Silverton Wind Farm:
Bird and Bat Monitoring 2018 - 2020

FINAL REPORT

Prepared for GE Renewable Energy

24 February 2021

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Document information

Report to:	GE Renewable Energy
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Biosis project no.:	33377
File name:	33377.Silverton.WF.Bird.Bat.Annual.Report.FNL01.20210215.docx
Citation:	Biosis 2021. Silverton Wind Farm: Bird and Bat Monitoring 2018 - 2020. Report for GE Renewable Energy. E. Baldwin & C. Potts. Biosis Pty Ltd. Melbourne, VIC. Project no 33377

Document control

Version	Internal reviewer	Date issued
Draft version 01	Ian Smales	23/11/2020
Draft version 02	Renée Woodward	21/01/2021
Final version 01	Renée Woodward	15/02/2021

Acknowledgements

Biosis acknowledges the contribution of the following people and organisations in undertaking this study:

- GE Renewable Energy: Alana Philp and Katie Sage
- Skylos: Tracy Lyten

Biosis staff involved in this project were:

- Matilda Terry, Matthew Jones and Sarah Alison (assistance in the field)
- Caitlin Potts and Kayla Asplet (bat call identification)
- Erin Baldwin (raptor, bird, Wedge-tail Eagle and carcass reporting)
- Caitlin Potts (Freckled Duck and bat reporting)
- Julian Turner (mapping)

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Summary

Biosis Pty Ltd (Biosis) was commissioned by GE Renewable Energy (GE) to implement the approved Bird and Bat Adaptive Management Plan (BBAMP) for Silverton Wind Farm (Biosis 2018), located approximately five kilometres north of Silverton and 25 kilometres north-west of Broken Hill in far west New South Wales.

The BBAMP specifies the relevant monitoring and reporting requirements to assess whether changes in bird and bat species distribution, abundance and activity (collectively termed 'utilisation') have resulted from the construction and operation of the energy facility.

In accordance with the BBAMP, this report has been prepared following one year of operation of the wind farm. The report summarises the methods and results of bird and bat monitoring data collected between spring 2018 and winter 2020.

Data collected between this period adds to baseline data collected by NGH Environmental (2018a) during the pre-construction phase and has been analysed in order to discern whether changes in the composition, abundance and activity (collectively referred to as 'utilisation') of bird and bat species can be detected as a result of the commissioning, testing and operation of Silverton Wind Farm.

This report also summarises carcasses and featherspots detected between the period spring 2018 and winter 2020. For this period, data obtained from collision monitoring by Biosis has been collated with results forwarded by Skylos Ecology to ensure no collisions meet or exceed trigger-levels for adaptive management as outlined in the Silverton Wind Farm BBAMP.

Bird utilisation

Monitoring of birds and raptors between spring 2018 and winter 2020 at Silverton Wind Farm was conducted at 18 control and 30 impact point locations that had been selected and monitored by NGH Environmental (2018a) during baseline surveys.

During the period of surveys covered by this report, a total of 70 bird species were recorded during point count surveys or incidentally, with the highest diversity and abundance of birds recorded in River Red Gum riparian woodland and Bluebush shrubland.

Simultaneous declines in bird abundance at both control and impact sites infer that significant changes in the demography and structure of avian assemblages at Silverton Wind Farm between the pre-construction and testing / operational phases is likely to be caused by declines in seasonal rainfall, with the associated decrease in resources considered likely in reducing survival and emigration of both individuals and certain species.

Wedge-tailed Eagle utilisation

As was documented during the baseline monitoring, Wedge-tailed Eagles were the raptors most frequently recorded onsite during surveys between spring 2018 and winter 2020; typically in Porcupine Grass sparse woodland and Mulga Dead Finish (open) woodland during the breeding months of winter.

Although observations of Wedge-tailed Eagles flying within Silverton Wind Farm were lowest during the operational phase of monitoring in comparison to the testing, commissioning and pre-construction phases, it is noted that these observations coincide with a significant decline in the presence of the species prey onsite. This was particularly evident for macropods, which were abundant during the winter and spring 2019 surveys than in 2020. Therefore, the decline in Wedge-tailed Eagle abundance is more likely to be associated with a reduction in the availability and abundance of prey within the site (i.e. macropods) attributed to the

surrounding dry conditions experienced over summer 2019 extending through to winter 2020, rather than an effect of the wind farm's operation.

Bat utilisation

Twenty-three microbat call detectors were installed at 20 locations. Six species of bats were recorded to species level during the bat call surveys. A further three were identified to genus level only. The same assemblage of bat species were recorded during the pre-construction, commissioning and post-construction monitoring phases. Seasonal fluctuations in richness and bat activity was generally observed to be similar at bat control and impact sites.

Three bat species and one genus grouping were recorded by detectors deployed at 65m height on meteorological masts. Of these, three species are known to have experienced collision(s) with turbines during the commissioning and first year of operation. There was no indication from the data that the local populations for the species flying at height were impacted by the turbines, with similar fluctuations in activity seen within control and impact sites.

Freckled Duck utilisation

Targeted surveys at focal wetlands surrounding Silverton Wind Farm were undertaken to determine the presence of the Freckled Duck, listed as vulnerable under the schedules of the *Biodiversity Conservation Act* 2016 (BC Act). Freckled Duck were recorded on separate occasions at Umberumberka Reservoir, directly west of the wind farm. It was not recorded at any other water body within the area, including Stephens Creek Reservoir.

The presence of Freckled Duck often coincided with a lack of water at other water bodies throughout region, when Umberumberka was one of the few water bodies with water present, making Umberumberka a likely drought-refuge for this species. During bird utilisation surveys at the wind farm, no flight activity for Freckled Duck was recorded, however it is acknowledged that flights for this species may be nocturnal and the nomadic nature of the species makes flight patterns hard to predict. Based upon the identified presence of Freckled Duck in close proximity to the wind farm, the risk assessment included in the BBAMP for Freckled Duck therefore maintained a moderate risk for impacts of turbine collisions.

Significant species utilisation

Seven significant species (identified in the BBAMP (Biosis 2018) as either species at risk of collisions with turbine and / or threatened or migratory) were detected incidentally and / or during bird utilisation surveys within the Silverton Wind Farm site between spring 2018 and winter 2020 (Wedge-tailed Eagle, Grey Falcon, Brown Falcon, Nankeen Kestrel, White-throated Needletail, Hooded Robin and Dusky Woodswallow).

Of the 19 species recorded within or above Rotor Sweep Height (RSH) between spring 2018 and winter 2020:

- Eight were previously recorded within or above RSH during the pre-construction period (Australian Raven, Brown Falcon, Galah, Little Corella, Nankeen Kestrel, Tree Martin, Wedge-tailed Eagle, Whistling Kite).
- One is listed as migratory under provisions of EPBC Act (White-throated Needletail).
- One is listed as vulnerable under schedules of the BC Act (Dusky Woodswallow).
- One is listed as endangered under schedules of the BC Act (Grey Falcon).
- Five were predicted to be 'species of concern' during the initial assessment of turbine collision risk (Brown Falcon, Dusky Woodswallow, Nankeen Kestrel, Wedge-tailed Eagle, White-throated Needletail).

Collision risk assessments have been revised to consider data from spring 2018 to winter 2020 monitoring.

Bird and bat collision monitoring

Searches to detect carcasses or featherspots were undertaken by ecologists with demonstrated capacity to identify bird and bat species of western NSW between May 2018 and October 2019. Data obtained from these searches was collated with results collected by Skylos Ecology and analysed to ensure no collisions meet or exceed trigger-levels for management responses outlined in the BBAMP. Despite the detection of 11 carcasses between spring 2018 and winter 2020, the testing and operation of the Silverton Wind Farm has not exceeded any of the BBAMP trigger levels for any threatened or non-threatened species.

Surveys for Wedge-tailed Eagle nests within the Silverton Wind Farm site and in suitable environs within 20 kilometres, during the breeding months of winter 2019 detected 17 nests. The majority of these nests were determined to be inactive, with only two nests each observed to contain a single fledgling during subsequent nest monitoring undertaken in spring and summer 2019. Breeding success averaged 1.0 for young fledged per attempt in which eggs were laid in 2019.

The distance between active nests detected during the 2019 breeding season was 9.6 kilometres, indicating a core breeding density of one pair per 22.09 square kilometres. However, a number of additional nests in solid structural condition suggests there may be additional pairs in the locality that may have not attempted to breed during drought conditions in 2019.

Results to-date are limited to records from 2019. However, for that year, two chicks were found to have successfully fledged from two nests however two juveniles were found to have collided with turbines. As the carcass persistence trial and searcher efficiency trial results are not available at the time of preparing this report a comparison of the known breeding success to impacts of the wind farm cannot be confidently made. Results of ongoing collision and nest monitoring through the first two years of operation, combined with monitoring of prey abundance and breeding activity during this operational phase of Silverton Wind Farm, will provide further evidence to inform interpretation of results and potential impacts over the longer-term.

1. Introduction

1.1 Project background

Silverton Wind Farm is located approximately five kilometres north of Silverton and 25 kilometres north-west of Broken Hill in far west New South Wales (NSW) (Figure 1). Silverton Wind Farm was approved by the then Minister for Planning in May 2009. The Wind Farm was declared to be a critical infrastructure project under the NSW Environmental Planning and Assessment Act 1979 (EP&A Act), as an energy generating development with the capacity to generate at least 250MW.

Project and Concept Approval was granted in May 2009, pursuant to Part 3A of the EP&A Act. Further modification (Modification 3) was then approved in December 2016 in accordance with Clause 8J(8) of the Environmental Planning and Assessment Regulation 2000 and the transitional arrangements of the EP&A Act. Approval was granted for the modifications to the project approval (08_022 MOD 3) and concept approval (08_0022MOD2) subject to the conditions set out in the instrument of approval.

Biosis was commissioned by GE Renewable (GE) to prepare the Bird and Bat Adaptive Management Plan (BBAMP) for Silverton Wind Farm in response to items in condition 17 and 19 of schedule 3 of the third modification of the project approval ('condition 17 and 19 of schedule 3 of the MOD 3 project approval') which was issued by the Planning Assessment Commissioning of NSW on the 22 December 2016, as well as the Statement of Commitments and Section 9.3 of the Environmental Assessment Main Report Part 2 undertaken by NGH Environmental in 2008.

The approved Bird and Bat Management Plan (BBAMP) for Silverton Wind Farm (Biosis 2018) specifies the relevant monitoring and reporting requirements to assess whether changes in bird and bat species distribution, abundance and activity (collectively termed 'utilisation') have resulted from the construction and operation of the energy facility.

Biosis began implementation of the various monitoring requirements of the approved BBAMP in spring 2018 during Silverton's Wind Farm's commission, continuing general bird and bat utilisation studies and targeted raptor nest surveys during various phases of testing, as well as following the staged commencement of operations from May 2019. Biosis also undertook monitoring of bird and bat turbine collision fatalities between the period of May 2018 and October 2019. Relevant monitoring and reporting requirements outlined in the BBAMP for Silverton Wind Farm related to bird and bat monitoring undertaken by Biosis are provided in Appendix 1.

This report summarises raptor nesting and bird and bat utilisation data collected between spring 2018 and winter 2020. It also summarises carcasses and featherspots detected during human collision carcass searches between the period of May 2018 and October 2019 and dog searches through to end June 2020. Raptor nesting and bird and bat utilisation data collected between spring 2018 and winter 2020 adds to baseline data collected by NGH Environmental (2018a) and Ecology and Heritage Partners (EHP 2017) during the pre-construction phase and has been analysed in order to discern whether changes in bird and bat utilisation can be detected as a result of the commission, testing and/or operation of Silverton Wind Farm. Data obtained from collision monitoring has also been collated with results collected by Skylos Ecology and analysed to ensure no collisions meet or exceed trigger-levels for management responses outlined in the BBAMP.

1.2 Scope of the assessment

Bird & bat collision monitoring

Detection and documentation of bird and bat mortalities due to collisions with turbines at Silverton Wind Farm were undertaken by Biosis during the months of May-June 2018, September-November 2018, Jan-March 2019 and May-October 2019. Results have been collated with those obtained from Skylos Ecology who undertook dog searches between November 2019 and end June 2020.

Bird and raptor utilisation

General bird (previously termed 'passerine') and raptor utilisation surveys were replicated using the same methods and locations used during baseline surveys undertaken by NGH Environmental prior to the wind farm's construction. Surveys were undertaken across the seasons of summer, autumn, winter and spring over a period of two years, during the wind farm's commission, testing (Phase 1 and 2) and commencement of full operation.

The objectives of the investigations are to document how birds utilise the Silverton Wind Farm site during different phases of testing and operation of the Silverton Wind Farm. Collected data has been compared against baseline surveys undertaken by NGH Environmental prior to construction in order to detect if changes have occurred in species presence, abundance and activity as a result of Silverton Wind Farm's construction and operation.

Bat utilisation

Utilisation of the Silverton Wind Farm site by microbats was monitored using ultrasonic detectors using the same methodologies and deployment locations used by NGH Environmental during baseline surveys prior to the wind farm's construction. Bat detector surveys were undertaken across the seasons of summer, autumn, winter and spring over a period of two years, during the wind farm's commissioning (spring 2018 – summer 2019) and commencement of full evening operations (autumn 2019 – winter 2020).

The objectives of the investigations are to identify bat calls using manual and automated identification software (AnaScheme), thus identifying species utilising the Silverton Wind Farm during both the commissioning and through the first year of the Silverton Wind Farm's evening operations. Collected data has been compared against baseline surveys undertaken by NGH Environmental prior to construction in order to detect if changes have occurred in species presence as a result of Silverton Wind Farm's operation.

Wedge-tailed Eagle reproductive behaviours and rates

Spatial and temporal breeding behaviours of raptors, with a focus on Wedge-tailed Eagles, were monitored over the nesting months of winter and spring in 2019 within the Silverton Wind Farm and in suitable accessible environs within 20 kilometres. Roaming surveys to identify and map the locations of Wedge-tailed Eagle nests were undertaken over a period of five days in winter 2019. All nests were monitored in spring 2019 for activity over a period of three days with the aim to:

- Develop an understanding of the local population of Wedge-tailed Eagles.
- Estimate the local population's likely reproductive and dispersal capacity.
- Evaluate whether turbine collisions of Wedge-tailed Eagles at Silverton Wind Farm are exceeding the estimated reproductive rate.

Freckled Duck utilisation

The spatial and temporal occurrence and behaviours of Freckled Ducks within and surrounding the Silverton Wind Farm were recorded during winter and spring in 2019. Monitoring was undertaken at focal locations (i.e. large wetlands) to determine the species presence at surrounding water bodies.

The objectives of the investigations are to identify the species presence within the landscape and document any flight behaviours that may inform the species' potential to fly within the Silverton Wind Farm site.

Reporting

The objectives of this report are to:

- Summarise and compare bird and bat utilisation data collected during Silverton Wind Farm's commissioning and first year of operation against baseline surveys previously undertaken by NGH Environmental.
- Present the locations of Wedge-tailed Eagle nests identified and monitored during spring and summer 2019 against those previously identified during baseline surveys.
- Estimate and compare the successful dispersal rate of the regional Wedge-tailed Eagle population during Silverton Wind Farm's first year of operation against recorded collision fatalities to assess whether collisions exceed reproductive rate.
- Summarise bird and bat collision carcass monitoring for the interim period of spring 2019.
- Analyse how "at risk" threatened bird and bat species are likely to be at Silverton Wind Farm based on results of monitoring to date.
- Provide an informed assessment of the likelihood of Freckled Duck to encounter turbines at Silverton Wind Farm.

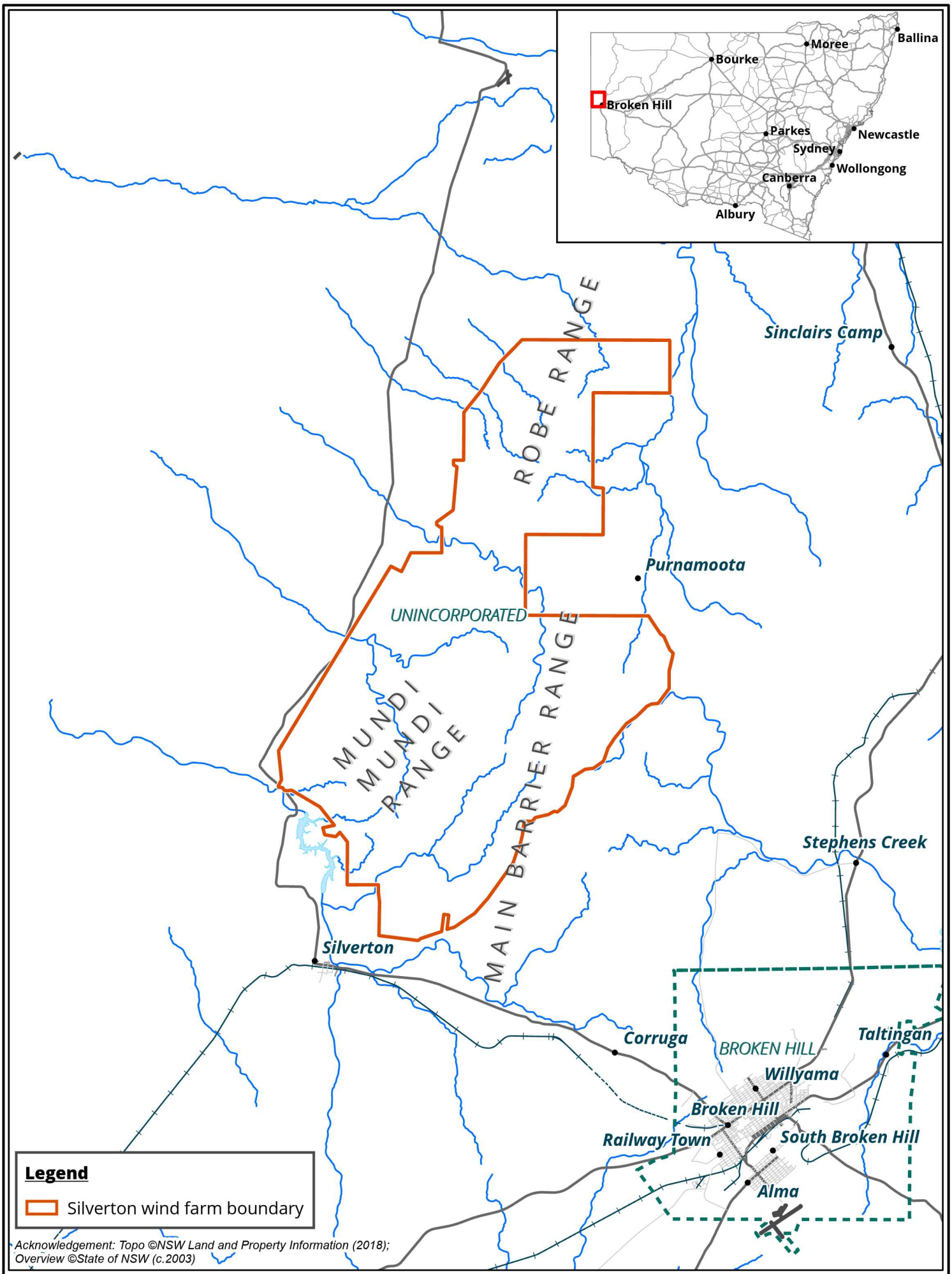

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Figure 1 Location of the study area, New South Wales

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2. Methods

Bird and bat surveys undertaken at Silverton Wind Farm between spring 2018 and winter 2020 have applied methodologies that are consistent with baseline surveys undertaken by NGH Environmental (NGH Environmental 2018a). The detailed methodologies for collision monitoring and bird and bat surveys undertaken between spring 2018 and winter 2020 are described in the below sections.

2.1 Determination of monitoring periods

A timeline of the commissioning, testing and commencement of full operations at Silverton Wind Farm is outlined in Table 1 below. Based on the staged timing of diurnal commissioning, testing and commencement of full operations, seasonal data collected for birds has been collated into a number of monitoring phases stages through 2018 to 2020. As bats are nocturnal, roosting in caves or other refuges during the day, data has been collated to allow assessment with the commencement of full night-time operations from 7 May 2019.

Table 1 Timeline of construction, commissioning (testing) and operations

Dates	Phase	Seasons	Bird phase	Bat phase
To 14/05/2018	Preconstruction	Spring 2016 – autumn 2018	Preconstruction	Preconstruction
14/05/2018– 07/05/2019	Commissioning of 58 turbines	Spring 2018– summer 2019	Commissioning (testing)	Commissioning (testing)
07/05/2019 – 29/03/2020	Up to 22 turbines operational in day, 58 at night	Autumn 2019 – summer 2020	Operation – Phase 1	Full operation (Year 1)
30/03/2020 – 20/05/2020	Up to 38 towers operational in day; 58 at night.	Autumn 2020	Operation – Phase 2	Full operation (Year 1)
21/05/2020	Up to 58 turbines online day and night	Winter 2020	Full operation (Year 1)	Full operation (Year 1)

2.2 Bird utilisation surveys

2.2.1 Locations

Monitoring of general birds and raptors during the commission, testing and operation of Silverton Wind Farm was conducted at 18 control (general bird: 10; raptor: 8) and 30 impact (general bird: 19; raptor: 11) point locations surveyed during baseline surveys. The locations of the 48 bird and raptor monitoring points are provided in Table 2 (below) and Figure 2.

Table 2 Location of general bird and raptor monitoring points

Site No	Taxa	Site Type	Habitat	Longitude	Latitude
Passerine					
1	G	I	MDF	141.3194	-31.7502
2	G	I	RR	141.312	-31.736
5	G	I	MDF	141.3062	-31.7823

Site No	Taxa	Site Type	Habitat	Longitude	Latitude
7	G	I	PGSW	141.2963	-31.7886
9	G	I	RR	141.3133	-31.7675
11	G	I	MDF	141.3231	-31.7416
12	G	I	MDF	141.2984	-31.7778
13	G	I	MDF	141.2858	-31.7964
16	G	I	MDF	141.289	-31.8052
23	G	I	MDF	141.238	-31.8306
24	G	I	MDF	141.2616	-31.8157
32	G	I	BB	141.2784	-31.8142
35	G	I	MDF	141.2329	-31.7783
36	G	I	MDF	141.2481	-31.7993
37	G	I	MDF	141.2149	-31.7971
38	G	I	MDF	141.2217	-31.8157
41	G	I	PGSW	141.2342	-31.7773
42	G	I	RR	141.2237	-31.8165
34	G	I	MDF	141.3338	-31.7511
15	G	C	PGSW	141.3177	-31.7914
17	G	C	MDF	141.2994	-31.806
19	G	C	MDF	141.2643	-31.7753
20	G	C	RR	141.2661	-31.7788
22	G	C	MDF	141.2487	-31.8375
26	G	C	RR	141.2538	-31.8413
30	G	C	RR	141.287	-31.8229
31	G	C	BB	141.2951	-31.8349
39	G	C	MDF	141.2233	-31.7725
40	G	C	PGSW	141.235	-31.7677
Raptor					
3	R	I	RR	141.3083	-31.733
4	R	I	MDF	141.304	-31.7814
6	R	I	MDF	141.3054	-31.7826
8	R	I	MDF	141.2918	-31.804
10	R	I	MDF	141.305	-31.779
25	R	I	MDF	141.2558	-31.8134
33	R	I	MDF	141.2745	-31.814
43	R	I	MDF	141.2099	-31.7948
46	R	I	PGSW	141.2312	-31.7783
47	R	I	PGSW	141.2382	-31.7773
48	R	I	MDF	141.2218	-31.8172
14	R	C	PGSW	141.3174	-31.7944

Site No	Taxa	Site Type	Habitat	Longitude	Latitude
18	R	C	RR	141.2981	-31.8051
21	R	C	MDF	141.2695	-31.7893
27	R	C	RR	141.2538	-31.8413
28	R	C	MDF	141.2688	-31.8534
29	R	C	RR	141.2895	-31.8197
44	R	C	MDF	141.2242	-31.7706
45	R	C	PGSW	141.2407	-31.767

Note to table: R = Raptor, G = General Bird, C = Control, I = Impact, PGSW = Porcupine Grass Sparse Woodland, RR = River Red Gum riparian woodland, MDF = Mulga Dead Finish (open) woodland, BB = Bluebush Shrubland

2.2.2 Methods

Count surveys for birds (including raptors) at bird monitoring points were undertaken by one stationary observer (qualified Zoologist) for a period of 20 minutes. Within this period the following information was recorded:

- Start time and date.
- Weather conditions.
- All bird species observations (including raptors), with descriptions of their behaviour, distance from observer and height of observation.

Count surveys for raptors (including birds) at raptor monitoring points were undertaken by one stationary observer (qualified Zoologist) for a period of 30 minutes. Within this period the following information was recorded:

- Start time and date.
- Weather conditions.
- All raptor species observations, with descriptions of their behaviour, distance from observer and height of observation.

2.2.3 Frequency and survey timing

Counts for raptors and birds were carried out across variable daylight hours and a variety of weather conditions, with the exception of conditions that would impede the ability of observers to undertake the surveys.

Each monitoring point was surveyed once by NGH during the pre-construction period:

- Summer 2016: 12/12/2016 – 14/12/2016
- Winter: 29/05/2017 – 02/06/2017
- Spring 2017: 10/10/2017 – 12/10/2017
- Autumn 2018: 19/03/2018 – 28/03/2018

Each monitoring point was surveyed once by Biosis during the following seasons and periods:

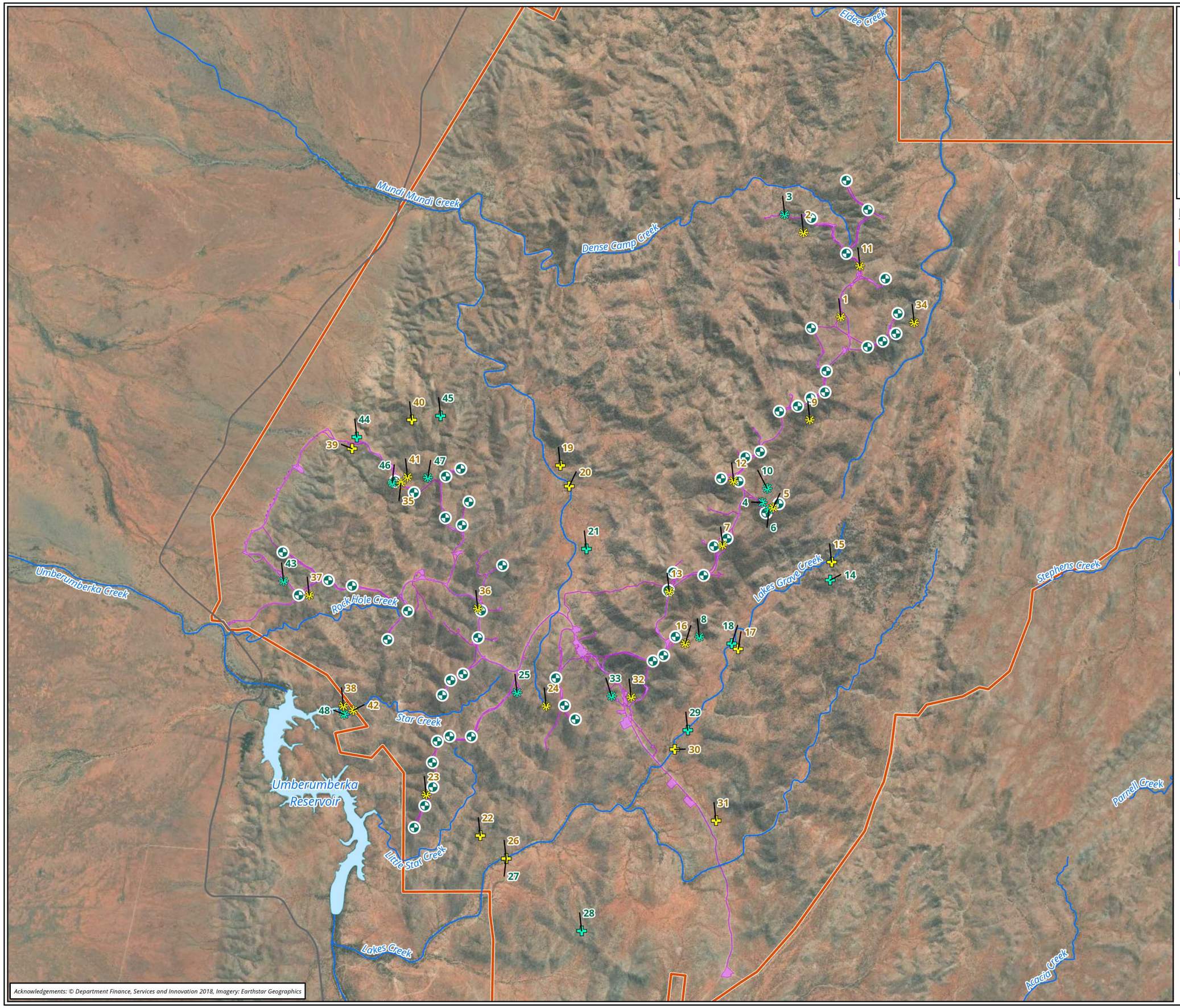
- Commissioning Phase
  - Spring 2018: 31/10/2018 – 07/11/2018

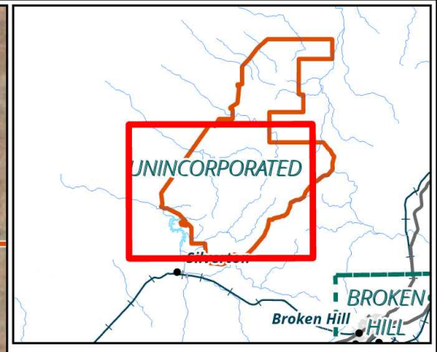
- Summer 2019: 08/02/2019 – 16/02/2020

- Operation – Phase 1
  - Autumn 2019: 03/05/2019 – 25/05/2020
  - Winter 2019: 14/08/2019 – 02/09/2019
  - Spring 2019: 02/10/2019 – 17/10/2019
  - Summer 2020: 07/02/2020 – 16/02/2020
- Operation – Phase 2
  - Autumn 2020: 16/04/2020 – 13/05/2020
- Full operation
  - Winter 2020: 28/07/2020 – 07/08/2020

2.2.4 Incidental records

Incidental observations of birds and raptors were also recorded during driving and walking around the site. Incidental observations for birds and raptors recorded within the Silverton Wind Farm site are provided in Appendix 2.





