrices

In addition to the CRM, the results of the qualitative risk assessment have identified the likely species at risk of collision with operational wind turbines. This then accounts for species that may fly within RSA, but were not recorded during BBUS and accounted for in the CRM, or species that are vagrant, cryptic or migrate infrequently. The qualitative risk assessment found 31 species (birds and bats) to be at more than a 'Negligible' risk of collision with an operating turbine as shown in Table 61 and Table 62.

The qualitative risk assessment identified 23 bird species with a likelihood of collision greater than 'Low - Repeated loss of small number of individuals but no reduction in population viability', which includes Spotted Harrier, Australian Magpie, Galah and waterbirds such as Straw-necked Ibis, White-necked Heron and Yellow Spoonbill. The qualitative risk assessment also identified seven bat species with a likelihood of collision listed as 'low'.

The risk assessment identified a total of four species with a 'moderate' collision risk such as Black Falcon, Black-Shouldered Kite, Nankeen Kestrel and Superb Parrot, and also one species with 'high' collision risk, being the Wedge-tailed Eagle.

Up to nine species including Australasian Bittern and Wedge-tailed Eagle, are considered to have a low risk of impact as a result of barrier effects for the proposed wind farm layout. This includes nomadic species that may employ macro or meso avoidance (see Section 6.3. All other species have no more than a negligible risk of impact as a result of barrier effect for the proposed wind farm layout.

Table 61 Bird collision risk and likelihood consequence

Scientific name	Common name	Status	Guild	Reasoning	Likelihood Collison	Consequence Collison	Risk rating Collison	Risk rating Indirect/barrier
Botaurus poiciloptilus	Australasian Bittern	EN- BC Act EN - EPBC Act	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Unlikely	Moderate	Low	Low
Tachybaptus novaehollandiae	Australasian Grebe	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Rare	Negligible	Negligible	Negligible
Ardeotis australis	Australian Bustard	V - BC Act	Grassland/Shrubland birds and Ground-dwellers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Falco longipennis	Australian Hobby	-	Raptors	Recorded onsite, however not within RSA	Unlikely	Minimal	Negligible	Negligible
Gymnorhina tibicen	Australian Magpie	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Probable	Minimal	Low	Negligible
Aegotheles cristatus	Australian Owlet-nightjar	-	Nocturnal foragers (Owls and Nightjars)	Recorded onsite, however not within RSA	Rare	Negligible	Negligible	Negligible
Rostratula australis	Australian Painted Snipe	EN - BC Act EN - EPBC Act	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Moderate	Negligible	Low
Pelecanus conspicillatus	Australian Pelican	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Unlikely	Minimal	Negligible	Negligible
Stiltia isabella	Australian Pratincole	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status	Guild	Reasoning	Likelihood Collison	Consequence Collison	Risk rating Collison	Risk rating Indirect/barrier
Corvus coronoides	Australian Raven	-	Woodland birds (including Parrots and Songbirds)	Recorded in RSA	Probable	Minimal	Low	Negligible
Barnardius zonarius	Australian Ringneck	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Porzana fluminea	Australian Spotted Crake	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Rare	Negligible	Negligible	Negligible
Threskiornis molucca	Australian White Ibis	-	Grassland/Shrubland birds and Ground-dwellers	Recorded onsite, however not within RSA	Likely	Minimal	Low	Negligible
Chenonetta jubata	Australian Wood Duck	-	Waterbirds, Seabirds and other aquatic foragers	Recorded in RSA	Likely	Minimal	Low	Negligible
Vanellus tricolor	Banded Lapwing	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Rare	Negligible	Negligible	Negligible
Ninox connivens	Barking Owl	-	Nocturnal foragers (Owls and Nightjars)	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Falco subniger	Black Falcon	V - BC Act	Raptors	Recorded in RSA	Likely	Moderate	Moderate	Low
Milvus migrans	Black Kite	-	Raptors	Recorded in RSA	Likely	Minimal	Low	Negligible
Cygnus atratus	Black Swan	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Unlikely	Minimal	Negligible	Negligible
Artamus cinereus	Black-faced Woodswallow	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Unlikely	Minimal	Negligible	Negligible

Scientific name	Common name	Status	Guild	Reasoning	Likelihood Collison	Consequence Collison	Risk rating Collison	Risk rating Indirect/barrier
Elanus axillaris	Black-shouldered Kite	-	Raptors	Recorded in RSA	Probable	Moderate	Moderate	Low
Limosa limosa	Black-tailed Godwit	V - BC Act EN - EPBC Act	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Minimal	Negligible	Negligible
Tribonyx ventralis	Black-tailed Native-hen	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Rare	Negligible	Negligible	Negligible
Himantopus himantopus	Black-winged Stilt	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Northiella haematogaster	Blue Bonnet	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Rare	Negligible	Negligible	Negligible
Neophema chrysostoma	Blue-winged Parrot	-	Woodland birds (including Parrots and Songbirds)	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Grus rubicunda	Brolga	V - BC Act	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Unlikely	Minimal	Negligible	Negligible
Falco berigora	Brown Falcon	-	Raptors	Recorded in RSA	Probable	Minimal	Low	Negligible
Accipiter fasciatus	Brown Goshawk	-	Raptors	Not recorded, BioNet Records	Likely	Negligible	Negligible	Negligible
Melopsittacus undulatus	Budgerigar	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Unlikely	Minimal	Negligible	Negligible
Burhinus grallarius	Bush Stone-curlew	V - BC Act	Grassland/Shrubland birds and Ground-dwellers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status	Guild	Reasoning	Likelihood Collison	Consequence Collison	Risk rating Collison	Risk rating Indirect/barrier
Hydroprogne caspia	Caspian Tern	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Unlikely	Negligible	Negligible	Negligible
Nymphicus hollandicus	Cockatiel	-	Woodland birds (including Parrots and Songbirds)	Recorded in RSA	Unlikely	Minimal	Negligible	Negligible
Accipiter cirrocephalus	Collared Sparrowhawk	-	Raptors	Not recorded, BioNet Records	Unlikely	Negligible	Negligible	Negligible
Tringa nebularia	Common Greenshank	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Actitis hypoleucos	Common Sandpiper	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Platycercus elegans	Crimson Rosella	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Likely	Minimal	Negligible	Negligible
Calidris ferruginea	Curlew Sandpiper	EN - BC Act CE - EPBC Act	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Eurystomus orientalis	Dollarbird	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Unlikely	Minimal	Negligible	Negligible
Gallinula tenebrosa	Dusky Moorhen	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V - BC Act	Woodland birds (including Parrots and Songbirds)	Not recorded, BioNet Records	Unlikely	Minimal	Negligible	Negligible

Scientific name	Common name	Status	Guild	Reasoning	Likelihood Collison	Consequence Collison	Risk rating Collison	Risk rating Indirect/barrier
Tyto javanica	Eastern Barn Owl	-	Nocturnal foragers (Owls and Nightjars)	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Bubulcus coromandus	Eastern Cattle Egret	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Likely	Negligible	Negligible	Negligible
Numenius madagascariensis	Eastern Curlew	CE - EPBC Act	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Ardea alba modesta	Eastern Great Egret	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Platycercus eximius	Eastern Rosella	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Unlikely	Minimal	Negligible	Negligible
Petrochelidon ariel	Fairy Martin	-	Woodland birds (including Parrots and Songbirds)	Not recorded, BioNet Records	Unlikely	Minimal	Negligible	Negligible
Apus pacificus	Fork-tailed Swift	Migratory	Woodland birds (including Parrots and Songbirds)	Recorded above RSA	Possible	Minimal	Low	Low
Eolophus roseicapilla	Galah	-	Woodland birds (including Parrots and Songbirds)	Recorded in RSA	Possible	Minimal	Low	Negligible
Calyptorhynchus lathami	Glossy Black-Cockatoo	V - BC Act V - EPBC Act	Woodland birds (including Parrots and Songbirds)	Not recorded, BioNet Records	Rare	Minimal	Negligible	Negligible
Plegadis falcinellus	Glossy Ibis	-	Waterbirds, Seabirds and other aquatic foragers	Recorded in RSA	Unlikely	Minimal	Negligible	Negligible

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Scientific name	Common name	Status	Guild	Reasoning	Likelihood Collison	Consequence Collison	Risk rating Collison	Risk rating Indirect/barrier
Phalacrocorax carbo	Great Cormorant	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Podiceps cristatus	Great Crested Grebe	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Falco hypoleucos	Grey Falcon	V - BC Act V - EPBC Act	Raptors	Not recorded, BioNet Records	Rare	Moderate	Negligible	Negligible
Anas gracilis	Grey Teal	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Gelochelidon nilotica	Gull-billed Tern	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Aythya australis	Hardhead	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Poliocephalus poliocephalus	Hoary-headed Grebe	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Rare	Negligible	Negligible	Negligible
Ardea intermedia	Intermediate Egret	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Gallinago hardwickii	Latham's Snipe	Migratory	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Dacelo novaeguineae	Laughing Kookaburra	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status	Guild	Reasoning	Likelihood Collison	Consequence Collison	Risk rating Collison	Risk rating Indirect/barrier
Elanus scriptus	Letter-winged Kite	-	Raptors	Not recorded, BioNet Records	Rare	Moderate	Negligible	Negligible
Phalacrocorax sulcirostris	Little Black Cormorant	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Cacatua sanguinea	Little Corella	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Hieraaetus morphnoides	Little Eagle	V - BC Act	Raptors	Not recorded, BioNet Records	Unlikely	Minimal	Negligible	Negligible
Egretta garzetta	Little Egret	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Likely	Minimal	Low	Negligible
Glossopsitta pusilla	Little Lorikeet	V - BC Act	Woodland birds (including Parrots and Songbirds)	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Microcarbo melanoleucos	Little Pied Cormorant	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Likely	Minimal	Low	Negligible
Corvus mellori	Little Raven	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Cacatua tenuirostris	Long-billed Corella	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Anseranas semipalmata	Magpie Goose	V - BC Act	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Minimal	Negligible	Negligible

Scientific name	Common name	Status	Guild	Reasoning	Likelihood Collison	Consequence Collison	Risk rating Collison	Risk rating Indirect/barrier
Lophochroa leadbeateri	Major Mitchell's Cockatoo	V - BC Act EN - EPBC Act	Woodland birds (including Parrots and Songbirds)	Not recorded, BioNet Records	Unlikely	Minimal	Negligible	Negligible
Tringa stagnatilis	Marsh Sandpiper	Migratory	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Tyto novaehollandiae	Masked Owl	V - BC Act	Nocturnal foragers (Owls and Nightjars)	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Artamus personatus	Masked Woodswallow	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Likely	Negligible	Negligible	Negligible
Psephotus varius	Mulga Parrot	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Biziura lobata	Musk Duck	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Falco cenchroides	Nankeen Kestrel	-	Raptors	Recorded in RSA	Probable	Moderate	Moderate	Low
Nycticorax caledonicus	Nankeen Night Heron	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Unlikely	Minimal	Negligible	Negligible
Anas superciliosa	Pacific Black Duck	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Unlikely	Negligible	Negligible	Negligible
Grantiella picta	Painted Honeyeater	V - BC Act V - EPBC Act	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Unlikely	Minimal	Negligible	Negligible

Scientific name	Common name	Status	Guild	Reasoning	Likelihood Collison	Consequence Collison	Risk rating Collison	Risk rating Indirect/barrier
Calidris melanotos	Pectoral Sandpiper	Migratory	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Falco peregrinus	Peregrine Falcon	-	Raptors	Not recorded, BioNet Records	Unlikely	Minimal	Negligible	Negligible
Phalacrocorax varius	Pied Cormorant	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Certhionyx variegatus	Pied Honeyeater	V - BC Act	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Unlikely	Minimal	Negligible	Negligible
Malacorhynchus membranaceus	Pink-eared Duck	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Unlikely	Minimal	Negligible	Negligible
Pedionomus torquatus	Plains-wanderer	CE- BC Act CE – EPBC Act	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Dendrocygna eytoni	Plumed Whistling-Duck	-	Waterbirds, Seabirds and other aquatic foragers	Recorded in RSA	Possible	Minimal	Low	Negligible
Merops ornatus	Rainbow Bee-eater	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Rare	Negligible	Negligible	Negligible
Charadrius ruficapillus	Red-capped Plover	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Recurvirostra novaehollandiae	Red-necked Avocet	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status	Guild	Reasoning	Likelihood Collison	Consequence Collison	Risk rating Collison	Risk rating Indirect/barrier
Psephotus haematonotus	Red-rumped Parrot	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Rare	Minimal	Negligible	Negligible
Platalea regia	Royal Spoonbill	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Unlikely	Negligible	Negligible	Negligible
Calidris acuminata	Sharp-tailed Sandpiper	Migratory	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Ninox novaeseelandiae	Southern Boobook	-	Nocturnal foragers (Owls and Nightjars)	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Porzana tabuensis	Spotless Crake	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Circus assimilis	Spotted Harrier	V - BC Act	Raptors	Recorded in RSA	Possible	Minimal	Low	Low
Lophoictinia isura	Square-tailed Kite	V - BC Act	Raptors	Not recorded, BioNet Records	Unlikely	Minimal	Negligible	Negligible
Threskiornis spinicollis	Straw-necked Ibis	-	Waterbirds, Seabirds and other aquatic foragers	Recorded in RSA	Possible	Minimal	Low	Negligible
Cacatua galerita	Sulphur-crested Cockatoo	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Unlikely	Minimal	Negligible	Negligible
Polytelis swainsonii	Superb Parrot	V - BC Act V - EPBC Act	Woodland birds (including Parrots and Songbirds)	Recorded in RSA	Likely	Moderate	Moderate	Low
Circus approximans	Swamp Harrier	-	Raptors	Recorded onsite, BioNet Records	Unlikely	Minimal	Negligible	Negligible

Scientific name	Common name	Status	Guild	Reasoning	Likelihood Collison	Consequence Collison	Risk rating Collison	Risk rating Indirect/barrier
Lathamus discolor	Swift Parrot	CE - BC Act CE - EPBC Act	Woodland birds (including Parrots and Songbirds)	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Podargus strigoides	Tawny Frogmouth	-	Nocturnal foragers (Owls and Nightjars)	Recorded onsite, however not within RSA	Likely	Negligible	Negligible	Negligible
Sterna sp.	Tern	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Petrochelidon nigricans	Tree Martin	-	Woodland birds (including Parrots and Songbirds)	Not recorded, BioNet Records	Unlikely	Minimal	Negligible	Negligible
Dendrocygna arcuata	Wandering Whistling-Duck	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Unlikely	Negligible	Negligible	Negligible
Aquila audax	Wedge-tailed Eagle	-	Raptors	Recorded in RSA	Probable	Moderate	High	Low
Hirundo neoxena neoxena	Welcome Swallow	-	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA	Unlikely	Negligible	Negligible	Negligible
Epthianura albifrons	White-fronted Chat	V - BC Act	Woodland birds (including Parrots and Songbirds)	Recorded onsite, however not within RSA. May fly in RSA on uncommon nomadic movement	Unlikely	Minimal	Negligible	Negligible
Numenius phaeopus	Whimbrel	Migratory	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible

