

Hexham Wind Farm

Matters of National Environmental Significance Assessment

**Prepared for
Hexham Wind Farm Pty Ltd**

June 2022
Report No. 18088.16 (1.3)



**Nature
Advisory**

(Formerly Brett Lane & Associates Pty Ltd)

5/61-63 Camberwell Road
Hawthorn East, VIC 3123
PO Box 337, Camberwell VIC 3124
(03) 9815 2111
www.natureadvisory.com.au

Contents

1	Executive summary	1
1.1	Relevant Matters of National Environmental Significance.....	1
1.2	Significant impact assessment outcomes.....	2
2	Introduction.....	4
2.1	Overview or proposed action.....	4
2.2	Location of proposed action.....	5
3	Existing information and methods	7
3.1	Sources of information	7
3.2	Methodology of field assessments	8
3.2.1	Survey summary and timings.....	8
3.2.2	Flora and vegetation assessments.....	9
3.2.3	Fauna assessments.....	10
4	Assessment results and likelihood of occurrence	27
4.1	Site description	27
4.2	Listed flora species.....	27
4.3	Listed Ecological Communities	28
4.4	Listed fauna species.....	30
5	Significant impact assessment	32
5.1	Listed flora species.....	32
5.2	Listed ecological communities.....	32
5.3	Listed fauna species.....	38
5.3.1	Migratory Shorebirds.....	39
5.3.2	Migratory birds: White-throated Needletail and Fork-tailed Swift.....	43
5.3.3	Bats.....	45
5.3.4	Striped Legless Lizard.....	52
5.3.5	Growling Grass Frog.....	54
5.4	Implications under the EPBC Act.....	58
6	References.....	60

Tables

Table 1:	Matters of National Environmental Significance (MNES) screened for their occurrence in the Project site.....	1
Table 2:	Significant impact conclusion.....	2

Table 3: Project summary.....	5
Table 4: Date ranges, number of days and sites for each survey period.....	16
Table 5: Habitat descriptions of SongMeter sites during Spring 2018.....	17
Table 6: Habitat descriptions of Songmeter sites during Autumn 2019	18
Table 7: Avoid and minimisation of threatened ecological communities	32
Table 8: Significant impact criteria assessment for NTGVVP	35
Table 9: Significant impact criteria assessment for SHWTLP.....	36
Table 10: Assessment against MNES Significant Impact Criteria for migratory shorebirds.....	42
Table 11: Assessment of White-throated Needletail and Fork-tailed Swift against MNES Impact Criteria for migratory species.....	43
Table 12: Assessment of White-throated Needletail against MNES Impact Criteria for vulnerable species	44
Table 13: Assessment of Southern Bent-wing Bat against MNES Impact Criteria.....	49
Table 14: Assessment of Grey-headed Flying Fox against MNES Impact Criteria.....	51
Table 15: Avoid and minimise impacts in Striped Legless Lizard	52
Table 16: Assessment of Striped Legless Lizard against MNES Impact Criteria.....	54
Table 17: Avoid and minimise process to reduce potential impacts on Growling Grass Frog.....	55
Table 18: Assessment of Growling Grass Frog against MNES Impact Criteria.....	57

Figures

Figure 1. Location map	6
Figure 2: Location of Bird utilisation points.....	12
Figure 3: Wetlands assessed for migratory shorebird habitat.....	14
Figure 4: Bat survey sites 2010 – 2011, Golden Sun Moth Survey Locations (EHP 2014).....	19
Figure 5: Bat survey sites Spring 2018	20
Figure 6: Bat survey sites Summer/Autumn 2019.....	21
Figure 7: Fish survey locations.....	26
Figure 8: Listed flora and ecological communities recorded in the search region	29
Figure 9: Locations of listed fauna species within the search region	31
Figure 10: Avoid and minimise process of listed ecological communities	34
Figure 11: Mitigation measures to avoid impacts on migratory shorebirds	41
Figure 12: Mitigation measures for reducing potential impacts to SBB and GHFF	48
Figure 13: Mitigation measures to reduce the potential impacts on Striped Legless Lizard	53
Figure 14: Mitigation measures to reduce the potential impacts on Growling Grass Frog	56

Appendices

Appendix 1: EPBC Act listed flora species and likelihood of occurrence. 64

Appendix 2: EPBC Act listed ecological communities and likelihood of occurrence in the investigation area..... 66

Appendix 3: Listed fauna species from the search region and likelihood of occurrence in the investigation area..... 67

1 Executive summary

The Hexham Wind Farm (HWF) project covers approximately 16,000 hectares of land located between the Western Victoria localities of Hexham, Caramut, Ellerslie, Minjah and Woolsthorpe. The wind farm site is bound by the Hamilton Highway to the north, the Woolsthorpe-Hexham and Hexham-Ballangeich Roads to the east, Gordons Lane to the south and the Warrnambool-Caramut Road to the west. The proposed HWF site is referred to herein as the 'Project site'.