Legend

- Silverton Wind Farm boundary
- Wind farm infrastructure
- Turbine

Raptor Monitoring Points

- Control
- Impact

General bird Monitoring Points

- Control
- Impact

Figure 2 Location of general bird and raptor monitoring points

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Coordinate System: GDA 1994 MGA Zone 54

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2.3 Bat detector surveys

2.3.1 Locations

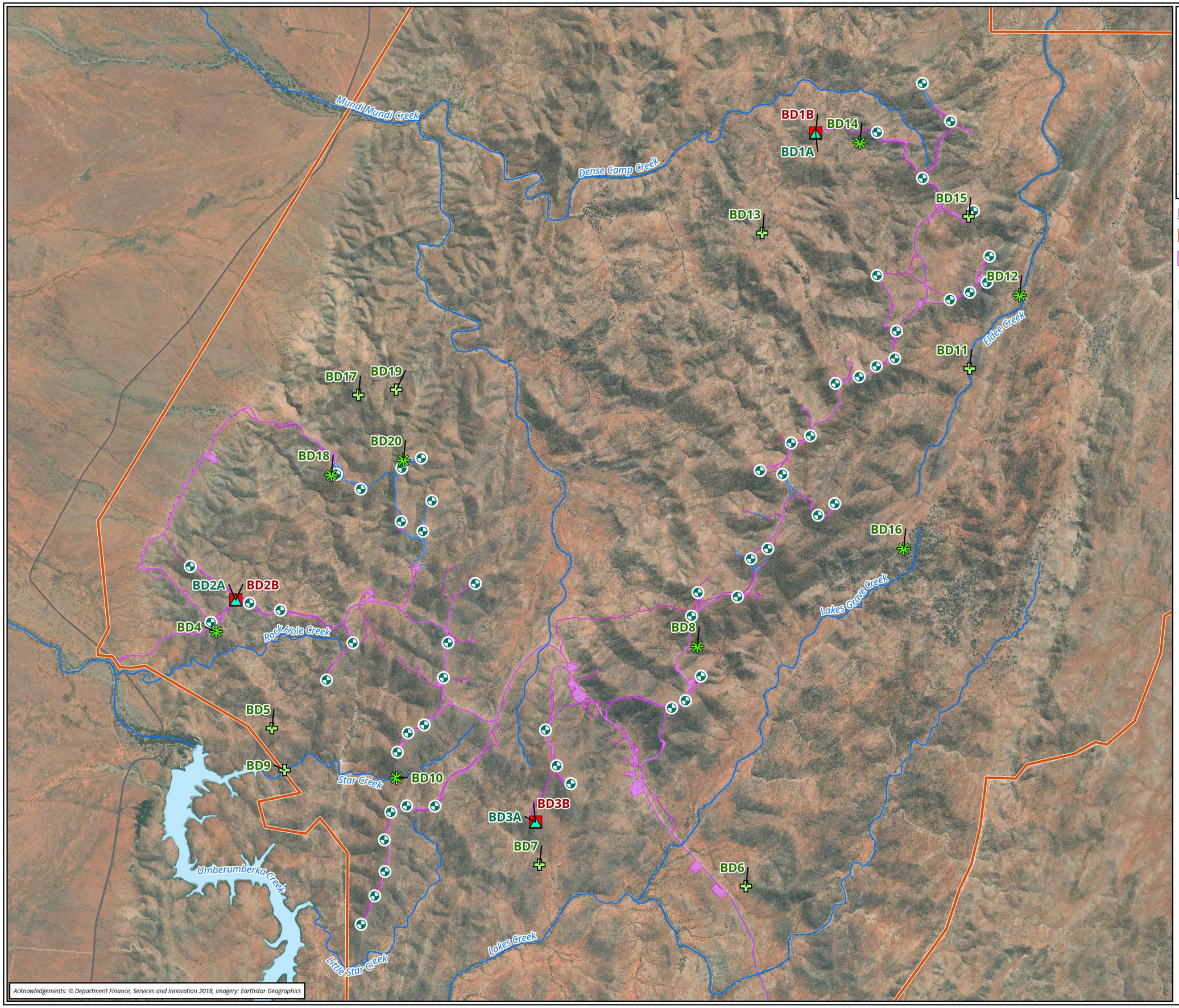
Microbats were surveyed during the commissioning and Year 1 operational periods using Anabat and Songmeter ultrasonic detectors. Detectors were deployed at the same 20 detector sites used during the spring 2017 and autumn 2018 baseline surveys. Survey effort was increased from four deployment locations during earlier baseline surveys undertaken in summer 2016 and autumn/winter 2017 at the request of the Biodiversity, Conservation and Science Directorate (BCS), formerly Office of Environment and Heritage (OEH).

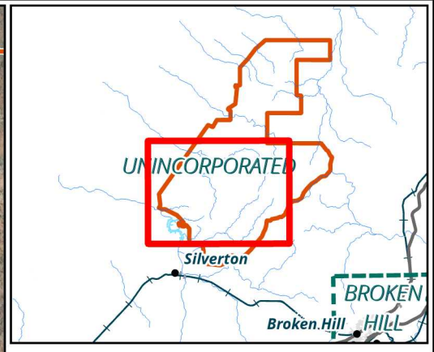
The locations of the 20 bat detector deployment sites are provided in Table 3 (below) and Figure 3.

Table 3 Bat detector deployment sites

Deployment Site	Deployment description	Habitat	Longitude	Latitude
BD1A	Top Mast	MDF	141.3042	-31.7337
BD1B	Bottom Mast	MDF	141.3042	-31.7337
BD2A	Top Mast	MDF	141.2166	-31.7943
BD2B	Bottom Mast	MDF	141.2166	-31.7943
BD3A	Top Mast	MDF	141.2621	-31.8229
BD3B	Bottom Mast	MDF	141.2621	-31.8229
BD4	Impact Ground	MDF	141.2136	-31.7984
BD5	Control Ground	MDF	141.2221	-31.8108
BD6	Control Ground	MDF	141.2940	-31.8311
BD7	Control Ground	MDF	141.2627	-31.8284
BD8	Impact Ground	MDF	141.2865	-31.8001
BD9	Control Ground	RRG	141.2241	-31.8162
BD10	Impact Ground	RRG	141.2411	-31.8172
BD11	Control Ground	RRG	141.3276	-31.7641
BD12	Impact Ground	RRG	141.3352	-31.7546
BD13	Control Ground	MRM	141.2962	-31.7467
BD14	Impact Ground	MRM	141.3109	-31.735
BD15	Control Ground	MRM	141.3274	-31.7444
BD16	Impact Ground	MRM	141.3177	-31.7874
BD17	Control Ground	PGSW	141.2351	-31.7677
BD18	Impact Ground	PGSW	141.2310	-31.7781
BD19	Control Ground	PGSW	141.2409	-31.767
BD20	Impact Ground	PGSW	141.2420	-31.7762

Note to table: MDF = Mulga Dead Finish (open) woodland, RRG = River Red Gum riparian woodland, MRM = Mallee Red Mulga woodland, PGSW = Porcupine Grass sparse woodland,





Legend

- Silverton wind farm boundary
- Wind farm infrastructure
- Turbine

Detector locations

- Bottom Mast
- Top Mast
- Control Ground
- Impact Ground

Figure 3 Bat detector deployment locations

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Kilometres

Scale: 1:50,000 @ A3

Coordinate System: GDA 1994 MGA Zone 54

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Silverton.aprx

2.3.2 Methods

A total of 23 ultrasonic detectors (Anabat or Songmeter units) were deployed at 20 pre-determined sites used to collect data during baseline surveys.

Seventeen ultrasonic detectors (Anabat or Songmeter units) were mounted at 17 deployment sites onto trees approximately 1 meter above the ground. At an additional three deployment sites, detectors were mounted at both the top and bottom of a met mast in order to account for variability in bat composition and activity levels occurring between the ground and RSH. At these sites, one detector was placed approximately 1 metre above the ground (either Anabat or Songmeter) and one detector (Songmeter) was placed 65 metres above the ground.

The configuration settings for the Anabat and Songmeter detectors are provided in Table 4 below.

Table 4 Bat detector configuration settings

Setting	Value
Sample rate	192000
Channels	Mono-L
File Format	ZC
Division Ratio	16
Location Prefix	MLWF
Start time	19:00
Stop time	7:00

2.3.3 Frequency and survey timing

NGH deployed detectors during the following seasons throughout the pre-construction period:

- Summer 2016: 12/12/2016 – 14/12/2016
- Winter 2017: 29/05/2017 – 02/06/2017
- Spring 2017: 22/10/2017 – 30/10/2017
- Autumn 2018: 19/03/2018 – 28/03/2018

All detectors deployed by Biosis to record bat calls were deployed for a minimum of four consecutive nights during the following seasons and periods:

- Commissioning Phase
  - Spring 2018: 30/10/2018 – 08/11/2018
  - Summer 2019: 11/01/2020 – 20/01/2020
  - Autumn 2019: 02/05/2019 – 11/05/2019 (note, full operations commenced during this survey period)
- Full operation
  - Winter 2019: 13/08/2019 – 24/08/2019
  - Spring 2019: 01/10/2019 – 10/10/2019
  - Summer 2020: 04/02/2020 – 14/02/2020

- Autumn 2020: 16/04/2020 – 25/04/2020
- Winter 2020: 28/07/2020 – 06/08/2020

2.4 Freckled Duck surveys

2.4.1 Locations

Counts and monitoring of the behaviour of Freckled Ducks were focused on the Umberumberka Reservoir and Stephens Creek Reservoir based on the species preference for permanent fresh waters such as creeks, lakes and reservoirs.

2.4.2 Methods

Counts and monitoring at focal wetlands were undertaken by two roaming observers (qualified Zoologists) for a period of one hour using spotting scopes and binoculars. Within this period the following information was recorded:

- Start time and date.
- Weather conditions.
- Total count of Freckled Ducks.
- Ground (water) and flight behaviour of Freckled Ducks.
- In-stream habitat, surrounding environment, notable landscape features and water levels.
- Incidental observations and documentation of behaviour was recorded where observed.

2.4.3 Frequency and survey timing

Counts for Freckled Ducks were carried out in the morning and afternoon during a variety of weather conditions, with the exception of conditions that would impede the ability of observers to undertake the surveys.

Roaming surveys were undertaken on the following dates:

- Operation – Phase 1
  - Winter 2019: 22/08/2019
  - Spring 2019: 9/10/2019
  - Summer 2020: 15/02/2020
- Operation – Phase 2
  - Autumn 2020: 23/04/2020

2.5 Wedge-tailed Eagle nest surveys

2.5.1 Locations

Surveys for Wedge-tailed Eagle nests were undertaken within the Silverton Wind Farm site and in suitable, accessible environments from within a surrounding 20 kilometer search area.

The study area and search effort for surveys can be reviewed in Figure 4.

2.5.2 Methods

Surveying raptor breeding activity based on nest characteristics during the later stages of breeding and after the fledgling season increases sampling capacity and minimising disturbances to nesting birds (Wiersma, J & Koch, A 2012). Roaming surveys to locate and map Wedge-tailed Eagle nests were conducted by two Zoologists using all accessible roads within and surrounding Silverton Wind Farm in suitable environs. Field methodologies to locate nests included:

- One Zoologist driving whilst the other scanned for nests using binoculars from the passenger seat.
- Walking along the ridge of one side of a valley and searching in trees on the opposite side with binoculars and a spotting scope.

Once a nest was detected, observations from a prominent vantage point were made using a spotting scope from approximately 100 metres away in order to minimise disturbance. An observer watched the nest for approximately an hour and recorded observations of any activity of the nest and from adult eagles observed nearby to gain information on habitat use and possible locations of other nests. Nest activity was characterised as:

- Active, if it was lined with fresh leaves, contained eggs, or was observed to be occupied by an adult incubating (Cherriman 2013).
- Abandoned, if it presented partial or total collapse (Cherriman 2013).
- Occupied, if it presented a flat top (Wiersma, J & Koch, A 2012), the best characteristic for predicting nest use outside of additional observations fresh chick, leaves, whitewash and prey remains.

All nests identified were again monitored in spring and summer using methods applied during the previous winter in order to avoid the risk of researcher-induced failure should a chick or fledgling be observed as present.

2.5.3 Frequency and survey timing

Surveys to locate Wedge-tailed Eagle nests were undertaken over five days in winter 2019, to determine whether pairs were present and at which nests breeding activity had commenced.

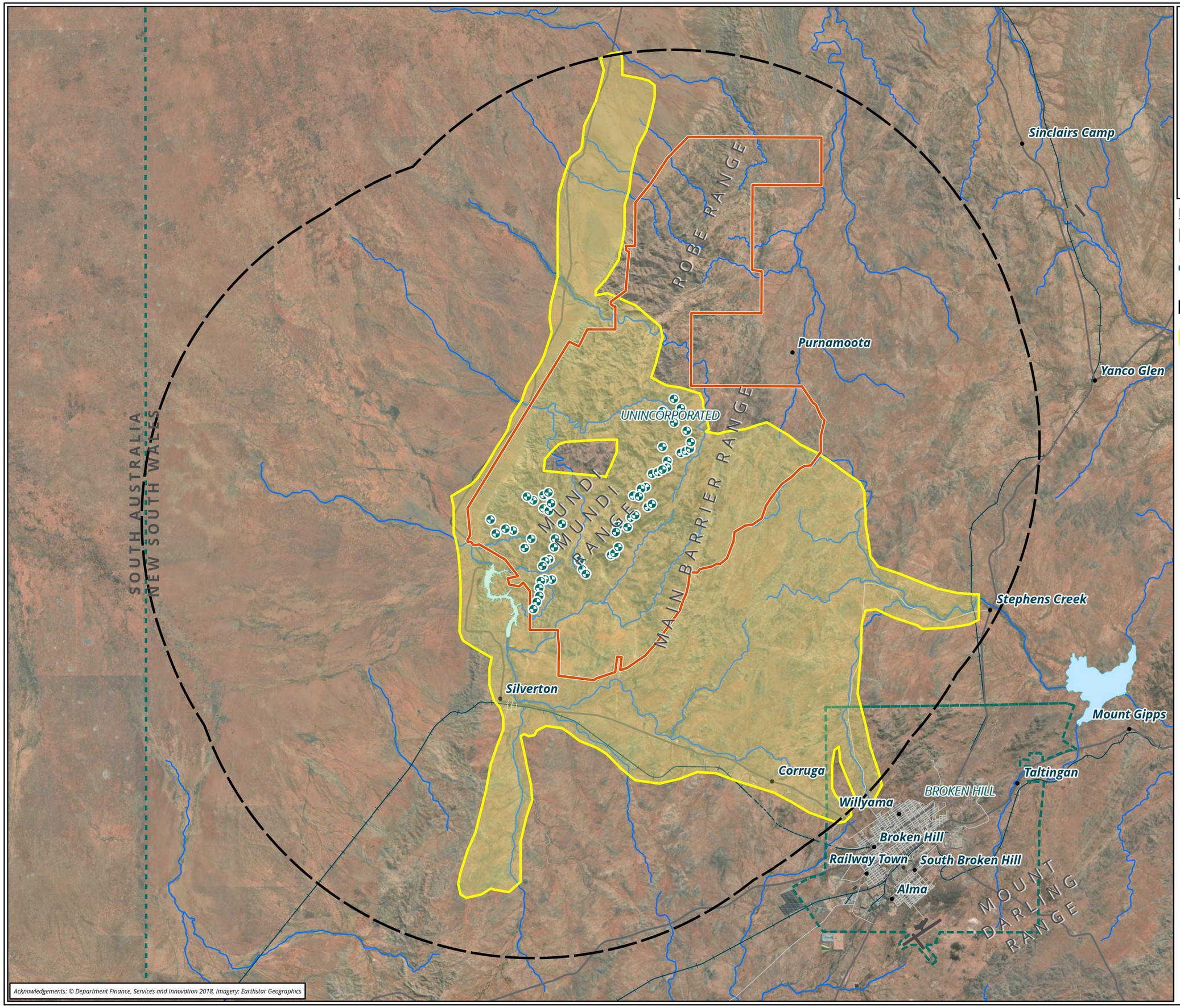
Surveys to locate nests were undertaken during the following period:

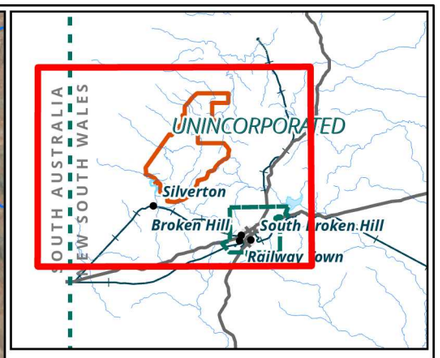
- Operation – Phase 1
  - Winter 2019: 14/08/2019 – 02/09/2019

All nests identified during winter 2019 were monitored over a period of three days in spring and summer 2019 in order to re-determine their activity.

Surveys to monitor nest activity were undertaken during the following period:

- Operation – Phase 1
  - Spring 2019: 02/10/2019 – 17/10/2019
  - Summer 2019: 09/12/2019 – 13/12/2019





Legend

- Silverton Wind Farm boundary
- NSW local government area boundary
- Nest search area (20km turbine buffer)
- Search effort
- Turbine

Figure 4 2019 Wedge-tailed Eagle search area and effort

0 2.5 5 7.5 10 Kilometres

N

Scale: 1:200,000 @ A3

Coordinate System: GDA 1994 MGA Zone 54

biosis

Matter: 33377,
Date: 30 November 2020,
Checked by: ERB, Drawn by: JPT, Last edited by: jturner
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2.6 Bird and bat collision monitoring

Searches to detect carcasses or featherspots were undertaken by ecologists with demonstrated capacity to identify bird and bat species of western NSW during the months of May-June 2018, September-November 2018, Jan-March 2019 and May-October 2019. A featherspot is any collection of five or more feathers found grouped together in a manner that suggests a bird has died at the location.

For the human searches, pulse searches were undertaken at 14 turbines over the course of one day, followed by a day's break. On the third day, pulse searches were undertaken again at the same nominated turbines. Of the 14 turbines nominated for survey, eight were chosen at random and six always included turbines outlined by BCS to have a higher risk for collision (T04, T10, T11, T22, T33 and T45). Pulse searches undertaken at nominated turbines were undertaken by two observers walking ten 100 m transects either side of the turbine, spaced six metres apart, or as near to six metres as is practical. Each observer carried a hand-held GPS unit and recorded the transects they walked. GIS maps showing transects walked can be made available to BCS on request.

Results were then collated with those obtained from Skylos Ecology who conducted pulsed dog searches of all turbines through the priority six month period of November 2019 - April 2020. As indicated in correspondence to DPIE on 4 November 2020, Skylos then randomly selected 29 turbines for ongoing surveying. They divided them up evenly across both sides of the wind farm (east and west) so they cover the whole wind farm in both months. They have been diligent in their efforts to ensure they stratified their search effort spatially, and included brief spot checks of additional turbines as they passed them during their surveys from the vehicle. This is above and beyond the required search effort. All priority turbines have been surveyed through May-September except T45. They will continue to do this as a good measure until the end of the monitoring period unless advised otherwise. Methodologies and results for dog searches will be highlighted in a separate report prepared and submitted to DPIE by Skylos Ecology.

During all searches, all species of birds and bats detected as carcasses or as bird featherspots, were recorded on a data pro forma designed for the purpose (see BBAMP; Appendix 4 and 5) (Biosis 2018). All information, including metadata for each turbine search were also recorded irrespective of whether a carcass was found during a given search. All data was entered into a single (backed-up) database maintained by the wind farm operator on return from the field.

Carcasses found were photographed in situ, with the location logged using a portable GPS device. Carcasses of all taxa, whether species of concern or not, were collected, labelled with relevant data details and placed into a freezer onsite fit for this purpose to permit any necessary investigations of cause of death and/or for use in future searcher efficiency or persistence trials. At the conclusion of the overall investigation, all specimens will be made available to the Australian Museum unless utilised in carcass persistence trials.

2.7 Data analysis

2.7.1 Significant bird and bat species

Assessments of turbine collision risk for birds and bats within the BBAMP relate to the probability that particular species may collide with turbines. Species identified to be of concern are those most at risk of turbine collision, and significant species such as those listed as:

- Threatened or migratory under provisions of the federal *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) .
- Threatened in schedules of the NSW *Biodiversity Conservation Act* 2016 (BC Act).

- Non-threatened species of 'at-risk' birds and bats that were not previously known or predicted for the site and / or have not been the subject of a risk assessment.

For the purpose of this report, these are collectively termed 'species of concern' (Table 5, replicated from the BBAMP).

Table 5 Species of concern for turbine collision risk for birds & bats at Silverton Wind Farm

Species		Conservation status*	Collision risk (Biosis 2018)
Birds			
Freckled Duck	*Stictonetta naevosa*	Vulnerable BCA	Moderate
Black Kite	*Milvus migrans*		High
Square-tailed Kite	*Lophoictinia isura*		Moderate
Black-breasted Buzzard	*Hamirostra melanosternon*	Vulnerable BCA	High
Collared Sparrowhawk	*Accipiter cirrocephalus*		Low
Little Eagle	*Hieraaetus morphnoides*	Vulnerable BCA	High
Wedge-tailed Eagle	*Aquila audax*		High
Spotted Harrier	*Circus assimilis*	Vulnerable BCA	High
Brown Falcon	*Falco berigora*		High
Nankeen Kestrel	*Falco cenchroides*		Moderate
Grey Falcon	*Falco hypoleucos*	Endangered BCA	Moderate
Pink Cockatoo	*Lophocroa leadbeateri*	Vulnerable BCA	Moderate
White-throated Needletail	*Hirundapus caudacutus*	Migratory EPBC	Moderate
Rufous Fieldwren	*Calamanthus campestris*	Vulnerable BCA	Low
Redthroat	*Pyrrholaemus brunneus*	Vulnerable BCA	Low
Pied Honeyeater	*Certhionyx variegatus*	Vulnerable BCA	Moderate
Painted Honeyeater	*Grantiella picta*	Vulnerable EPBC & BCA	Moderate
White-fronted Chat	*Epthianura albifrons*	Vulnerable BCA	Low
Hooded Robin (SE form)	*Melanodryas cucullata*	Vulnerable BCA	Low
Varied Sittella	*Daphoenositta chrysoptera*	Vulnerable BCA	Low
Dusky Woodswallow	*Artamus cyanopterus*	Vulnerable BCA	Low
Diamond Firetail	*Stagonopleura guttata*	Vulnerable BCA	Moderate
Bats			
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	Vulnerable BCA	High
Gould's Wattled Bat	*Chalinolobus gouldii*		Moderate
Little Pied Bat	*Chalinolobus picatus*	Vulnerable BCA	Moderate
Corben's Long-eared Bat	*Nyctophilus corbeni*	Vulnerable EPBC & BCA	Low
Inland Forest Bat	*Vespadelus baverstocki*	Vulnerable BCA	High
Bristle-faced Freetail Bat	*Mormopterus eleryi*	Endangered BCA	Low
White-striped Freetail Bat	*Tadarida australis*		High

*EPBC - Environment Protection & Biodiversity Conservation Act 1999;

BCA – NSW *Biodiversity Conservation Act 2016*

Data collected for threatened and migratory species between spring 2018 and winter 2020 surveys has been re-assessed with respect to the risk matrix outlined within the Silverton Wind Farm BBAMP (Biosis 2018). The risk assessment, developed by NGH Environmental (2016, 2018b), is qualitative (i.e. it is not quantitative in the manner of mathematical collision-risk modelling) and is therefore only indicative about potential risk for particular taxa.

The NGH Environmental (2016, 2018b) risk matrix utilised during the assessment is provided in Table 6 below.

Table 6 Risk matrix from NGH Environmental (2016)

Risk Matrix	Consequence			
Likelihood	**Insignificant**	**Minor**	**Moderate**	**Significant**
Rare	Low	Low	Moderate	High
Unlikely	Low	Low	Moderate	High
Possible	Low	Moderate	High	High
Probable	Moderate	High	High	High

Descriptions of likelihood and consequence factors for significant birds and bats, as used by NGH (2016), within the NGH risk matrix are set out in Table 7.

Table 7 Likelihood and consequence descriptors used in the NGH risk matrix

Likelihood	Description	Consequence	Description
Rare	An impact may occur only in unusual circumstances	**Insignificant**	Impact on species not detectable in the short term
Unlikely	An impact might occur at some time	**Minor**	Impact may cause non-significant changes to local abundance of some species
Possible	An impact could occur during most circumstances	**Moderate**	Impacts may cause significant changes to local abundance of species
Probable	An impact is expected to occur in most circumstances	**Significant**	Impacts may be significant at a population scale

2.7.2 Estimating Wedge-tailed Eagle reproductive and dispersal capacity

Objectives of the annual report are to develop an understanding of the local population of Wedge-tailed Eagles by estimating the local population's likely reproductive and dispersal capacity, and identifying impacts of successful breeding caused by the wind farm.

Breeders are the individuals that contribute to future generations (Olsen 2005). The method has attempted to estimate the mean area associated with each breeding territory (or breeding pair) for the 2019 breeding season by calculating the density of active nests detected within the Silverton Wind Farm site using nearest-neighbour methods (Sharp, A, Norton, M, & Marks, A 2016; Cherriman 2013). This method assumes the territory shape to be circular, and calculates the area of a circle with a radius equal to half the average distance between active nests.

To calculate the distance of active nests to other active nests, the ArcGIS Average Nearest Neighbour tool was used. This tool works by measuring the distance between each feature centroid and its nearest neighbour's centroid location.

The reproductive success of Wedge-tailed Eagles is variable and can be measured in different ways (Olsen 2005). Failure can occur at any stage, but is generally considered where pairs fail to lay or chicks are lost as soon as after hatching (Olsen 2005). For the purposes of estimating reproductive success and dispersal capacity for the 2019 breeding season, consideration was given to the number of nests that were found to be lined with fresh leaves and those in which eggs were laid to measure the success of young that fledged (Cherriman 2013).

2.7.3 Bat call identification and analysis

Bat calls were analysed using a mix of the automated identification software AnaScheme, developed by Matthew Gibson and widely used in the automated analysis of microbat vocalisations within Australia, and manual checking of calls. Anascheme allows for development of identification keys based on analysis of reference calls. Keys used to analyse bat calls for this project include the NW Victorian Mallee bat key in AnaScheme.

The AnaScheme system applies a conservative approach to identifying calls in that only clear, high quality calls are assigned to a species. The system also counts recordings that match the criteria to be considered true bat calls, but may be of insufficient quality to identify to species level. This allows a measure of overall bat activity to be calculated.

Any calls identified by the system as significant or uncommon species were checked manually against the Far West NSW reference calls, by visual comparison of sonograms with published reference calls by an experienced bat expert, to ensure accurate results.

In order to compare bat activity across the site some species were grouped into the species complexes used during the pre-construction surveys.

2.7.4 Suitability of statistical data analysis

Investigations of the presence and locations of bird species at Silverton Wind Farm site have been established as a Before-After-Control-Impact (BACI) design. Bird abundance data collected at control monitoring points during the testing and operation phase of the Silverton Wind Farm (Autumn 2019 – winter 2020) was compared to abundance data collected at control monitoring points during the pre-construction phase (Winter 2017 – Autumn 2018) in order to test:

- The suitability of the control sites selected for statistical comparison against impact sites.
- The assumption that observed changes in bird abundance are more likely to be associated with variability in environmental conditions rather than an effect of environmental disturbance related to the various testing phases or operation of Silverton Wind Farm.

Data collected during the months of summer during the testing phase was not used in statistical analysis as no summer data was collected during the pre-construction period for it to be compared to. Data collected during autumn in 2019 and 2020 and winter 2019 and 2020 during the testing and operation phases were also averaged for each monitoring point within a season in order to compare to single round of seasonal data collected during winter 2017 and autumn 2018 during the pre-construction period.

Normality

In statistics, normality tests are used to determine if a data set is well-modelled by a normal distribution and to guide whether the data should be assessed under a parametric test or non-parametric equivalent.

Prior to statistical analysis, the differences in bird abundance during surveys at raptor and bird control monitoring points were assessed for a normal distribution using the Shapiro-Wilk normality test. Results of this test were used to determine whether bird abundance data collected at Silverton Wind Farm should be assessed under a parametric *t*-test or the equivalent Wilcoxon signed-rank test, which does not assume normality in the data to be analysed.

2.8 Assumptions and limitations

Assumptions and limitations relating to the above mentioned investigations include:

- Mapping was conducted using hand-held GPS units. The accuracy of this mapping is therefore subject to the accuracy of the GPS units (generally +/- 5 metres) and dependent on the limitations of aerial photo rectification.
- Observations of Freckled Duck were limited to diurnal surveys. Biosis acknowledge the potential for long range movements to occur nocturnally and that any such nocturnal movements through the wind farm would not have been observed.
- Estimates from investigations should not be viewed as estimates of the local breeding capacity or population density of Wedge-tailed Eagles, because:
  - The large tracts of land adjacent to the Silverton Wind Farm site within the 20 kilometre search area occur on private land. Access within these areas was significantly restricted due to landholder concerns of livestock disturbance during the drought conditions and coinciding lambing season.
  - Of the potential for some nests to be overlooked during ground-based searches due to the undulating terrain and the species preference for selecting nesting trees within these environments.
  - Nests identified are not necessarily in the centre of territories, thus Average Nearest Neighbour analysis is not intended to represent an accurate reflection of breeding territory size (Olsen 2005).
- The pre-construction bat acoustic surveys for spring and winter did not include all 20 sites, limiting the ability to compare the data collected during the commissioning and operational phases. As reported to BCS on 30 March 2020, data was also not collected for the meteorological mast paired sites during summer 2019/2020, due to the ropes of all pulley systems at the masts breaking and repairs unable to be undertaken in time.
- Ecological monitoring programs may be confounded by varying responses of populations to impacts or environmental conditions in differing ways. Therefore, monitoring and interpretation of data with a 'one size fits all' approach (i.e. bird abundance and density) must be treated with caution. As such, a number of parameters including both qualitative and quantitative metrics are recorded to establish multiple lines of evidence to inform the interpretation of results. Biosis is committed to the continual review of monitoring programs to provide options for improvement.

3. Results

3.1 Normality data analysis

The differences in bird abundance during surveys at raptor and general bird control monitoring points were assessed for a normal distribution using the Shapiro-Wilk normality test. Results for the test are provided in Table 8 below. Results of the Shapiro-Wilk normality test highlight that the differences in bird abundance recorded in autumn, winter and spring during the pre-construction period and subsequent testing / operation monitoring period do not follow a normal distribution (Table 8; $p < 0.05$). As the Wilcoxon signed-rank test does not assume normality in the data to be analysed, it was selected as the alternative to the parametric *t*-test to determine if significant differences in bird abundance are more likely to be associated with variability in environmental conditions rather than an effect of environmental disturbance related to the testing and operational phase of Silverton Wind Farm.