Scientific name	Common name	Status	Guild	Reasoning	Likelihood Collison	Consequence Collison	Risk rating Collison	Risk rating Indirect/barrier
Chlidonias hybrida	Whiskered Tern	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Unlikely	Negligible	Negligible	Negligible
Haliastur sphenurus	Whistling Kite	-	Raptors	Recorded in RSA	Possible	Minimal	Low	Negligible
Haliaeetus leucogaster	White-bellied Sea-Eagle	V - BC Act	Raptors	Not recorded, BioNet Records	Unlikely	Negligible	Negligible	Negligible
Artamus leucorynchus	White-breasted Woodswallow	-	Woodland birds (including Parrots and Songbirds)	Not recorded, BioNet Records	Unlikely	Minimal	Negligible	Negligible
Artamus superciliosus	White-browed Woodswallow	-	Woodland birds (including Parrots and Songbirds)	Not recorded, BioNet Records	Unlikely	Minimal	Negligible	Negligible
Egretta novaehollandiae	White-faced Heron	-	Waterbirds, Seabirds and other aquatic foragers	Recorded onsite, however not within RSA	Likely	Minimal	Low	Negligible
Ardea pacifica	White-necked Heron	-	Waterbirds, Seabirds and other aquatic foragers	Recorded in RSA	Likely	Minimal	Low	Negligible
Hirundapus caudacutus	White-throated Needletail	V - BC Act V - EPBC Act	Woodland birds (including Parrots and Songbirds)	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Tringa glareola	Wood Sandpiper	-	Waterbirds, Seabirds and other aquatic foragers	Not recorded, BioNet Records	Rare	Negligible	Negligible	Negligible
Platalea flavipes	Yellow-billed Spoonbill	-	Waterbirds, Seabirds and other aquatic foragers	Recorded in RSA	Likely	Minimal	Low	Negligible

Table 62 Bat collision risk and likelihood consequence

Species	Common name	Status	Reasoning	Habitat values and behavioural considerations	Likelihood Collison	Consequence Collison	Risk Collison	Risk Indirect/barrier
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 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.	Possible	Minimal	Low	Low

Species	Common name	Status	Reasoning	Habitat values and behavioural considerations	Likelihood Collison	Consequence Collison	Risk Collison	Risk Indirect/barrier
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	V- BC Act	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
Myotis macropus	Southern Myotis	V- BC Act	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	Corben's	V- BC Act	Species	Generally restricted to foraging within	Unlikely	Minimal	Negligible	Negligible

Species	Common name	Status	Reasoning	Habitat values and behavioural considerations	Likelihood Collison	Consequence Collison	Risk Collison	Risk Indirect/barrier
corbeni	Long-eared Bat	V- EPBC Act	group recorded via ultrasonic detection on ground based detectors only	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.				
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 only to occur to a very small number of individuals that would be impacted.	Rare	Negligible	Negligible	Negligible
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	Unlikely	Negligible	Negligible	Negligible

Species	Common name	Status	Reasoning	Habitat values and behavioural considerations	Likelihood Collison	Consequence Collison	Risk Collison	Risk Indirect/barrier
				that would be impacted.				
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 is 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
Ozimops ridei	Ride's Free-tailed Bat	-	Recorded via ultrasonic detection in RSA		Possible	Minimal	Low	Negligible
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V- BC Act	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	Rare	Negligible	Negligible	Negligible

Species	Common name	Status	Reasoning	Habitat values and behavioural considerations	Likelihood Collison	Consequence Collison	Risk Collison	Risk Indirect/barrier
				roosting preferences. In the unlikely event a collision occurs, populations generally secure and dense to withstand low instances of mortality should it occur.				
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	V- BC Act	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	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	Rare	Negligible	Negligible	Negligible

Species	Common name	Status	Reasoning	Habitat values and behavioural considerations	Likelihood Collison	Consequence Collison	Risk Collison	Risk Indirect/barrier
			only	event a collision occurs, populations 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	V- BC Act V- EPBC Act	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 camps and forage resources mean regular flights through the development footprint	Unlikely	Minimal	Negligible	Negligible

Species	Common name	Status	Reasoning	Habitat values and behavioural considerations	Likelihood Collison	Consequence Collison	Risk Collison	Risk Indirect/barrier
				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
In general:								
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.								

6.2.3. 'At-risk' species

The following section summarises species considered to be at risk from collision with turbines such that impacts could occur to the species and/or population levels. A full list of species considered in the qualitative risk assessments and potentially at risk by the project is detailed in Table 61 and Table 62. A total of 23 species of birds and 7 species of bats are considered to be at more than a negligible risk of impact from turbine collisions, and thus 'at-risk' as a result of the project, summarised in Table 63.

As impacts associated with blade strike are considered somewhat uncertain in accordance with the BAM, and as previously mentioned, adaptive management is required through the preparation and implementation of an operational BBAMP that will be finalised prior to operation. Further information is provided in Section 8.3.4 below.

Table 63 Summary of species considered 'at-risk' of collision impacts from the project

Common name	Scientific name	Threat listing		Risk assessed species risk conclusion
		EPBC Act	BC Act	
Birds				
Australasian Bittern	*Botaurus poiciloptilus*	Endangered	Endangered	Low
Australian Magpie	*Gymnorhina tibicen*	-	-	Low
Australian Raven	*Corvus coronoides*	-	-	Low
Australian White Ibis	*Threskiornis molucca*	-	-	Low
Australian Wood Duck	*Chenonetta jubata*	-	-	Low
Black Falcon	*Falco subniger*	-	Vulnerable	Moderate
Black Kite	*Milvus migrans*	-	-	Low
Black-shouldered Kite	*Elanus axillaris*	-	-	Moderate
Brown Falcon	*Falco berigora*	-	-	Low
Fork-tailed Swift	*Apus pacificus*	-	-	Low
Galah	*Eolophus roseicapilla*	-	-	Low
Little Egret	*Egretta garzetta*	-	-	Low
Little Pied Cormorant	*Microcarbo melanoleucos*	-	-	Low
Nankeen Kestrel	*Falco cenchroides*	-	-	Moderate
Plumed Whistling-Duck	*Dendrocygna eytoni*	-	-	Low
Spotted Harrier	*Circus assimilis*	-	Vulnerable	Low
Straw-necked Ibis	*Threskiornis spinicollis*	-	-	Low
Superb Parrot	*Polytelis swainsonii*	Vulnerable	Vulnerable	Moderate
Wedge-tailed Eagle	*Aquila audax*	-	-	High
Whistling Kite	*Haliastur sphenurus*	-	-	Low
White-faced Heron	*Egretta novaehollandiae*	-	-	Low
White-necked Heron	*Ardea pacifica*	-	-	Low
Yellow-billed Spoonbill	*Platalea flavipes*	-	-	Low

Common name	Scientific name	Threat listing		Risk assessed species risk conclusion
		EPBC Act	BC Act	
Bats				
White-striped Free-tailed Bat	*Austronomus australis*	-	-	Low
Gould's Wattled Bat	*Chalinolobus gouldii*	-	-	Low
Inland Free-tailed Bat	*Ozimops petersi*	-	-	Low
South-eastern Free-tailed Bat	*Ozimops planiceps*	-	-	Low
Ride's Free-tailed Bat	*Ozimops ridei*	-	-	Low
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	-	Vulnerable	Low
Little Red Flying Fox	*Pteropus scapulatus*	-	-	Low

6.3. Turbine risk assessment

The potential risk and consequence of turbine strike has been assessed for at-risk bird and bat species within the subject land, and is outlined above in Section 6.2. Further assessment is provided to determine which individual 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 proximity to operational turbines, and the potential consequence on species utilising those habitats if they were to collide with a turbine, which is largely driven by the 'at-risk' and conservation status of those species.

6.3.1. Turbine strike consequence

The severity of potential impacts of turbine strike to those species of birds and bats determined to be at more than a negligible risk from turbines strike (as outlined in Section 6.2.3 above) have been assessed, for those species rated as having more than a negligible consequence listed in Table 63 above. Table 64 below presents the risk matrix used to determine the severity of potential impacts of turbine strike, with each turbine being given a worst case scenario consequence rating, which is then used, in combination with strike likelihood, to determine the over turbine risk rating.

Table 64 Turbine strike consequence criteria

Threat status (BC Act or EPBC Act)	Bird or bat species 'at risk' rating				
	Negligible	Low	Moderate	Significant	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

Key habitats form the basis of the turbine strike likelihood assessment provided in Section 6.3.2 below. Key habitats 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.

6.3.2. Turbine strike likelihood assessment

Turbine strike likelihood has been assessed relative to the criteria outlined in the BCS Draft Turbine Risk Assessment and Avoidance Guidance (BCS 2023), 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 65 below. The following turbine parameters have been included as the 'worst case scenario' turbine being considered for the project.

- Hub height – 150 m, +/- nominal 2%variation.
- Blade length – 86 m
- RSA height – 61 m (min) – 239 m (max) as a worse case

Table 65 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. • 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. • 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**
• 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%).
• 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	**Possible** An event could occur during most circumstances (>50% - <95%).

• Minor deviations from the above rule set where habitats align with 'possible' likelihood assessment	
• 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%).
• Limited habitat features <1000 m from WTG blade tip	**Rare** An event may occur only in unusual circumstances (<5%)

The above criteria are considered to better represent the potential for turbine strike within the subject land than the recommended criteria included in the BCS guidance (BCS 2023). The majority of habitat for bird and bat species within the subject land is present as either ephemeral wooded waterways, isolated pine communities, isolated ephemeral waterbodies, irrigated cropping paddocks or along defined road corridors. Movements through the operational wind farm, with potential to put individuals at risk of collision, are more likely to occur when fauna are flying directly between patchy habitats or along major movement corridors. Therefore, focussing solely on proximity of habitats supported by treed vegetation (as recommended by the BCS guidance) may misrepresent the actual likelihood of collisions.

The above criteria also allows for consideration of birds' (and possibly to a lesser extent bats) capacity for avoidance of collisions with operational turbines, whether that occurs due to a cognitive response on the part of a bird or not. It should be noted that internationally there is little empirical evidence for the actual avoidance rate for any bird species, however the evidence that is available suggests that avoidance capacity is species-specific and that the great majority of birds have very high avoidance capability that is higher than 98 %. The avoidance rate of some large raptors in Australia has been shown to be between 95 % and 98 % (Smales et al. 2013, Smales 2017). 'Avoidance' is recognised at different spatial scales, with commonly used definitions provided by Cook et al. (2014). These different scales of avoidance include: (1) macro-avoidance, when a bird or bat responds to the presence of the entire wind farm by flying around or over it; (2) meso-avoidance, refers to the response in which birds or bats fly within the overall wind farm but avoid collisions by choosing to fly only in the airspace between turbines; and (3) micro-avoidance, when a bird or bat flying in close proximity to a turbine and that is otherwise on a collision course, does not in fact collide with the turbine (Smales 2017).

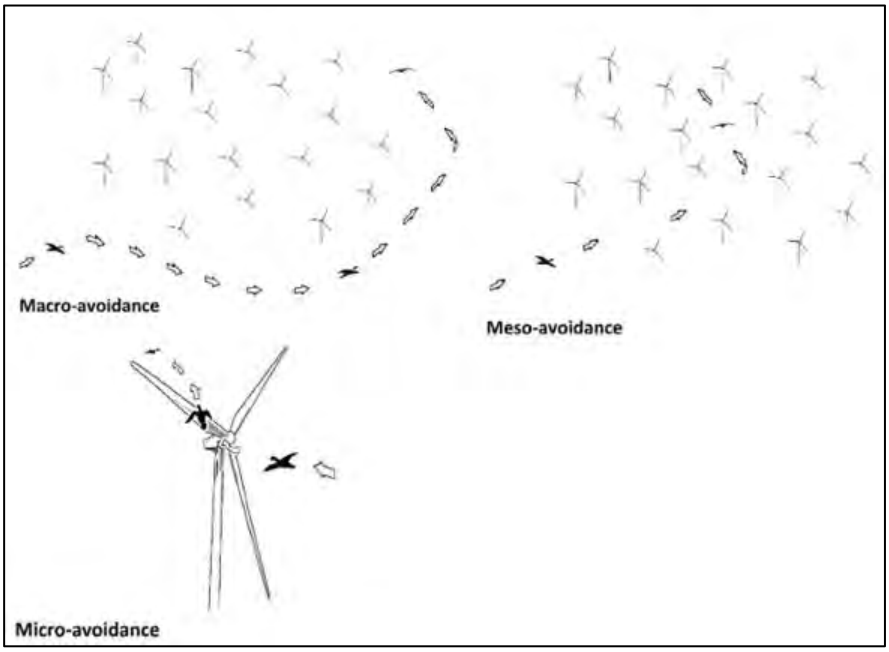


Photo 7 Types of avoidance

The turbine strike likelihood assessment buffer distances have been calculated using the formula for calculating buffers to areas of vegetation developed in *Natural England Technical Information Note TIN051 – Bats and onshore wind turbines interim guidance* (Natural England 2009). This method takes into consideration hub height, blade length, habitat feature height (i.e. tree canopies), and the horizontal distance to habitat features and provides a diagram and formula for how buffer distances between blade tips and adjacent habitat features can be calculated (refer Figure 15 below).

$$b = \sqrt{(50 + bl)^2 - (hh - fh)^2}$$

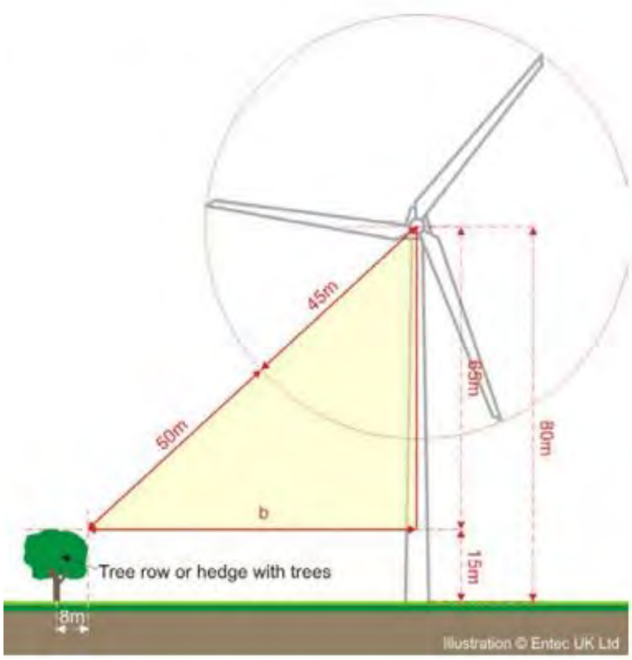


Figure 15 Extract from Technical Information Note TIN051 Bats and onshore wind turbines, showing how buffer distance is determined from top of canopy to blade tip

The above formula was used to calculate the buffer distances for assessment of the presence of key habitat features, with the following horizontal distances calculated for each of the assessed buffer distances:

- 200 m buffer distance from blade tip – 238 m horizontal buffer to key habitat feature
- 500 m buffer distance from blade tip – 547 m horizontal buffer to key habitat feature
- 1000 m buffer distance from blade tip – 1056 m horizontal buffer to key habitat feature

The above distances were calculated based on a maximum feature height of 9 metres for treed vegetation, which equates to the tallest mean canopy height value for PCTs within the subject land as outlined in the BioNet Vegetation Classification database.

6.3.3. Turbine risk assessment

Turbine risk combines the results of the assessment of turbine strike consequence and turbine strike likelihood and has again been based on the BCS Draft Turbine Risk Assessment and Avoidance Guidance (BCS 2023). Adjustments have again been made to the recommended risk rating to better reflect the habitats, aerial fauna, and movement patterns within the subject land, as well as the conclusions of the risk assessments undertaken for all at risk species.

The turbine risk assessment matrix applied to the project is outlined in Table 66.

Table 66 Turbine risk assessment matrix

Likelihood criteria	Consequence criteria			
	Severe	**Major**	**Moderate**	**Minor**
Probable	Very high	Very high	High	Moderate
Possible	Very high	High	Moderate	Moderate
Unlikely	High	High	Moderate	Low
Rare	High	Moderate	Low	Low

Final turbine risk assessment results are presented in Table 67.

Table 67 Turbine risk assessment results

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk	
ET1	**Removed from project**			
ET10	Unlikely	Moderate	Moderate	
ET100	Rare	Moderate	Low	
ET101	Unlikely	Moderate	Moderate	
ET102	**Removed from project**			
ET103	Rare	Moderate	Low	
ET104	Rare	Moderate	Low	
ET105	Unlikely	Moderate	Moderate	

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk	
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	Possible	Moderate	High	
ET117	Unlikely	Moderate	Moderate	
ET118	Possible	Moderate	High	
ET119	Unlikely	Moderate	Moderate	
ET12	Unlikely	Moderate	Moderate	
ET120	Possible	Moderate	High	
ET122	**Removed from project**			
ET123	Possible	Moderate	High	
ET124	**Removed from project**			
ET125	Possible	Moderate	High	
ET126	**Removed from project**			
ET13	**Removed from project**			
ET14	Rare	Moderate	Low	
ET15	Possible	Moderate	High	
ET16	**Removed from project**			
ET17	Rare	Moderate	Low	
ET18	Unlikely	Moderate	Moderate	
ET19	**Removed from project**			
ET20	Unlikely	Moderate	Moderate	

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk	
ET21	Removed from project			
ET22	Rare	Moderate	Low	
ET23	Removed from project			
ET24	Unlikely	Moderate	Moderate	
ET25	Unlikely	Moderate	Moderate	
ET26	Removed from project			
ET27	Possible	Moderate	High	
ET28	Unlikely	Moderate	Moderate	
ET29	Removed from project			
ET3	Unlikely	Moderate	Moderate	
ET30	Possible	Moderate	High	
ET31	Rare	Moderate	Low	
ET32	Removed from project			
ET33	Unlikely	Moderate	Moderate	
ET34	Removed from project			
ET35	Removed from project			
ET36	Unlikely	Moderate	Moderate	
ET37	Unlikely	Moderate	Moderate	
ET38	Possible	Moderate	High	
ET39	Removed from project			
ET4	Removed from project			
ET40	Removed from project			
ET41	Unlikely	Moderate	Moderate	
ET42	Rare	Moderate	Low	
ET43	Possible	Moderate	High	
ET44	Rare	Moderate	Low	
ET45	Unlikely	Moderate	Moderate	
ET47	Removed from project			
ET48	Possible	Moderate	High	
ET49	Unlikely	Moderate	Moderate	

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk	
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	
ET59	**Removed from project**			
ET6	**Removed from project**			
ET61	Rare	Moderate	Low	
ET62	**Removed from project**			
ET63	**Removed from project**			
ET64	Possible	Moderate	High	
ET66	**Removed from project**			
ET67	**Removed from project**			
ET69	Unlikely	Moderate	Moderate	
ET7	**Removed from project**			
ET70	Rare	Moderate	Low	
ET71	Unlikely	Moderate	Moderate	
ET72	Possible	Moderate	High	
ET73	Unlikely	Moderate	Moderate	
ET74	Rare	Moderate	Low	
ET75	**Removed from project**			
ET76	**Removed from project**			
ET77	Unlikely	Moderate	Moderate	
ET78	Possible	Moderate	High	
ET79	Unlikely	Moderate	Moderate	
ET8	Rare	Moderate	Low	
ET80	**Removed from project**			
ET81	Unlikely	Moderate	Moderate	

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk	
ET82	Unlikely	Moderate	Moderate	
ET83	Rare	Moderate	Low	
ET84	**Removed from project**			
ET85	Unlikely	Moderate	Moderate	
ET86	Unlikely	Moderate	Moderate	
ET87	Rare	Moderate	Low	
ET88	Unlikely	Moderate	Moderate	
ET89	Unlikely	Moderate	Moderate	
ET9	**Removed from project**			
ET90	**Removed from project**			
ET91	Unlikely	Moderate	Moderate	
ET92	Unlikely	Moderate	Moderate	
ET93	Rare	Moderate	Low	
ET94	Rare	Moderate	Low	
ET95	Unlikely	Moderate	Moderate	
ET96	**Removed from project**			
ET97	Rare	Moderate	Low	
ET98	Unlikely	Moderate	Moderate	
ET99	Rare	Moderate	Low	
WT1	Unlikely	Moderate	Moderate	
WT10	Possible	Moderate	High	
WT100	**Removed from project**			
WT101	Unlikely	Moderate	Moderate	
WT102	Unlikely	Moderate	Moderate	
WT103	Unlikely	Moderate	Moderate	
WT104	Unlikely	Moderate	Moderate	
WT105	Unlikely	Moderate	Moderate	
WT106	Possible	Moderate	High	
WT108	**Removed from project**			
WT109	**Removed from project**			

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk
WT11	Unlikely	Moderate	Moderate
WT110	Removed from project		
WT111	Rare	Moderate	Low
WT112	Removed from project		
WT113	Unlikely	Moderate	Moderate
WT114	Removed from project		
WT115	Removed from project		
WT118	Removed from project		
WT119	Unlikely	Moderate	Moderate
WT12	Rare	Moderate	Low
WT120	Rare	Moderate	Low
WT121	Possible	Moderate	High
WT122	Unlikely	Moderate	Moderate
WT123	Possible	Moderate	High
WT124	Removed from project		
WT125	Removed from project		
WT127	Unlikely	Moderate	Moderate
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
WT135	Removed from project		
WT136	Removed from project		
WT137	Rare	Moderate	Low
WT138	Removed from project		
WT139	Unlikely	Moderate	Moderate
WT14	Unlikely	Moderate	Moderate

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk	
WT140	Removed from project			
WT141	Possible	Moderate	High	
WT142	Possible	Moderate	High	
WT143	Removed from project			
WT144	Removed from project			
WT145	Unlikely	Moderate	Moderate	
WT146	Removed from project			
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	
WT154	Removed from project			
WT155	Unlikely	Moderate	Moderate	
WT156	Unlikely	Moderate	Moderate	
WT157	Removed from project			
WT158	Unlikely	Moderate	Moderate	
WT159	Removed from project			
WT16	Removed from project			
WT160	Unlikely	Moderate	Moderate	
WT161	Unlikely	Moderate	Moderate	
WT162	Unlikely	Moderate	Moderate	
WT163	Removed from project			
WT164	Unlikely	Moderate	Moderate	
WT17	Unlikely	Moderate	Moderate	
WT18	Rare	Moderate	Low	
WT19	Rare	Moderate	Low	
WT2	Removed from project			

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk	
WT20	Unlikely	Moderate	Moderate	
WT21	Unlikely	Moderate	Moderate	
WT22	Unlikely	Moderate	Moderate	
WT23	Unlikely	Moderate	Moderate	
WT24	Rare	Moderate	Low	
WT25	Rare	Moderate	Low	
WT26	Unlikely	Moderate	Moderate	
WT27	Rare	Moderate	Low	
WT28	Rare	Moderate	Low	
WT29	Unlikely	Moderate	Moderate	
WT3	Unlikely	Moderate	Moderate	
WT30	Removed from project			
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	

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk	
WT48	Rare	Moderate	Low	
WT49	Rare	Moderate	Low	
WT50	Removed from project			
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	
WT59	Removed from project			
WT6	Unlikely	Moderate	Moderate	
WT60	Rare	Moderate	Low	
WT61	Unlikely	Moderate	Moderate	
WT62	Rare	Moderate	Low	
WT63	Possible	Moderate	High	
WT64	Unlikely	Moderate	Moderate	
WT66	Removed from project			
WT67	Rare	Moderate	Low	
WT68	Rare	Moderate	Low	
WT69	Possible	Moderate	High	
WT7	Possible	Moderate	High	
WT70	Removed from project			
WT71	Rare	Moderate	Low	
WT72	Unlikely	Moderate	Moderate	
WT73	Possible	Moderate	High	
WT75	Rare	Moderate	Low	
WT76	Unlikely	Moderate	Moderate	
WT77	Removed from project			

WTG #	Turbine strike likelihood	Maximum consequence	Turbine risk	
WT78	Rare	Moderate	Low	
WT79	Possible	Moderate	High	
WT80	Possible	Moderate	High	
WT81	Possible	Moderate	High	
WT82	Unlikely	Moderate	Moderate	
WT83	Unlikely	Moderate	Moderate	
WT85	Removed from project			
WT86	Removed from project			
WT87	Unlikely	Moderate	Moderate	
WT88	Unlikely	Moderate	Moderate	
WT89	Unlikely	Moderate	Moderate	
WT9	Rare	Moderate	Low	
WT90	Unlikely	Moderate	Moderate	
WT91	Removed from project			
WT92	Unlikely	Moderate	Moderate	
WT93	Removed from project			
WT94	Rare	Moderate	Low	
WT95	Removed from project			
WT97	Possible	Moderate	High	

Table 68 below summarises the number of turbines within each risk category for the project. In total, 83.5% of the turbines fall within a low to moderate risk category, whilst the remaining 16.5% fall within the high category.

Table 68 Turbine risk assessment summary

Turbine risk	Total	Total %
Very High	-	-
High	33	16.5
Moderate	105	52
Low	62	31.5

STAGE 2 — IMPACT ASSESSMENT

7. Avoid and minimise impacts

This section demonstrates the efforts to avoid and minimise impacts on biodiversity values (including prescribed impacts) associated with the project in accordance with BAM, including an analysis of:

- Alternative locations' potential impacts on biodiversity values and justification for selecting the project location.
- Efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design.
- Routes that avoid and minimise impacts on biodiversity values.
- Technologies that would avoid or minimise impacts on biodiversity values.

7.1. Actions to avoid/minimise project impacts

During initial phases of the project feasibility, multiple properties and regions within the broader Riverina and South West REZ were considered. The South West REZ as a whole was chosen for multiple reasons including renewable energy resource potential, existing (and planned) electricity network (i.e. Project EnergyConnect), low human population densities and existing land use patterns. Many of the proposed renewable energy developments in the South West REZ are sited in areas that support native vegetation cover, particularly in the central to eastern portions of the REZ. The prevalence of native vegetation in these areas is due to land use practices and patterns of agricultural development. Lower rainfall areas and non-arable areas away from irrigation infrastructure still support large tracts of native vegetation where broadacre grazing takes place. Development of intensive dryland and/or irrigated agriculture has been limited by appropriate soil types and proximity to irrigation infrastructure. Government policy and community pressure has meant future renewable energy development in the South West REZ is now focussed on the undeveloped grazing land that supports native vegetation rather than on the areas of high value agricultural land. This has made complete avoidance of biodiversity impacts at a landscape and site selection level challenging within the South West REZ. The site selection process has therefore focused on avoiding higher quality woodland and forested areas and on utilising land previously disturbed by low intensity agriculture. Whilst avoidance of native vegetation is challenging in the South West REZ, a key focus was siting wind farm infrastructure and the development footprint, particularly turbine locations, outside of riparian buffers, outside of important mapped habitat areas for Plains Wanderer, and outside of the highest value biodiversity areas within the subject land as much as possible.

Similar to the Dinawan Solar Farm, the final location of the project was chosen based on (EMM 2022):

- The subject land is within the South West REZ, an area nominated for significant investment in renewable energy generation, storage and transmission projects.
- The subject land is adjacent to Project EnergyConnect (including the Dinawan Substation), which minimises the impacts and cost of transmission infrastructure required to export the electricity generated by the project directly into the grid via Project EnergyConnect.
- The subject land is relatively flat and has a very good wind yield, particularly at night, that complements the available solar resource proposed to be utilised as part of the Dinawan Solar Farm.
- The land surrounding the subject land is sparsely populated with only 22 non-associated residences within 8 kilometres of a proposed turbine.

- The existing agricultural land use (native pasture grazing) and cropping land within and surrounding the subject land is compatible with wind energy generation.
- The subject land connects directly to Kidman Way, an approved B-Double route, with access to the Sturt and Newell Highways.

7.2. Preliminary constraints and opportunities assessment

Biosis was commissioned by Spark Renewables in late 2021 to undertake a preliminary biodiversity opportunities and constraints assessment at multiple contiguous properties totalling 54,000 hectares, as part of an overall due diligence for both potential solar and wind farm developments. Initially, the constraints and opportunities assessment was undertaken with desktop data only, followed by rapid field investigation to verify findings. The scope of this assessment was to identify high level constraints and describe biodiversity values within the subject land and neighbouring properties and allowed for recommendations to be provided in terms of avoidance, mitigation and/or further detailed assessment of biodiversity, guiding concept, preliminary and final designs. The constraints identified across the 54,000 hectare investigation area are listed in Table 69 and shown on Figure 16. **Note**, some constraints have been revised back from those indicated below and in Figure 16 following multiple field surveys, such as No-go to high constraint, and mostly around absence of Intact Weeping myall TEC or mapped wetlands. This is more prevalent for general infrastructure constraints (access tracks, cabling, compounds etc) as opposed to wind turbine locations (Figure 16a and Figure 16b).

Table 69 Constraints assessment for turbine layout and general infrastructure

Constraint category	Definition	Wind constraint value (Predominantly in regard to turbine placement)	General infrastructure constraint value
No Go areas (Constraint score – 4)	These are areas that should be avoided and if not, may seriously effect regulatory approval of the project (i.e. regulators may require significant redesign to reduce impacts).	• 200 m No-Go zone setback required around NPWS estate (Oolambeyan National Park). • Mapped NSW wetlands (DECCW 2010) with an additional 200 m buffer. • 300 m from treed watercourses that are the most likely location of raptor and parrot breeding sites. • 100 m buffer of mapped Plains Wanderer Important Habitat Areas.	• 200 m No-Go zone setback required around NPWS estate (Oolambeyan National Park). • 100 m buffer of mapped Plains Wanderer Important Habitat Areas.