Table 8 Normality test results.

Normality Test Results			
Test parameter	Shapiro-Wilk		
	Statistic	df	Sig.
Difference	0.945	51	0.02

Note that 'difference' stands for the difference in seasonal bird abundance data calculated between paired control sites monitored during pre-construction and testing/operation periods.

3.2 Bird and raptor utilisation

3.2.1 Species richness, density and assemblage

A total of 70 bird species have been observed at Silverton Wind Farm incidentally or during point surveys, during the commissioning, testing and through the first year of full operations of Silverton Wind Farm between spring 2018 and winter 2020. A list of all 107 bird species were recorded at Silverton Wind Farm between summer 2016 and winter 2020, including the number of times they have been observed, is provided in Appendix 2.

The diversity of species (richness) recorded at monitoring sites in Bluebush shrubland, Porcupine Grass sparse woodland, River Red Gum riparian woodland and Mulga Dead Finish (open) woodland during point count surveys over the duration of the monitoring program (excluding summer 2016) are presented in Table 9 below. Relative to the abundance of all species, the Galah (*n*=374), Tree Martin (*n*=191), Wedge-tailed Eagle (*n*=100), Australian Raven (*n*=133) and Chestnut-rumped Thornbill (*n*=79) were the bird species most frequently observed between during surveys between spring 2018 and winter 2020 (Appendix 2).

The total number of birds (abundance) recorded at monitoring sites within Porcupine Grass sparse woodland, River Red Gum riparian woodland, Mulga Dead Finish (open) woodland and Bluebush shrubland are presented in Figure 5 through to Figure 8.

Table 9 Total observations of species in vegetation communities over the duration of the monitoring program (excluding summer 2016)

Scientific name	Common name	BB (sites: n=2)	PGSW (sites: n=8)	RR (sites: n=9)	MDF (sites: n=28)	Total
Dromaius novaehollandiae	Emu	-	-	1	2	**3**
Phaps chalcoptera	Common Bronzewing	-	1	-	2	**3**
Ocyphaps lophotes	Crested Pigeon	4	-	9	5	**18**
Tadorna tadornoides	Australian Shelduck	-	-	-	2	**2**
Aquila audax	Wedge-tailed Eagle	4	76	15	102	**197**
Haliastur sphenurus	Whistling Kite	-	-	-	3	**3**
Milvus migrans	Black Kite	-	-	2	-	**2**
Falco longipennis	Australian Hobby	-	1	-	1	**2**
Falco peregrinus	Peregrine Falcon	-	-	-	1	**1**
Falco berigora	Brown Falcon	1	-	1	1	**3**
Falco cenchroides	Nankeen Kestrel	1	1	11	27	**40**
Cacatua sanguinea	Little Corella	11	6	19	7	**43**
Eolophus roseicapilla	Galah	23	29	345	176	**573**
Psephotus haematonotus	Red-rumped Parrot	6	-	-	2	**8**
Psephotellus varius	Mulga Parrot	8	-	25	16	**49**
Northiella haematogaster	Blue Bonnet	-	3	-	-	**3**
Neophema chrysostoma	Blue-winged Parrot	-	-	1	-	**1**
Podargus strigoides	Tawny Frogmouth	-	-	1	-	**1**
Merops ornatus	Rainbow Bee-eater	-	-	7	2	**9**
Hirundapus caudacutus	White-throated Needletail	-	-	-	3	**3**
Apus pacificus	Fork-tailed Swift	-	-	16	5	**21**
Chrysococcyx osculans	Black-eared Cuckoo	-	-	1	1	**2**

Scientific name	Common name	BB (sites: n=2)	PGSW (sites: n=8)	RR (sites: n=9)	MDF (sites: n=28)	Total
***Pigeon* sp.**	Pigeon sp.	-	-	-	5	**5**
Barnardius zonarius barnardi	Mallee Ringneck	-	2	38	23	**63**
Hirundo neoxena	Welcome Swallow	-	-	-	6	**6**
***Martin* sp.**	Martin sp.	-	-	-	4	**4**
Petrochelidon nigricans	Tree Martin	-	3	184	61	**248**
Petrochelidon ariel	Fairy Martin	-	-	10	23	**33**
Rhipidura albiscapa	Grey Fantail	-	-	-	2	**2**
Rhipidura leucophrys	Willie Wagtail	8	1	23	31	**63**
***Robin* sp.**	Robin sp.	-	-	1	2	**3**
Petroica goodenovii	Red-capped Robin	1	9	19	42	**71**
Melanodryas cucullata	Hooded Robin	3	-	4	3	**10**
Pachycephala rufiventris	Rufous Whistler	-	-	2	1	**3**
Colluricincla harmonica	Grey Shrike-thrush	-	-	1	-	**1**
Coracina maxima	Ground Cuckoo-shrike	-	-	-	1	**1**
Coracina novaehollandiae	Black-faced Cuckoo-shrike	-	3	4	3	**10**
Lalage tricolor	White-winged Triller	-	-	-	1	**1**
***Babbler* sp.**	Babbler sp.	-	-	-	1	**1**
Pomatostomus superciliosus	White-browed Babbler	-	5	22	28	**55**
Pomatostomus ruficeps	Chestnut-crowned Babbler	9	-	14	19	**42**
Gerygone fusca	Western Gerygone	-	-	3	-	**3**
Smicrornis brevirostris	Weebill	1	7	3	5	**16**
Aphelocephala leucopsis	Southern Whiteface	7	7	14	76	**104**
***Acanthiza* spp.**	Thornbills	-	-	-	6	**6**

Scientific name	Common name	BB (sites: n=2)	PGSW (sites: n=8)	RR (sites: n=9)	MDF (sites: n=28)	Total
Acanthiza lineata	Striated Thornbill	-	1	-	-	**1**
Acanthiza nana	Yellow Thornbill	1	1	-	2	**4**
Acanthiza pusilla	Brown Thornbill	-	9	2	2	**13**
Acanthiza apicalis	Inland Thornbill	-	2	-	10	**12**
Acanthiza uropygialis	Chestnut-rumped Thornbill	5	21	23	65	**114**
Acanthiza reguloides	Buff-rumped Thornbill	-	4	-	-	**4**
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	1	2	13	37	**53**
Pyrrholaemus brunneus	Redthroat	2	-	-	-	**2**
Malurus cyaneus	Superb Fairy-wren	-	-	-	3	**3**
Malurus splendens	Splendid Fairy-wren	-	1	4	-	**5**
Malurus leucopterus	White-winged Fairy-wren	8	-	2	6	**16**
Malurus lamberti	Variegated Fairy-wren	6	2	44	27	**79**
Artamus leucorynchus	White-breasted Woodswallow	-	3	3	-	**6**
Artamus personatus	Masked Woodswallow	-	-	-	4	**4**
Artamus superciliosus	White-browed Woodswallow	-	-	-	5	**5**
Artamus cinereus	Black-faced Woodswallow	-	-	1	22	**23**
Artamus cyanopterus	Dusky Woodswallow	-	9	-	-	**9**
Dicaeum hirundinaceum	Mistletoebird	-	-	4	1	**5**
Plectorhyncha lanceolata	Striped Honeyeater	1	-	8	5	**14**
***Honeyeater* sp.**	Honeyeater sp.	-	-	1	1	**2**
Gavicalis virescens	Singing Honeyeater	13	6	31	53	**103**
Ptilotula penicillata	White-plumed Honeyeater	-	-	-	2	**2**

Scientific name	Common name	BB (sites: n=2)	PGSW (sites: n=8)	RR (sites: n=9)	MDF (sites: n=28)	Total
Manorina melanocephala	Noisy Miner	-	1	1	-	**2**
Manorina flavigula	Yellow-throated Miner	-	12	40	12	**64**
Anthochaera carunculata	Red Wattlebird	-	-	2	-	**2**
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	9	1	19	23	**52**
Anthus australis	Australian Pipit	-	-	1	2	**3**
Taeniopygia guttata	Zebra Finch	2	-	6	43	**51**
Struthidea cinerea	Apostlebird	11	20	48	14	**93**
Corvus bennetti	Little Crow	-	6	3	1	**10**
Cracticus nigrogularis	Pied Butcherbird	-	-	2	1	**3**
Cracticus torquatus	Grey Butcherbird	1	4	16	24	**45**
Gymnorhina tibicen	Australian Magpie	6	5	20	32	**63**
Psophodes cristatus	Chirruping Wedgebill	15	3	9	7	**34**
Corvus coronoides	Australian Raven	4	10	49	44	**107**
Corvus mellori	Little Raven	-	2	5	2	**9**
Pardalotus striatus	Striated Pardalote	-	1	13	7	**21**
Passer domesticus	House Sparrow	-	-	1	-	**1**
Corvus orru	Torresian Crow	-	-	-	1	**1**
***Corvus* spp.**	Ravens and Crows	-	2	4	2	**8**

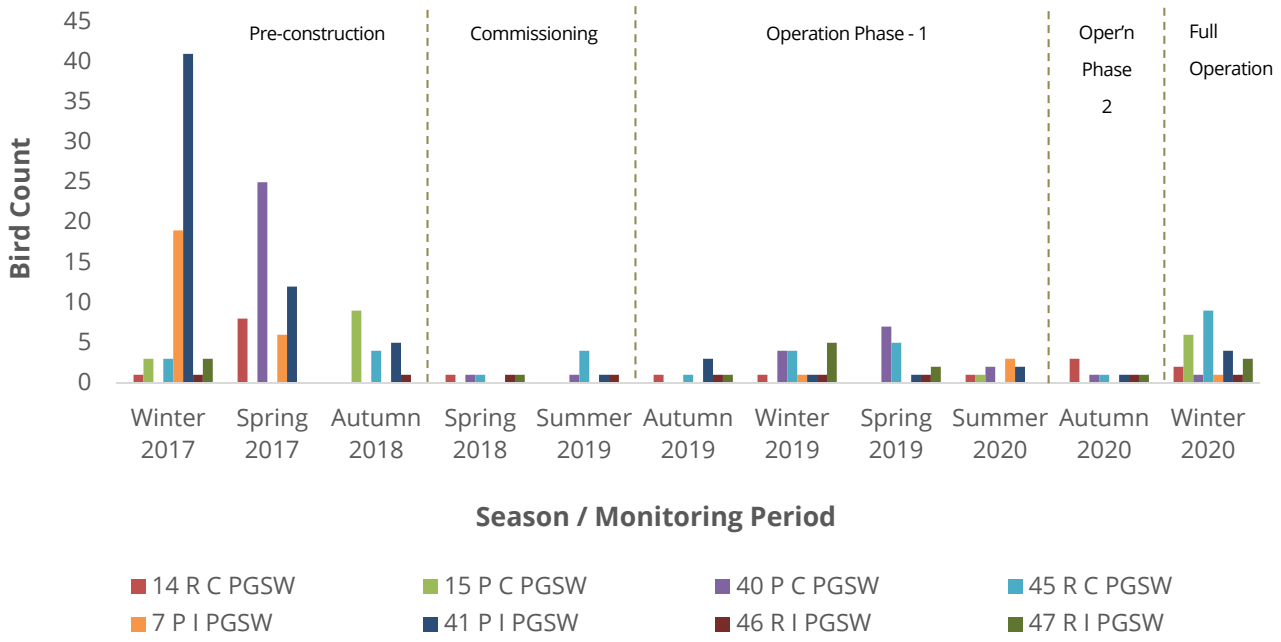


Figure 5 **Total number of birds observed at monitoring points within PGSW over the duration of the monitoring program (excluding summer 2016). Dashed lines represent the collation of seasonal data into defined monitoring periods (Section 2.1) and abbreviations (R, P, C and I), as those previously described in 2.2.1 of this report.**

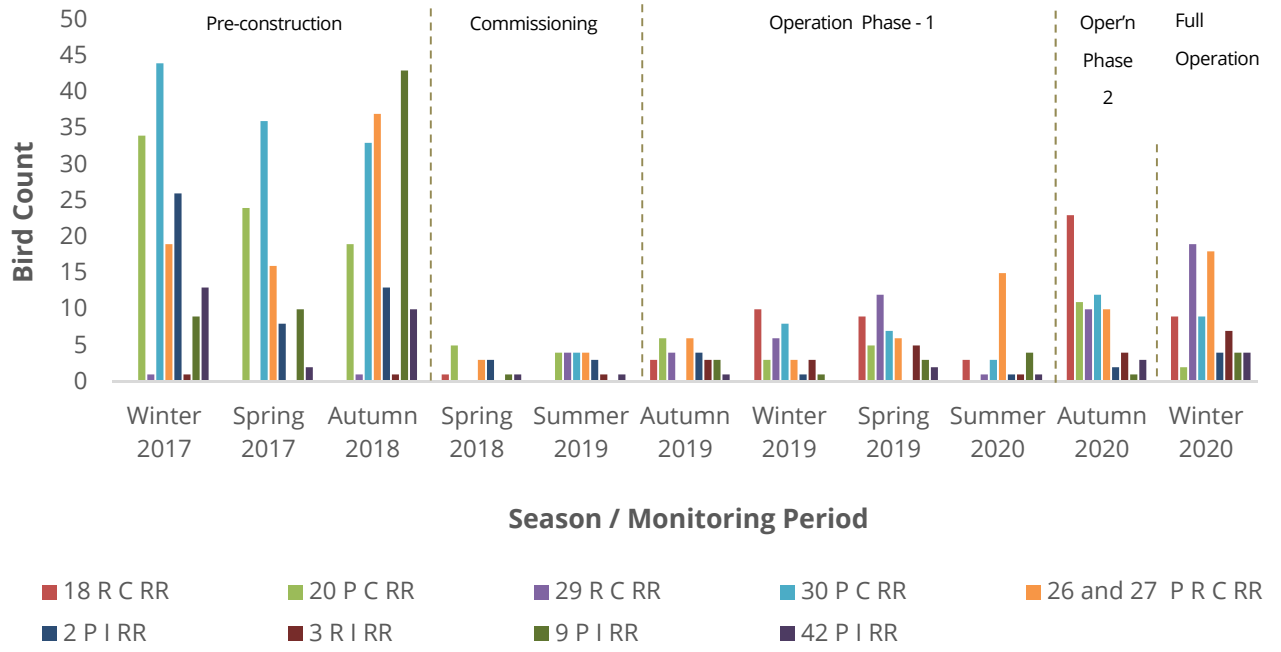


Figure 6 **Total number of birds observed at monitoring points within RR over the duration of the monitoring program (excluding summer 2016). Dashed lines represent the collation of seasonal data into defined monitoring periods (Section 2.1) and abbreviations (R, P, C and I), as those previously described in 2.2.1 of this report.**

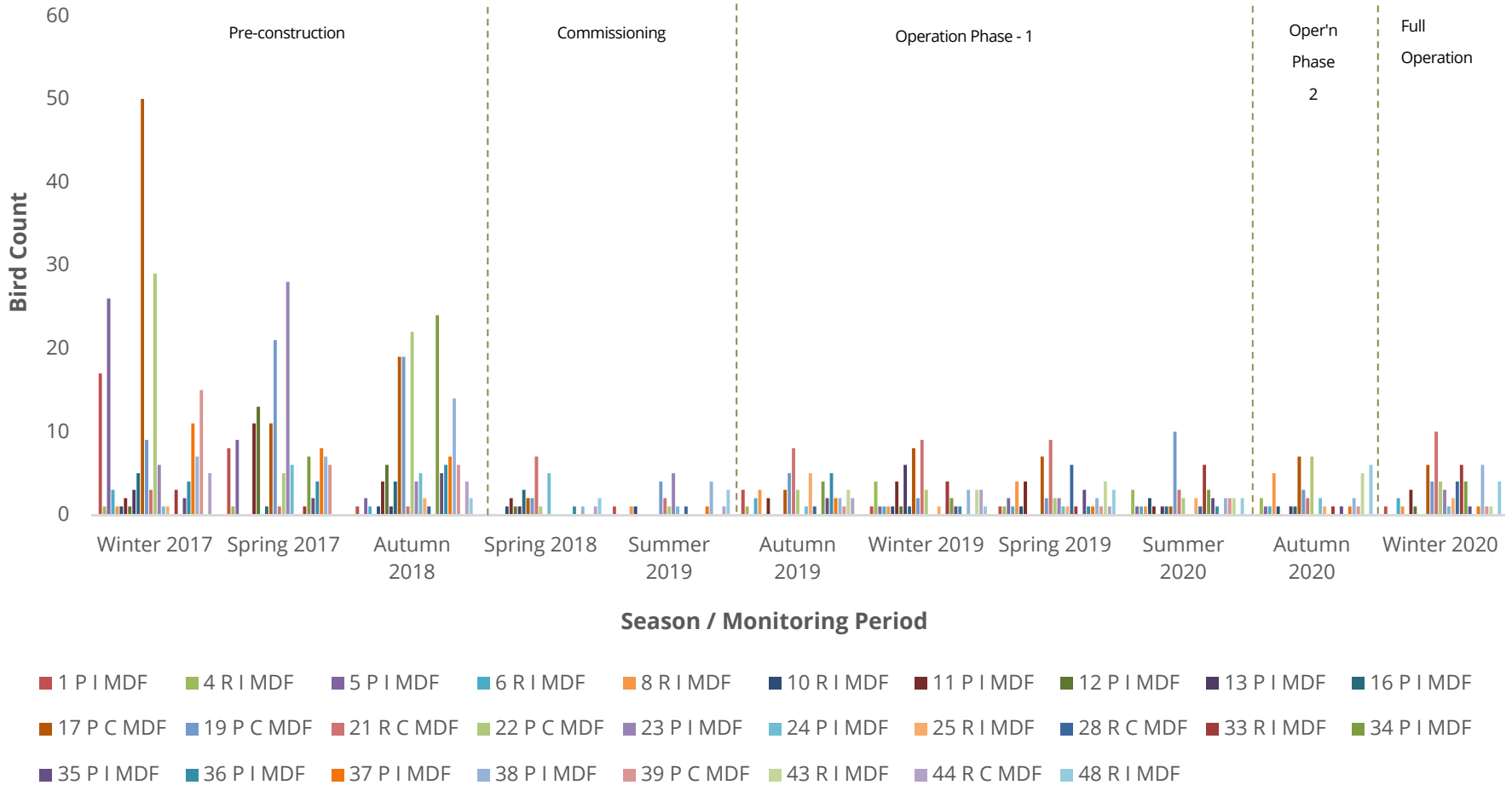


Figure 7 **Total number of birds observed at monitoring points within MDF over the duration of the monitoring program (excluding summer 2016). Dashed lines represent the collation of seasonal data into defined monitoring periods (Section 2.1) and abbreviations (R, P, C and I), as those previously described in 2.2.1 of this report.**

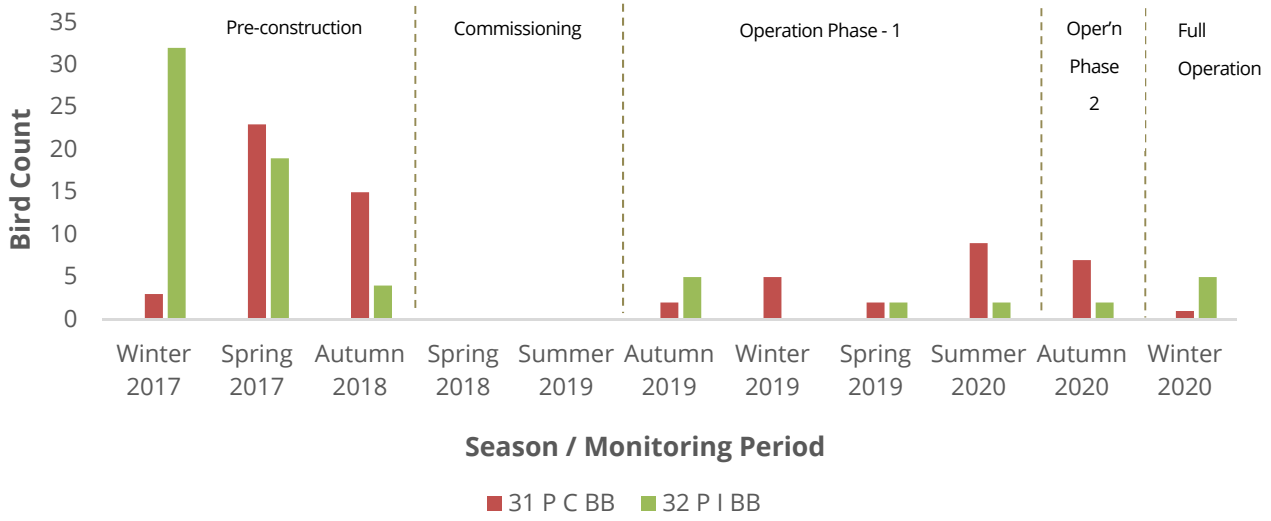


Figure 8 **Total number of birds observed at monitoring points within BB over the duration of the monitoring program (excluding summer 2016). Dashed lines represent the collation of seasonal data into defined monitoring periods (Section 2.1) and abbreviations (P, C and I), as those previously described in 2.2.1 of this report.**

Consistent with data collected during the pre-construction phase, species richness and abundance recorded during point count surveys between spring 2018 and winter 2020 was typically highest in River Red Gum riparian woodland and Bluebush shrubland (Figure 9 –Figure 10).

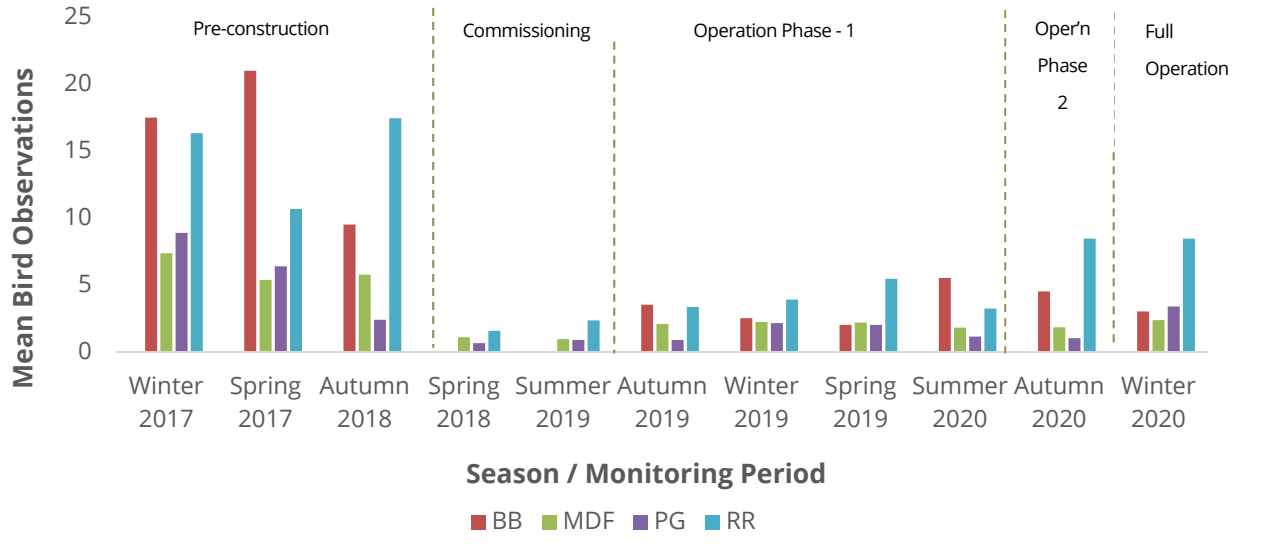


Figure 9 **Mean bird abundance recorded at monitoring sites within different vegetation communities over the duration of the monitoring program (excluding summer 2016). Total number of records per season averaged by number of monitoring points to take into consideration variance in the number of monitoring points per vegetation community. Dashed lines represent the collation of seasonal data into defined monitoring periods, as those previously described in 2.1 of this report.**

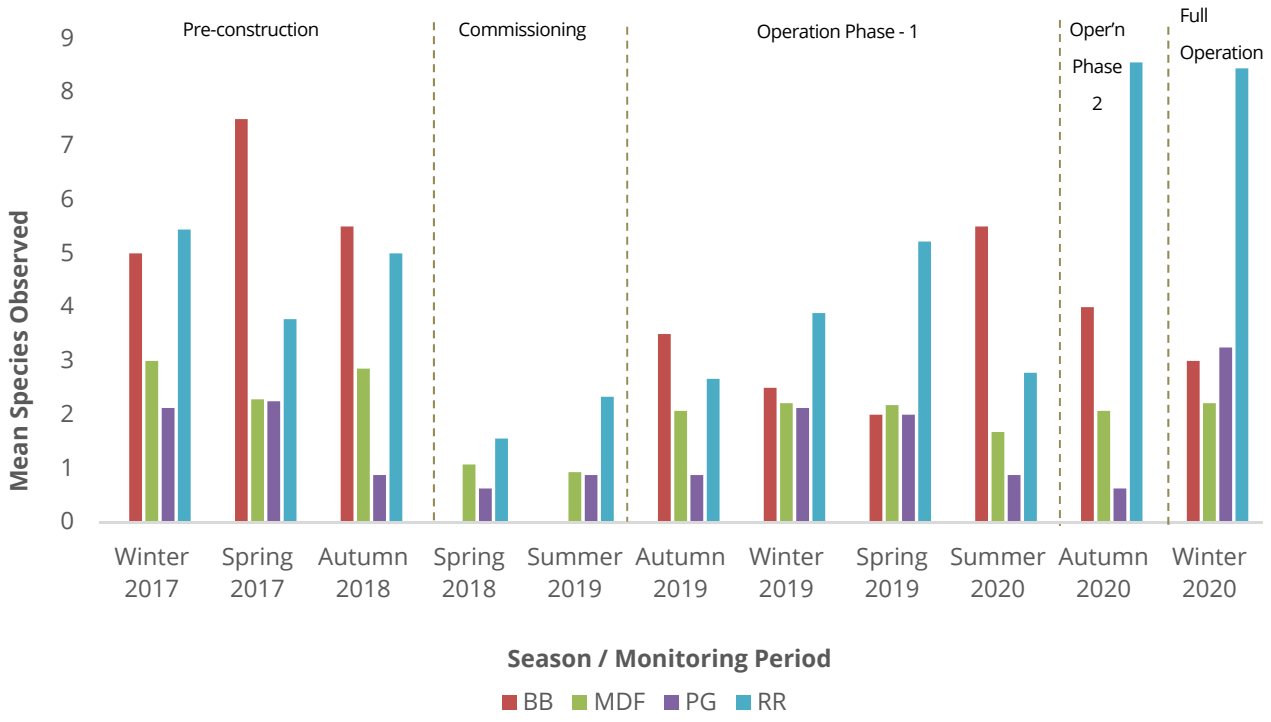


Figure 10 Mean species richness recorded at monitoring sites within different vegetation communities over the duration of the monitoring program (excluding summer 2016). Total number of records per season averaged by number of monitoring points to take into consideration variance in the number of monitoring points per vegetation community. Dashed lines represent the collation of seasonal data into defined monitoring periods, as those previously described in 2.1 of this report.

Across each vegetation community, the total abundance and species richness of birds recorded during seasonal survey was significantly lower in spring 2018 during the commissioning of Silverton Wind Farm when compared to monitoring undertaken during the pre-construction phase (Figure 9 – Figure 10).

During spring 2018, only 14 genus / species were recorded over a total of 48 point count surveys. Typical species that were previously recorded during the pre-construction phase that were not observed during spring 2018 include parrots, wrens and babblers (Table 9), with no birds observed within Bluebush shrubland in either spring 2018 or summer 2019 (Table 9; Figure 8).

A list of species / genus recorded during spring 2018 across all 48 point count surveys is provided in Table 10 below.

Table 10 Bird species observed during spring 2018 surveys

Species name	Common name	Count no.
Pigeon sp.	Pigeon Sp.	2
Aquila audax	Wedge-tailed Eagle	6
Falco berigora	Brown Falcon	1
Falco cenchroides	Nankeen Kestrel	5
Eolophus roseicapilla	Galah	5
Robin sp.	Robin sp.	2
Petrochelidon nigricans	Tree Martin	3

Species name	Common name	Count no.
Petrochelidon ariel	Fairy Martin	1
Coracina novaehollandiae	Black-faced Cuckoo-shrike	1
Lalage tricolor	White-winged Triller	1
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	1
Cracticus torquatus	Grey Butcherbird	3
Gymnorhina tibicen	Australian Magpie	3
Corvus mellori	Little Raven	1
Honeyeater sp.	Honeyeater sp.	2
Raven sp.	Raven sp.	1
Thornbill sp.	Thornbill sp.	1

Declines in bird abundance between spring 2018 and winter 2020 have occurred simultaneously at control and impact sites when compared with seasonal monitoring undertaken during the pre-construction period (Figure 11). Results of the non-parametric Wilcoxon Signed-rank test found that the median difference in bird abundance recorded across 48 point count surveys at paired control monitoring points over the months of autumn, winter and spring during the pre-construction period was statistically different to results collected over the same months during the operational phases of the Silverton Wind Farm ($Z=297.00$, $p=0.003$). Significant differences in bird abundance recorded at control and impact sites between the pre-construction and operational phases of Silverton Wind Farm indicate that the temporal changes observed in bird abundance across monitoring phases may be more likely associated with variability in environmental conditions rather than an effect of environmental disturbance related to the wind farm's operation. Further investigation into the relationship between rainfall and periodic fluctuations in bird abundance and density across seasonal monitoring suggest that observed changes in the abundance and demography of avian assemblages at Silverton Wind Farm across control and impact sites may be associated with monthly rainfall (Figure 12).

Declines in bird abundances (Figure 12) and observed changes in assemblages in spring (October) 2018 (Table 9; Table 10) may therefore be explained by substantial declines in monthly rainfall in the lead up to the spring 2018 monitoring, reducing the availability of resources; and consequently resulting in lowered survival and/or increases emigration of both individuals and certain species. Although the total number of birds recorded during seasonal monitoring within the testing and operational periods is lower than total figures reported during the pre-construction period, the collective abundance of birds recorded during point count surveys shows a general trend of increase since summer 2019 following the significant low abundance in spring 2018 (Figure 11; Figure 12).