Constraint category	Definition	Wind constraint value (Predominantly in regard to turbine placement)	General infrastructure constraint value
High Constraint (Constraint score – 3)	These are areas that should be avoided if possible and will require justification in a BDAR if they cannot be avoided. Likely to result in curtailment of wind turbines, and/or include areas that are likely to generate high biodiversity credit per hectare requirements that will require offsetting.	• Additional >200 m – 900 m buffer from mapped NSW wetlands (DECCW 2010) for potential of breeding migratory and/or nomadic wetland birds. • High likelihood EPBC and BC Act listed TECs. • 100 - 300 m buffer of mapped Plains Wanderer Important Habitat Areas. • Additional >300 m – 500 m buffer from treed watercourses to reduce impacts to raptor and wetland bird breeding sites • Woodland Plant Community Types (PCTs) that are more likely to provide habitat for birds (non-waders) and microbats likely to be at risk of collision with turbines • Lower likelihood TECS and/or TECs that require ground validation to confirm presence and constraint level (incl. EPBC Act Grasslands, Sandhill Pine Woodland and Box Gum Woodland) (hatched areas on figures).	• 300 m within treed watercourses are the most likely location of raptor and parrot breeding sites. • 100 - 300 m buffer of mapped Plains Wanderer Important Habitat Areas. • Any EPBC and BC Act listed TECs. • Additional >300 m – 500 m buffer from treed watercourses to reduce impacts to raptor breeding sites. • All other PCTs within 300m of a watercourse. • EPBC grassland TECs that require ground-truthing to confirm presence and constraint level (hatched areas on figures).
Moderate Constraint (Constraint score – 2)	Suitable for development. These areas do not necessarily need to be avoided but will generate a moderate biodiversity credit per hectare that require offsetting.	• All native vegetation not subject to the above constraints.	• All native vegetation not subject to the above constraints. • Non-native vegetation or areas likely to meet the definition of Category 1 land however where prescribed impacts may be possible.

Constraint category	Definition	Wind constraint value (Predominantly in regard to turbine placement)	General infrastructure constraint value
Low Constraint (Constraint score – 1)	Best suited for development. These areas are unlikely to generate biodiversity credits (exotic/cultivated/irrigated areas) or may have low biodiversity credit requirements per hectare.	• Non-native vegetation or areas likely to meet the definition of Category 1 exempt land and where prescribed impacts are considered negligible.	• Non-native vegetation or areas likely to meet the definition of Category 1 land and where prescribed impacts are considered negligible.

The development corridor and development footprint has been refined through consideration of the findings of a preliminary ecological study and identification of constraints and opportunities mapped through the environmental impact assessment process (including this BDAR). The intent of this process was to avoid impacts to the highest ecological values identified as much as possible, whilst taking into account the high proportion of native vegetation within the subject land. Although impacts to native vegetation, threatened species habitat and TECs will occur, complete avoidance of impacts wasn't possible due to the large amount of native vegetation within the subject land and broader investigation area, with instead a focus on avoidance of the highest value areas (Figure 16).

Measures to avoid and minimise impacts on highest value areas of native vegetation were considered during the planning stage of the project and designs were 'workshopped' through an iterative mapping process between Spark Renewables, EMM and the Biosis BAM Assessors and project ecologists. Other disciplines such as flooding and archaeology were also considered during multiple revisions of the development corridor to ensure highest biodiversity values, as well archaeological values and areas likely to be inundated during significant flood events were accounted for.

Overall, siting of current infrastructure within the exhibited EIS design resulted in the following areas of constraints

- 1.5% of the development footprint occurring in Very High areas.
  - Primarily based on impacts (predominantly access) to important mapped areas for Plains Wanderer and non-ground truthed mapped wetlands.
- 12.8% of the development footprint occurring in highly constrained areas.
  - Primarily buffers applied to wetlands areas, treed riparian areas and buffers to important mapped areas for Plains Wanderer
- 71.6% of the development footprint occurring in moderately constrained areas.
  - Primarily due to levels of native vegetation present.
- 14.1% of the development footprint occurring in low constrained areas.

Following this, the process of further refinement once areas were ground truthed has resulted in impacts to areas of highest biodiversity value being avoided and/or minimised, which has included;

- Project design workshops were held on multiple occasions between Biosis ecologists, project designers/engineers and environmental approvals specialists to work through opportunities and constraints relating to how impacts to biodiversity values could be avoided and minimised through project design and the location of infrastructure.

- Removal of infrastructure from the Four Corners property, adjacent to Oolambeyan National Park.
- Avoidance of impacts throughout the broader study area, and an overall reduction in loss of higher quality habitats from multiple design revisions.
- Use of existing tracks, public roads and fencelines to delineate sections of the project and used preferentially for locating access tracks and linear infrastructure.
- Relocating and combining footprints and micro-siting corridors to contain as much infrastructure as possible (e.g. collocating access tracks with electrical cabling and/or transmission line infrastructure), making a more efficient design and keeping impacts to the minimum extent necessary.
- Large scale avoidance of important mapped areas for the Plains Wanderer which is common within the subject land.
- Minimising the removal of habitat trees that may provide habitat for species such as Superb Parrot and Corbens long-eared Bat.
- Siting turbine mast locations at least 200m away from PCT 13, PCT 15, PCT 10 and PCT 28 as far as practicable, allows increased buffers from blade tip to edge of canopy.
- Removing and/or relocating turbines away from active and non-active large nests observed during the surveys.
- Removing and/or relocating turbines out of PCT 26 intact areas where vulnerable listed Painted Honeyeaters were recorded and vulnerable listed Grey-crowned Babblers were nesting.
- Avoidance and minimisation of impacts to large patches of *Swainsona murrayana* and *Swainsona sericea.*
- Removal of all 'very high' risk turbines and 26 'high' risk turbines.
- Avoidance of a known location of a Plains Wanderer individual and supporting habitat buffers.

Following turbine layout revisions, the preliminary layout was reduced from 294 turbines to 267, with 214 of the original 294 turbines relocated to some degree based on biodiversity impacts, as well as other environmental constraints.

An overall summary of the reduction of the scale of the development corridor can be seen in Table 70.

Table 70 Summary of key project refinements

Area	Preliminary investigation Area (ha)	Preliminary Development Corridor total area (ha)	Development Corridor V3 (ha) total area	Exhibited Development Corridor V8 total area (ha)	Amended Development Corridor V8 total area
Total hectares	54,000 ha	10,366 ha	7,956 ha	7,256 ha	6,385

As previously indicated, the principal means to reduce impacts on biodiversity values is to avoid and/or minimise the removal of native vegetation and fauna habitat. Additional recommendations include measures to mitigate residual impacts after all measures to avoid and minimise impacts have been considered in Section 9. Figure 17 shows the extent of refinements undertaken to avoid or minimise impacts on biodiversity values. The final development footprint (including construction and operation) as well as demonstrating prescribed impacts and indirect impact zones where applicable is shown in Figure 18 and Figure 19 respectively.

7.3. Hollow bearing trees

Many patches of woody vegetation dominated by Black Box within the development corridor contain a significant number of hollows, many of which are classified within the small size category, however, do contain medium to large hollows on occasion. Due to the significant number of hollow bearing trees, recording of hollow bearing tree data was focused on the medium or greater size classes that many of the threatened fauna in the region would occupy. A concerted effort during preliminary design was to avoid Black box dominated vegetation and hollow bearing trees as much as possible, and site wind turbines at least 200 metres away from these areas. However, due primarily to access and cabling requirements, some hollow bearing trees will be impacted. During the course of multiple surveys, 132 hollow bearing trees were observed in the broader subject land, of which 60 are within the development corridor. The development footprint will impact directly or indirectly upon nine hollow bearing trees. This represents a 85% retention of woody vegetation with medium or greater sized hollows. The EIS exhibited BDAR had potential impacts resulting to 15 hollow bearing trees, which has now been reduced to nine. These hollows provide denning, sheltering and breeding for a raft of hollow dependent native fauna, however observations during multiple seasonal surveys noted use of the hollows by more common fauna such as Galahs and Blue Bonnets.

7.4. Response to submissions

As previously mentioned, following the exhibition of the EIS, further review of the design has been completed to refine and optimise the project layout (including the removal of 67 potential WTG locations and an 18% reduction to the development footprint). The reduction has facilitated further avoidance of impacts in the amended design. Amendments to the project layout and development footprint have also been made in response to biodiversity constraints, as well as feedback from key stakeholders, including Transgrid (as proponents for the proposed VNI West) and Origin (as proponents for the approved Yanco Delta Wind Farm). A summary of amended project has resulted the following

- a reduction in the project area from 39,061 ha to 34,510 ha (12% decrease).
- a reduction in the development corridor from 7,256 ha to 6,382 ha (12% decrease).
- a reduction in the development footprint from 1,339 ha to 1,098 ha (18% decrease).
- a reduction in the number of assessed locations for WTGs from 267 to 200.

An overview of reductions and amendments specifically in relation to biodiversity can be seen in Table 71 and Table 72.

Table 71 Comparison of EIS and amended project (PCT)

Vegetation zone	Development corridor (Ha) EIS	Development corridor (Ha) Amended project	Development footprint (Ha) EIS	Development footprint (Ha) Amended project	Footprint (%) change
PCT 10_moderate	9.35	4.25	0.33	0.19	-41
PCT 13_moderate	19.71	16.61	4.83	3.56	-26
PCT 13_thinned	29.17	29.78	9.14	7.88	-14
PCT 15_moderate	34.32	33.13	6.20	2.54	-59
PCT 15_thinned	7.05	6.39	1.61	1.10	-31

Vegetation zone	Development corridor (Ha) EIS	Development corridor (Ha) Amended project	Development footprint (Ha) EIS	Development footprint (Ha) Amended project	Footprint (%) change
PCT 17_mod_good	15	23.90	1.84	0.76	-59
PCT 17_moderate	3.06	11.16	1.09	1.27	+17
PCT 24_moderate	2.52	-	0.23	-	-100
PCT 26_DNG	2,282.95	2,177.64	395.93	342.38	-14
PCT 26_intact	871.09	795.43	133.14	116.79	-12
PCT 26_sparse	2,137.46	1,961.78	416.60	341.38	-18
PCT 28_low	278.04	240.65	54.00	47.46	-12
PCT 28_moderate	25.36	22.54	0.98	1.11	-13
PCT 45_mod_good	57	22.79	8.83	2.24	-80
PCT 45_Intersection	-	0.83	-	0.83	+100
PCT 46_moderate	620.14	399.65	105.59	73.44	-30
PCT 46_ Intersection	-	0.34	-	0.34	+100
PCT 160_mod_good	42.34	27.70	4.07	4.97	+22
PCT 160_moderate	5.75	-	0.84	-	-100

Table 72 Comparison of EIS and amended project (threatened ecological communities)

TEC	Listing status	Development corridor (Ha) EIS	Development Corridor (Ha) Amended project	Development footprint (Ha) EIS	Development footprint (Ha) Amended project	Footprint (%) change
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	BC Act Endangered	3,008.55	2,757.21	549.75	457.75	-17
	EPBC Act Endangered	991.34	873.53	150.46	128.73	-14
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	BC Act Endangered	303.40	263.19	54.98	48.87	-11

TEC	Listing status	Development corridor (Ha) EIS	Development Corridor (Ha) Amended project	Development footprint (Ha) EIS	Development footprint (Ha) Amended project	Footprint (%) change
Natural Grasslands of the Murray Valley Plains	EPBC Act Critically Endangered	677.14	421.25	114.42	76.87	-33

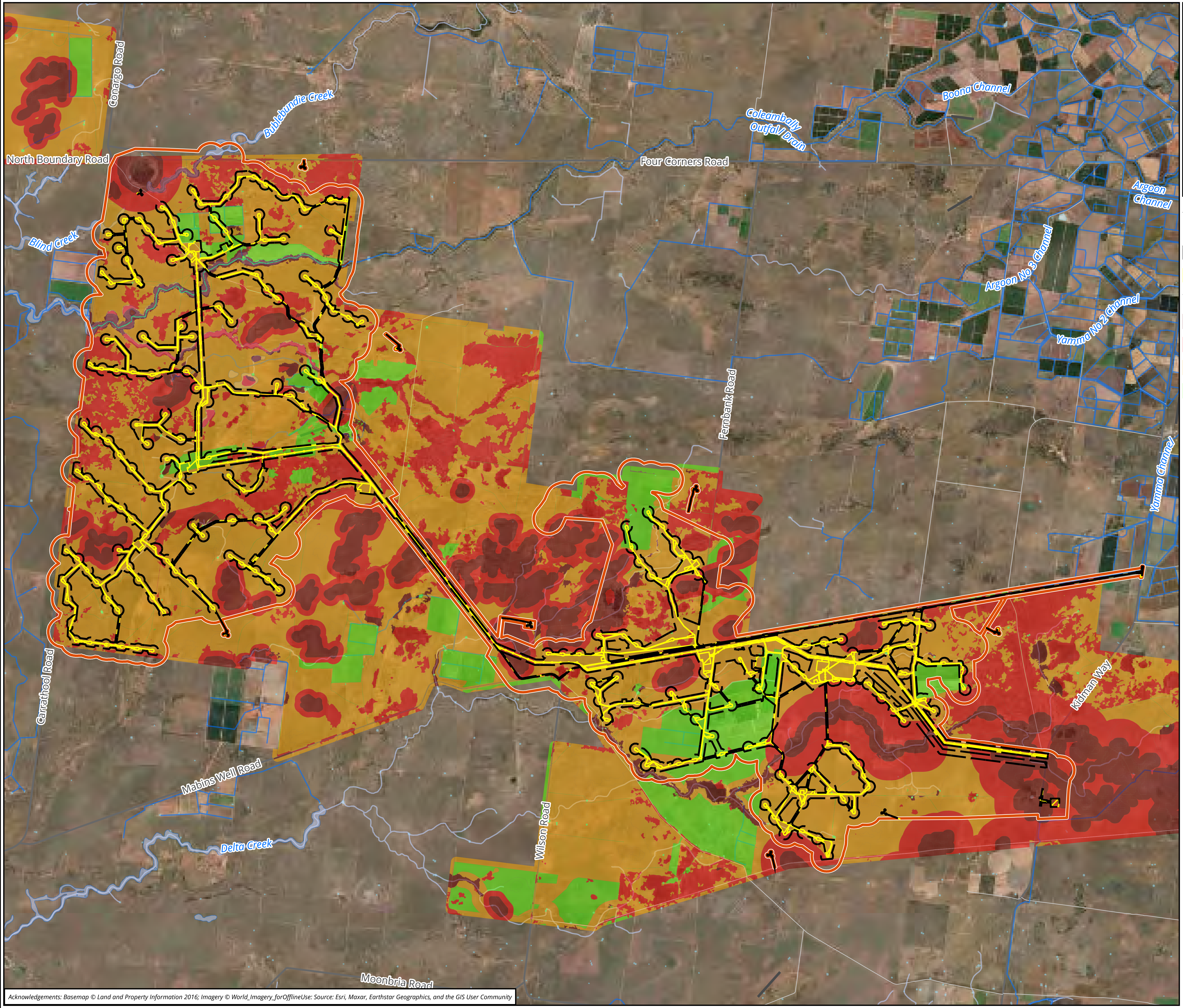
7.5. Avoid and minimise summary

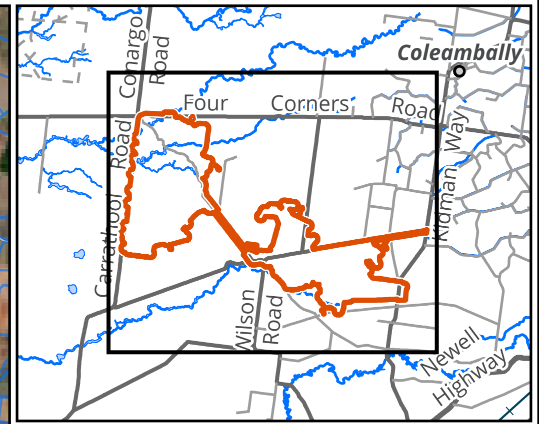
Table 73 demonstrates the application of the high level criteria for avoid and minimise in accordance with the BAM. As previously indicated, the principal means to reduce impacts on biodiversity values within a development corridor and subject land is to avoid and/or minimise the removal of native vegetation and fauna habitat. Additional recommendations include measures to mitigate residual impacts after all measures to avoid and minimise impacts have been considered (refer to Section 9. Figure 16 demonstrates the constraints modelling used to guide earlier designs, Figure 17 demonstrates further avoidance and previous footprints and development corridors and Figure 18 demonstrates the current footprint for assessment.

Table 73 Summary of avoidance and minimisation of impact

Avoidance and minimisation components	Action	Outcome	Timing	Responsibility
Modes or technologies that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed mode or technology.	Investigate modes or technologies that would avoid or minimise impacts on biodiversity values. High turbine masts and hub height.	High turbine masts and hub height currently selected allow for at least an 68m horizontal distance from blade tip to canopy tip.	Project design	Spark Renewables
Routes that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed route.	Utilisation of existing public roads and access tracks as far as possible. Good access to existing local and regional roads.	Minimise clearing impacts. Avoidance of higher biodiversity values.	Project design Construction	Spark Renewables
Alternative locations that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed location	Site selection. Location next to Dinawan Substation and Project EnergyConnect.	Minimise clearing impacts. Avoidance of higher biodiversity values.	Project design	Spark Renewables

Avoidance and minimisation components	Action	Outcome	Timing	Responsibility
Alternative sites within a property on which the project is located that would avoid or minimise impacts on biodiversity values and justification for selecting the proposed site.	Constraints and opportunities assessment undertaken. Adapting project design to avoid areas of highest biodiversity value.	Avoidance of higher biodiversity values as much as practicable. Minimising impacts to key habitat for Plains Wanderer. Minimising impacts to hollow bearing trees.	Project design	Spark Renewables
Describe efforts to avoid and minimise impacts (including prescribed impacts) to biodiversity values through proposal design.	Constraints and opportunities assessment undertaken. Adapting project design to avoid areas of highest biodiversity value. Amended turbine layout in response to collision risks and TECS	Avoidance of higher biodiversity values as much as practicable. Minimising impacts to key habitat for Plains Wanderer. Minimising impacts to hollow bearing trees. Relocating wind turbines away from key nesting sites and breeding habitat for threatened avian fauna. Allowing for movement corridors and fly paths, minimising barrier effects.	Project design	Spark Renewables
Identification of any other site constraints that the proponent has considered in determining the location and design of the project.	Conduct surveys to identify site constraints and opportunities to avoid and minimise.	Avoidance and minimising impacts to confirmed areas of *Swainsona murrayana* and *Swainsona sericea* patches. Relocating wind turbines away from key active nesting sites and breeding habitat for threatened avian fauna.	Project design Construction	Spark Renewables





Legend

- Subject land
- Development corridor
- Development footprint

Wind constraints

- No-go
- High
- Moderate
- Low

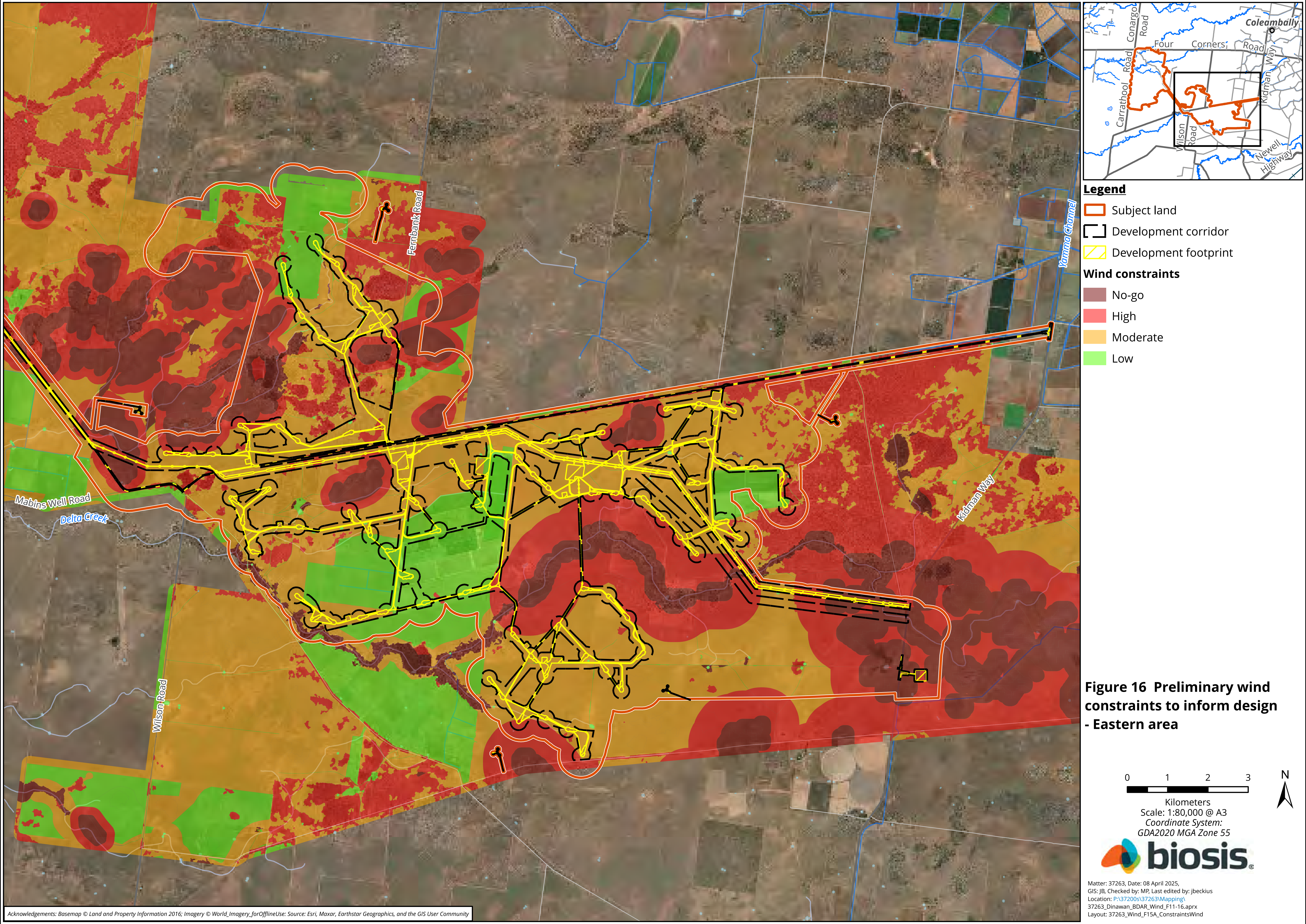
Figure 16 Preliminary wind constraints to inform design - Overview

0 1 2 3 4 5
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_F11-16.aprx
Layout: 37263_Wind_F15A_ConstraintsWind



Legend

- Subject land
- Development corridor
- Development footprint

Wind constraints

- No-go
- High
- Moderate
- Low

Figure 16 Preliminary wind constraints to inform design - Eastern area

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

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_F11-16.aprx
Layout: 37263_Wind_F15A_ConstraintsWind

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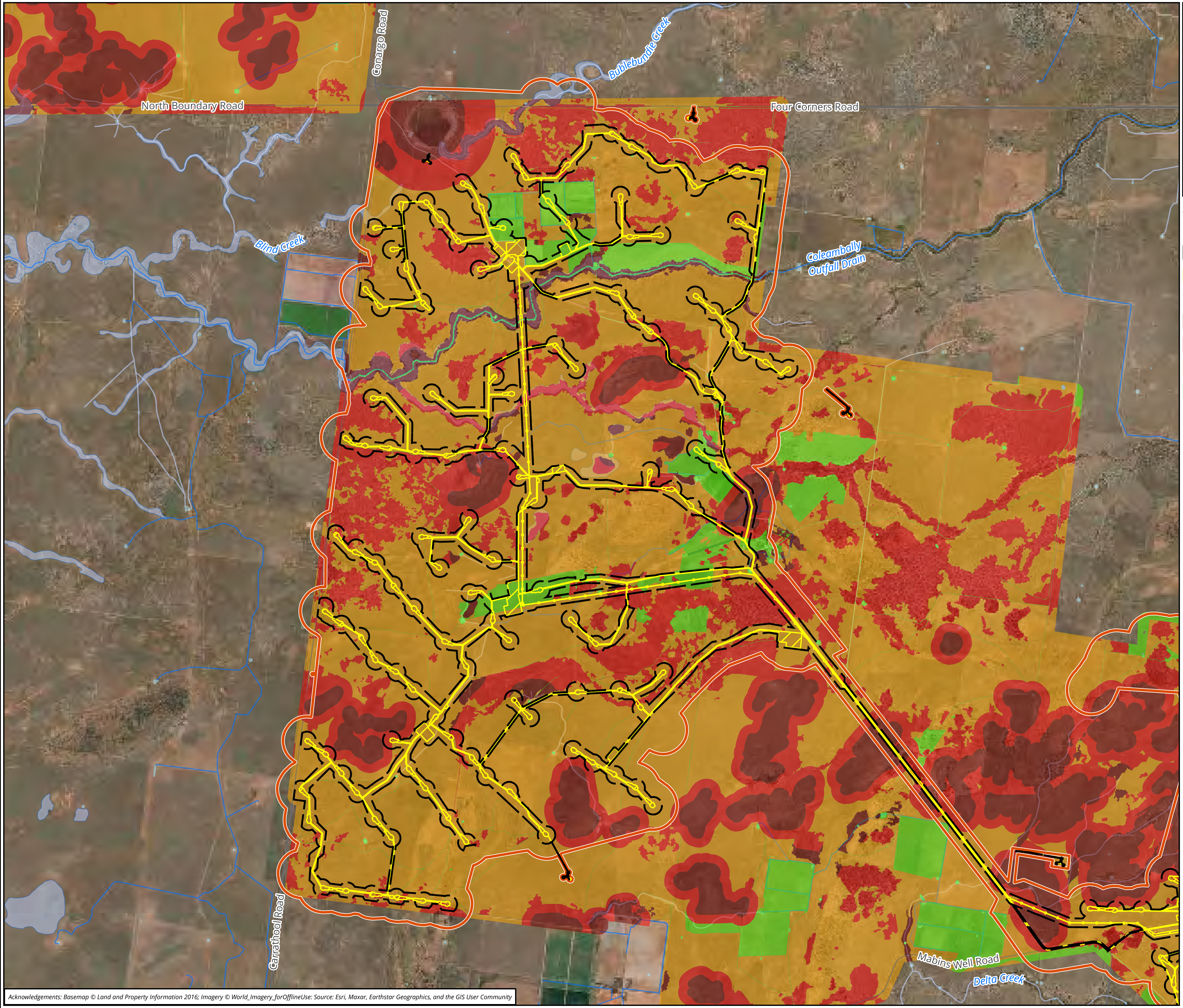

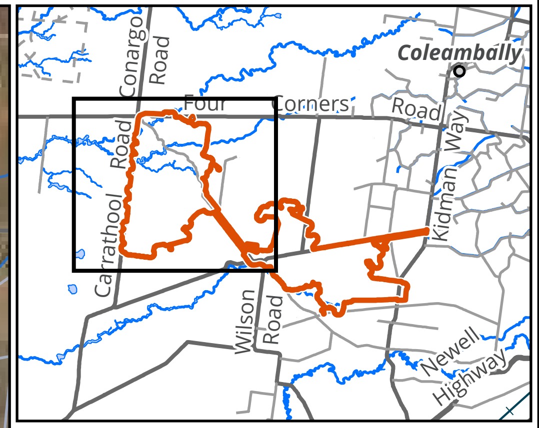

Legend

- Subject land
- Development corridor
- Development footprint

Wind constraints

- No-go
- High
- Moderate
- Low

Figure 16 Preliminary wind constraints to inform design - 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\
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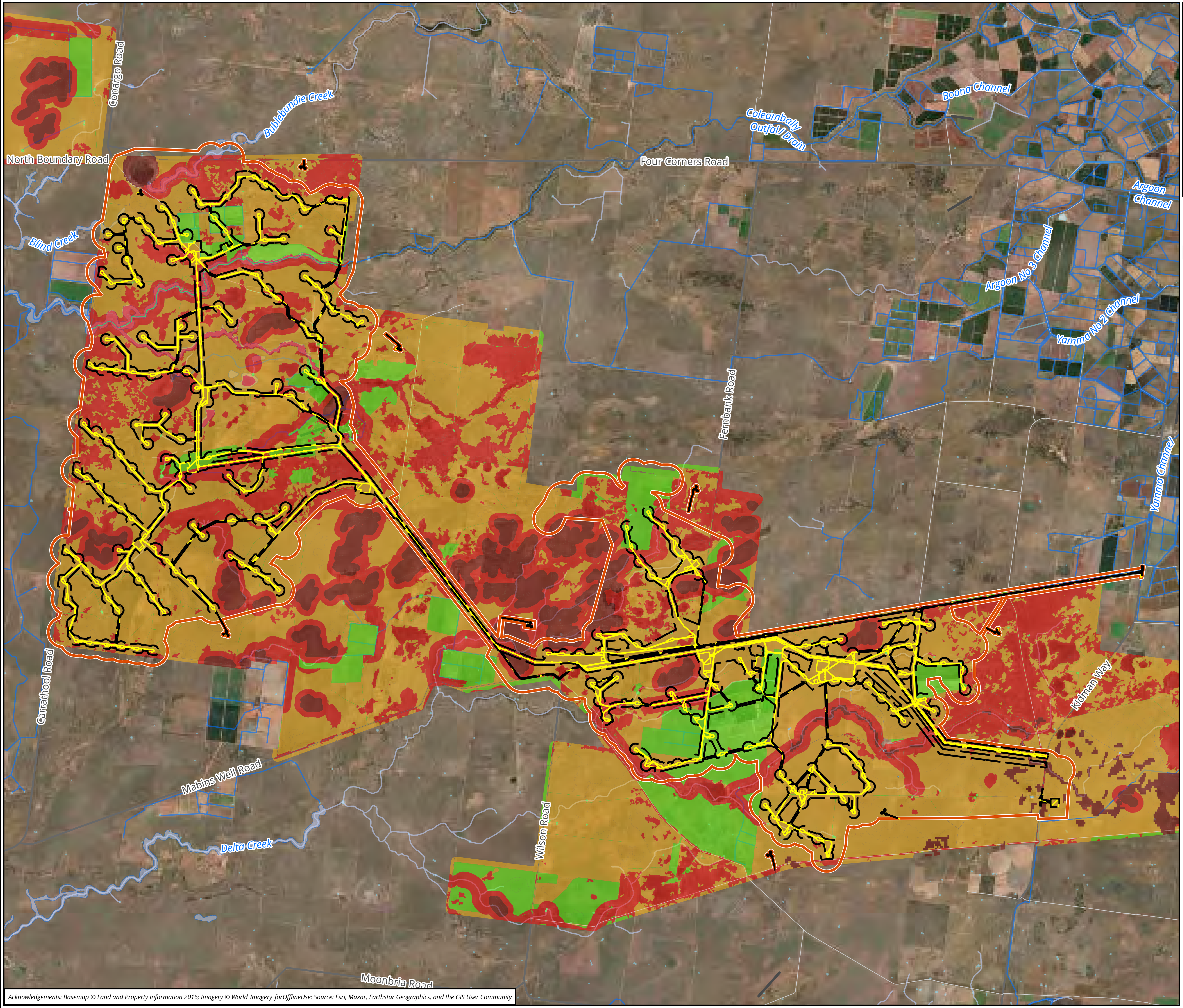
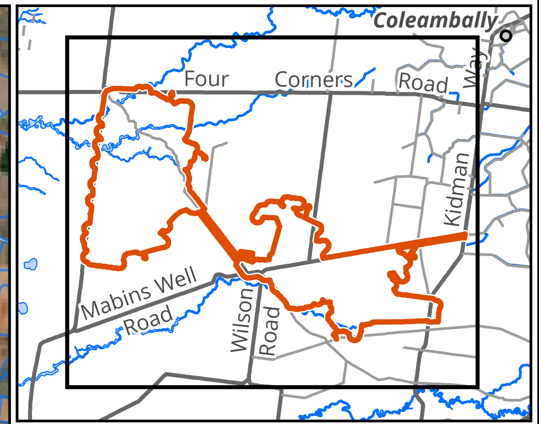
Layout: 37263_Wind_F15A_ConstraintsWind