Whilst the collective diversity of species observed across impact and control monitoring points between spring 2018 and winter 2020 is lower than the total number of species recorded during the pre-construction monitoring period (Figure 12), the average number of species recorded at control monitoring points is noted to be higher between spring 2019 and winter 2020 in comparison to the number of species recorded at control sites during the pre-construction period (Figure 13). This may be attributed to environmental differences between paired control sites, including variations in topography. Potential differences in selected monitoring sites will be investigated during subsequent rounds of monitoring.

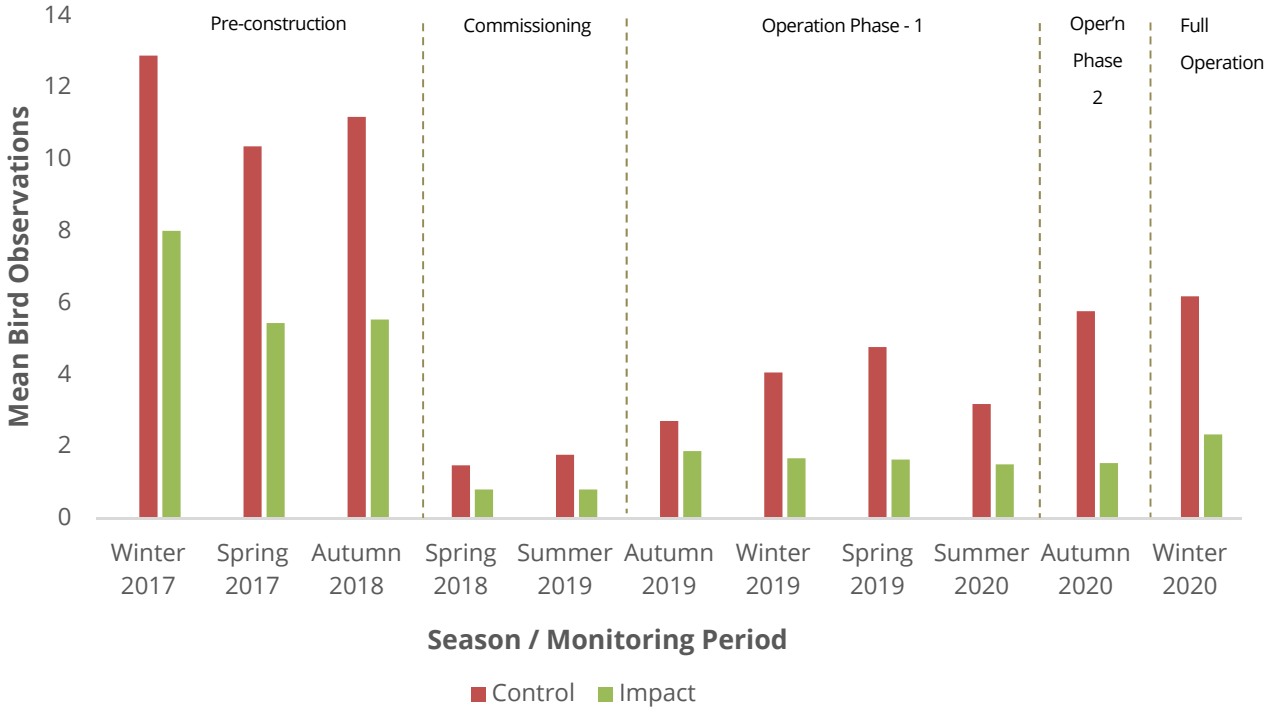


Figure 11 **Mean bird observations recorded at control and impact monitoring points over the duration of the monitoring program (excluding summer 2016). Total number of observations per season averaged by type of monitoring point to take into consideration variance in the number of control (17) and impact (30) points**

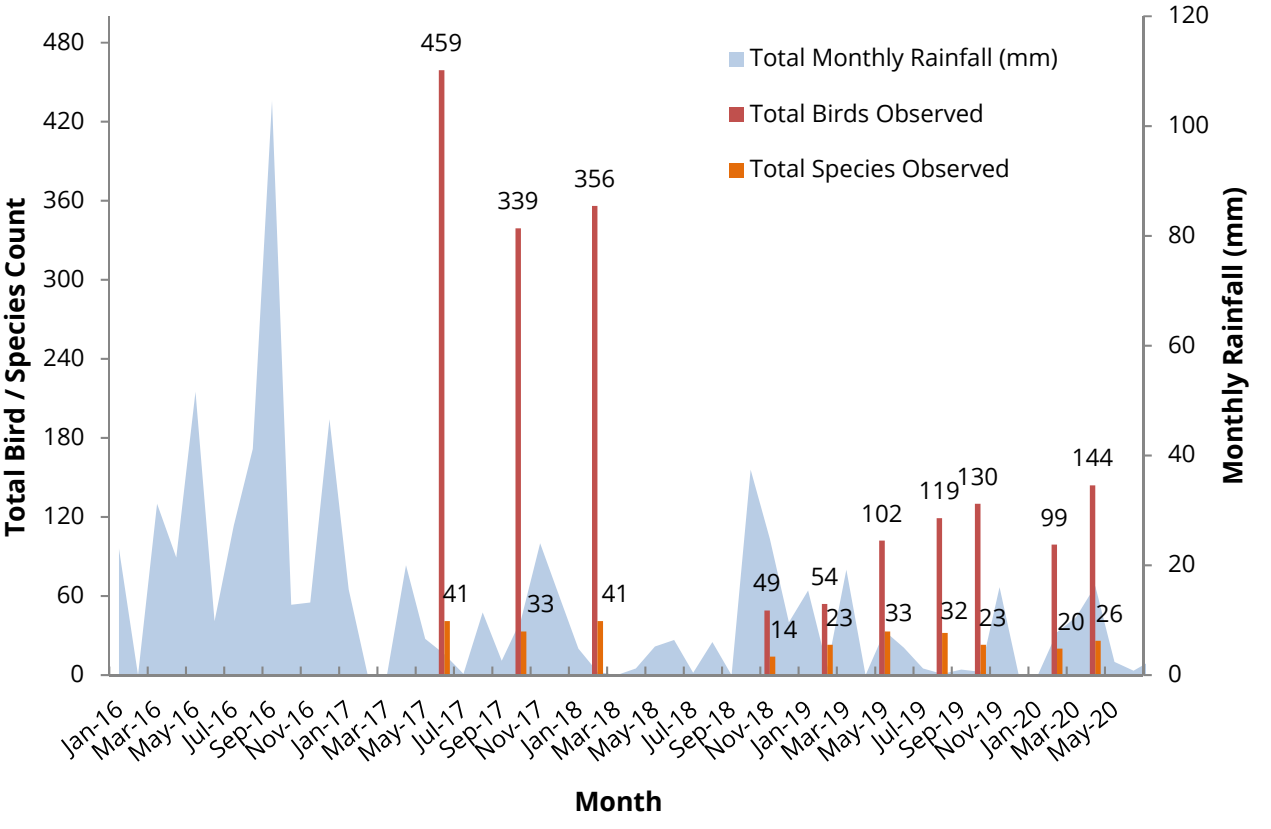


Figure 12 Total counts of birds and species recorded during seasonal monitoring of 48 monitoring points over the duration of the monitoring program (excluding summer 2016). Collected data compared against total monthly rainfall (mm) recorded for Broken Hill.

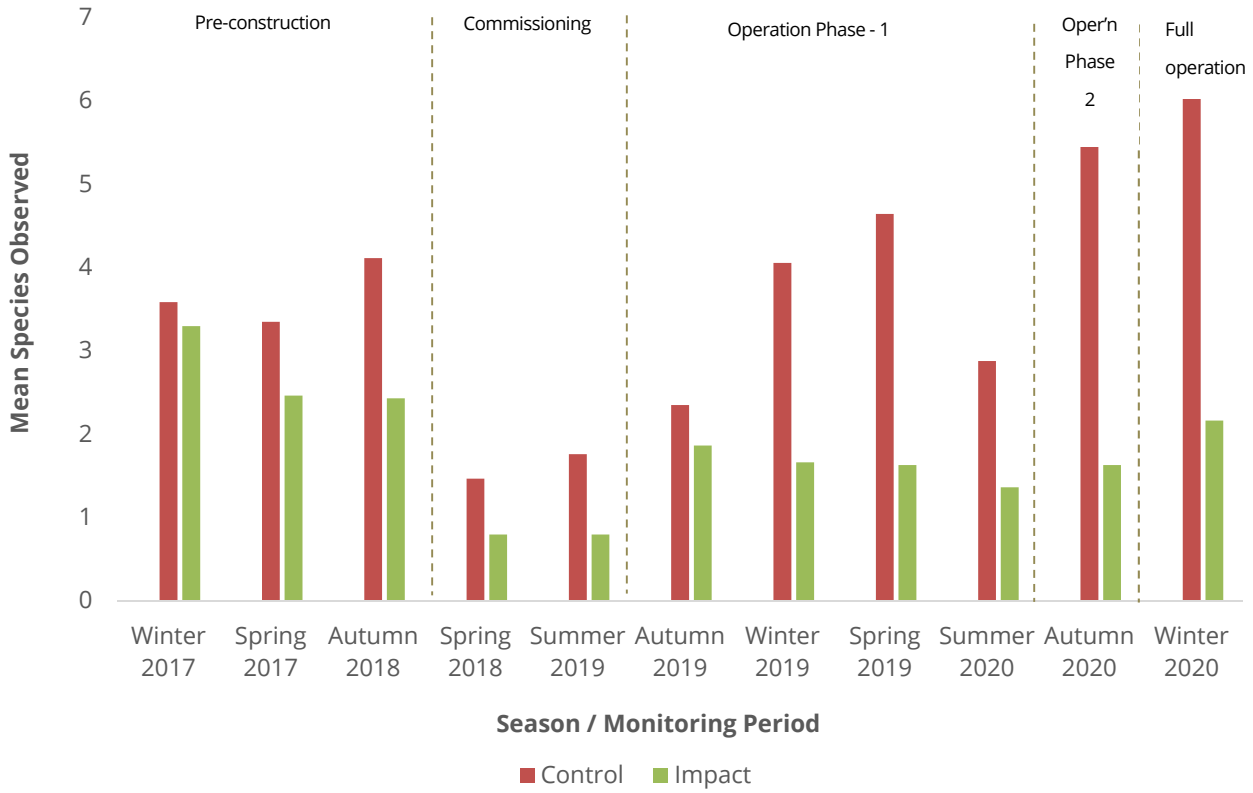


Figure 13 Mean species richness recorded at control and impact monitoring points over the duration of the monitoring program (excluding summer 2016). Total number of species per season averaged by type of monitoring point to take into consideration variance in the number of control (17) and impact (30) points.

3.2.2 Raptor utilisation

Raptors were observed during point surveys across all monitoring seasons between spring 2018 and winter 2020 (Figure 14). Of the five species detected between spring 2018 and winter 2020, Wedge-tailed Eagles were the most frequently recorded at the Silverton Wind Farm site, equating to 74% of observations (*n*=100). Consistent with previous observations recorded during the pre-construction period, records of Wedge-tailed Eagles were typically highest during the months of winter, coinciding with the species breeding season (Figure 14); and most frequently observed in Porcupine Grass sparse woodland and Mulga Dead Finish (open) woodland (Table 9).

Observations of Wedge-tailed Eagles flying within Silverton Wind Farm were lowest during the operation of Silverton Wind Farm in comparison to observations recorded during the pre-construction, testing and commissioning phases (Figure 14).

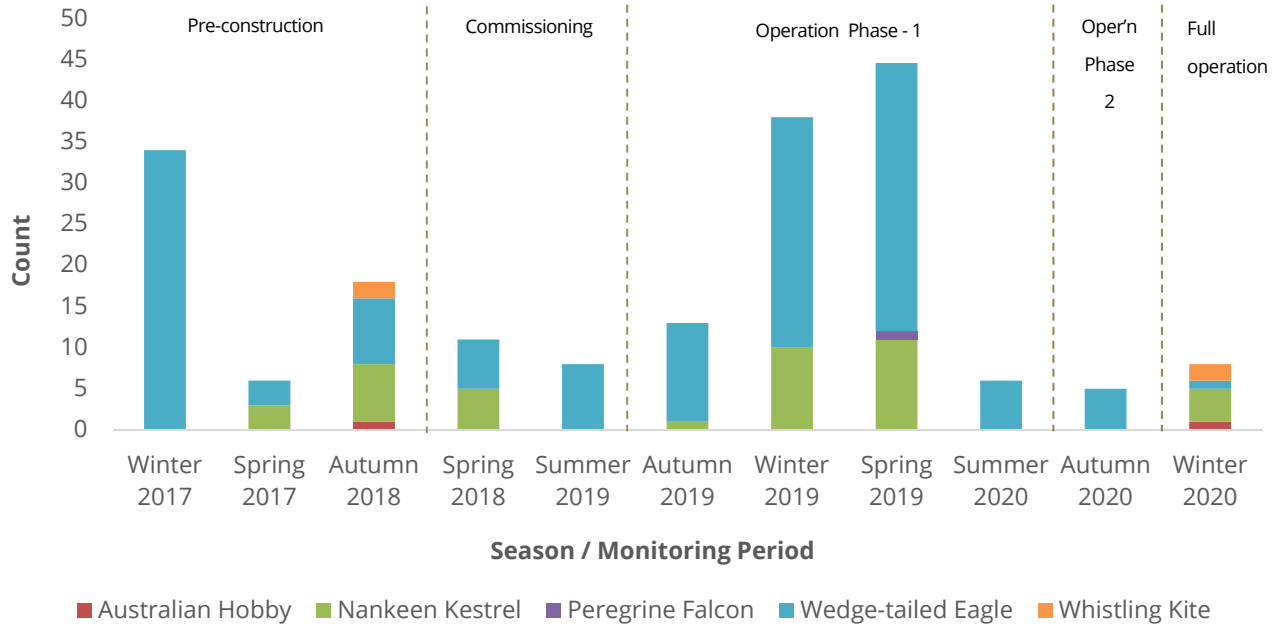


Figure 14 Total count of raptors collectively observed during 48 point surveys during each season.

Anecdotally, a significant decline in the presence of mammals was observed onsite in summer 2019/2020, particularly macropods, which were previously abundant during the winter and spring 2019 Wedge-tailed Eagle breeding surveys. Declines in the observations of Wedge-tailed Eagles between summer 2019/2020 and winter 2020 may be explained by a reduction in the availability and abundance of prey from within the site (i.e. macropods and feral goats) rather than an effect of the testing and operation of Silverton Wind Farm.

Increases in rainfall in October 2018 are likely to have contributed to the increased number of macropods observed onsite in the months leading up to the 2019 Wedge-tailed Eagle breeding season (due to increases in breeding and juvenile survival), resulting in the observed increase in activity of Wedge-tailed Eagles during winter and spring 2019. Subsequent rounds of seasonal raptor and vegetation monitoring during the operational phase of Silverton Wind Farm, that takes into consideration of the presence and abundance of the species prey (i.e. macropods), will provide further evidence to greater inform this interpretation of results.

No defined directional flight patterns of raptors within the Silverton Wind Farm site have been observed during monitoring between spring 2018 and winter 2020 that could be attributed to the commissioning, testing or operation of the wind facility. However, most raptor individuals and convocations (groups) were typically observed near escarpments within the Silverton Wind Farm site, likely attributed to the ridges providing orographic uplift and energy for movement.

3.2.3 Birds within or above Rotor Sweep Height

A total of 209 birds and raptors have been recorded flying within or above RSH (>30 metres) between spring 2018 and winter 2020 (Table 11). A complete list of the 225 flight observations recorded within or above RSH for each season over the duration of the monitoring program, including the birds and raptors and the heights at which they were observed, are provided in Appendix 3.

A total of 19 species were observed within or above RSH during the commission, testing and operation of the Silverton Wind Farm. The number of times in which these species were recorded flying within or above RSH

are provided in Table 11. Consistent with previous iterations of monitoring undertaken during the pre-construction phase, records of Wedge-tailed Eagles flying within or above RSH account for the majority of observations between spring 2018 and winter 2020 (*n*=88). Other species frequently observed flying at risk heights were the Galah (*n*=33), Australian Raven (*n*=24) and Nankeen Kestrel (*n*=18).

Observations of Wedge-tailed Eagles flying within or above RSH were lowest in winter 2020 (*n*=1) in comparison to all other monitoring periods. Monitoring undertaken in winter 2020 is the first round of monitoring that follows all 58 turbines at Silverton Wind Farm commencing operation both day and night. It is likely that reductions in flight observations at these heights are more attributed to a decline in the species presence onsite as a result of a reduction in prey availability during the drought rather than a change in flight behaviour due to the operation of the wind farm.

Of the 19 species recorded within or above RSH between spring 2018 and winter 2020 (Table 11Table 11):

- Eight were previously recorded within or above RSH during the pre-construction period (Australian Raven, Brown Falcon, Galah, Little Corella, Nankeen Kestrel, Tree Martin, Wedge-tailed Eagle, Whistling Kite).
- One is listed as migratory under provisions of EPBC Act (White-throated Needletail).
- One is listed as vulnerable under schedules of the BC Act (Dusky Woodswallow).
- One is listed as endangered under schedules of the BC Act (Grey Falcon).
- Five were predicted to be 'species of concern' during the initial assessment of turbine collision risk (Brown Falcon, Dusky Woodswallow, Nankeen Kestrel, Wedge-tailed Eagle, White-throated Needletail).

Trigger levels for management response(s) at Silverton Wind Farm are defined in the BBAMP by numbers of mortalities that may be actually detected by carcass searches, rather than by the indirect measures obtainable from bird utilisation studies, including flights recorded within or above RSH. Collisions detected and documented during the testing and operational phase of the wind farm related to the above species are described in Section 3.5 of this report.

Table 11 Species observed within or above RSH (>30m) at Silverton Wind Farm between spring 2018 and winter 2020

Species	Status	Previously recorded	Collision Risk	Spr 2018	Sum 2019	Win 2019	Spr 2019	Sum 2020	Aut 2020	Win 2020	Total
Australian Magpie				1	0	0	0	0	0	0	**1**
Australian Raven		X		0	2	4	7	4	1	6	**24**
Australian Shelduck				0	0	2	0	0	0	0	**2**
Brown Falcon		X	High	1	0	0	0	0	0	0	**1**
Dusky Woodswallow	V		Low	0	0	3	0	0	0	0	**3**
Fork-tailed Swift				0	0	10	0	0	0	0	**10**
Galah		X		0	6	6	8	10	2	1	**33**
Grey Butcherbird				0	1	0	0	0	0	0	**1**
Grey Falcon	E			1	0	0	1	0	0	0	**2**
Little Corella		X		0	0	0	0	0	0	6	**6**
Little Crow				0	0	0	0	6	0	0	**6**
Little Raven				0	0	2	0	1	0	0	**3**
Nankeen Kestrel		X	Moderate	3	0	6	6	0	1	2	**18**
Peregrine Falcon				0	0	0	1	0	0	0	**1**
Tree Martin		X		0	0	0	4	0	1	0	**5**
Wedge-tailed Eagle		X	High	3	11	36	29	5	3	1	**88**
Welcome Swallow				0	0	0	2	0	0	0	**2**
Whistling Kite		X		0	0	0	0	0	0	0	**0**
White-throated Needletail	VU Mi		Moderate	0	0	3	0	0	0	0	**3**
Grand Total	**2**	**8**	**5**	**9**	**20**	**72**	**58**	**26**	**8**	**16**	**209**

Note: Codes for conservation status are as those listed in Appendix 2.

3.3 Bat utilisation

There were six species of bats identified during the analysis of calls across the eight seasons. These are:

- **White Striped Freetail Bat** *Austronomous australis*
- **Gould's Wattled Bat** *Chalinolobus gouldii*
- **Little Pied Bat** *Chalinolobus picatus*
- **Yellow-bellied Sheathtail Bat** *Saccolaimus flaviventris*
- **Inland Broad-nosed Bat** *Scotorepens balstoni*
- **Little Broad-nosed Bat** *Scotorepens greyii*

At least three further species were recorded as present but were identified only to genus level. These cannot be definitively ascribed to particular species because the characteristics of the calls of various species within the same genus overlap. These are:

- **Freetail Bats** *Ozimops* sp.
  Calls recorded during this study are most likely to be calls of the Inland Freetail Bat *Ozimops petersi*. They may also be the Southern Freetail Bat *Ozimops planiceps* or the threatened Bristle-faced Freetail Bat *Setirostris eleryi*.
- **Long-eared Bats** *Nyctophilus* sp.
  Ultrasonic calls of the two Long-eared Bat species cannot be reliably distinguished. Most or all of the calls recorded at Silverton are likely to be from the Lesser Long-eared Bat *Nyctophilus geoffroyi* or the threatened Corben's Long-eared Bat *Nyctophilus corbeni*.
- **Forest Bats** *Vespadelus* sp.
  Ultrasonic calls of two Forest Bat species cannot be reliably distinguished. Most or all of the calls recorded at Silverton are likely to be from Little Forest Bat *Vespadelus vulturnus* or the threatened Inland Forest Bat *Vespadelus baverstocki*.

Bat species recorded during the commissioning and post-construction operation of Silverton Wind Farm are presented in Table 12 below. The number of calls recorded for each species within each vegetation community during the entire monitoring period except Spring 2016 is presented in Table 13 below.

Table 12 Bat species recorded during commision and post-construction operation at Silverton Wind Farm

Species	Status	Collision risk	Previously recorded	Spr 2018	Sum 2019	Aut 2019	Win 2019	Spr 2019	Sum 2020	Aut 2020	Win 2020
Yellow-bellied Sheathtail Bat	V	High	✓	✓				✓			
Gould's Wattled Bat		Moderate	✓	✓	✓	✓	✓	✓	✓	✓	✓
Little Pied Bat	V		✓	✓	✓	✓	✓	✓	✓	✓	✓
Long-eared Bats	VU, V (Corben's Long-eared Bat only)	Low (Corben's Long-eared Bat only)	✓	✓		✓	✓	✓	✓	✓	✓
Inland Broad-nosed Bat			✓	✓	✓	✓	✓	✓	✓		✓
Little Broad-nosed Bat			✓	✓	✓	✓	✓	✓	✓		
Forest Bats	V (Inland Forest Bat only)	High (Inland Forest Bat Only)	✓	✓	✓	✓	✓	✓	✓	✓	✓
Freetail Bats	E (Bristle-faced Freetail Bat only)	Low (Bristle-faced Freetail Bat only)	✓	✓	✓	✓	✓	✓	✓		✓
White-striped Freetail Bat		High	✓	✓	✓	✓	✓	✓	✓	✓	✓

Note: Codes for conservation status are as those listed in Appendix 2.

Table 13 Total calls by species in the vegetation communities over the duration of the monitoring program (excluding summer 2016)

Species	Mulga Dead Finish (open) woodland		River Red Gum riparian woodland		Mallee Red Mulga woodland		Porcupine Grass sparse woodland		Total
	Control (Monitoring sites: n=3)	Impact (Monitoring sites: n=2)	Control (Monitoring sites: n=2)	Impact (Monitoring sites: n=2)	Control (Monitoring sites: n=2)	Impact (Monitoring sites: n=2)	Control (Monitoring sites: n=2)	Impact (Monitoring sites: n=2)	
Yellow-bellied Sheathtail Bat	0	11	35	113	4	90	87	3	**343**
Gould's Wattled Bat	579	317	3920	3007	373	2014	421	181	**10812**
Little Pied Bat	5	30	65	13	0	9	1	0	**123**
Long-eared Bats	209	31	576	212	54	111	27	64	**1284**
Inland Broad-nosed Bat	32	20	274	195	44	167	18	23	**773**
Little Broad-nosed Bat	2	45	51	76	4	7	0	0	**185**
Forest Bats	31	3	1007	560	22	171	36	1	**1831**
Freetail Bats	336	417	1992	1384	274	1210	199	64	**5876**
White-striped Freetail Bat	68	39	1780	2740	571	899	368	502	**6967**

All bat species and genus groupings recorded during the pre-construction phase were also recorded during commission, testing and operation at the impact and control sites. Throughout the monitoring period the species with the most calls recorded was consistently the Gould's Wattled Bat. Only one species was not recorded across all seasons, this being the Yellow-bellied Sheathtail Bat which was not recorded during any winter surveys and during commissioning and post construction was only recorded during spring. Species richness for bats across the sites showed only small seasonal fluctuations and no indications of declines (Figure 15).

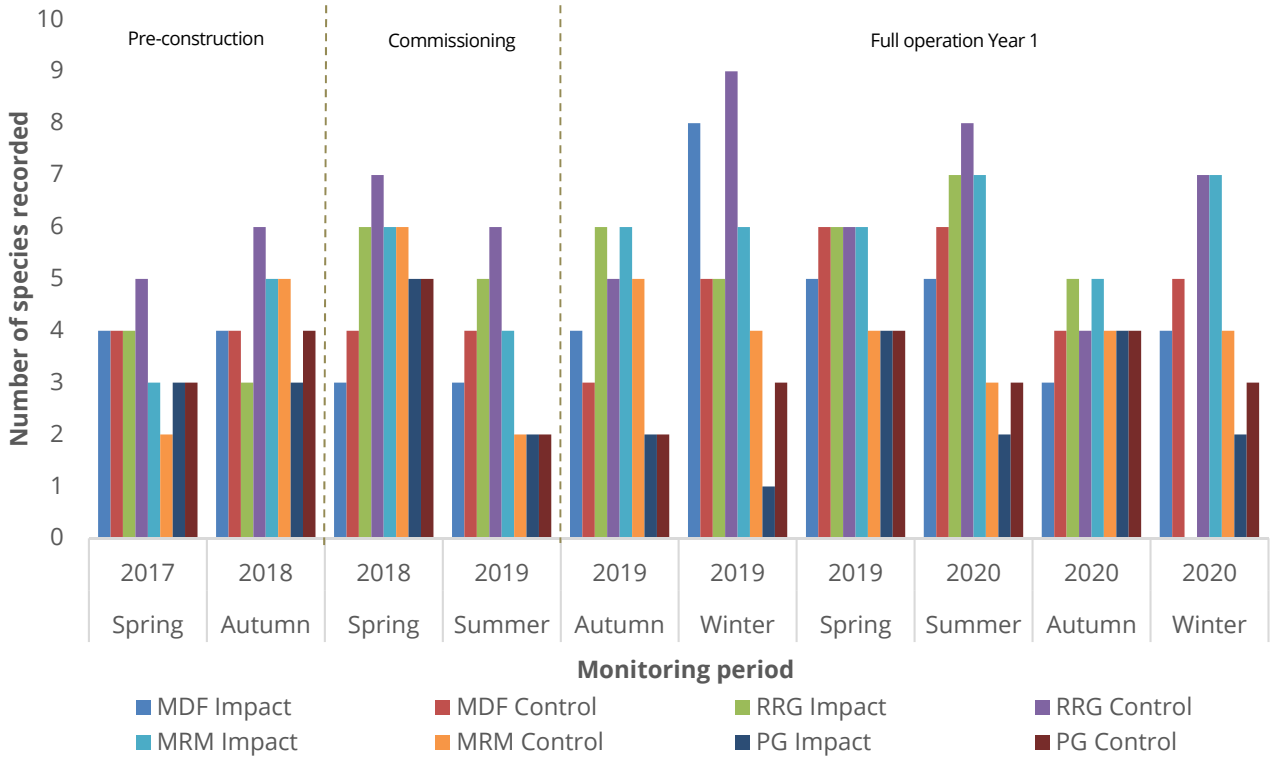


Figure 15 Bat diversity observed at monitoring points over the duration of the monitoring program (excluding summer 2016 and winter 2017). Legend abbreviations for the monitoring points are as those outlined in Table 3.

The number of calls recorded for all species fluctuated across seasons and sites, with a general pattern of the calls increasing over spring into summer and then decreasing autumn with lowest activity in winter (Figure 16). This is largely influenced by the number of calls recorded for Gould's Wattle Bat with Freetail Bats, Long-eared Bats, Forest Bats showing similar seasonal patterns. These fluctuations were relatively consistent at control and impact sites. There were two exceptions which were:

- River Red Gum Woodland control sites had higher numbers of calls recorded during spring whilst impact sites had higher numbers during autumn, a trend that repeated both years.
- Mallee Red Mulga Woodland impact sites had higher calls recorded compared to control sites from autumn 2019 until autumn 2020.

Overall there was a decline in bat activity at both control and impact sites, although it is important to note this may not be a true reflection of abundance. As this decline is seen across impact and control sites it can be assumed that bat activity was most likely influenced by external factors than as a result of the operation of the Silverton Wind Farm. Tables with number of passes for all species at each site is available in Appendix 4 .

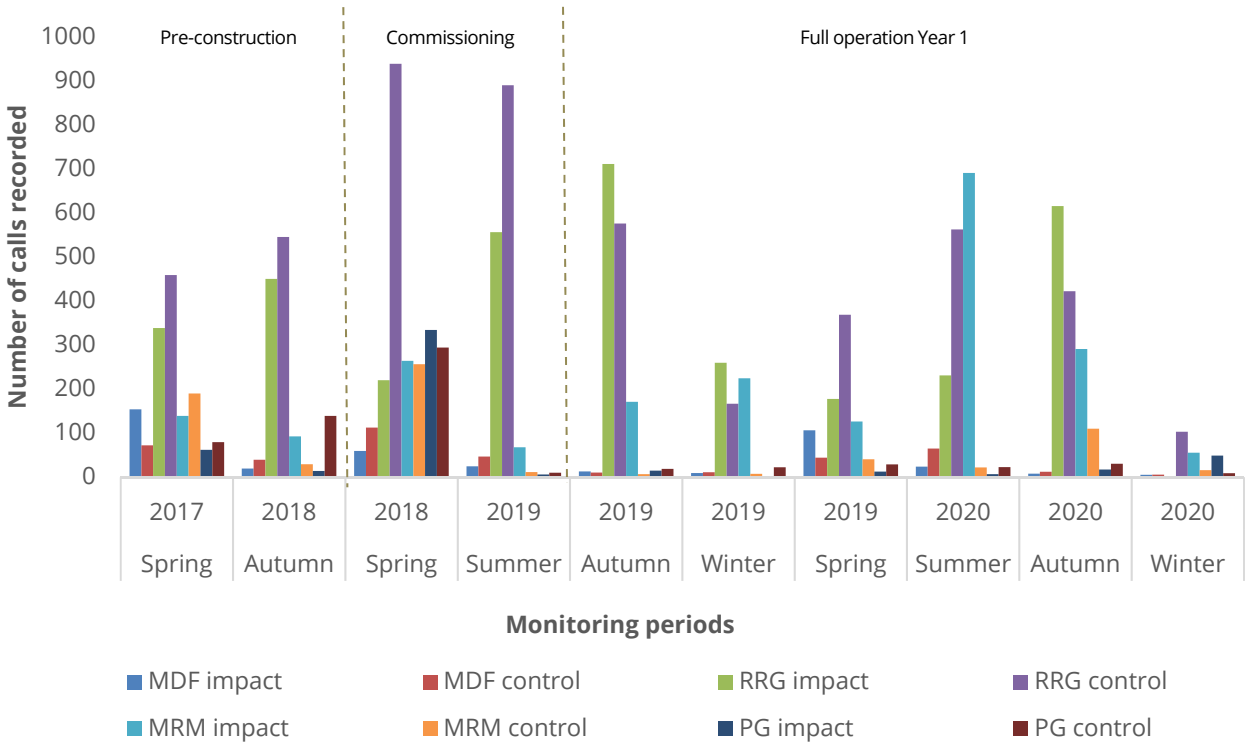


Figure 16 Total counts of bat calls recorded at monitoring points over the duration of the monitoring program (excluding summer 2016 and winter 2017 periods). Legend abbreviations for the monitoring points are as those outlined in Table 3.