Legend

- Subject land
- Development corridor
- Development footprint

Civil constraints

- No-go
- High
- Moderate
- Low

Figure 16B Preliminary civil constraints to inform design - Overview

0 1 2 3 4 5
Kilometers
Scale: 1:130,000 @ A3
Coordinate System: GDA2020 MGA Zone 55

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_F11-16.aprx
Layout: 37263_Wind_F15B_ConstraintsCivil

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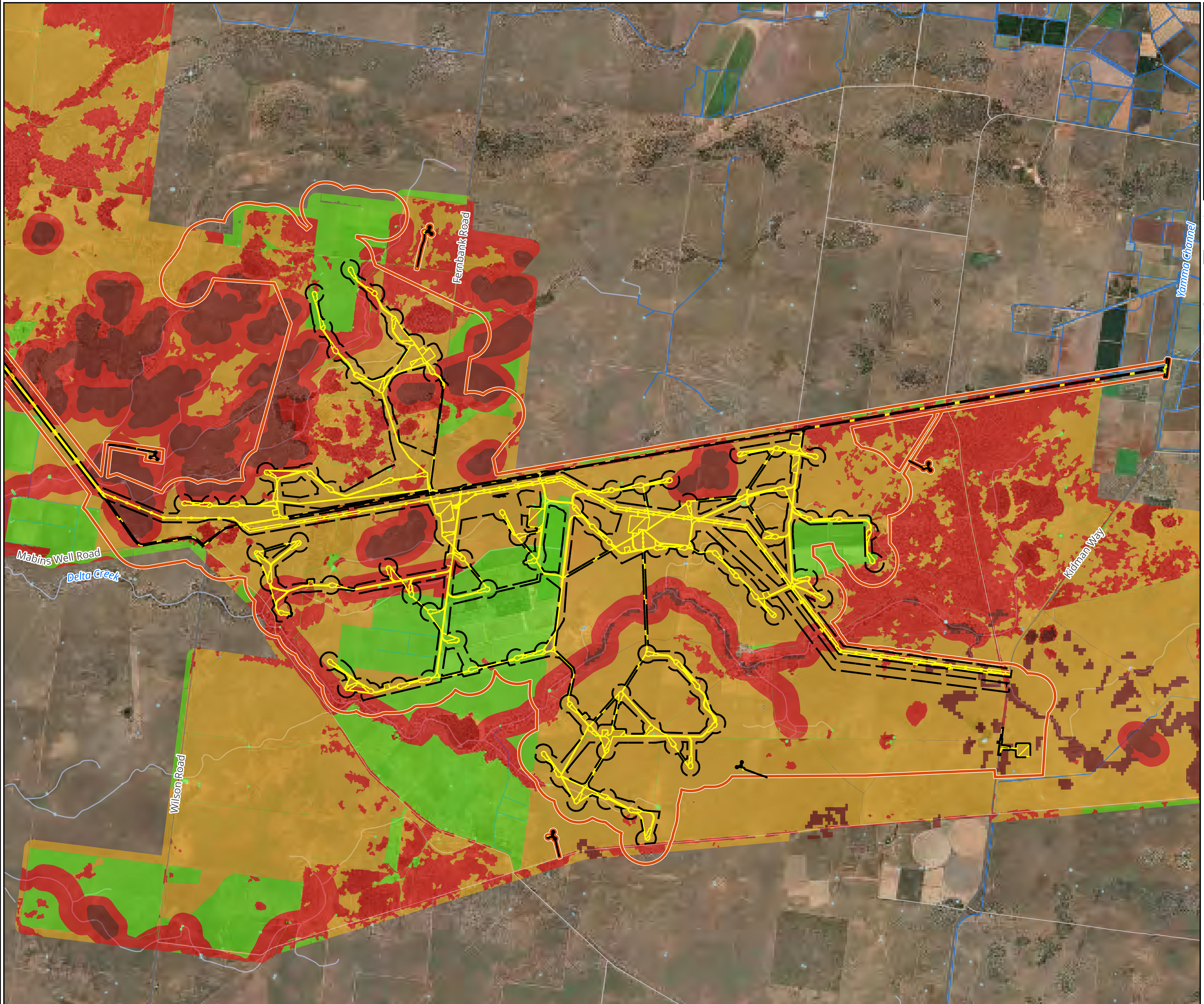

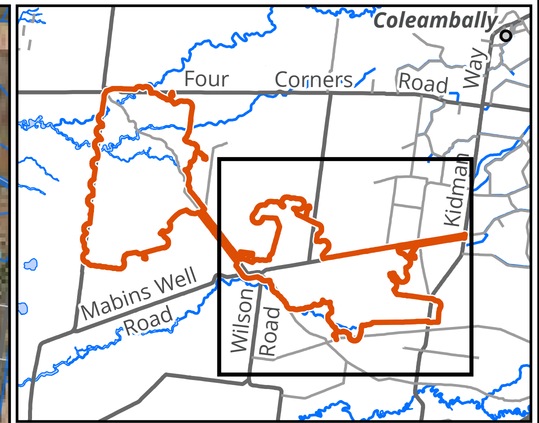

Legend

- Subject land
- Development corridor
- Development footprint

Civil constraints

- No-go
- High
- Moderate
- Low

Figure 16B Preliminary civil constraints to inform design - Eastern area

0 1 2 3
Kilometers
Scale: 1:80,000 @ A3
Coordinate System: GDA2020 MGA Zone 55

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_F11-16.aprx
Layout: 37263_Wind_F15B_ConstraintsCivil

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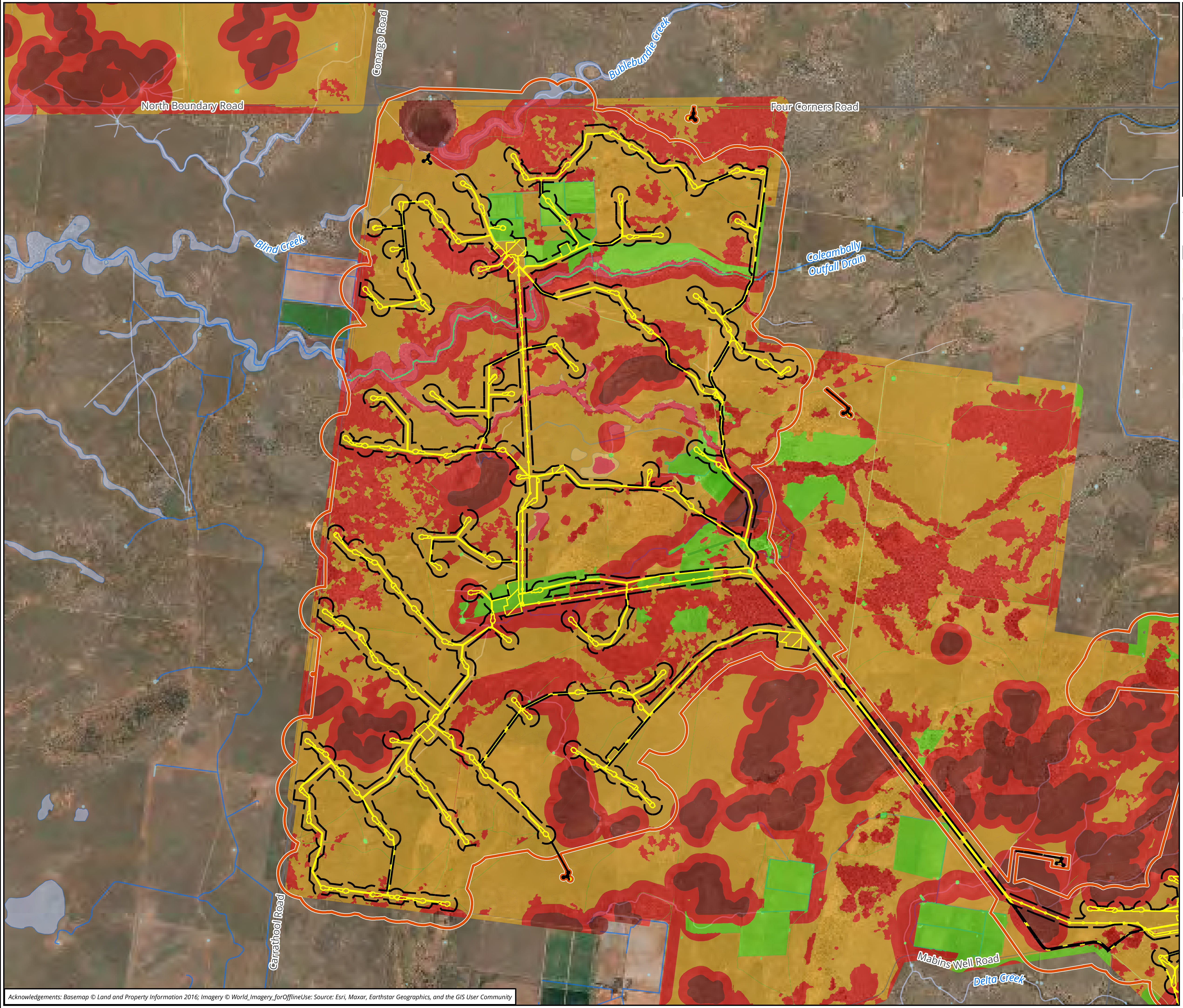

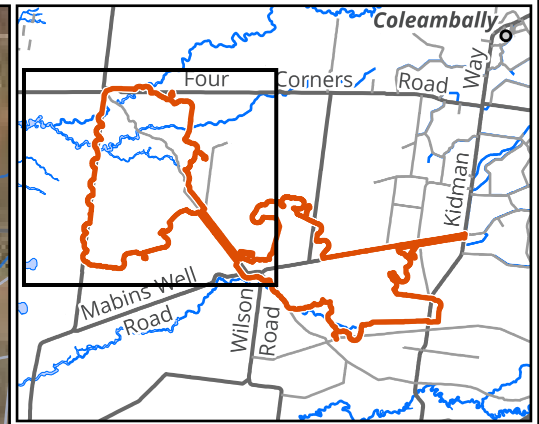

Legend

- Subject land
- Development corridor
- Development footprint

Civil constraints

- No-go
- High
- Moderate
- Low

Figure 16B Preliminary civil constraints to inform design - Western area

0 1 2 3
Kilometers
Scale: 1:80,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

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_F11-16.aprx
Layout: 37263_Wind_F15B_ConstraintsCivil

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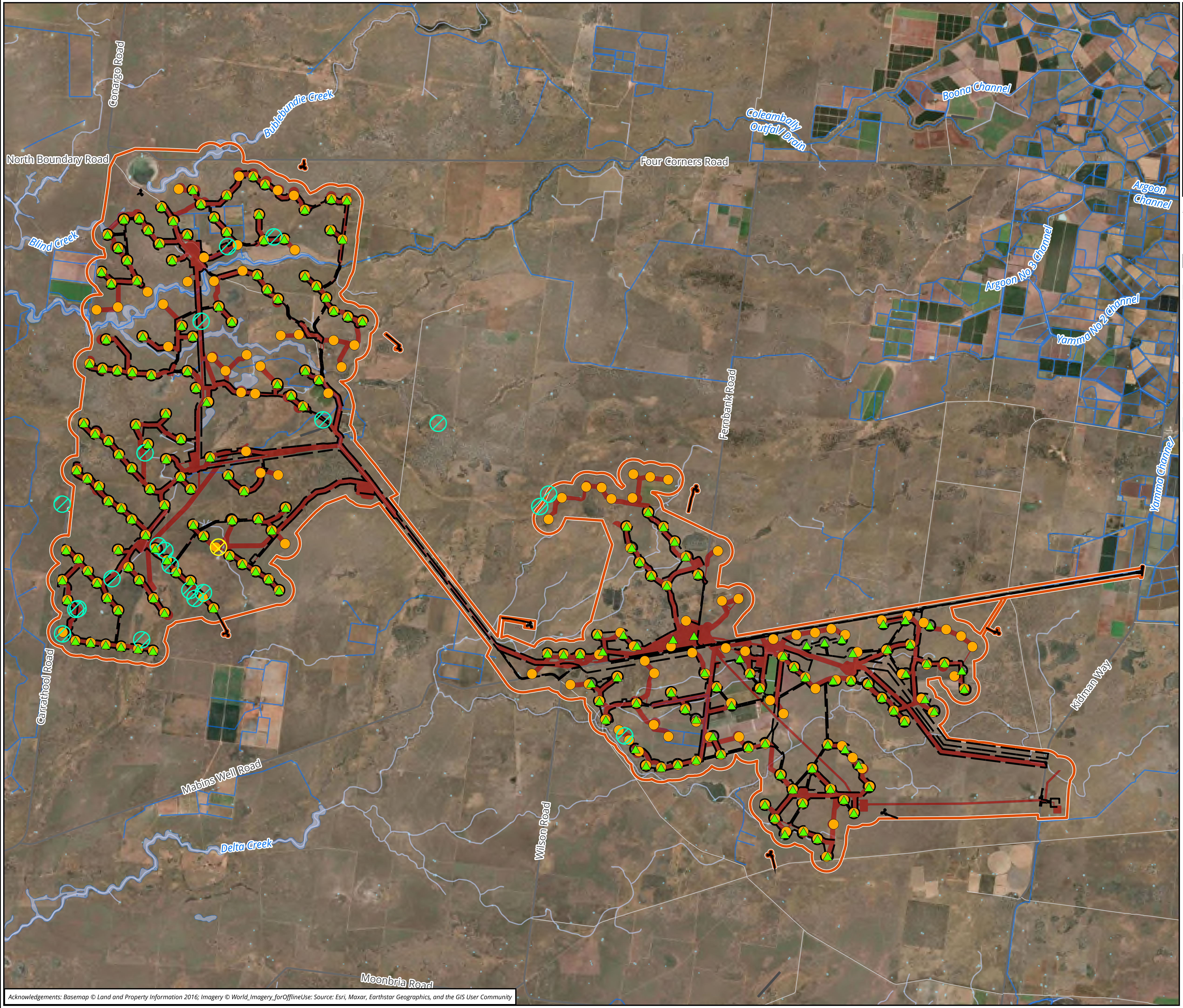
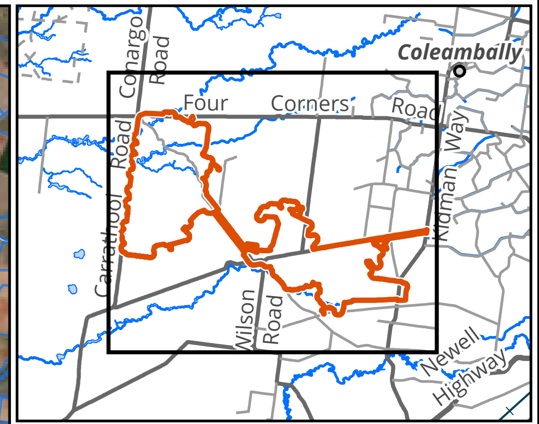