The majority of bat calls were recorded within the River Red Gum Woodlands whilst the least calls were recorded within the Mulga dead finish woodland. In particular the meteorological masts located within Mulga dead finish sites had the least calls recorded. Bat species recorded by detectors on the masts are presented in Table 14 below.

Three bat species and one genus grouping of bats were recorded at the detectors deployed at 65m whilst seven were recorded on the paired ground detectors. Detectors mounted at 65m had fewer calls recorded than the detectors at ground level. However during some of the sessions calls recorded at height were greater than the paired ground sites for three species, White-striped Freetail Bat, Gould's Wattle Bat and Freetail Bats (likely Inland Freetail Bat). These three species were also found during carcass searches, confirming a probable likelihood for collision risk. The other species recorded at height was the Inland Broad-nosed Bat.

The results indicate that during summer bat activity at height is lower than during the other seasons. However due to damage to the meteorological masts during summer 2020, detectors were not able to be deployed and no detectors were deployed at masts during summer pre-construction. Therefore there is limited information to compare summer activity across the different years. This will be considered further in the 2021 annual report.

Table 14 Total calls recorded for each bat species during baseline, commission and post-construction operation at Silverton Wind Farm meterological mast sites

Species	Season	Baseline		Commission		Year 1 post-construction	
		1m height	65m height	1m height	65m height	1m height	65m height
White-striped Freetail Bat	Summer	0	0	0	0	0	0
	Autumn	1	0	45	74	23	9
	Winter	0	0	92	80	11	17
	Spring	0	0	1	3	18	18
	Total	**1**	**0**	**138**	**157**	**52**	**44**
Gould's Wattled Bat	Summer	0	0	14	0	0	0
	Autumn	3	10	2	0	23	5
	Winter	0	0	4	2	2	0
	Spring	70	7	35	5	10	0
	Total	**73**	**17**	**55**	**7**	**35**	**5**
Yellow-bellied Sheathtail Bat	Summer	0	0	0	0	0	0
	Autumn	0	0	0	0	0	0
	Winter	0	0	0	0	0	0
	Spring	0	0	0	0	13	0
	Total	**0**	**0**	**0**	**0**	**13**	**0**
Inland Broad-nosed Bat	Summer	0	0	0	0	0	0
	Autumn	1	0	0	0	0	1
	Winter	0	0	0	2	0	1
	Spring	6	2	0	0	2	0
	Total	**7**	**2**	**0**	**2**	**2**	**2**
Freetail Bats	Summer	0	0	2	0	0	0
	Autumn	9	2	0	0	0	14
	Winter	0	0	0	3	1	1
	Spring	79	21	0	1	108	74
	Total	**88**	**23**	**2**	**4**	**109**	**89**
Long-Eared Bats	Summer	0	0	0	0	0	0
	Autumn	1	0	3	0	1	0
	Winter	0	0	0	0	2	0
	Spring	6	0	4	0	0	0
	Total	**7**	**0**	**7**	**0**	**3**	**0**
Forest Bats	Summer	0	0	0	0	0	0
	Autumn	0	0	4	0	0	0
	Winter	0	0	0	0	1	0
	Spring	0	0	0	0	0	0
	Total	**0**	**0**	**4**	**0**	**1**	**0**

3.4 Significant species utilisation

3.4.1 Freckled Duck

In August 2019 approximately 50 Freckled Ducks were recorded at Umberumberka Reservoir, west of the wind farm, and in February 2020, four Freckled Ducks were recorded also at Umberumberka. During the surveys Freckled Ducks were observed resting on the banks, preening feathers and foraging for food in the water. No observations of any flights were observed. No other observations of Freckled Duck were recorded by field staff when on or near site, including during bird utilisation surveys and during targeted surveys at Stephens Creek Reservoir. No breeding or evidence of breeding was observed at Umberumberka Reservoir. During the initial testing phase and first year of operation for the wind farm there were no confirmed turbine collisions of Freckled Duck. Due to the sporadic occurrence of Freckled Duck close to site, the risk level remains as moderate for this species (Table 15).

Table 15 Summary of 'likelihood' and 'risk' of Freckled Duck.

Species name	Scientific name	BBAMP 2018 Risk	Revised Risk	Likelihood	Consequence
Freckled Duck	*Stictonetta naevosa*	Moderate	Moderate	Unlikely	Moderate

3.4.2 Other significant bird species

Seven significant species (identified as either species at risk of collision with wind turbines and / or listed species) were detected incidentally or during utilisation surveys at Silverton Wind Farm between spring 2018 and winter 2020. The monitoring points and / or incidental locations where each species was recorded is provided in Figure 17.

A summary of significant bird species detected incidentally or during bird utilisation surveys across all monitoring phases at Silverton Wind Farm is provided in Table 16 below. The number of times in which each significant species was recorded over all monitoring seasons and periods is detailed in Appendix 2.

Of the fifteen significant birds recorded within the Silverton Wind Farm site across all monitoring periods and phases:

- Seven were recorded between spring 2018 and winter 2020 (Wedge-tailed Eagle, Grey Falcon, Brown Falcon, Nankeen Kestrel, White-throated Needletail, Hooded Robin and Dusky Woodswallow). All species detected are those previously predicted to be 'species of concern' during the initial assessment of turbine collision risk (Wedge-tailed Eagle, Grey Falcon, Brown Falcon, Nankeen Kestrel, White-throated Needletail, Hooded Robin and Dusky Woodswallow) (NGH Environmental 2018b).
- Eight were recorded during the pre-construction monitoring phase only (Spotted Harrier, Little Eagle, Black Kite, Black-breasted Buzzard, Redthroat, Rufous Fieldwren, Varied Sittella and White-browed Treecreeper).
- Two were recorded across all monitoring seasons and phases (Wedge-tailed Eagle and Hooded Robin).
- Two were found to have collided with wind turbines (Wedge-tailed Eagle; see Section 3.5).

Table 16 Significant bird species detected at Silverton Wind Farm

Common Name	Status	Recorded prior to construction	Recorded during commission	Recorded during oper'n - Phase 1	Recorded during oper'n - Phase 2	Recorded during oper'n
Spotted Harrier	V	✓				
Wedge-tailed Eagle		✓	✓	✓	✓	✓
Little Eagle	V	✓				
Black Kite		✓				
Black-breasted Buzzard	V	✓				
Grey Falcon	E		✓	✓		
Brown Falcon		✓	✓			
Nankeen Kestrel		✓	✓	✓		✓
White-throated Needletail	VU Mi		✓			
Hooded Robin (SE form)	V	✓	✓	✓	✓	✓
Redthroat	V	✓				
Rufous Fieldwren	V	✓				
Dusky Woodswallow	V				✓	
Varied Sittella	V	✓				
White-browed Treecreeper	E2	✓				

Note: Codes for conservation status are as those listed in Appendix 2.

Monitoring data collected for species of concern and / or threatened or migratory species between spring 2018 and winter 2020 surveys have been analysed with respect to the NGH Environmental (2016, 2018b) likelihood and risk matrix as provided in the BBAMP and outlined in Section 2.7.1 of this report. Outcomes of the NGH risk assessment for threatened and migratory bird species detected between spring 2018 and winter 2020 are provided in Table 17 below.

Table 17 Summary of 'likelihood' and 'risk' of significiant species recorded at Silverton Wind Farm between spring 2018 and winter 2020, showing both BBAMP results and those of this review.

Species name	BBAMP 2018 Risk	Revised Risk	Likelihood	Consequence
Wedge-tailed Eagle	High	High	Probable	Moderate
Grey Falcon	Moderate	Moderate	Unlikely	Moderate
Brown Falcon	High	High	Probable	Moderate
Nankeen Kestrel	Moderate	Moderate	Possible	Minor
White-throated Needletail	Moderate	Moderate	Unlikely	Moderate
Hooded Robin	Low	Low	Rare	Insignificant
Dusky Woodswallow	Low	Moderate	Unlikely	Moderate

The Wedge-tailed Eagle has been recorded flying within and above RSH across all seasons and monitoring periods. Two Wedge-tailed Eagle carcasses were detected in November 2018 and March 2020 attributed to collisions with turbines of the Silverton Wind Farm (Section 3.5). The species has also been identified to nest within close proximity to turbines within the Silverton Wind Farm site (Section 3.5, Table 19). The likelihood of a Wedge-tailed Eagle colliding with a turbine within the Silverton Wind Farm site remains high.

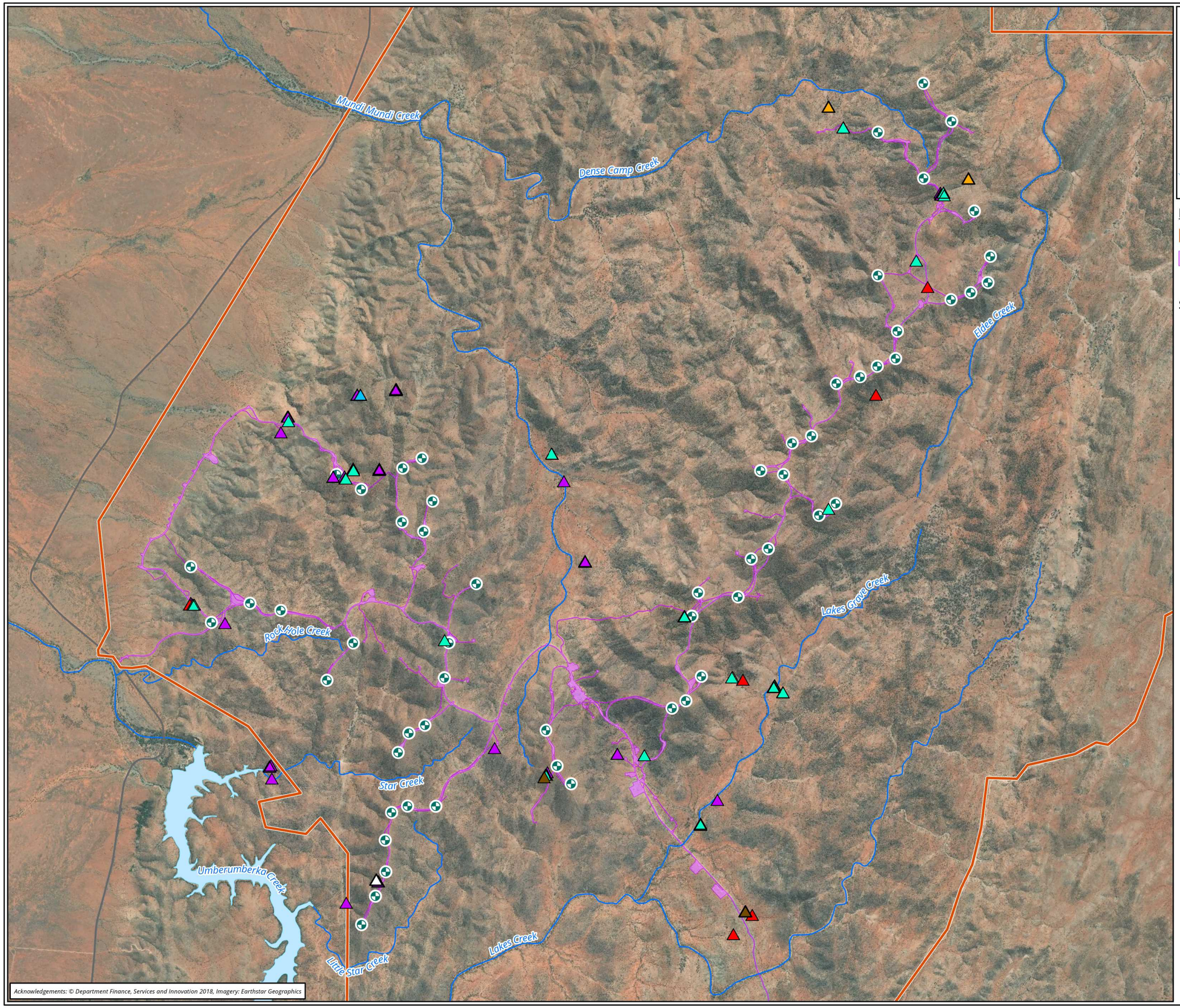
The Grey Falcon was recorded incidentally flying in the north east of the wind farm within RSW on two separate occasions. The likelihood of a Grey Falcon colliding with a turbine was reassessed to have increased from 'rare' to 'unlikely' due to observations of the species flight heights onsite. However, the consequences of a collision did not increase during re-assessment, meaning the overall risk category for the species ('moderate') remains unchanged since initial assessment.

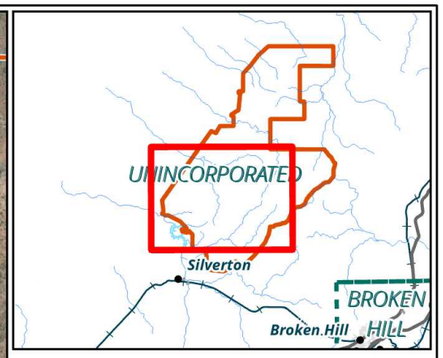
The Brown Falcon was recorded during point count surveys during the commission of the Silverton Wind Farm within RSH in spring 2018. The likelihood of a Brown Falcon colliding with a turbine was reassessed to have increased from 'rare' to 'unlikely' due to observations of the species flight heights onsite. However, the consequences of a collision did not increase during re-assessment, meaning the overall risk category for the species ('moderate') remains unchanged since initial assessment.

The Hooded Robin (SE form) has been detected incidentally and during point count surveys across all monitoring seasons and phases. The risk of a Hooded Robin colliding with a turbine remains low due to observations of the species flight heights onsite and knowledge of their preference to forage on or near to the ground.

Although White-throated Needletail has only been observed on one occasion during seasonal monitoring (winter 2019), turbine operations remain a moderate risk of collision to this vulnerable species. This is based on the species flight heights observed on site, knowledge of its widespread geographical occurrence and the continuing uncertainties related to its movement patterns.

Outcomes of the risk assessment for Dusky Woodswallow upgraded in risk category from 'low' to 'moderate' from previous assessments. Whilst predominantly spending most of its time flying close to the canopy, three individuals were observed flying in a group at 40 metres above ground at Silverton Wind Farm. The increase in risk is attributed to flight observations onsite and knowledge of the species as being gregarious and an active aerial hunter.





Legend

- Silverton wind farm boundary
- Wind farm infrastructure
- Turbine

Species name

- Brown Falcon
- Dusky Woodswallow
- Grey Falcon
- Hooded Robin
- Nankeen Kestrel
- Wedge-tailed Eagle
- White-throated Needletail

Figure 17 Monitoring points and/or incidental locations of significant bird species recorded at Silverton Wind Farm between spring 2018 and winter 2020

0 0.5 1 1.5 2 2.5 N

Kilometres

Scale: 1:50,000 @ A3

Coordinate System: GDA 1994 MGA Zone 54

biosis

Matter: 33377,
Date: 11 January 2021,
Checked by: ERB, Drawn by: JPT, Last edited by: jturner
Layout: F17_SignificantBirds
Location: P:\31100s\31198\Mapping\
Silverton.aprx

3.4.3 Significant bat species

Four significant bat species (identified as either species at risk of collision with wind turbines and / or listed species) were identified through call analysis (Yellow-bellied Sheathtail Bat, Gould's Wattled Bat, Little Pied Bat, White-striped Freetail Bat). There is also the potential for three additional threatened species (Corben's Long-eared bat, Bristle-faced Freetail Bat and Inland Forest Bat) which could not be separated from other similar species and therefore were grouped, that may have been recorded within the Silverton Wind Farm site. Of these species and groupings:

- All were recorded during pre-construction surveys.
- Four bat species/groupings were recorded during all seasons of the commissioning period and first year (White-striped Freetail, Gould's Wattled Bat, Little Pied Bat, Forest Bats).
- One was potentially recorded in all seasons of the commissioning period and first year except for summer 2019 (Corben's Long-eared Bat).
- One was potentially recorded in all seasons of the commissioning period and first year except for autumn 2020 (Bristle-face Freetail Bat).
- One was recorded only in spring monitoring periods (Yellow-bellied Sheathtail Bat).
- Two species were predicted to be 'species of concern' during the assessment of turbine collision risk. These species include the White-striped Freetail (High) and Gould's Wattled Bat (Moderate). Both of these species were recorded at height from the masts and were also found to have collided with wind turbines (see section 3.6).
- One threatened bat species was potentially recorded at height from the masts. The calls from the Freetail bat grouping were recorded and may be from the Bristle-faced Freetail Bat or one of the other two Freetail bats occurring within the region. There is potential the calls were from the Inland Freetail Bat, which was found to have collided with wind turbines.

Monitoring data collected for threatened and at risk species between spring 2018 and winter 2020 surveys has been analysed with respect to the NGH Environmental (2016, 2018a) likelihood and risk matrix as provided in the BBAMP and outlined in Section 2.7.1 of this report. Outcomes of the NGH risk assessment for threatened and at risk species detected between spring 2018 and winter 2020 are provided in Table 18 below.

Table 18 Summary of 'likelihood' and 'risk' of significiant species recorded at Silverton Wind Farm between spring 2018 and winter 2020.

Species name	Scientific name	BBAMP 2018 Risk	Revised Risk	Likelihood	Consequence
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	High	High	Rare	Significant
Gould's Wattled Bat	*Chalinolobus gouldii*	Moderate	Moderate	Probable	Insignificant
Little Pied Bat	*Chalinolobus picatus*	Moderate	Moderate	Rare	Moderate
Corben's Long-eared Bat	*Nyctophilus corbeni*	Low	Low	Rare	Minor
Inland Forest Bat	*Vespadelus baverstocki*	High	Moderate	Rare	Moderate
Inland Freetail Bat	*Ozimops petersi*	NA	Moderate	Probable	Insignificant
Bristle-faced Freetail Bat	*Setirostris eleryi*	Low	Low	Possible	Minor
White-striped Freetail Bat	*Austronomous australis*	High	High	Probable	Moderate

There were two changes to the risk assessment for the bat species. Inland Forest Bat was revised from High to Moderate as this species was never recorded flying at any of the 65 metre high detectors and very rarely at ground level at the mast locations. The majority of call activity was recorded at control sites and impact sites that were located within creek lines. It is therefore likely to be rare that the Inland Forest Bat would be collide with a turbine.

The other change was the inclusion of the Inland Freetail Bat, which has been included due to the single recorded collision of this species with a turbine during the first year of operation and a number of calls recorded at height. All other species maintained the risk levels as per assessed during the pre-construction assessments.

3.5 Temporal and spatial patterns of Wedge-tailed Eagles

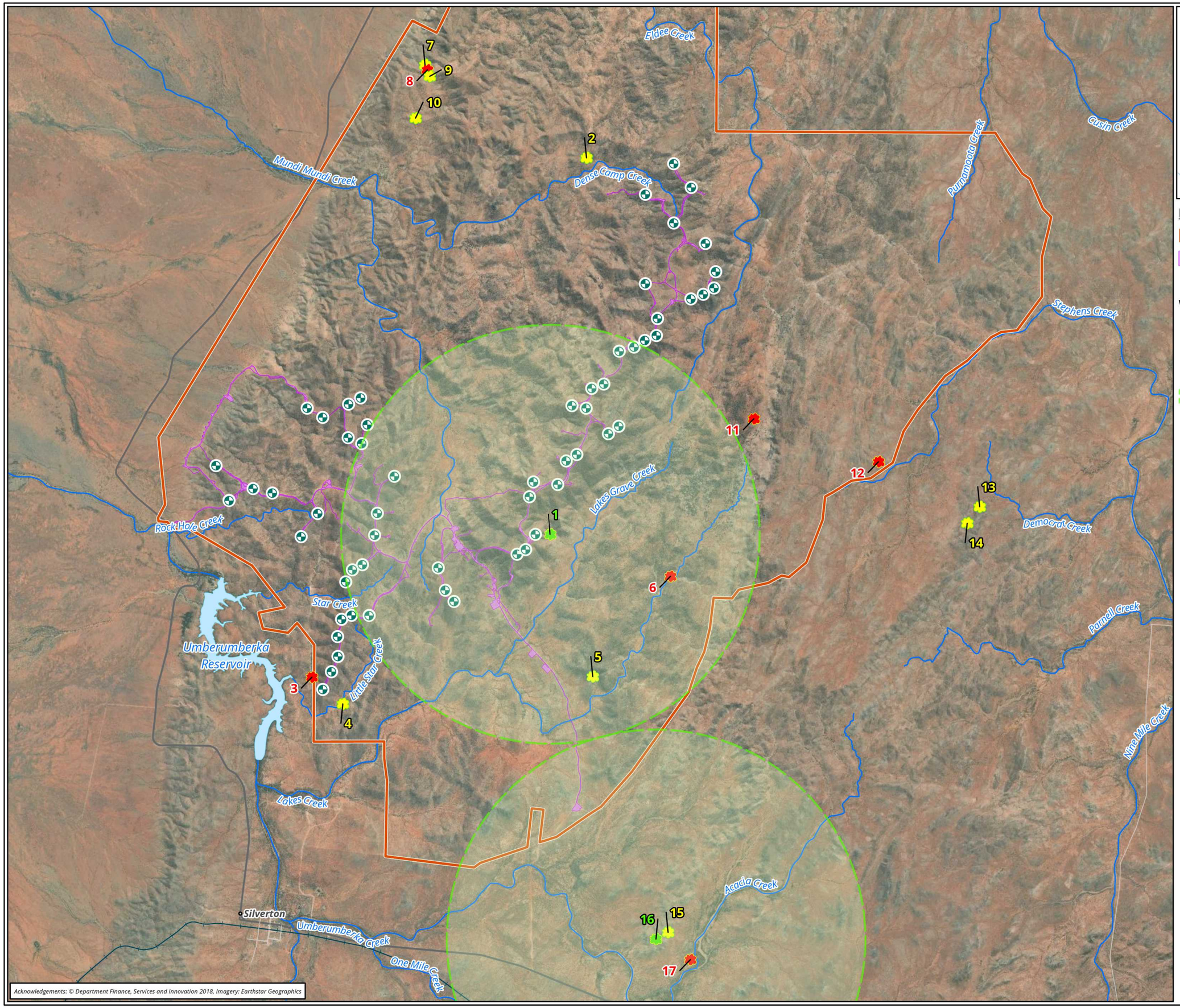
A total of 16 Wedge-tailed Eagle nests were detected in winter 2019 during roaming surveys within 20 kilometres of the Silverton Wind Farm (the 'search area'). One nest previously identified in a report by Ecology & Heritage Partners in 2017 was not able to be detected during searches (EHP 2017).

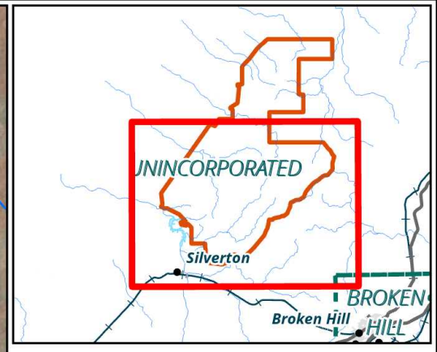
Of the 16 Wedge-tailed Eagle nests detected during targeted surveys:

- One was determined to be active, based on the observation of an incubating adult.
- Nine were determined to be abandoned, based on the nest's partial or total collapse (Appendix 5).
- Six were determined to be occupied, based on the presence of a flat top (Wiersma, J & Koch, A 2012), the best characteristic for predicting occupation outside of fresh leaves, whitewash and prey remains (Appendix 5)).

Subsequent nest monitoring in spring 2019 detected a single fledgling in the nest previously identified with an incubating adult (Nest #1). An additional fledgling was also detected in summer 2019 in a nest found incidentally and not previously identified during the targeted nest surveys (Table 19: Nest #16). In each case, juveniles of each active nest were observed flying and / or perched in their nest or within nearby trees in summer 2019 (Plate 1). The locations and activity descriptions of all nests detected/re-visited during the 2019 breeding season are provided in Figure 18 and Table 19.

Plate 1 Fledgling observed in nest detected on the 12/12/2019 (hereafter Nest #16).





Legend

- Silverton Wind Farm boundary
- Wind farm infrastructure
- Turbine

Wedge-tailed Eagle nests

- Abandoned
- Active
- Occupied
- Estimated breeding territory

Figure 18 Locations of Wedge-tailed Eagle nests identified during 2019 breeding season

0 0.5 1 1.5 2 2.5

Kilometres

N

Scale: 1:80,000 @ A3

Coordinate System: GDA 1994 MGA Zone 54

biosis

Matter: 33377,
Date: 11 January 2021,
Checked by: ERB, Drawn by: JPT, Last edited by: jturner
Layout: F18_WTE_2019
Location: P:\31100s\31198\Mapping\
Silverton.aprx

Table 19 2019 Wedge-tailed Eagle nest activity

Nest No.	Year Detected	Tree species	2019 Activity	Distance to nearest active nest	Distance to nearest turbine	2019 Young Hatched	2019 Young Fledged
Nest #1	2019	*Eucalyptus* sp.	Active	9579 m (16)	348 m (51)	1	1
Nest #2	2019	Mulga (Dead)	Occupied	8667 m (1)	1583 m (24)	-	-
Nest #3	2019	Mulga (Dead)	Abandoned	6375 m (1)	376 m (58)	-	-
Nest #4	2019	*Eucalyptus* sp.	Occupied	6143 m (1)	567 m (58)	-	-
Nest #5	2019	Mulga (Live)	Occupied	3404 m (1)	3296m (50)	-	-
Nest #6	2019	*Eucalyptus* sp.	Abandoned	2620 m (1)	3250 m (51)	-	-
Nest #7	2019	Mulga (Live)	Occupied	11132 m (1)	5859 m (24)	-	-
Nest #8	2019	Mulga (Dead)	Abandoned	11013 m (1)	5758 m (24)	-	-
Nest #9	2019	Mulga (Live)	Occupied	10854 m (1)	5639 m (24)	-	-
Nest #10	2019	*Eucalyptus* sp.	Occupied	10025 m (1)	5556 m (24)	-	-
Nest #11	2019	*Eucalyptus* sp.	Abandoned	5364 m (1)	2934 m (15)	-	-
Nest #12	2019	Mulga (Dead)	Abandoned	7703 m (1)	5478 m (20)	-	-
Nest #13	2019	Mulga (Live)	Occupied	9859 m (1)	7883 m (20)	-	-
Nest #14	2019	Mulga (Live)	Occupied	9556 m (1)	7917 m (20)	-	-
Nest #15	2019	Mulga (Live)	Occupied	321 m (16)	9035 m (48)	-	-
Nest #16	2019	Mulga (Live)	Active	9579 m (1)	9016 m (48)	1	1
Nest #17	2019	Mulga (Dead)	Abandoned	920 m (16)	9837 m (48)	-	-

Some abandoned nests found were clustered around nests determined to be occupied, and thus probably the alternative/disused nests of those pairs (Cherriman 2013). Consistent with studies by Sharp et al. (2016), Wedge-tailed Eagle nests detected within the defined search area were found in a variety of tree species (eucalypts *Eucalyptus* spp. and Mulga *Acacia aneura*), but were predominantly found in large emergent trees on slope habitat concentrated to the Barrier Ranges (n=13), or in flat areas (creek lines) that are immediately adjacent (n=5).

Consistent with Cherriman (2013), nests determined to be active or occupied during the 2019 season were predominantly found in living trees (*n*=11). The distance between active nests detected during the 2019 breeding season was 9.6 kilometres (*n*=2), suggestive of a core breeding density of one pair per 22.09 square kilometres (Figure 18). This nearest-neighbour distance is slightly higher than distances recorded within similar habitat approximately 120 kilometres north-east of Broken Hill, Western New South Wales. Average distances between active nests recorded within the north-east portion of Mutawintju National Park, the adjacent Coturaundee Nature Reserve and surrounding pastoral properties ranged from 2.0-3.3 kilometres (*n*=80), with a core breeding territory size of 3-9 square kilometres (Sharp, A, Norton, M, & Marks, A 2016, Olsen 2005, Cherriman 2007).

Whilst these results are higher than breeding densities recorded by Norton et al. (2016), they are lower than breeding densities previously reported for arid and semi-arid regions (1 pair per 71 km^2 and 1 pair per 40-48km^2, respectively) (Sharp, A, Norton, M, & Marks, A 2016). The solid structural conditions of a number of nests (*n*=9) suggest the presence of a number of occupied territories of additional pairs that did not attempt to breed in 2019 (Rowe, Brinsley, & Dennis 2017). Given the ongoing drought conditions in 2019, this may be considered normal for Wedge-tailed Eagles, whose reproductive rates are known to vary considerably

between years; largely influenced by rainfall affecting the abundance and availability of prey species and/or age distribution of the population (Sharp, A, Norton, M, & Marks, A 2016, Olsen 2005, Cherriman 2007).

Breeding success, for nests where the outcome was known (*n*=2) averaged 1.0 for young fledged per attempt in which eggs were laid in 2019. This estimate for breeding productivity takes into account that no other nests were identified during the 2019 breeding season that were found to have been lined (active) during monitoring undertaken in 2019 and thus assumes the number of nonbreeding pairs was not underestimated (Cherriman 2013). These results are similar to results reported by Robertson (1987) for Kinchega National Park (90km south east of Broken Hill), where the number of young per pair averaged 0.99 over six years regardless if conditions were favourable or severely drought effected.

Two Wedge-tailed Eagle carcasses were detected in November 2018 and March 2020 attributed to collisions with turbines of the Silverton Wind Farm (Section 3.5). Both of these individuals were identified as juveniles. Losses of juveniles and sub-adults to turbine collisions may be considered less important to the local Wedge-tailed Eagle population (Olsen 2005) because the natural population demography of Wedge-tailed Eagles functions with a high rate of juvenile/sub-adult mortality, and because breeding adults are the individuals that contribute to future generations (Olsen 2005).

Whilst older adults tend to enjoy greater breeding success than younger birds, the lifetime productivity of each breeding pair has only to result in two offspring that attain to breeding age for the population to remain stable. Abundant observations of Wedge-tailed Eagles recorded during the 2019 breeding season suggest the potential for a substantial pool of floaters to be present within the local population that can provide a source of replacements for occasional resident adult mortalities caused by collision with turbines.

Results to-date are limited to records from 2019. However, for that year, two chicks were found to have successfully fledged from two nests and two juveniles were found to have collided with turbines. As the carcass persistence trial and searcher efficiency trial results are in preparation by Elmoby Ecology and hence not available at the time of preparing this report (results are due March 2021). Therefore a comparison of the known breeding success to impacts of the wind farm cannot be confidently made. Subsequent years of collision and nest monitoring combined with monitoring of prey abundance and breeding activity during the operational phase of Silverton Wind Farm will provide further evidence to greater inform greater interpretation of results over the longer-term.

3.6 Bird and bat collision monitoring

A summary of all 11 carcasses detected incidentally or through pulse surveys, including those by Skylos Ecology, between spring 2018 and winter 2020 are provided in Table 20 below. It is noted that no featherspots were detected by either Biosis or Skylos Ecology during any searches within this period.

Details of the bird and bat carcasses detected during human intensity searches are provided in Appendix 6. All six species detected to have collided with turbines between spring 2018 and winter 2020 were identified to be common (Table 20). This includes one bat specimen (detected on the 28 December 2019) initially considered by the Australian Museum on the 14 July 2020 to be the endangered Bristle-faced Freetail Bat *Setirostris eleryi*. Further assessments of this specimen undertaken by the Australian Museum on 21 July 2020 later re-assessed this individual to be the common Inland Freetail Bat. Of the six species recorded, two species were predicted to be 'species of concern' during the assessment of turbine collision risk. These species include the White-striped Freetail Bat (High) and Gould's Wattled Bat (Moderate).

Table 20 Species summary of carcasses detected between spring 2018 and winter 2020 at Silverton Wind Farm

Phase	Recorder	Search Effort	Record type	Location	Date	Species name	Common name	Status*
Birds								
Commissioning	Biosis	Human Search	Pulse Survey	Turbine 54	13 Nov 2018	*Aquila audax*	Wedge-tailed Eagle	Secure
Operation - Phase 1	Skylos Ecology	Dog search	Incidental	Turbine 7	27 Dec 2019	*Aegotheles cristatus*	Australian Owlet-nightjar	Least Concern
Operation - Phase 1	Skylos Ecology	Dog search	Incidental	Turbine 44	28 Dec 2019	*Falco cenchroides*	Nankeen Kestrel	Secure
Operation - Phase 1	Skylos Ecology	Dog search	Incidental find outside the search area	Turbine 35	24 Mar 2020	*Aquila audax*	Wedge-tailed Eagle	Secure
Bats								
Commissioning	Biosis	Human Search	Pulse Survey	Turbine 17	6 May 2019	*Austronomus australis*	White-striped Freetail Bat	Secure
Full operation	Biosis	Human Search	Pulse Survey	Turbine 45	28 July 2019	*Austronomus australis*	White-striped Freetail Bat	Secure
Full operation	Skylos Ecology	Dog search	Pulse Survey	Turbine 32	28 Dec 2019	*Ozimops petersi*	Inland Freetail Bat	Least concern
Full operation	Skylos Ecology	Dog search	Pulse Survey	Turbine 24	13 April 2020	*Chalinolobus gouldii*	Gould's Wattled Bat	Least concern
Full operation	Skylos Ecology	Dog search	Incidental	Turbine 5	16 April 2020	*Chalinolobus gouldii*	Gould's Wattled Bat	Least concern
Full operation	Skylos Ecology	Dog search	Incidental find by a handler	Turbine 32	8 May 2020	*Austronomus australis*	White-striped Freetail Bat	Secure
Full operation	Skylos Ecology	Dog search	Incidental find by a handler	Turbine 58	11 June 2020	*Austronomus australis*	White-striped Freetail Bat	Secure

Note: *NSW Conservation status

Turbines T04, T10, T11, T22, T33 and T45 were identified to present the highest risk of collision by BCS. Of those turbines identified, only one turbine (T45) has recorded a single collision with a White-striped Freetail Bat (Table 20). The highest incidence of collisions were at turbine 32, with the detection of two bat carcasses (White-striped Freetail Bat and Inland Freetail Bat). This turbine is in close proximity to T33, which was identified to present a higher risk of collision by BCS. Other turbine collisions that are noted to be in close proximity to turbines identified to present a higher risk by BCS include:

- T05, in close proximity for T04.
- T44, in close proximity to T45.

Despite the detection of 11 carcasses between spring 2018 and winter 2020, testing and operation of the Silverton Wind Farm has not exceeded any of the BBAMP trigger levels for any threatened or non-threatened species. This is determined by no detection of:

- A carcass, featherspot, or injured animal of a single threatened species under or close to a wind turbine during survey or incidentally by wind farm personnel.
- Three or more carcasses or featherspots of a single non-threatened raptor species during carcass searches in any two consecutive months.
- Four or more carcasss or featherspots of a single non-threatened species during formal searches and/or incidentally in the period of any two consecutive months.

3.7 Revisions to turbine collision risk

Collision risk assessments of the BBAMP have been revised to consider data from spring 2018 to winter 2020 monitoring as summarised in Table 21 below.

Table 21 Re-assessment of turbine collision risk for birds & bat species of concern at Silverton Wind Farm following spring 2018 to winter 2020 monitoring

Species		Conservation status*	Collision risk (Biosis 2018)	Collision risk (current assessment)
Birds				
Freckled Duck	*Stictonetta naevosa*	Vulnerable BCA	Moderate	Moderate
Black Kite	*Milvus migrans*		High	High
Square-tailed Kite	*Lophoictinia isura*		Moderate	Moderate
Black-breasted Buzzard	*Hamirostra melanosternon*	Vulnerable BCA	High	High
Collared Sparrowhawk	*Accipiter cirrocephalus*		Low	Low
Little Eagle	*Hieraaetus morphnoides*	Vulnerable BCA	High	High
Wedge-tailed Eagle	*Aquila audax*		High	High
Spotted Harrier	*Circus assimilis*	Vulnerable BCA	High	High
Brown Falcon	*Falco berigora*		High	High
Nankeen Kestrel	*Falco cenchroides*		Moderate	Moderate
Grey Falcon	*Falco hypoleucos*	Endangered BCA	Moderate	Moderate
Pink Cockatoo	*Lophocroa leadbeateri*	Vulnerable BCA	Moderate	Moderate
White-throated Needletail	*Hirundapus caudacutus*	Migratory EPBC	Moderate	Moderate
Rufous Fieldwren	*Calamanthus campestris*	Vulnerable BCA	Low	Low
Redthroat	*Pyrrholaemus brunneus*	Vulnerable BCA	Low	Low
Pied Honeyeater	*Certhionyx variegatus*	Vulnerable BCA	Moderate	Moderate
Painted Honeyeater	*Grantiella picta*	Vulnerable EPBC & BCA	Moderate	Moderate
White-fronted Chat	*Epthianura albifrons*	Vulnerable BCA	Low	Low
Hooded Robin (SE form)	*Melanodryas cucullata*	Vulnerable BCA	Low	Low
Varied Sittella	*Daphoenositta chrysoptera*	Vulnerable BCA	Low	Low
Dusky Woodswallow	*Artamus cyanopterus*	Vulnerable BCA	Low	Moderate
Diamond Firetail	*Stagonopleura guttata*	Vulnerable BCA	Moderate	Moderate
Bats				
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*	Vulnerable BCA	High	High
Gould's Wattled Bat	*Chalinolobus gouldii*		Moderate	Moderate
Little Pied Bat	*Chalinolobus picatus*	Vulnerable BCA	Moderate	Moderate
Corben's Long-eared Bat	*Nyctophilus corbeni*	Vulnerable EPBC & BCA	Low	Low
Inland Forest Bat	*Vespadelus baverstocki*	Vulnerable BCA	High	Moderate
Inland Freetail Bat	*Ozimops petersi*		NA	Moderate
Bristle-faced Freetail Bat	*Mormopterus eleryi*	Endangered BCA	Low	Low
White-striped Freetail Bat	*Tadarida australis*		High	High

4. Discussion and conclusion

Bird and raptor utilisation

Of the total 107 bird genera/species documented across all surveys at Silverton Wind Farm, a total of 70 bird species have been recorded incidentally or during point surveys during the commissioning, testing and commencement of full operations. Of note, these surveys have occurred during extended drought conditions in far western NSW, impacting resource availability within the landscape (Biosis 2020).

Consistent with data collected during the pre-construction phase, bird abundances observed during point count surveys between spring 2018 and winter 2020 were typically highest in River Red Gum riparian woodland and Bluebush shrubland. Relative to the abundance of all species, the Galah, Tree Martin, Wedge-tailed Eagle, Australian Raven and Chestnut-rumped Thornbill were the bird species most frequently observed.

Investigations of the presence and locations of bird species at Silverton Wind Farm site have been established as a Before-After-Control-Impact (BACI) design. Significant differences in bird abundance recorded at control sites between the pre-construction and testing / operational phase suggest that the temporal changes observed in bird abundance across monitoring phases at impact sites is more likely associated with variability in environmental conditions rather than an effect of environmental disturbance related to the wind farm's testing or operation. Correlations between rainfall and periodic fluctuations in bird abundance and density across seasonal monitoring suggest that observed changes in the abundance and demography of avian assemblages at Silverton Wind Farm across control and impact sites is more likely to be associated with the impacts of extended low rainfall influencing the availability of resources and, consequently, survival and emigration.

Although species richness and abundance is lower during the testing and operational phases of the wind facility in comparison to total figures reported during the pre-construction period, the collective abundance of birds observed across the site during point count surveys shows a general trend of increase since summer 2019. Increases in the diversity of species recorded at control monitoring points during the testing and operational phases of the wind facility may be attributed to topographic variation between sites resulting in higher habitat diversity in control sites, relative to ridgeline habitats of impact sites. Potential differences in species richness between paired control and impacts sites will be investigated further in the 2021 monitoring and documented in the 2021 annual report.

Consistent with previous iterations of monitoring, Wedge-tailed Eagles were the raptors most frequently recorded onsite during the commissioning, testing and operational phase of Silverton Wind Farm; typically in Porcupine Grass sparse woodland and Mulga Dead Finish (open) woodland during the breeding months of winter.

Although observations of Wedge-tailed Eagles flying within Silverton Wind Farm were lowest during the operational phase of monitoring in comparison to the commissioning and pre-construction phases, it is noted that these observations coincide with a significant decline in the presence of wildlife onsite, particularly macropods; which were observed to previously be abundant during the winter and spring 2019 surveys. Declines in the observations of Wedge-tailed Eagles during the operational phase of Silverton Wind Farm may be explained by a reduction in the availability and abundance of prey from within the site (i.e. macropods) attributed, in turn, to the surrounding dry conditions experienced over summer 2019 rather than an effect of the wind farm's operation. Further consideration given to the presence and abundance of the species' prey

availability from within the site during subsequent rounds of seasonal monitoring in the operational phase will provide further evidence to inform this interpretation of the results.

Approximately 207 birds, composed of 19 species, have been recorded flying within turbine RSH over the monitoring period of spring 2018 to winter 2020. Consistent with iterations of monitoring undertaken during the pre-construction phase, records of Wedge-tailed Eagles flying within or above RSH account for the majority of observations between spring 2018 and winter 2020. Of the species detected:

- Seven were recorded during the pre-construction period (Australian Raven, Brown Falcon, Galah, Little Corella, Nankeen Kestrel, Tree Martin, Wedge-tailed Eagle and Whistling Kite).
- One is listed as migratory under provisions of EPBC Act (White-throated Needletail).
- One is listed as vulnerable under schedules of the BC Act (Dusky Woodswallow).
- One is listed as endangered under schedules of the BC Act (Grey Falcon).
- Five were predicted to be 'species of concern' during the assessment of turbine collision risk Brown Falcon, Nankeen Kestrel, Wedge-tailed Eagle, Dusky Woodswallow and White-throated Needletail.

Bat utilisation

The acoustic monitoring undertaken at Silverton Wind Farm during the commissioning phase and first year of operation found similar composition of bat species across the site. Most species were recorded during each season, with the exception of the Yellow-bellied Sheathtail Bat which was recorded only during spring surveys. Gould's Wattled Bat was the most commonly occurring bat across the site, with the highest number calls recorded during monitoring.

Similar to the bird utilisation surveys, the BACI design allowed for the comparison of control and impact sites to observe any notable changes of bats within the impact areas before and after various potential effects. There were some seasonal fluctuations which were generally recorded across both the control and impact sites, however across the pre-construction to first year of operation period there was no notable change in diversity. For bat calls recorded the trend across this period saw an increase in calls at impact sites, whilst there was some decline at the control sites. Overall there appears to be no effect of the wind farm on bat activity and diversity with fluctuations likely to be due to seasonal variation and other background environmental factors.

Three species and one genus grouping of bats were recorded by detectors deployed at 65m height on three meteorological masts. Three of these species were found to collide with turbines during carcass surveys. They were the White-striped Freetail Bat, Gould's Wattled Bat and Inland Freetail Bat. White-striped Freetail Bat and Gould's Wattled Bat were assessed to be at risk of turbine collision in the BBAMP (Biosis 2018), whilst Inland Freetail Bat was not part of the original assessment. Inland Freetail Bat has now been included and will be considered in future monitoring. For the White-striped Freetail Bat which was assessed as high risk, there appears to be no decline in activity at impact sites with most seasons showing increases in calls from pre-construction surveys during comparable seasons.

Freckled Duck

The movements and flight paths of Freckled Ducks are hard to predict due to their nomadic nature (Marchant & Higgins 1990). Surveys for the species and bird utilisation surveys across the wind farm detected the species only at Umberumberka Reservoir and no flights within or through the wind farm were observed. Without direct observations of flight paths and heights it is hard to quantify the risk of collision with turbines for Freckled Duck. There is the potential that any long distance movements may be nocturnal, similar to those of other nomadic waterfowl within arid and semi-arid landscapes (McEvoy et al. 2015) and therefore not

easily observed. The only waterfowl species observed flying was Australian Shelduck *Tadorna tadornoides* which on one occasion was observed flying over the ranges at a height of 40m. Australian Shelduck have also been observed flying towards and away from Umberumberka via the creek lines surrounding the wind farm.

Freckled Ducks are a nomadic species particularly during drought, with a preference for shallow large fresh water bodies with dense surrounding vegetation (Marchant & Higgins 1990). The change in presence of Freckled Duck close to Silverton may coincide with water availability within the western NSW region including the return of water to the Darling River, Paroo River and their associated lake systems. When Freckled Duck was present at Umberumberka it is noted that the reservoir was the only large water body observed in the area except Stephens Reservoir at which no Freckled Duck were observed. During August 2019 and February 2020 when Freckled Ducks were recorded at Umberumberka the water level was estimated to be 15% capacity. Across this period the region was in significant drought and other wetlands and waterbodies where Freckled Ducks historically occur were mostly dry, including the Menindee Lakes system at 1% or less capacity full (*WaterNSW Weekly water availability reports*, n.d.).

In October 2019, when Freckled Ducks were absent, the water level at Umberumberka was less than 1%. The final survey in May 2020 was undertaken after significant rainfall across the region with the water level at Umberumberka similar to the level observed in August 2019 and February 2020, however unlike the previous months other wetlands and river systems were also experiencing a rise in water levels. For example the Menindee Lakes Systems were at 18% capacity as of 4th May 2020 (*WaterNSW Weekly water availability reports*, n.d.). This suggests that Umberumberka Reservoir may provide a drought refuge for this species when the wider region is experiencing drought. Freckled Duck may also be present during wetter periods, however as much of the assessments was undertaken during drought conditions this is unable to be determined.

Due to the sporadic presence of Freckled Duck at Umberumberka Reservoir, which is in close proximity to the wind farm, there is potential Freckled Duck may fly through the wind farm and at height near the turbines on occasion, and collisions may impact the local abundance of this species. Therefore the risk assessment for this species remains at moderate as per the BBAMP.

Significant species

Seven significant species (identified as either species at risk of collisions with turbine and / or threatened or migratory in the BBAMP, see Table 5 in this report) were also detected incidentally and / or during bird utilisation surveys within the Silverton Wind Farm site between spring 2018 and winter 2020 (Wedge-tailed Eagle, Grey Falcon, Brown Falcon, Nankeen Kestrel, White-throated Needletail, Hooded Robin and Dusky Woodswallow).

The Wedge-tailed Eagle has been recorded flying within and above RSH across all seasons and monitoring periods. Two Wedge-tailed Eagle carcasses were detected in November 2018 and March 2020 attributed to collisions with turbines of the Silverton Wind Farm. The species has also been identified to nest within close proximity to turbines within the Silverton Wind Farm site. The likelihood of a Wedge-tailed Eagle colliding with a turbine within the Silverton Wind Farm site remains high.

The Grey Falcon was recorded incidentally flying in the north east of the wind farm within RSW on two separate occasions. The likelihood of a Grey Falcon colliding with a turbine was reassessed to have increased from 'rare' to 'unlikely' due to observations of the species flight heights onsite. However, the consequences of a collision did not increase during re-assessment, meaning the overall risk category for the species ('moderate') remains unchanged since initial assessment.

The Brown Falcon was recorded during point count surveys during the commission of the Silverton Wind Farm within RSH in spring 2018. The likelihood of a Brown Falcon colliding with a turbine was reassessed to have increased from 'rare' to 'unlikely' due to observations of the species flight heights onsite. However, the

consequences of a collision did not increase during re-assessment, meaning the overall risk category for the species ('moderate') remains unchanged since initial assessment.

The Hooded Robin (SE form) has been detected incidentally and during point count surveys across all monitoring seasons and phases. The risk of a Hooded Robin colliding with a turbine remains low due to observations of the species flight heights onsite and knowledge of their preference to forage on or near to the ground.

Although White-throated Needletail has only been observed on one occasion during seasonal monitoring (winter 2019), turbine operations remain a moderate risk of collision to this vulnerable species. This is based on the species flight heights observed on site, knowledge of its widespread geographical occurrence and the continuing uncertainties related to its movement patterns.

Outcomes of the risk assessment for Dusky Woodswallow upgraded in risk category from 'low' to 'moderate' from previous assessments. Whilst predominantly spending most of its time flying close to the canopy, three individuals were observed flying in a group at 40 metres above ground at Silverton Wind Farm. The increase in risk is attributed to flight observations onsite and knowledge of the species as being gregarious and an active aerial hunter.

Bird and bat mortalities

Multiple variables external to the operation of Silverton Wind Farm, including land management practices, weather and climate are all likely to affect the local utilisation of birds and, consequently, the levels of mortalities that occur across the operational life of the wind farm. For that reason, trigger levels for management response(s) at Silverton Wind Farm are defined by numbers of mortalities that may be actually detected by carcass searches, rather than by the indirect measures obtainable from utilisation studies.

A total of 11 bird and bat carcasses were detected by dogs or humans to have collided with turbines between spring 2018 and winter 2020. Birds and bats were detected either incidentally or during pulse searches for carcasss and featherspots. All species detected to have collided with turbines between spring 2018 and winter 2020 were identified to be common, including one bat specimen that was initially incorrectly identified by the Australian Museum as endangered before later being re-assessed to be common. Of the six species recorded, two were predicted to be 'species of concern' during the assessment of turbine collision risk. These species include the two bat species White-striped Freetail (High) and Gould's Wattled Bat (Moderate).

Of the six turbines identified as high risk for collisions by BCS, only one turbine (T45) has recorded a single collision with a single White-striped Freetail Bat. The highest incidence of collisions were at turbine 32, with the detection of two bat carcasses (White-striped Freetail Bat and Inland Freetail Bat). This turbine is in close proximity to T33, which was identified to present a higher risk of collision by BCS. Other turbines that noted collisions that are in close proximity to turbines identified by BCS to present a higher risk to bird and bat fauna include:

- T05, in close proximity for T04.
- T44, in close proximity to T45.

Despite the detection of 11 carcasses between spring 2018 and winter 2020, testing and operation of the Silverton Wind Farm has not exceeded any of the BBAMP trigger levels for any threatened or non-threatened species. This is determined by no detection of:

- A carcass, featherspot, or injured animal of a single threatened species under or close to a wind turbine during survey or incidentally by wind farm personnel.

- Three or more carcasses or featherspots of a single non-threatened raptor species during carcass searches in any two consecutive months.
- Four or more carcasss or featherspots of a single non-threatened species during formal searches and/or incidentally in the period of any two consecutive months.

Spatial and temporal patterns of Wedge-tailed Eagle breeding

Surveys for Wedge-tailed Eagle nests within the Silverton Wind Farm site, and in suitable environs within 20 kilometres, during the breeding months of winter 2019 detected 17 nests. The majority of these nests were determined to be inactive (*n*=15), with only two nests observed to contain a single fledgling during subsequent nest monitoring undertaken in spring and summer 2019.

The distance between active nests detected during the 2019 breeding season is considered normal for Wedge-tailed Eagles and it is common for reproductive rates to vary considerably between years.

Breeding success, for the two nests in which eggs were laid in 2019 and where the outcome was known averaged 1.0 for young fledged. These results are similar to results reported by Robertson (1987) for Kinchega National Park (90km south east of Broken Hill), regardless if conditions were favourable or severely drought effected.

Two Wedge-tailed Eagle juveniles were detected in November 2018 and March 2020 attributed to collisions with turbines of the Silverton Wind Farm. Losses of some juveniles and sub-adults is unlikely to have substantive impacts on the population in which high mortality of those age-classes is a natural characteristic of the species demography given a substantial pool of floaters provides a source of replacements for occasional resident adult mortalities. It is likely that occasional mortalities, as documented here, are unlikely to exceed the reproductive rate of the local population.

Subsequent years of collision and nest monitoring combined with monitoring of prey abundance and breeding activity during the operational phase of Silverton Wind Farm will provide further evidence to inform the interpretation of results over the longer-term.

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Appendices

Appendix 1 Relevant BBAMP bird and bat utilisation monitoring requirements

A1.1 Relevant BBAMP monitoring and reporting requirements

No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing / frequency
Bird and bat utilisation							
BBAMP.27	Seasonal bird and bat monitoring	Seasonal bird and bat utilisation survey using the timing and methodology established by NGH.	Bird and bat surveys conducted seasonally.	Data collated for inclusion in the annual report following 1 and 2 years of operation.	N/A	GE Contracted qualified ecologist	Seasonally, during the commissioning phase and first 2 years of operation
BBAMP.28	Freckled Duck monitoring	Monitoring of any potential risk to Freckled Duck posed by the wind farm to address requirements of BCS.	Surveys conducted seasonally during the first year of wind farm operation	Data collated for inclusion in the annual report following 1 year of operation.	N/A	GE Contracted qualified ecologist	Seasonally during the commissioning phase and first year of operation.
BBAMP.29	Wedge-tailed Eagle monitoring	Survey to estimate the likely reproductive and dispersal capacity of the regional Wedge-tailed Eagle population, to address requirements of BCS.	Surveys conducted in spring and summer for at least the first two years of wind farm operation.	Data collated for inclusion in the annual report following 1 and 2 years of operation.	N/A	GE Contracted qualified ecologist	Spring and summer for at least the first two years of wind farm operation.

No.	Action	Objective	Measure	Reporting	Adaptive management	Responsibility	Timing / frequency
BBAMP.30	Report on results of all bird and bat investigations, including Freckled Duck and Wedge-tailed Eagle investigations.	The annual report in will include analysis and reporting on the bird and bat utilisation (and in 2020, will include the collision monitoring collected in the interim phase during commissioning of the wind farm).	Annual report completed in accordance with the BBAMP and submitted to GE, BCS and DPIE planning.	Annual report prepared within two months following 1 and 2 years of operation.	Report includes recommendations for any amendments to monitoring or management	GE; contracted qualified ecologist	Following winter survey in 2020 and 2021

Appendix 2 Bird Species List (including raptors)

The following abbreviations and symbols are relevant to this Appendix:

Code	Meaning	Reference
National listings (EPBC Act)		
EX	Extinct	
CR	Critically endangered	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
EN	Endangered	
VU	Vulnerable	
NT	Near threatened	
CD	Conservation dependent	
PMST	Protected Matters Search Tool	
State listings (BC Act)		
E1	Endangered species (Part 1, Schedule 1)	NSW *Biodiversity Conservation Act 2016* (BC Act)
E2	Endangered population (Part 2, Schedule 1)	
E4	Presumed extinct (Part 4, Schedule 1)	
E4,A	Critically endangered	
V	Vulnerable (Part 1, Schedule 2)	

A2.2 Silverton Wind Farm bird observations

EPBC	BC Act	Scientific name	Common name	Sum 16	Aut 17	Spr 17	Aut 18	Spr 18	Sum 19	Aut 19	Win 19	Spr 19	Sum 20	Aut 20	Win 20	Total
	E2	*Dromaius novaehollandiae*	Emu		1	0	0	0	0	0	0	2	0	0	0	**3**
		Turnix velox	Little Button-quail	X	0	0	0	0	0	0	0	0	0	0	0	**X**
		Phaps chalcoptera	Common Bronzewing		0	0	0	0	1	0	0	0	0	2	0	**3**
		Ocyphaps lophotes	Crested Pigeon		1	1	3	0	0	1	0	0	9	4	0	**19**
		Tachybaptus novaehollandiae	Australasian Grebe		0	3	0	0	0	0	0	0	0	0	0	**3**
		Tadorna tadornoides	Australian Shelduck		0	0	0	0	0	0	1	0	0	0	0	**1**
	V	*Circus assimilis*	Spotted Harrier	X	0	0	0	0	0	0	0	0	0	0	0	**X**
		Aquila audax	Wedge-tailed Eagle	X	34	3	8	6	8	12	28	34	6	5	1	**145**
	V	*Hieraaetus morphnoides*	Little Eagle	X	0	0	0	0	0	0	0	0	0	0	0	**X**
		Haliastur sphenurus	Whistling Kite		0	0	2	0	0	0	0	0	0	0	2	**4**
		Milvus migrans	Black Kite	X	0	0	1	0	0	0	0	0	0	0	0	**1**
	V	*Hamirostra melanosternon*	Black-breasted Buzzard	X	0	0	0	0	0	0	0	0	0	0	0	**X**
		Falco longipennis	Australian Hobby	X	0	0	1	0	0	0	0	0	0	0	1	**2**
		Falco peregrinus	Peregrine Falcon		0	0	0	0	0	0	0	1	0	0	0	**1**
		Falco berigora	Brown Falcon	X	1	0	0	1	0	0	0	0	0	0	0	**2**
		Falco cenchroides	Nankeen Kestrel	X	0	3	7	5	0	1	10	11	0	0	4	**41**
		Cacatua sanguinea	Little Corella	X	2	1	101	0	0	0	1	0	0	4	24	**133**
		Cacatua tenuirostris	Long-billed Corella		0	0	0	0	0	0	0	2	0	0	0	**2**
		Eolophus roseicapillus	Galah	X	7	0	87	5	6	12	11	60	142	73	65	**468**

EPBC	BC Act	Scientific name	Common name	Sum 16	Aut 17	Spr 17	Aut 18	Spr 18	Sum 19	Aut 19	Win 19	Spr 19	Sum 20	Aut 20	Win 20	Total
		Psephotus haematonotus	Red-rumped Parrot		1	1	1	0	0	0	0	0	0	0	0	**3**
		Psephotus varius	Mulga Parrot	X	3	1	1	0	3	3	2	4	0	4	10	**31**
		Northiella haematogaster	Blue Bonnet		0	0	0	0	0	0	0	0	0	0	3	**3**
		Neophema chrysostoma	Blue-winged Parrot		0	0	0	0	0	0	0	0	0	1	0	**1**
		Melopsittacus undulatus	Budgerigar	X	0	0	0	0	0	0	0	0	0	0	0	**X**
		Podargus strigoides	Tawny Frogmouth		0	0	0	0	0	1	0	0	0	0	0	**1**
		Aegotheles cristatus	Australian Owlet-nightjar	X	0	0	0	0	0	0	0	0	0	0	0	**X**
	Mi	*Merops ornatus*	Rainbow Bee-eater	X	0	3	0	0	1	0	0	1	0	0	0	**5**
VU	Mi	*Hirundapus caudacutus*	White-throated Needletail		0	0	0	0	0	0	1	0	0	0	0	**1**
		Apus pacificus	Fork-tailed Swift		0	0	0	0	0	0	6	0	0	0	0	**6**
		Chrysococcyx osculans	Black-eared Cuckoo		0	0	0	0	0	0	0	0	1	0	0	**1**
		Barnardius zonarius	Australian Ringneck	X	0	0	0	0	0	0	0	0	0	0	0	**X**
		Barnardius zonarius barnardi	Mallee Ringneck	X	4	0	16	0	3	3	2	0	4	3	13	**48**
		Hirundo neoxena	Welcome Swallow	X	1	0	21	0	0	1	0	3	0	0	0	**26**
		Petrochelidon nigricans	Tree Martin	X	1	4	3	3	0	6	0	37	2	113	30	**199**
		Petrochelidon ariel	Fairy Martin		0	0	0	1	0	2	0	0	0	0	0	**3**
		Rhipidura albiscapa	Grey Fantail		2	0	0	0	0	0	0	0	0	0	0	**2**
		Rhipidura leucophrys	Willie Wagtail	X	9	6	10	0	4	4	2	3	13	4	3	**58**
		Petroica goodenovii	Red-capped Robin	X	6	2	5	0	1	9	5	3	2	12	7	**52**
	V	*Melanodryas cucullata*	Hooded Robin	X	2	1	0	0	0	2	0	1	1	0	0	**7**