Legend

- Subject land
- Amended development corridor
- EIS Development corridor
- Wind turbine
- Wind turbine alternative option

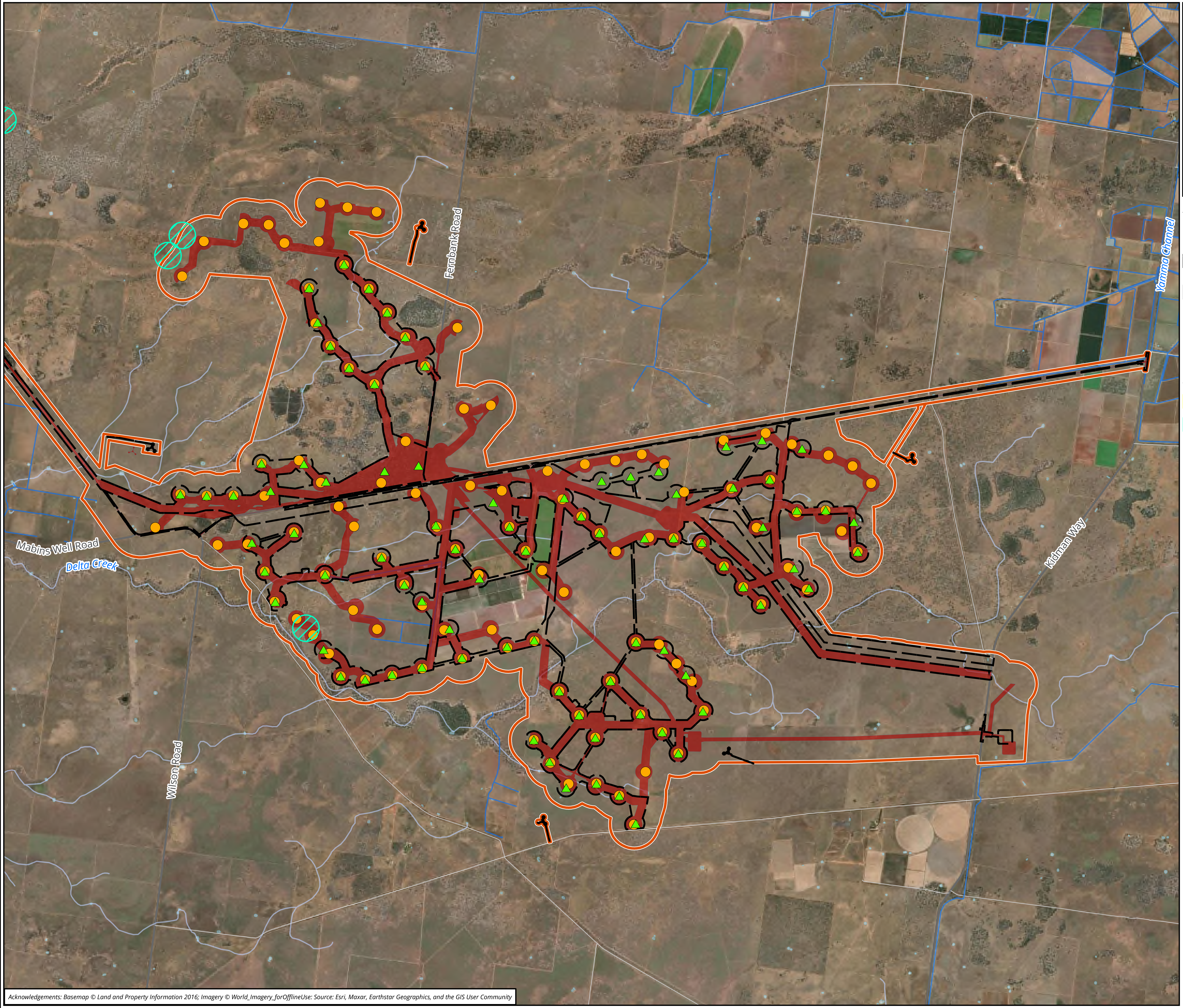
Additional avoidance measures

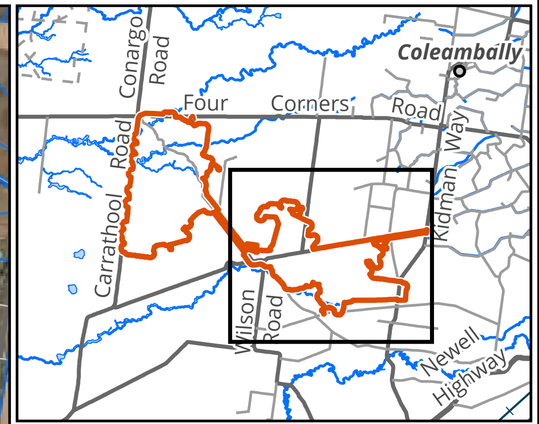
- Plains-wanderer buffer (300m)
- Large nest buffers (300m)

Figure 17 Alternative options - Overview

0 1 2 3 4 5
Kilometers
Scale: 1:130,000 @ A3
Coordinate System: GDA2020 MGA Zone 55

Matter: 37263, Date: 08 April 2025,
GIS: JB, Checked by: MP, Last edited by: jbeckius
Location: P:\37200s\37263\Mapping\37263_Dinawan_BDAR_Wind_F11-16.aprx
Layout: 37263_Wind_F16_AltOptions





Legend

- Subject land
- Amended development corridor
- EIS Development corridor
- Wind turbine
- Wind turbine alternative option

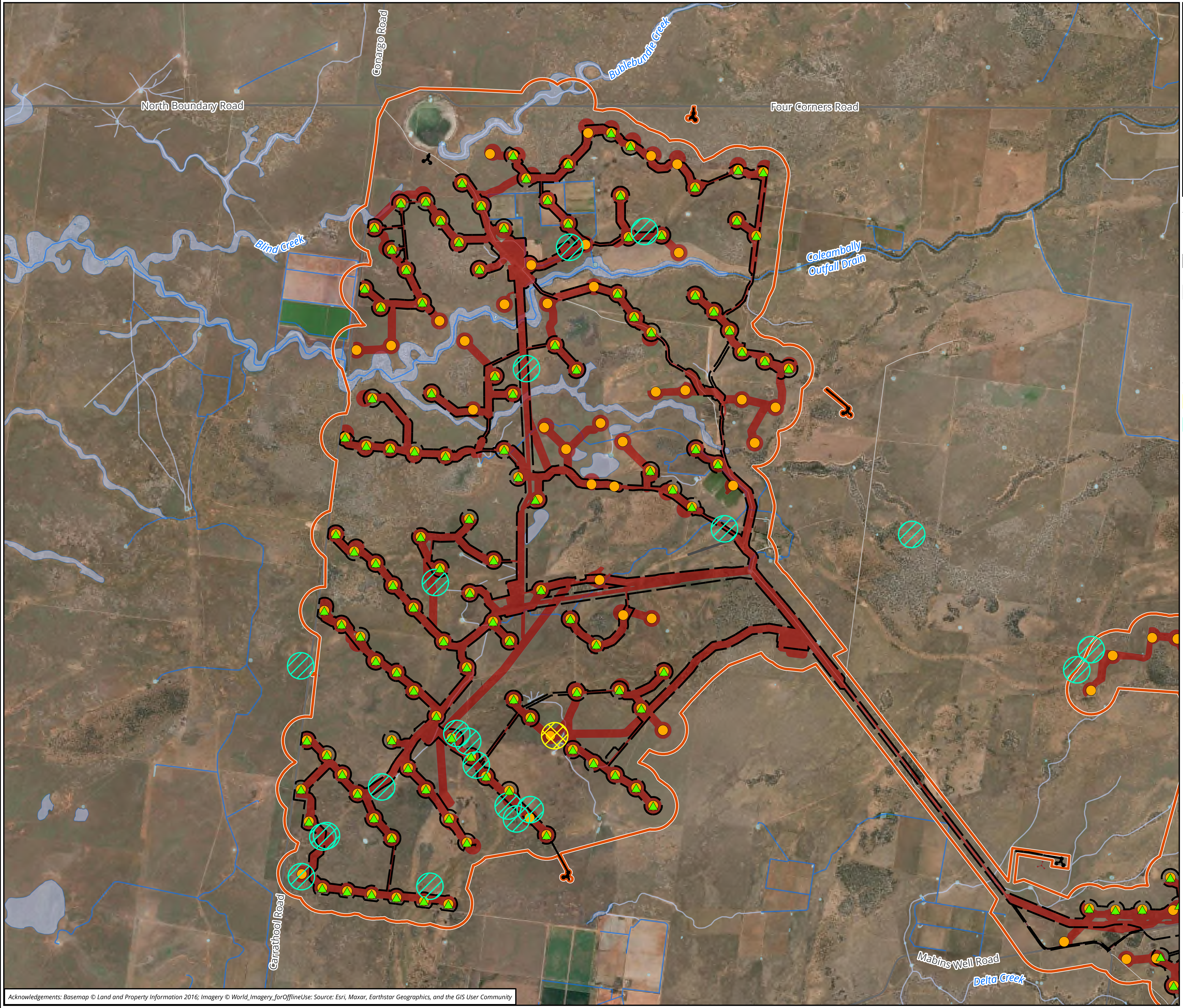
Additional avoidance measures

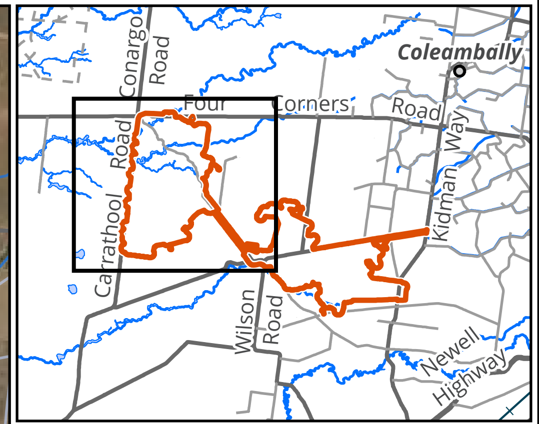
- Plains-wanderer buffer (300m)
- Large nest buffers (300m)

Figure 17 Alternative options - Eastern area

0 1 2 3
Kilometers
Scale: 1:80,000 @ A3
Coordinate System: GDA2020 MGA Zone 55

Matter: 37263, Date: 08 April 2025,
GIS: JB, Checked by: MP, Last edited by: jbeckius
Location: P:\37200s\37263\Mapping\
37263_Dinawan_BDAR_Wind_F11-16.aprx
Layout: 37263_Wind_F16_AltOptions





Legend

- Subject land
- Amended development corridor
- EIS Development corridor
- Wind turbine
- Wind turbine alternative option

Additional avoidance measures

- Plains-wanderer buffer (300m)
- Large nest buffers (300m)

Figure 17 Alternative options - 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_F11-16.aprx
Layout: 37263_Wind_F16_AltOptions

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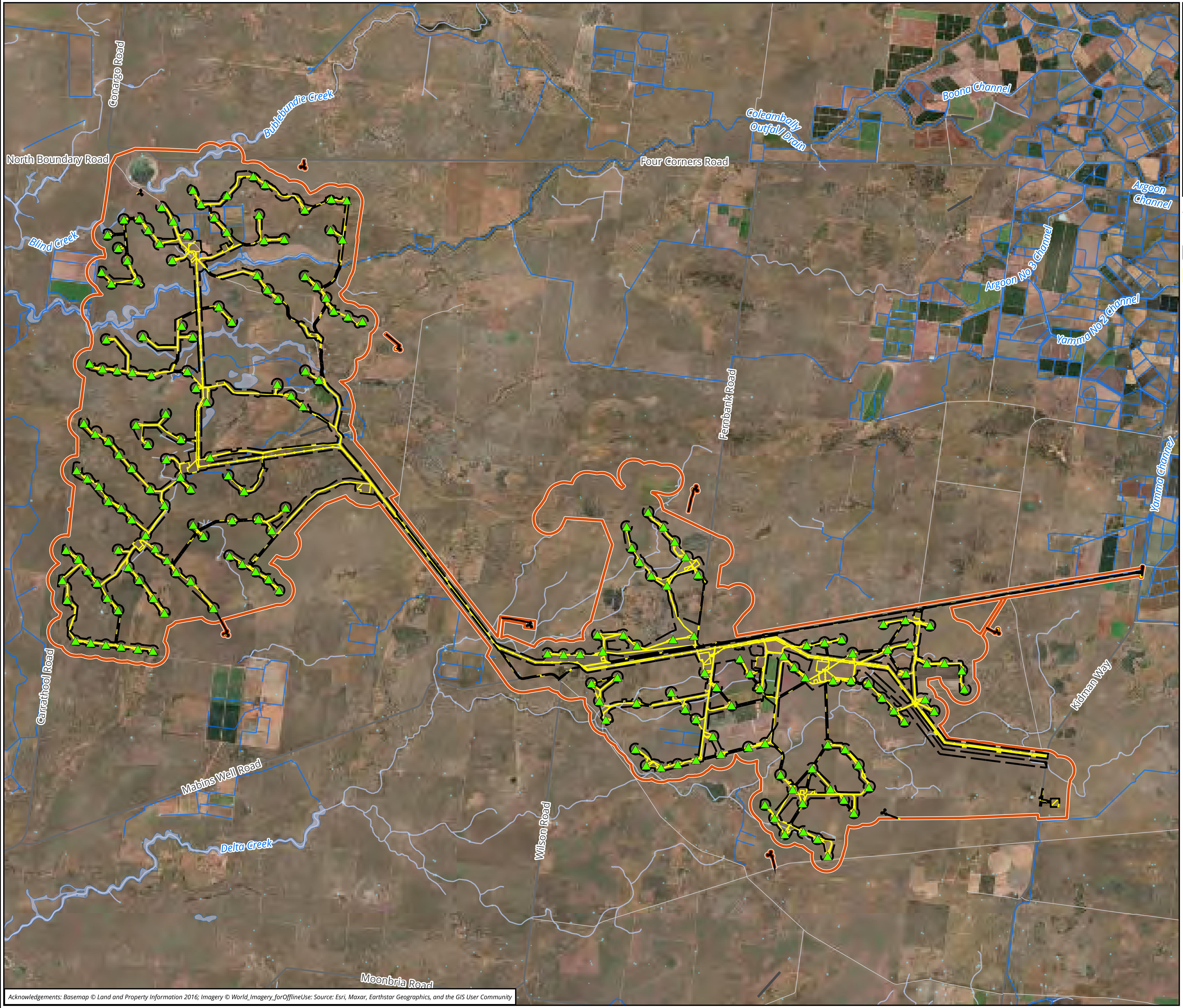

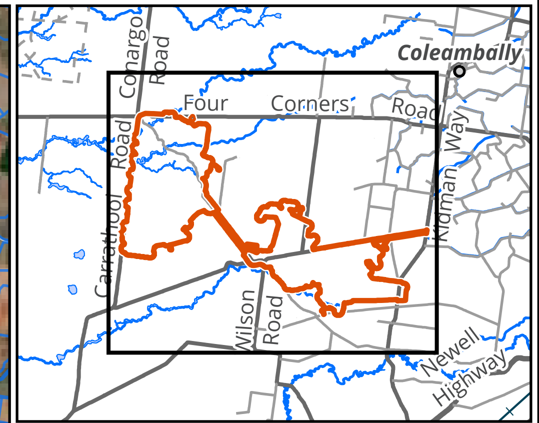

Legend

- Subject land
- Development corridor
- Development footprint
- Wind turbine

Figure 18 Development footprint and corridor - Overview

0 1 2 3 4 5
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_F18_DFDC

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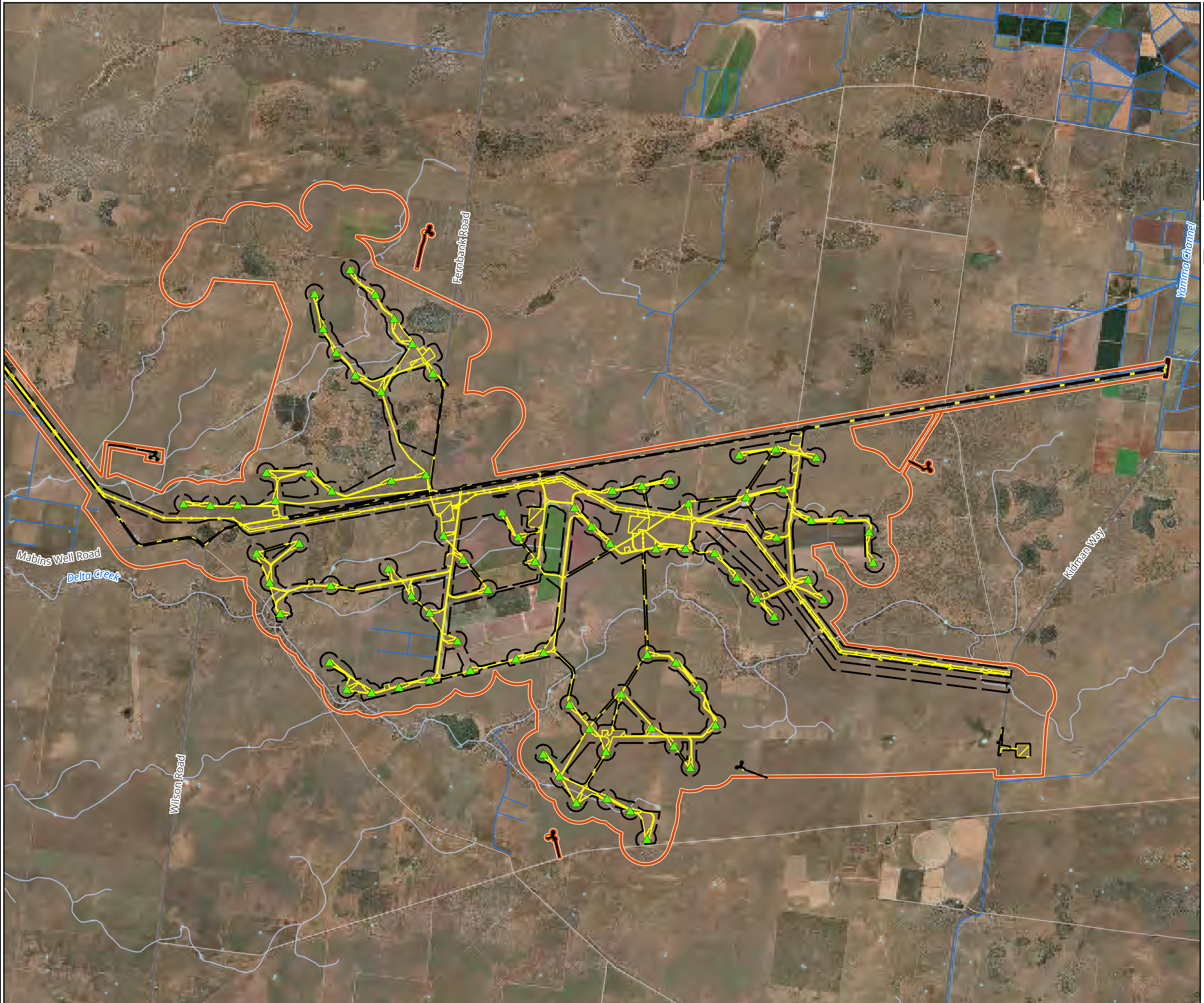
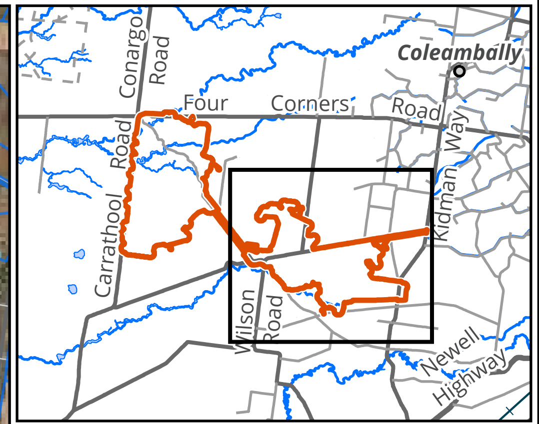




Legend

- Subject land
- Development corridor
- Development footprint
- Wind turbine

Figure 18 Development footprint and corridor - Eastern area

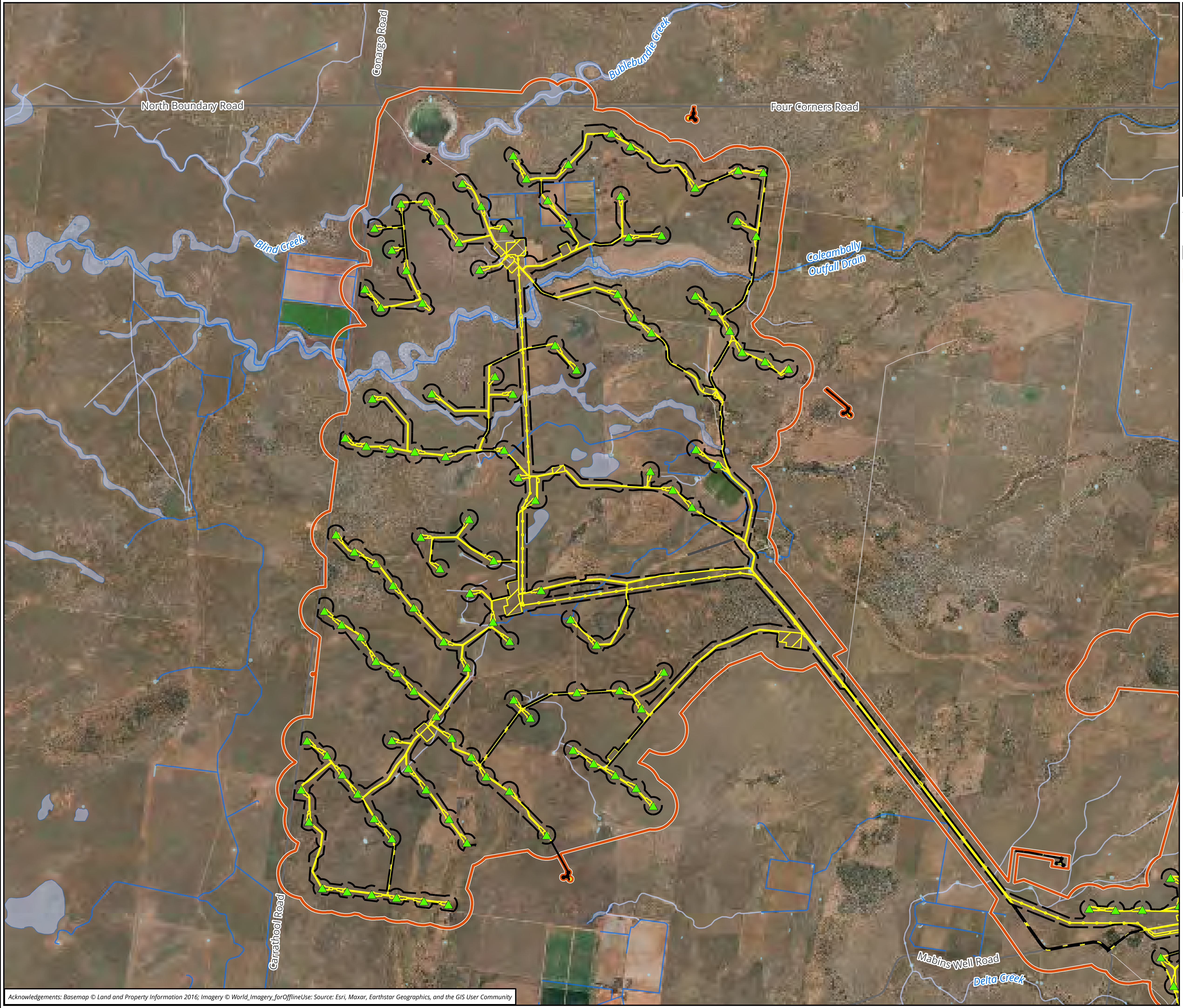
0 1 2 3
Kilometers
Scale: 1:80,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

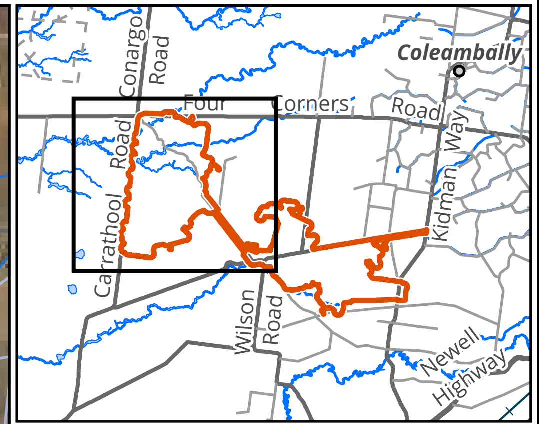
N

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_F18_DFDC

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
- Wind turbine

Figure 18 Development footprint and corridor - Western area

0 1 2 3
Kilometers
Scale: 1:80,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

N

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_F18_DFDC

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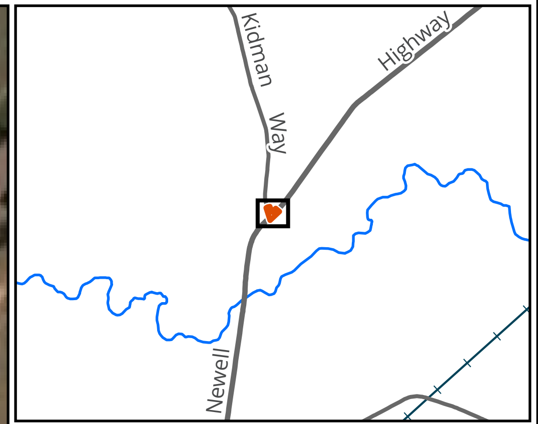

Legend

- Subject land
- Development corridor
- Development footprint

Figure 18 Development footprint and corridor - Newell Highway/ Kidman Way

0 80

Meters

Scale: 1:2,000 @ A3

Coordinate System:

GDA2020 MGA Zone 55

N

biosis

Matter: 37263, Date: 14 March 2025,
GIS: JB, Checked by: MP, Last edited by: jbeckius
Location: P:\37200s\37263\Mapping\
37263_Dinawan_BDAR_Wind_F4-10.aprx
Layout: 37263_Wind_F7_TECs_P5

Legend

- Subject land
- Development corridor
- Development footprint

Figure 18 Development footprint and corridor - Sturt Highway/Eunony Bridge Road

0 40
Meters
Scale: 1:1,000 @ A3
Coordinate System:
GDA2020 MGA Zone 55

N

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_P5-6

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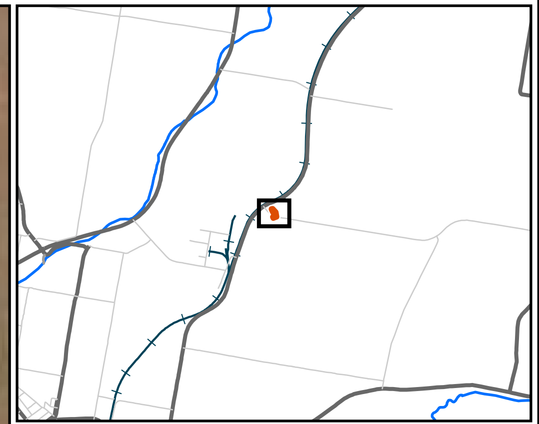

Acknowledgements: Basemap © Land and Property Information 2016; Imagery © World_Imagery_forOfflineUse: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

Legend

- Subject land
- Development corridor
- Development footprint

Figure 18 Development footprint and corridor - Byrnes Road/West Bomen Road

0 50
Meters
Scale: 1:1,500 @ A3
Coordinate System: GDA2020 MGA Zone 55

N

Matter: 37263, Date: 07 May 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_F18_DFDC_P7-8

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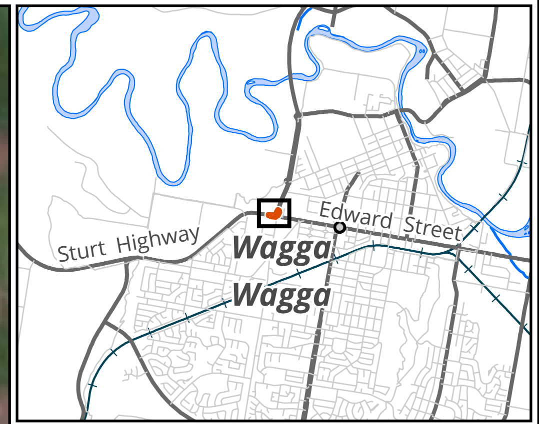

Legend

- Subject land
- Development corridor
- Development footprint

Figure 18 Development footprint and corridor - Olympic Highway/Sturt Highway

0 50
Meters
Scale: 1:1,500 @ A3
Coordinate System: GDA2020 MGA Zone 55

N

biosis

Matter: 37263, Date: 07 May 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_F18_DFDC_P7-8