EPBC	BC Act	Scientific name	Common name	Sum 16	Aut 17	Spr 17	Aut 18	Spr 18	Sum 19	Aut 19	Win 19	Spr 19	Sum 20	Aut 20	Win 20	Total
		Pachycephala rufiventris	Rufous Whistler	X	0	0	6	0	0	0	0	0	0	0	0	**6**
		Colluricincla harmonica	Grey Shrike-thrush	X	0	0	1	0	0	0	0	0	0	0	0	**1**
		Oreoica gutturalis	Crested Bellbird	X	0	0	0	0	0	0	0	0	0	0	0	**X**
		Coracina maxima	Ground Cuckoo-shrike		1	0	0	0	0	0	0	0	0	0	0	**1**
		Coracina novaehollandiae	Black-faced Cuckoo-shrike	X	0	1	2	1	0	0	1	1	3	0	0	**9**
		Lalage tricolor	White-winged Triller	X	0	0	0	1	0	0	0	0	0	0	0	**1**
		Pomatostomus superciliosus	White-browed Babbler	X	3	0	2	0	0	1	0	0	7	14	7	**34**
		Pomatostomus ruficeps	Chestnut-crowned Babbler		4	0	1	0	0	0	0	0	5	4	5	**19**
		Gerygone fusca	Western Gerygone	X	0	2	0	0	0	0	0	0	0	0	0	**2**
		Smicrornis brevirostris	Weebill		4	2	9	0	0	0	0	0	0	0	0	**15**
		Aphelocephala leucopsis	Southern Whiteface	X	6	3	8	0	0	1	1	9	4	30	24	**86**
		Acanthiza lineata	Striated Thornbill		0	0	0	0	0	0	1	0	0	0	0	**1**
		Acanthiza nana	Yellow Thornbill	X	2	0	2	0	0	0	0	0	0	0	0	**4**
		Acanthiza pusilla	Brown Thornbill		3	0	0	0	0	0	0	0	0	0	0	**3**
		Acanthiza uropygialis	Chestnut-rumped Thornbill	X	7	11	19	0	0	2	5	2	12	19	35	**112**
		Acanthiza reguloides	Buff-rumped Thornbill		0	1	0	0	0	0	0	0	0	0	0	**1**
		Acanthiza chrysorrhoa	Yellow-rumped Thornbill	X	3	0	10	1	4	2	1	15	2	2	0	**40**
	V	*Pyrrholaemus brunneus*	Redthroat	X	0	1	0	0	0	0	0	0	0	0	0	**1**
	V	*Calamanthus campestris*	Rufous Fieldwren	X	0	0	0	0	0	0	0	0	0	0	0	**X**

EPBC	BC Act	Scientific name	Common name	Sum 16	Aut 17	Spr 17	Aut 18	Spr 18	Sum 19	Aut 19	Win 19	Spr 19	Sum 20	Aut 20	Win 20	Total
		Cincloramphus mathewsi	Rufous Songlark	X	0	0	0	0	0	0	0	0	0	0	0	**X**
		Malurus cyaneus	Superb Fairy-wren		0	0	0	0	0	0	1	0	0	0	0	**1**
		Malurus splendens	Splendid Fairy-wren		2	0	0	0	0	0	0	0	0	0	0	**2**
		Malurus leucopterus	White-winged Fairy-wren	X	0	3	8	0	0	0	1	0	4	0	0	**16**
		Malurus lamberti	Variegated Fairy-wren	X	4	8	20	0	1	1	2	0	17	0	0	**53**
		Artamus leucorynchus	White-breasted Woodswallow	X	0	0	0	0	0	1	0	0	3	2	0	**6**
		Artamus personatus	Masked Woodswallow	X	1	0	0	0	1	0	0	0	0	0	0	**2**
		Artamus cinereus	Black-faced Woodswallow	X	4	1	0	0	1	2	0	3	0	0	0	**11**
		Artamus cyanopterus	Dusky Woodswallow		0	0	0	0	0	0	2	0	0	0	0	**2**
	V	*Daphoenositta chrysoptera*	Varied Sittella	X	0	0	0	0	0	0	0	0	0	0	0	**X**
	E2	*Climacteris affinis*	White-browed Treecreeper	X	0	0	0	0	0	0	0	0	0	0	0	**X**
		Dicaeum hirundinaceum	Mistletoebird		2	0	0	0	0	0	0	0	0	0	0	**2**
		Honeyeater sp.	Honeyeater sp.		0	0	0	2	0	0	0	0	0	0	0	**2**
		Plectorhyncha lanceolata	Striped Honeyeater		1	1	3	0	1	1	0	0	1	1	5	**14**
		Lichenostomus virescens	Singing Honeyeater	X	15	12	31	0	1	5	1	1	1	9	18	**94**
		Lichenostomus penicillatus	White-plumed Honeyeater	X	0	0	2	0	0	0	0	0	0	0	0	**2**
		Sugomel nigrum	Black Honeyeater	X	0	0	0	0	0	0	0	0	0	0	0	**X**
		Manorina melanocephala	Noisy Miner		1	0	0	0	1	0	0	0	0	0	0	**2**
		Manorina flavigula	Yellow-throated Miner		6	4	15	0	0	0	0	5	0	0	19	**49**

EPBC	BC Act	Scientific name	Common name	Sum 16	Aut 17	Spr 17	Aut 18	Spr 18	Sum 19	Aut 19	Win 19	Spr 19	Sum 20	Aut 20	Win 20	Total
		Anthochaera carunculata	Red Wattlebird		0	0	0	0	1	0	0	0	0	0	0	**1**
		Acanthagenys rufogularis	Spiny-cheeked Honeyeater	X	7	6	0	0	1	4	0	7	1	3	5	**34**
		Anthus australis	Australian Pipit		0	6	0	0	1	0	2	0	0	0	0	**9**
		Taeniopygia guttata	Zebra Finch	X	2	2	26	0	1	8	0	0	0	0	0	**39**
		Struthidea cinerea	Apostlebird	X	3	3	0	0	0	1	1	0	0	10	0	**18**
		Corvus bennetti	Little Crow		0	1	0	0	0	0	0	0	10	2	0	**13**
		Cracticus nigrogularis	Pied Butcherbird	X	1	1	0	0	0	0	0	0	0	0	0	**2**
		Cracticus torquatus	Grey Butcherbird		6	0	6	3	6	0	4	0	3	12	5	**45**
		Cracticus tibicen	Australian Magpie	X	2	0	12	3	3	7	5	4	4	0	9	**49**
		Psophodes cristatus	Chirruping Wedgebill	X	0	1	10	0	0	0	0	0	8	11	0	**30**
		Corvus coronoides	Australian Raven	X	6	0	11	0	3	8	10	15	15	20	18	**106**
		Corvus mellori	Little Raven		0	0	0	1	0	0	0	0	1	0	0	**2**
		Pardalotus striatus	Striated Pardalote	X	6	8	0	0	0	0	0	0	0	0	0	**14**
		Passer domesticus	House Sparrow		0	0	0	0	1	0	0	0	0	0	0	**1**
		Corvus orru	Torresian Crow		0	0	0	0	0	0	0	0	1	0	0	**1**
		Thornbill sp.	Thornbill sp.		0	0	0	1	0	1	0	0	0	0	0	**2**
		Total		**0**	**177**	**107**	**471**	**34**	**54**	**102**	**107**	**224**	**282**	**364**	**313**	**2235**

Appendix 3 Bird / Raptor Observations within or above RSH

A3.3 Silverton Wind Farm Bird and Raptor Observations

Species name	Common name	Season	Point observed	No. of Birds	Height
Aquila audax	Wedge-tailed Eagle	Summer 2016	48 R	1	400
Aquila audax	Wedge-tailed Eagle	Summer 2016	4 R	1	100
Falco cenchroides	Nankeen Kestrel	Summer 2016	21 9	1	50
Aquila audax	Wedge-tailed Eagle	Summer 2016	46 R	1	100-600
Aquila audax	Wedge-tailed Eagle	Summer 2016	46 R	1	200
Aquila audax	Wedge-tailed Eagle	Summer 2016	47 R	1	30 - 200
Aquila audax	Wedge-tailed Eagle	Summer 2016	47 R	1	80
Aquila audax	Wedge-tailed Eagle	Summer 2016	44 R	1	100 – 200
Aquila audax	Wedge-tailed Eagle	Summer 2016	44 R	1	80 – 800
Aquila audax	Wedge-tailed Eagle	Summer 2016	44 R	1	150
Falco cenchroides	Nankeen Kestrel	Summer 2016	44 R	1	80
Aquila audax	Wedge-tailed Eagle	Summer 2016	7 P	1	80
Aquila audax	Wedge-tailed Eagle	Summer 2016	OPP	1	100
Aquila audax	Wedge-tailed Eagle	Summer 2016	28 R	1	200
Aquila audax	Wedge-tailed Eagle	Summer 2016	23 P	1	50
Milvus migrans	Black Kite	Summer 2016	2 P	1	50
Milvus migrans	Black Kite	Summer 2016	2 P	1	40 - 100
Aquila audax	Wedge-tailed Eagle	Summer 2016	45 R	1	200
Artamus cinereus	Black-faced Woodswallow	Summer 2016	1 P	1	100 - 200
Corvus coronoides	Australian Raven	Summer 2016	1 P	1	50
Aquila audax	Wedge-tailed Eagle	Autumn 2017	8 R	1	150
Aquila audax	Wedge-tailed Eagle	Autumn 2017	21 R	1	100
Aquila audax	Wedge-tailed Eagle	Autumn 2017	21 R	1	50
Aquila audax	Wedge-tailed Eagle	Autumn 2017	21 R	1	>600
Aquila audax	Wedge-tailed Eagle	Autumn 2017	43 R	1	600
Aquila audax	Wedge-tailed Eagle	Autumn 2017	43 R	1	100-400
Aquila audax	Wedge-tailed Eagle	Autumn 2017	43 R	1	100-400
Aquila audax	Wedge-tailed Eagle	Autumn 2017	43 R	1	200-300
Aquila audax	Wedge-tailed Eagle	Autumn 2017	48 R	1	200
Aquila audax	Wedge-tailed Eagle	Autumn 2017	48 R	1	40-80
Aquila audax	Wedge-tailed Eagle	Autumn 2017	16 P	1	50
Aquila audax	Wedge-tailed Eagle	Autumn 2017	19 P	1	50
Aquila audax	Wedge-tailed Eagle	Autumn 2017	38 P	1	100
Aquila audax	Wedge-tailed Eagle	Autumn 2017	OPP	1	150 - 200

Species name	Common name	Season	Point observed	No. of Birds	Height
Aquila audax	Wedge-tailed Eagle	Autumn 2017	3 R	1	200
Aquila audax	Wedge-tailed Eagle	Autumn 2017	3 R	1	300-500
Aquila audax	Wedge-tailed Eagle	Autumn 2017	25 R	1	150
Aquila audax	Wedge-tailed Eagle	Autumn 2017	29 R	1	100
Aquila audax	Wedge-tailed Eagle	Autumn 2017	44 R	1	300 – 500
Aquila audax	Wedge-tailed Eagle	Autumn 2017	44 R	1	100 – 300
Aquila audax	Wedge-tailed Eagle	Autumn 2017	44 R	1	300 – 400
Aquila audax	Wedge-tailed Eagle	Autumn 2017	44 R	1	250
Aquila audax	Wedge-tailed Eagle	Autumn 2017	44 R	1	250
Aquila audax	Wedge-tailed Eagle	Autumn 2017	45 R	1	50 - 200
Aquila audax	Wedge-tailed Eagle	Autumn 2017	45 R	1	50 - 300
Aquila audax	Wedge-tailed Eagle	Autumn 2017	45 R	1	100
Cacatua sanguinea	Little Corella	Autumn 2017	32 P	1	40
Aquila audax	Wedge-tailed Eagle	Autumn 2017	6 R	1	100 - 300
Aquila audax	Wedge-tailed Eagle	Autumn 2017	6 R	1	50
Aquila audax	Wedge-tailed Eagle	Autumn 2017	6 R	1	50
Aquila audax	Wedge-tailed Eagle	Autumn 2017	46 R	1	400
Aquila audax	Wedge-tailed Eagle	Autumn 2017	47 R	1	400
Aquila audax	Wedge-tailed Eagle	Autumn 2017	47 R	1	100 – 300
Aquila audax	Wedge-tailed Eagle	Autumn 2017	47 R	1	400
Aquila audax	Wedge-tailed Eagle	Autumn 2017	41 P	1	100
Aquila audax	Wedge-tailed Eagle	Spring 2017	21 R	1	60
Falco cenchroides	Nankeen Kestrel	Spring 2017	33 R	1	40
Aquila audax	Wedge-tailed Eagle	Spring 2017	31 P	1	30-50
Petrochelidon nigricans	Tree Martin	Spring 2017	17 P	1	60
Falco cenchroides	Nankeen Kestrel	Spring 2017	4 R	1	60
Aquila audax	Wedge-tailed Eagle	Spring 2017	7 P	1	200
Corvus sp.	Raven sp.	Spring 2017	7 P	1	80
Coracina novaehollandiae	Black-faced Cuckoo-shrike	Spring 2017	7 P	1	80
Falco cenchroides	Nankeen Kestrel	Spring 2017	9 P	1	100
Aquila audax	Wedge-tailed Eagle	Spring 2017	30 P	1	50
Petrochelidon nigricans	Tree Martin	Spring 2017	41 P	1	80
Falco cenchroides	Nankeen Kestrel	Spring 2017	11 P	1	100
Aquila audax	Wedge-tailed Eagle	Spring 2017	21 R	1	60
Aquila audax	Wedge-tailed Eagle	Spring 2017	39 P	1	50
Aquila audax	Wedge-tailed Eagle	Spring 2017	43 R	1	50
Aquila audax	Wedge-tailed Eagle	Autumn 2018	3 R	1	10-100
Falco cenchroides	Nankeen Kestrel	Autumn 2018	6 R	1	30-50
Falco cenchroides	Nankeen Kestrel	Autumn 2018	10 R	1	50-100

Species name	Common name	Season	Point observed	No. of Birds	Height
Falco cenchroides	Nankeen Kestrel	Autumn 2018	2 P	1	20-100
Gymnorhina tibicen	Australian Magpie	Autumn 2018	11 P	1	30-80
Aquila audax	Wedge-tailed Eagle	Autumn 2018	21 R	1	100-50
Aquila audax	Wedge-tailed Eagle	Autumn 2018	25 R	1	150-200
Aquila audax	Wedge-tailed Eagle	Autumn 2018	25 R	1	150-200
Aquila audax	Wedge-tailed Eagle	Autumn 2018	28 R	1	50-100
Aquila audax	Wedge-tailed Eagle	Autumn 2018	29 R	1	0-150
Eolophus roseicapilla	Galah	Autumn 2018	17 P	1	50
Corvus coronoides	Australian Raven	Autumn 2018	17 P	1	50
Eolophus roseicapilla	Galah	Autumn 2018	20 P	1	60
Milvus migrans	Black Kite	Autumn 2018	30 P	1	80
Aquila audax	Wedge-tailed Eagle	Autumn 2018	31 P	1	100
Haliastur sphenurus	Whistling Kite	Autumn 2018	36 P	1	50
Aquila audax	Wedge-tailed Eagle	Autumn 2018	36 P	1	50
Aquila audax	Wedge-tailed Eagle	Autumn 2018	37 P	1	90
Cacatua sanguinea	Little Corella	Autumn 2018	38 P	1	200
Aquila audax	Wedge-tailed Eagle	Autumn 2018	38 P	1	200
Aquila audax	Wedge-tailed Eagle	Autumn 2018	44 R	1	50
Aquila audax	Wedge-tailed Eagle	Autumn 2018	44 R	1	50
Aquila audax	Wedge-tailed Eagle	Autumn 2018	44 R	1	50
Falco longipennis	Australian Hobby	Autumn 2018	44 R	1	50
Aquila audax	Wedge-tailed Eagle	Autumn 2018	45 R	1	100
Aquila audax	Wedge-tailed Eagle	Autumn 2018	45 R	1	100
Aquila audax	Wedge-tailed Eagle	Autumn 2018	45 R	1	100
Aquila audax	Wedge-tailed Eagle	Autumn 2018	45 R	1	200
Aquila audax	Wedge-tailed Eagle	Autumn 2018	46 R	1	60
Aquila audax	Wedge-tailed Eagle	Autumn 2018	48 R	1	75
Aquila audax	Wedge-tailed Eagle	Autumn 2018	48 R	1	400
Aquila audax	Wedge-tailed Eagle	Spring 2018	44	1	40
Gymnorhina tibicen	Australian Magpie	Spring 2018	16	1	150
Aquila audax	Wedge-tailed Eagle	Spring 2018	24	2	80
Falco berigora	Brown Falcon	Spring 2018	24	1	50
Falco cenchroides	Nankeen Kestrel	Spring 2018	24	1	50
Falco cenchroides	Nankeen Kestrel	Spring 2018	11	1	50
Falco cenchroides	Nankeen Kestrel	Spring 2018	11	1	50
Eolophus roseicapilla	Galah	Summer 2019	30	6	30
Cracticus torquatus	Grey Butcherbird	Summer 2019	40	1	238
Aquila audax	Wedge-tailed Eagle	Summer 2019	45	6	80
Aquila audax	Wedge-tailed Eagle	Summer 2019	45	2	50

Species name	Common name	Season	Point observed	No. of Birds	Height
Aquila audax	Wedge-tailed Eagle	Summer 2019	41	1	250
Aquila audax	Wedge-tailed Eagle	Summer 2019	19	1	100
Corvus coronoides	Australian Raven	Summer 2019	23	2	30
Aquila audax	Wedge-tailed Eagle	Summer 2019	23	1	40
Aquila audax	Wedge-tailed Eagle	Winter 2019	43	1	100
Aquila audax	Wedge-tailed Eagle	Winter 2019	43	3	100
Falco cenchroides	Nankeen Kestrel	Winter 2019	43	1	50
Aquila audax	Wedge-tailed Eagle	Winter 2019	25	1	150
Aquila audax	Wedge-tailed Eagle	Winter 2019	47	2	300
Aquila audax	Wedge-tailed Eagle	Winter 2019	47	1	200
Aquila audax	Wedge-tailed Eagle	Winter 2019	47	1	300
Falco cenchroides	Nankeen Kestrel	Winter 2019	36	1	40
Falco cenchroides	Nankeen Kestrel	Winter 2019	44	1	60
Aquila audax	Wedge-tailed Eagle	Winter 2019	44	1	200
Aquila audax	Wedge-tailed Eagle	Winter 2019	44	1	200
Aquila audax	Wedge-tailed Eagle	Winter 2019	46	2	150
Hirundapus caudacutus	White-throated Needletail	Winter 2019	8	3	300
Corvus coronoides	Australian Raven	Winter 2019	14	1	300
Corvus coronoides	Australian Raven	Winter 2019	6	1	150
Corvus coronoides	Australian Raven	Winter 2019	4	2	100
Aquila audax	Wedge-tailed Eagle	Winter 2019	33	1	200
Aquila audax	Wedge-tailed Eagle	Winter 2019	33	2	200
Aquila audax	Wedge-tailed Eagle	Winter 2019	33	2	300
Aquila audax	Wedge-tailed Eagle	Winter 2019	33	1	200
Aquila audax	Wedge-tailed Eagle	Winter 2019	21	1	200
Aquila audax	Wedge-tailed Eagle	Winter 2019	21	1	300
Aquila audax	Wedge-tailed Eagle	Winter 2019	21	3	100
Aquila audax	Wedge-tailed Eagle	Winter 2019	21	2	150
Aquila audax	Wedge-tailed Eagle	Winter 2019	21	1	150
Aquila audax	Wedge-tailed Eagle	Winter 2019	21	1	200
Aquila audax	Wedge-tailed Eagle	Winter 2019	21	1	200
Aquila audax	Wedge-tailed Eagle	Winter 2019	21	1	200
Aquila audax	Wedge-tailed Eagle	Winter 2019	21	2	200
Falco cenchroides	Nankeen Kestrel	Winter 2019	30	1	30
Aquila audax	Wedge-tailed Eagle	Winter 2019	29	1	150
Apus pacificus	Fork-tailed Swift	Winter 2019	29	3	30
Eolophus roseicapilla	Galah	Winter 2019	17	2	30
Apus pacificus	Fork-tailed Swift	Winter 2019	17	1	40
Falco cenchroides	Nankeen Kestrel	Winter 2019	17	1	50

Species name	Common name	Season	Point observed	No. of Birds	Height
Eolophus roseicapilla	Galah	Winter 2019	17	4	30
Apus pacificus	Fork-tailed Swift	Winter 2019	17	3	35
Apus pacificus	Fork-tailed Swift	Winter 2019	18	3	100
Falco cenchroides	Nankeen Kestrel	Winter 2019	18	1	30
Artamus cyanopterus	Dusky Woodswallow	Winter 2019	40	3	40
Corvus mellori	Little Raven	Winter 2019	40	2	80
Aquila audax	Wedge-tailed Eagle	Winter 2019	45	1	40
Aquila audax	Wedge-tailed Eagle	Winter 2019	45	1	200
Aquila audax	Wedge-tailed Eagle	Winter 2019	38	1	80
Tadorna tadornoides	Australian Shelduck	Winter 2019	22	2	40
Aquila audax	Wedge-tailed Eagle	Spring 2019	3	1	200
Falco cenchroides	Nankeen Kestrel	Spring 2019	3	1	100
Aquila audax	Wedge-tailed Eagle	Spring 2019	3	1	100
Eolophus roseicapilla	Galah	Spring 2019	8	2	30
Corvus coronoides	Australian Raven	Spring 2019	9	1	50
Falco cenchroides	Nankeen Kestrel	Spring 2019	11	1	30
Aquila audax	Wedge-tailed Eagle	Spring 2019	11	2	500
Petrochelidon nigricans	Tree Martin	Spring 2019	17	3	70
Falco cenchroides	Nankeen Kestrel	Spring 2019	18	1	50
Eolophus roseicapilla	Galah	Spring 2019	18	1	40
Petrochelidon nigricans	Tree Martin	Spring 2019	18	1	30
Aquila audax	Wedge-tailed Eagle	Spring 2019	19	1	250
Falco cenchroides	Nankeen Kestrel	Spring 2019	19	1	100
Eolophus roseicapilla	Galah	Spring 2019	21	2	30
Corvus coronoides	Australian Raven	Spring 2019	22	1	80
Aquila audax	Wedge-tailed Eagle	Spring 2019	23	1	150
Aquila audax	Wedge-tailed Eagle	Spring 2019	23	1	100
Corvus coronoides	Australian Raven	Spring 2019	25	1	100
Eolophus roseicapilla	Galah	Spring 2019	28	1	80
Corvus coronoides	Australian Raven	Spring 2019	29	1	30
Corvus coronoides	Australian Raven	Spring 2019	29	2	100
Falco cenchroides	Nankeen Kestrel	Spring 2019	32	1	50
Corvus coronoides	Australian Raven	Spring 2019	33	1	200
Aquila audax	Wedge-tailed Eagle	Spring 2019	35	1	200
Aquila audax	Wedge-tailed Eagle	Spring 2019	40	1	40
Aquila audax	Wedge-tailed Eagle	Spring 2019	40	1	30
Aquila audax	Wedge-tailed Eagle	Spring 2019	40	1	50
Aquila audax	Wedge-tailed Eagle	Spring 2019	40	2	150
Aquila audax	Wedge-tailed Eagle	Spring 2019	40	4	40

Species name	Common name	Season	Point observed	No. of Birds	Height
Aquila audax	Wedge-tailed Eagle	Spring 2019	40	2	50
Aquila audax	Wedge-tailed Eagle	Spring 2019	40	1	100
Falco cenchroides	Nankeen Kestrel	Spring 2019	41	1	200
Aquila audax	Wedge-tailed Eagle	Spring 2019	43	1	250
Hirundo neoxena	Welcome Swallow	Spring 2019	43	2	50
Falco peregrinus	Peregrine Falcon	Spring 2019	44	1	40
Aquila audax	Wedge-tailed Eagle	Spring 2019	46	1	80
Aquila audax	Wedge-tailed Eagle	Spring 2019	47	1	30
Aquila audax	Wedge-tailed Eagle	Spring 2019	47	1	80
Aquila audax	Wedge-tailed Eagle	Spring 2019	45	2	50
Aquila audax	Wedge-tailed Eagle	Spring 2019	45	1	30
Aquila audax	Wedge-tailed Eagle	Spring 2019	45	2	100
Eolophus roseicapilla	Galah	Spring 2019	26 and 27	2	30
Aquila audax	Wedge-tailed Eagle	Summer 2020	3	2	100
Corvus bennetti	Little Crow	Summer 2020	7	6	50
Corvus mellori	Little Raven	Summer 2020	9	1	30
Aquila audax	Wedge-tailed Eagle	Summer 2020	11	1	50
Eolophus roseicapilla	Galah	Summer 2020	15	2	100
Eolophus roseicapilla	Galah	Summer 2020	28	2	30
Aquila audax	Wedge-tailed Eagle	Summer 2020	38	2	100
Eolophus roseicapilla	Galah	Summer 2020	39	6	45
Corvus coronoides	Australian Raven	Summer 2020	42	2	50
Corvus coronoides	Australian Raven	Summer 2020	43	2	100
Aquila audax	Wedge-tailed Eagle	Autumn 2020	5	2	80
Corvus coronoides	Australian Raven	Autumn 2020	6	1	100
Petrochelidon nigricans	Tree Martin	Autumn 2020	26 and 27	1	40
Eolophus roseicapilla	Galah	Autumn 2020	39	2	80
Falco cenchroides	Nankeen Kestrel	Winter 2020	17	1	100
Falco cenchroides	Nankeen Kestrel	Winter 2020	25	1	80
Corvus coronoides	Australian Raven	Winter 2020	29	1	50
Eolophus roseicapilla	Galah	Winter 2020	38	1	100
Aquila audax	Wedge-tailed Eagle	Winter 2020	40	1	50
Corvus coronoides	Australian Raven	Winter 2020	45	4	80
Cacatua sanguinea	Little Corella	Winter 2020	46	6	30
Corvus coronoides	Australian Raven	Winter 2020	47	1	30

Appendix 4 Bat species tables

White-striped Freetail *Austronomus australis*													
Site	Habitat type	Site Type	Summer			Autumn			Winter			Spring		
			2016	2019	2020	2018	2019	2020	2017	2019	2020	2017	2018	2019
1A	MDF	Top Mast					42	2		52	8		3	18
1B	MDF	Bottom Mast				1	35	15		61	6		0	18
2A	MDF	Top Mast					10	6		2	1		0	
2B	MDF	Bottom Mast					2	8		9	1		1	
3A	MDF	Top Mast					22	1		26	8		0	
3B	MDF	Bottom Mast					8			22	4		0	
4	MDF	Impact				1	7	4		2	2		0	
5	MDF	Control					12	5		1	1		0	
6	MDF	Control					3	8	X				0	
7	MDF	Control					10	8		17	2		1	
8	MDF	Impact				1	10	3	X	7	1		1	
9	RRG	Control		1	1	1	37	266		22	6		24	40
10	RRG	Impact	1	12	3		566	967		233			56	4
11	RRG	Control		5			702	465		33	14		154	9
12	RRG	Impact		4	1		599	216		71			1	6
13	MRM	Control					2	2		2			317	2
14	MRM	Impact			3		51	504		31	1		231	2
15	MRM	Control					2	212		1	2		4	25
16	MRM	Impact		1		1	16	47		5	2		2	2
17	PG	Control				2	18	7		12	2		159	9
18	PG	Impact					13	7					60	2
19	PG	Control						13		2	2		138	4
20	PG	Impact						3		1	8		404	4

Gould's Wattled Bat *Chalinobolous gouldii*													
Site	Habitat type	Site Type	Summer			Autumn			Winter			Spring		
			2016	2019	2020	2018	2019	2020	2017	2019	2020	2017	2018	2019
1A	MDF	Top Mast				4		2		1			0	
1B	MDF	Bottom Mast				1		15				41	4	10
2A	MDF	Top Mast				3		2					0	
2B	MDF	Bottom Mast		7		1	2	8			2	19	20	
3A	MDF	Top Mast				3		1		1		7	5	
3B	MDF	Bottom Mast		7		1				4		10	11	
4	MDF	Impact		3	6	5		4				57	54	
5	MDF	Control		14	3	11		5		4		1	59	4
6	MDF	Control		52	40	12	1	8			1	4	66	11
7	MDF	Control		25	6	14	1	8		6	2	21	189	11
8	MDF	Impact		30	19	7	5	3		8	2	54	57	3
9	RRG	Control		616	423	231	38	266		55	34	118	679	11
10	RRG	Impact	X	415	72	418	20	967		130		21	26	5
11	RRG	Control	X	215	234		23	465		81	9	193	65	164
12	RRG	Impact		149	242	36	65	216		32		122	35	36
13	MRM	Control		4	5	3	1	2		10			12	
14	MRM	Impact		47	838	14	38	504		174	40		22	58
15	MRM	Control		12	25	8		212			12	67	0	
16	MRM	Impact		29	34	41	16	47		5	2	21	81	3
17	PG	Control		7	30	65	1	7		21	8	35	94	18
18	PG	Impact		5	5	1		7		2	4	34	7	0
19	PG	Control			7			13		5		102	5	3
20	PG	Impact				9		3		1	1	67	32	3

Little Pied Bat *Chalinobolus picatus*													
			Summer			Autumn			Winter			Spring		
Site	Habitat type	Site Type	2016	2019	2020	2018	2019	2020	2017	2019	2020	2017	2018	2019
1A	MDF	Top Mast												
1B	MDF	Bottom Mast												
2A	MDF	Top Mast												
2B	MDF	Bottom Mast												
3A	MDF	Top Mast												
3B	MDF	Bottom Mast												
4	MDF	Impact			1									
5	MDF	Control												
6	MDF	Control			1	3								
7	MDF	Control		1										
8	MDF	Impact											29	
9	RRG	Control			5	4				22	29	1		
10	RRG	Impact	1		6		6							
11	RRG	Control			2							2		
12	RRG	Impact												
13	MRM	Control												
14	MRM	Impact			2					2	1	1		
15	MRM	Control												
16	MRM	Impact			2			1						
17	PG	Control				1								
18	PG	Impact												
19	PG	Control												
20	PG	Impact												

Freetail Bats *Ozimops* sp.														
			Summer			Autumn			Winter			Spring		
Site	Habitat type	Site Type	2016	2019	2020	2018	2019	2020	2017	2019	2020	2017	2018	2019
1A	MDF	Top Mast						13		2	1	8	1	73
1B	MDF	Bottom Mast				2						33		93
2A	MDF	Top Mast										8		1
2B	MDF	Bottom Mast		1		4						33		0
3A	MDF	Top Mast				2		1		1		5		0
3B	MDF	Bottom Mast		1		3					1	13		15
4	MDF	Impact		4	5	17				1	2	35		103
5	MDF	Control		10	1	11	3				1			7
6	MDF	Control		27	15	13			X			18		34
7	MDF	Control		6	1	13				1	1	140		34
8	MDF	Impact		5	10	4	2		X	1		151		77
9	RRG	Control	X		109	188	108			4	45	74	499	80
10	RRG	Impact	X	139	18	284	34					25	226	38
11	RRG	Control	X	14	20		154				41	426	108	122
12	RRG	Impact	X	9	29	22	32			1		414	1	112
13	MRM	Control		4	11	21	1						36	13
14	MRM	Impact		43	284	14	183			172	30		89	70
15	MRM	Control		3	2	25	4			1	12	108		33
16	MRM	Impact		9	9	78	17			6		107	41	58
17	PG	Control		2	6	60						8	92	12
18	PG	Impact		1	2	2						5	5	6
19	PG	Control			1							8	8	2
20	PG	Impact				12						13	16	2

Long-eared Bats *Nyctophilus* sp.													
			Summer			Autumn			Winter			Spring		
Site	Habitat type	Site Type	2016	2019	2020	2018	2019	2020	2017	2019	2020	2017	2018	2019
1A	MDF	Top Mast												
1B	MDF	Bottom Mast					2	1				5	1	
2A	MDF	Top Mast												
2B	MDF	Bottom Mast				1					1	1	2	
3A	MDF	Top Mast												
3B	MDF	Bottom Mast					1				1		1	
4	MDF	Impact			1			4			1	3	7	
5	MDF	Control			1	1		3		1		10	4	
6	MDF	Control			120	30		1				3	7	1
7	MDF	Control				4	1			2	2	10	7	1
8	MDF	Impact			1	4	2				2	1		5
9	RRG	Control	X		141	64	30	59		41	5	10	144	15
10	RRG	Impact	X		6		1	5				93	6	
11	RRG	Control	X		12	16	9	20			5		5	
12	RRG	Impact	X		16	32	13	28		1		9	2	
13	MRM	Control					2	2			3	22	16	
14	MRM	Impact			39		2	1			4		39	
15	MRM	Control				1		2					6	
16	MRM	Impact			5	2		8			1	1	9	
17	PG	Control			2	2		1		3	6	2	2	
18	PG	Impact					2	3				1	37	
19	PG	Control						1				3	5	
20	PG	Impact				1		17				2	1	

Forest Bats *Vespadelus* sp.													
			Summer			Autumn			Winter			Spring		
Site	Habitat type	Site Type	2016	2019	2020	2018	2019	2020	2017	2019	2020	2017	2018	2019
1A	MDF	Top Mast												
1B	MDF	Bottom Mast												
2A	MDF	Top Mast												
2B	MDF	Bottom Mast									1			
3A	MDF	Top Mast												
3B	MDF	Bottom Mast					4							
4	MDF	Impact			1						1			
5	MDF	Control											2	
6	MDF	Control		3	4			2			6		1	4
7	MDF	Control		1				1			1		2	4
8	MDF	Impact						1						
9	RRG	Control	X	308	126		40	19		36	14		94	7
10	RRG	Impact		47	21		2	1		8			2	1
11	RRG	Control	X	220	20		10	2		25	2		55	29
12	RRG	Impact		250	36		82	1		39			52	18
13	MRM	Control			1		2			1			1	3
14	MRM	Impact		2	111		15	2		5	2		0	13
15	MRM	Control									1		13	
16	MRM	Impact			1		1	13			1		3	2
17	PG	Control						36						
18	PG	Impact												
19	PG	Control												
20	PG	Impact						1						

Yellow-bellied Sheathtail Bat *Saccolaimus flaviventris*														
			Summer			Autumn			Winter			Spring		
Site	Habitat type	Site Type	2016	2019	2020	2018	2019	2020	2017	2019	2020	2017	2018	2019
1A	MDF	Top Mast												
1B	MDF	Bottom Mast												1
2A	MDF	Top Mast												
2B	MDF	Bottom Mast												
3A	MDF	Top Mast												
3B	MDF	Bottom Mast												12
4	MDF	Impact												
5	MDF	Control												
6	MDF	Control												
7	MDF	Control												
8	MDF	Impact										1	6	4
9	RRG	Control											3	22
10	RRG	Impact				1							1	
11	RRG	Control	1											9
12	RRG	Impact										2	97	12
13	MRM	Control											4	
14	MRM	Impact											7	8
15	MRM	Control												
16	MRM	Impact											75	
17	PG	Control											35	
18	PG	Impact											0	3
19	PG	Control											52	
20	PG	Impact												

Little Broad-nosed Bat *Scotorepens greyii*													
			Summer			Autumn			Winter			Spring		
Site	Habitat type	Site Type	2016	2019	2020	2018	2019	2020	2017	2019	2020	2017	2018	2019
1A	MDF	Top Mast												
1B	MDF	Bottom Mast												
2A	MDF	Top Mast												
2B	MDF	Bottom Mast												
3A	MDF	Top Mast												
3B	MDF	Bottom Mast												
4	MDF	Impact												
5	MDF	Control												
6	MDF	Control				2								
7	MDF	Control												
8	MDF	Impact												45
9	RRG	Control		7	10	1						13		6
10	RRG	Impact		5			1							49
11	RRG	Control				3				5		2		4
12	RRG	Impact		15								6		
13	MRM	Control												2
14	MRM	Impact												2
15	MRM	Control												2
16	MRM	Impact				5								
17	PG	Control												
18	PG	Impact												
19	PG	Control												
20	PG	Impact												

Inland Broad-nosed Bat *Scotorepens Balstoni*													
			Summer			Autumn			Winter			Spring		
Site	Habitat type	Site Type	2016	2019	2020	2018	2019	2020	2017	2019	2020	2017	2018	2019
1A	MDF	Top Mast						1		1	1	2		
1B	MDF	Bottom Mast												2
2A	MDF	Top Mast												
2B	MDF	Bottom Mast				1						5		
3A	MDF	Top Mast								1				
3B	MDF	Bottom Mast										1		
4	MDF	Impact		2	4							1		
5	MDF	Control			1	1								2
6	MDF	Control			1									8
7	MDF	Control				2				2		7		8
8	MDF	Impact										4		9
9	RRG	Control			20	34				4	1	20	5	10
10	RRG	Impact			2	12				2		5	15	5
11	RRG	Control		13		29				5		48		85
12	RRG	Impact		27	10					2		49		66
13	MRM	Control										15	1	
14	MRM	Impact			48	1	3			49	27	9	5	8
15	MRM	Control				28								
16	MRM	Impact		3		9							2	3
17	PG	Control											10	5
18	PG	Impact											13	
19	PG	Control								2				1
20	PG	Impact				3							6	1

Appendix 5 Eagle nest photos

Plate 2 **Example of a Wedge-tailed Eagle nest determined to be abandoned based on the dilapitated appearance of the nest and inabilty to support an incubating adult and/or chick.**

Plate 3 **Example of a Wedge-tailed Eagle nest determined to be occupied based on its good condition, whitewash and presence of a flat top.**

Appendix 6 Dead or injured bird/bat datasheets

Appendix 2: Dead or injured bird / bat data sheet

This datasheet must be completed for every dead / injured bird or bat found during high- and general-intensity turbine mortality surveys. This datasheet should also be completed for any dead /injured bird or bar recorded incidentally (i.e. not during routine surveys).

Each dead bird or bat (including feather spots) must be removed upon discovery and placed into a clearly labelled plastic bag with the date, time, location (GPS coordinates) and turbine number, as required for species identification.

Date and location:				
Date: 13/11/18			Observer/s: MJ, CEP	
Time animal was found: 11:09				
Turbine ID: ~~69~~ 54			Easting/Northing of carcass:	
Detection:				
Survey method (circle):	*Dog search*	*Human search intensity* (circled)	*Incidental*	NOTE: turbine survey datasheet must also be completed.
Distance of carcass / injured animal from observer when first detected: 50m				
Describe ground visibility within a 1 m radius of where carcass / injured animal was found: Cleared hardstand				
Carcass / injured animal photographed? *Yes* (circled) / *No*			Photo and camera details (e.g. camera number, photo numbers, location of saved photos): 20181113_110912 MJ Phone. 20181113_110906	
Weather details at time of detection (please circle):				
Temperature: 27				
Precipitation: *Fine* (circled)	*Showers*	*Rain*		
Wind strength: *Calm*	*Breeze*	*Moderate* (circled)	*Strong*	
Wind direction: N		Cloud cover (%): 100		
Carcass / injured animal information and condition:				
Species (if unknown closest taxonomic group, e.g. raptor, bat):				
Age (circle): *Unknown* (circled)	*Adult*	*Juvenile*		
Sex (circle): *Unknown* (circled)	*Male*	*Female*		
Condition (circle): *Dead (carcass)* (circled)	*Injured but alive*	*Feather spot (≥ 10 feathers)*		
Degree of decay (circle): *Fresh* (circled)	*More than a week old*	*Very old or highly decayed*		

Describe location and type of any injuries evident: located on hardstand at T54, broken neck
Describe evidence of scavenging, if any: None
Notes / additional information:

Appendix 1: Turbine mortality survey data sheet

Survey details:			
Date: 6/5/2019		Observers: JF	
Start time: 13:10		Finish time: 13:30	
Turbine ID: T17			
Survey methodology (please tick):			
Dog ID			
Human observers Jules Farquhar			
Incidental (Any bird or bat turbine mortality observed outside a routine survey)			
Ground visibility (circle): (*High*) *Moderate* *Poor*			
Was entire search area covered? (*Yes*) / *No*	NOTE: If not, estimate area covered as a percentage (%) of total search area:		
Survey limitations (e.g. long grass, any areas that were inaccessible/not surveyed and why): —			
Weather details (please circle):			
Temperature: 21.5			
Precipitation: *Fine* *Showers* *Rain*			
Wind strength: *Calm* (*Breeze*) *Moderate* *Strong*			
Wind direction: S	Cloud cover (%): 0		
Turbine bird and bat mortality record:			
Dead/injured bird or bat recorded? (*Yes*) / *No*	If yes, record total number: 1	Bird and Bat carcass / injury datasheet completed? (*Yes*) / *No*	Photographs taken? (*Yes*) / *No*
Additional notes			

Appendix 2: Dead or injured bird / bat data sheet

This datasheet must be completed for every dead / injured bird or bat found during high- and general-intensity turbine mortality surveys. This datasheet should also be completed for any dead /injured bird or bar recorded incidentally (i.e. not during routine surveys).

Each dead bird or bat (including feather spots) must be removed upon discovery and placed into a clearly labelled plastic bag with the date, time, location (GPS coordinates) and turbine number, as required for species identification.

Date and location:				
Date: 6/5/2019			Observer/s: JF Jules Farquhar	
Time animal was found: 13:16				
Turbine ID: T17			Easting/Northing of carcass: Lat: -31.751846 Long: 141.313889	
Detection:				
Survey method (circle): *Dog search* (*Human search intensity*) *Incidental*			NOTE: turbine survey datasheet must also be completed.	
Distance of carcass / injured animal from observer when first detected: 2m				
Describe ground visibility within a 1 m radius of where carcass / injured animal was found: High – Moderate visibility; Rocky; undisturbed; open				
Carcass / injured animal photographed? (*Yes*) / *No*			Photo and camera details (e.g. camera number, photo numbers, location of saved photos): 5 Photos taken on JF Phone.	
Weather details at time of detection (please circle):				
Temperature: 21.5				
Precipitation: *Fine* *Showers* *Rain*				
Wind strength: *Calm* (*Breeze*) *Moderate* *Strong*				
Wind direction: S			Cloud cover (%): 0	
Carcass / injured animal information and condition:				
Species (if unknown closest taxonomic group, e.g. raptor, bat): Austronomus australis				
Age (circle): *Unknown* (*Adult*) *Juvenile*				
Sex (circle): *Unknown* (*Male*) *Female*				
Condition (circle): (*Dead (carcass)*) *Injured but alive* *Feather spot (≥ 10 feathers)*				
Degree of decay (circle): *Fresh* — *More than a week old* *Very old or highly decayed*				
Describe location and type of any injuries evident: Rocky undisturbed, away from hardstand, 36M from base of Turbine. on the ground, Fresh but with maggots.				

Appendix 1: Turbine mortality survey data sheet

Survey details:	
Date: 28/7/19	Observers: CP & Alana
Start time: 13:56	Finish time: 14:16
Turbine ID: 45	
Survey methodology (please tick):	
Dog ID	
Human observers ✓	
Incidental (Any bird or bat turbine mortality observed outside a routine survey)	
Ground visibility (circle): (*High*) *Moderate* *Poor*	
Was entire search area covered? (*Yes*) / *No*	NOTE: If not, estimate area covered as a percentage (%) of total search area:
Survey limitations (e.g. long grass, any areas that were inaccessible/not surveyed and why):	
Weather details (please circle):	
Temperature: 22°C	
Precipitation: (*Fine*) *Showers* *Rain*	
Wind strength: *Calm* (*Breeze*) *Moderate* *Strong*	
Wind direction: NE	Cloud cover (%): 80%.

Turbine bird and bat mortality record:			
Dead/injured bird or bat recorded? (*Yes*) / *No*	If yes, record total number: 1	Bird and Bat carcass / injury datasheet completed? (*Yes*) / *No*	Photographs taken? (*Yes*) / *No*

Additional notes White-striped freetail found directly under turbine on hard stand

Appendix 2: Dead or injured bird / bat data sheet

This datasheet must be completed for every dead / injured bird or bat found during high- and general-intensity turbine mortality surveys. This datasheet should also be completed for any dead /injured bird or bar recorded incidentally (i.e. not during routine surveys).

Each dead bird or bat (including feather spots) must be removed upon discovery and placed into a clearly labelled plastic bag with the date, time, location (GPS coordinates) and turbine number, as required for species identification.

Date and location:	
Date: 28/7/19	Observer/s: CP & Alana
Time animal was found: 14:14	
Turbine ID: 45	Easting/Northing of carcass: 54 050201 5827 6482043 6
Detection:	
Survey method (circle): *Dog search* (*Human search intensity*) *Incidental*	NOTE: turbine survey datasheet must also be completed.
Distance of carcass / injured animal from observer when first detected: 4 metres	
Describe ground visibility within a 1 m radius of where carcass / injured animal was found: Clear ground on hardstand. Highly visible	
Carcass / injured animal photographed? (*Yes*) / *No*	Photo and camera details (e.g. camera number, photo numbers, location of saved photos): Cam 1 photos: 1451 - 1455

Weather details at time of detection (please circle):			
Temperature: 22°C			
Precipitation: (*Fine*)	*Showers*	*Rain*	
Wind strength: *Calm*	(*Breeze*)	*Moderate*	*Strong*
Wind direction: NE		Cloud cover (%):	80%.

Carcass / injured animal information and condition:			
Species (if unknown closest taxonomic group, e.g. raptor, bat): White-striped freetail			
Age (circle): *Unknown*	(*Adult*)	*Juvenile*	
Sex (circle): *Unknown*	(*Male*)	*Female*	
Condition (circle): (*Dead (carcass)*)	*Injured but alive*	*Feather spot (≥ 10 feathers)*	
Degree of decay (circle): (*Fresh*)	*More than a week old*	*Very old or highly decayed*	

Describe location and type of any injuries evident: Hard stand
Describe evidence of scavenging, if any: NONE – ~~potential~~ small clots of dried blood on inside of wings.
Notes / additional information:
Area searched 3 days prior on 25/7/19 So died between 25-28/7/2019 • Still able to move arms.

Appendix 3. Carcass persistence trial: carcass deployment data sheet

This carcass deployment sheet must be completed for each turbine used in the scavenger trial.

Survey and turbine details:					
Date:				Observers:	
Time:					
Turbine ID:					
Ground visibility (circle): *High* *Moderate* *Poor*					
Description of ground visibility (e.g. grass height, rock cover):					
Carcass deployment record:					
Carcass type	Unique carcass identifier:	Direction from turbine base:	Distance from turbine base:	Easting / northing:	Notes:
Additional notes:					

SILVERTON WIND FARM

December 2019 Find Report (BBAMP carcass searches)

Background

Skylos Ecology Pty Ltd was engaged by GE Renewables Australia to take over the Silverton Wind farm BBAMP implementation in November 2019. Short monthly reports communicating any carcass search finds will be provided by Skylos Ecology, however after the first full year of environmental monitoring (July 2020) a full annual report will be written by our Principle Ecologist Emma Bennett (Elmoby Ecology) and submitted as per Silverton Wind farm BBAMP plan requirements. Subsequently, a final report will be submitted at the end of the 24 months of environmental monitoring (July 2021).

Summary

There was a total of three (3) finds in December 2019. All finds were recorded on pulse survey days, indicating a potential fresh strike with the turbine. Two of the finds were recorded outside of the survey area as prescribed in the BBAMP. Find SJ01 was detected 8 metres outside of the 70-metre radius, find SO01 was detected in a drop-off zone inside the 70 metres radius.

December 2019 Find Data

1.			
Find ID:	SJ01 (INCIDENTAL)	**Date:**	27 December 2019
Turbine:	7	**Carcass:**	Bird
Coordinates:	Longitude 141.301413970068097, Latitude -31.774143017828465	**Species:**	Australian Owlet-nightjar (*Aegotheles cristatus)*
Proximity to turbine:	78m	**Status:**	Least concern
Direction from turbine:	SE	**Weather:**	Very hot and sunny morning, 25 - 41 deg., winds NE-SE 15 - 20 km/h, chance of rain 30% <1mm
Comments:	Incidental find, dog detected outside the survey area by 8 metres. Carcass was covered in ants scavenging the remains.		

2.			
Find ID:	SO01 (INCIDENTAL)	**Date:**	28 December 2019
Turbine:	44	**Carcass:**	Bird
Coordinates:	Longitude 141.209676973521709, Latitude -31.789563959464431	**Species:**	Nankeen Kestrel (*Falco cenchroides)*
Proximity to turbine:	41m	**Status:**	Secure
Direction from turbine:	SE	**Weather:**	Hot. Partly cloudy. 29 - 40 deg., winds N - NW 20 - 30 km/h, chance of rain 70% 1 - 5mm
Comments:	Incidental find, dog detected outside the survey area in drop-off zone.		

3.			
Find ID:	SJ02	**Date:**	28 December 2019
Turbine:	32	**Carcass:**	Bat
Coordinates:	Longitude 141.235272958874702, Latitude -31.77960298955441214	**Species:**	TBC - Suspected Inland freetail bat (Mormopterus *(Ozimops) petersi)*
Proximity to turbine:	38m	**Status:**	Least concern
Direction from turbine:	NW	**Weather:**	Hot. Partly cloudy. 29 - 40 deg., winds N - NW 20 - 30 km/h, chance of rain 70% 1 - 5mm
Comments:	To date there has been three (3) reviews of this bat, initially by Skylos Ecology team members, followed by Emma Bennett (Principle Ecologist, Elmoby Ecology) and finally by bat specialist Anna Lloyd (NSW). All three parties are confident that the bat is likely to be an Mormopterus (Ozimops) petersi (Inland Freetail bat, Mormopterus species 3). However, according to our bat specialist it may also be a Mormopeerus (Setirostis) eleryi (Hairy-nosed or Bristle-faced Freetail). The species is listed in the BBAMP and is endangered. This would constitute as a trigger-level find. It may also be a Mormopterus (O) planicepts (Southeastern Freetail Bat), this bat is not listed in the BBAMP and is of least concern in its conservation status. Currently (as of Friday 24 January 2020) Skylos Ecology is waiting for callipers to arrive at our office from Anna Lloyd, this precise measuring tool should assist with further efforts to identify this individual. There have been limited measurements of Mormopterus species of bat on record. A key identifiable character of the Inland Freetail is the genitalia which is missing on the SJ02 specimen. If we are unable to provide further confidence with the species identification after further measurements, we will liaise with GE Renewable Australia to potentially seek assistance from the Australian Museum to gauge their interest in conducting a fourth and final review.		

December 2019 Find Photographs

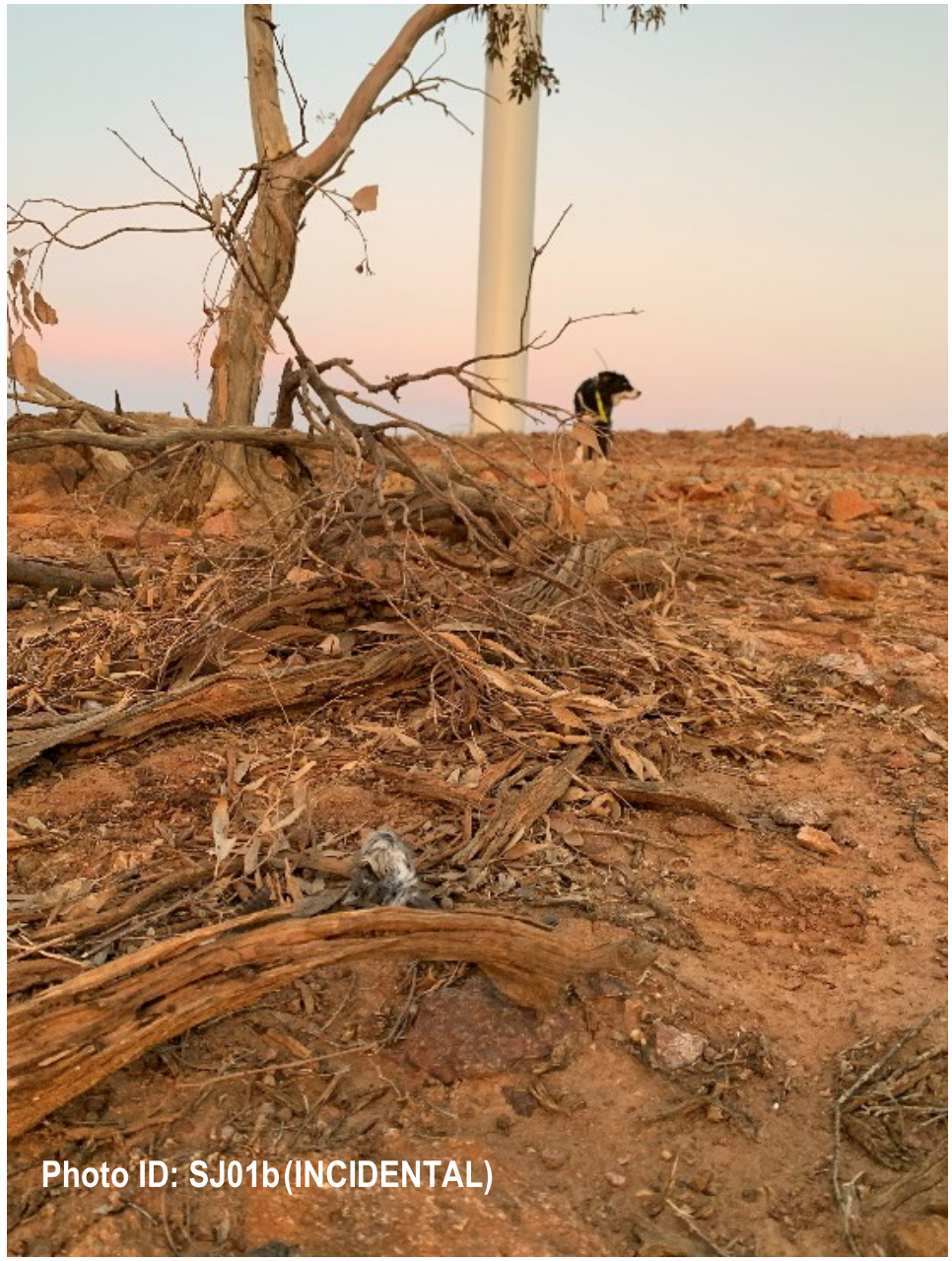

Photo ID: SO01a (INCIDENTAL)

Photo ID: SO01b (INCIDENTAL)

Photo ID: SJ02a

Photo ID: SJ02b

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SILVERTON WIND FARM

March 2020 Find Report (BBAMP carcass searches)

Background

Skylos Ecology Pty Ltd was engaged by GE Renewables Australia to take over the Silverton Wind farm BBAMP implementation in November 2019. Short monthly reports communicating any carcass search finds will be provided by Skylos Ecology, however after the first full year of environmental monitoring (November 2020) a full annual report will be written by our Principle Ecologist Emma Bennett (Elmoby Ecology) and submitted as per Silverton Wind farm BBAMP plan requirements. Subsequently, a final report will be submitted at the end of the 24 months of environmental monitoring (November 2021).

Summary

There was a total of one (1) find in March 2020. This find was recorded on a pulse survey day, indicating a potential fresh strike with the turbine. This find (SO02 INCIDENTAL) was located outside the survey area as prescribed in the BBAMP. The find was detected off the access track and 82 meters from turbine 35.

March 2020 Find Data

1.			
Find ID:	SO02 (INCIDENTAL)	Date and find time:	24 March 2020, 07:31
Turbine:	35	Carcass:	Bird
Coordinates:	Longitude 141.243815, Latitude -31.775943	Species:	Wedge-tailed eagle (*Aquila audax)*
Proximity to turbine:	82m	Status:	Secure
Directionfromturbine:	WSW	Weather:	Partly cloudy, 14 – 25 deg., winds SSE – S 16 – 21 km/h, chance of rain 50% <1mm.
Comments:	Incidental find, was detected outside the survey area by 12 metres and off from the access track.		

March 2020 Find Photographs

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SILVERTON WIND FARM

April 2020 Find Report (BBAMP carcass searches)

Background

Skylos Ecology Pty Ltd was engaged by GE Renewables Australia to take over the Silverton Wind farm BBAMP implementation in November 2019. Short monthly reports communicating any carcass search finds will be provided by Skylos Ecology, however after the first full year of environmental monitoring (November 2020) a full annual report will be written by our Principle Ecologist Emma Bennett (Elmoby Ecology) and submitted as per Silverton Wind farm BBAMP plan requirements. Subsequently, a final report will be submitted at the end of the 24 months of environmental monitoring (November 2021).

Summary

There was a total of two (2) finds in April 2020. Find SO03 was a Gould's Wattled bat found on a standard survey day within the survey area. Find SJ03 (INCIDENTAL) was also a Gould's Wattled, detected on a pulse survey day. SJ03 (INCIDENTAL) was recored 64 metres from the turbine, but approximately 8 metres west of the access road on rocky ground, as such it was located outside the survey area as prescribed in the BBAMP.

April 2020 Find Data

1.			
Find ID:	SO03	Date and find time:	13 April 2020, 11:17
Turbine:	24	Carcass:	Bat
Coordinates:	Longitude 141.313401, Latitude -31.733618	Species:	Gould's Wattled *(Chalinolobus gouldii)*
Proximity to turbine:	13m	Status:	Least concern
Direction from turbine:	W	Weather:	Mostly sunny, 7 - 23 deg., winds ENE - ESE 14 - 7 km/h, chance of rain 5% < 1mm
Comments:	Carcass was complete and whole, a recent strike. Male.		

2.			
Find ID:	SJ03 (INCIDENTAL)	Date and find time:	16 April 2020, 09:37
Turbine:	5	Carcass:	Bat
Coordinates:	Longitude 141.297132, Latitude -31.788039	Species:	Gould's Wattled *(Chalinolobus gouldii)*
Proximity to turbine:	64m	Status:	Least concern
Direction from turbine:	S	Weather:	Partly cloudy,19 -28 deg., winds NW - SW 26 - 23 km/h, chance of rain 10% <1mm
Comments:	Carcass was complete and whole, a recent strike. Male. Comments: Carcass was complete and whole, a recent strike. Male. Dog located carcass outside of the survey area as the bat was approximately 8 metres west from the southern access road on rocky terrain. Bat was within the 70 m radius of turbine base.		

April 2020 Find Photographs

April 2020 Find Photographs

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SILVERTON WINDFARM Incidental Find Sheet				
Survey details	**Collector**	Tracy Lyten	**Date**	08/05/2020
	Start time	N/A	**Finish time**	N/A
	Turbine identifier	32	**Location**	Hard stand
Vegetation	**Description**	Hard stand		
	Average height	N/A	**Density**	Graded stone
	Temperature	24 deg.	**Wind direction / speed**	N NW 15 to 25km/h
	Search purpose	Incidental find during set up of a carcass persistence trial.	**If scheduled, search completed**	Not scheduled
Carcass details	**Find ID**	ST01 (Incidental)		
	Find time	11:29am		
	Coordinates	S 31° 46.796 E 141° 14.139		
	Distance from tower	15 m	**Bearing from tower**	SE
	Species common name	White-striped free-tail	**Age / sex**	Unknown
	Photo taken	Yes (located in Dropbox “May 2020” folder)		
	Carcass condition	Fresh		
	Signs of injury	No obvious trauma		
	How old is the carcass estimated to be	Likely overnight as carcass was very fresh and rigor mortis had not set in.		
Comments	This was an incidental find during carcass persistence trial set up, it was not part of a standard or pulse survey. The bat was left in location upon request of Principle Ecologist Emma Bennett (Elmoby Ecology). All finds outside of scheduled survey times are to be left in situ to ensure data integrity through the data analysis processes. GPS point and photographs are taken and find details included in “incidental finds summary” sheet in survey excel. Highly likely (90%) to be a White-striped free-tail based on in field observations. Bat was no longer in situ by the standard survey day on 11/05/2020. Bat was likely scavenged during this time.			

SILVERTON WINDFARM Incidental Find Sheet				
Survey details	**Collector**	Fiona Jackson	**Date**	11/06/2020
	Start time	N/A	**Finish time**	N/A
	Turbine identifier	58	**Location**	Hard stand
Vegetation	**Description**	Hard stand		
	Average height	N/A	**Density**	Graded stone
	Temperature	18 deg.	**Wind direction / speed**	ESE 6-9km/h
	Search purpose	Incidental find whilst driving past turbine.	**If scheduled, search completed**	N/A
Carcass details	**Find ID**	SF01 (Incidental)		
	Find time	11:42		
	Coordinates	S 31°50.144' E 141° 14.258'		
	Distance from tower	55m	**Bearing from tower**	N/NE
	Species common name	White-striped free-tail	**Age / sex**	Unknown/Male
	Photo taken	Yes (located in Dropbox "June 2020" folder)		
	Carcass condition	Fresh		
	Signs of injury	Injury to neck (torn) and abrasion to back.		
	How old is the carcass estimated to be	Likely overnight as carcass was very fresh and rigor mortis had not set in.		
Comments	Bat was located within Turbine 58 survey area.			