HWF proposes to install up to 108 wind turbines as well as onsite access tracks, turbine footings and hardstands for cranes, temporary construction facilities, overhead power lines, a terminal station, operations and maintenance facility, battery energy storage, underground cabling and wind monitoring masts. The feasibility of an onsite quarry will also be investigated.

Flora and fauna assessments were undertaken for HWF by Ecological and Heritage Partners Pty Ltd from 2010-2012 and Nature Advisory Pty Ltd from 2018 to 2022.

The wind farm site (Project site) and surrounding land supports agriculture, including dryland cropping and sheep and cattle grazing, with a relatively low density of associated residences. Widespread historical clearing of the Project site and surrounds for agriculture has resulted in native vegetation being largely restricted to roadside reserves and watercourses.

This assessment focusses on threatened species, ecological communities and migratory species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that are defined as Matters of National Environmental Significance (MNES) to support a referral under the EPBC Act. Any impact on these matters considered significant requires the approval of the Australian Minister for the Environment. The Minister will decide after 20 business days whether the project will be a 'Controlled Action' under the Act, in which case it cannot be undertaken without the approval of the Minister.

Vegetation proposed for removal at the wind farm site includes 4.977 hectares of native vegetation and four scattered trees. Threatened ecological communities listed under the EPBC Act proposed for removal includes 0.218 hectares *Natural Temperate Grassland of the Victorian Volcanic Plain* and 0.225 hectares of *Seasonal Herbaceous Wetland of the Temperate Lowland Plain*.

1.1 Relevant Matters of National Environmental Significance

As a result of Nature Advisory's review, the number of Matters of National Environmental Significance (MNES) with potential to occur on or near the Project site and screened for the possibility of a significant impact are given below in Table 1.

Table 1: Matters of National Environmental Significance (MNES) screened for their occurrence in the Project site.

MNES	VBA/Protected Matter Search Tool Results	Number assessed to potentially occur or known to occur following field surveys
Threatened Flora	4	0
Threatened Fauna	24	13
Ecological Communities	5	3

1.2 Significant impact assessment outcomes

This assessment found that the proposed action was not likely to have a significant impact on any MNES. Table 2 below summarises the significant impact assessment outcomes.

Table 2: Significant impact conclusion

MNES	Significant Impact Conclusion
Listed ecological community	<p>Assessment against the significant impact criteria for listed threatened communities found that a significant impact on <i>Natural Temperate Grassland of the Victorian Volcanic Plain</i> and <i>Seasonal Herbaceous Wetland of the Temperate Lowland Plain</i> would not result from the proposed action.</p>
Listed fauna species	<p>Migratory shorebirds</p> <p>Common Greenshank (EPBC Act: migratory)</p> <p>Common Sandpiper (EPBC Act: migratory)</p> <p>Curlew Sandpiper (EPBC Act: Critically Endangered, migratory)</p> <p>Double-banded Plover (EPBC Act: migratory)</p> <p>Latham’s Snipe (EPBC Act: migratory)</p> <p>Red-necked Stint (EPBC Act: migratory)</p> <p>Sharp-tailed Sandpiper (EPBC Act: migratory)</p> <p>The Project area does not have any important habitat for migratory shorebirds and therefore the proposed development is unlikely to pose a significant impact on any migratory shorebird populations.</p>
	<p>Fork-tailed Swift (EPBC Act: migratory)</p> <p>White-throated Needletail (EPBC Act: vulnerable and migratory)</p> <p>The Fork-tailed Swift and White-throated Needletail have the potential to occur over the Project site. There are few regional records to date. This low level of historical occurrence, coupled with the sub-optimal habitat on the site (primarily farmland with few forested areas), suggests the frequency of occurrence of these species over the site is likely to be low. Overall assessment of likelihood of significant impact was assessed as unlikely.</p>
	<p>Grey-headed Flying-fox (EPBC Act: vulnerable)</p> <p>A temporary camp has established itself in the past three years within four kilometres of the Project site. Numbers vary between 500 to 2,499 (Feb 2022) and 2,500 to 9,999 (August 2021) according to the National Flying-fox monitor viewer (DAWE 2022b). The species is attracted to the area when Sugar Gum are in flower and the camp is likely only used for a brief period of the year when their food source is in flower (Sugar Gum flower from January to March). Mitigation measures aimed at reducing potential impacts would include buffers from foraging habitat, a minimum blade tip height of 40 metres above the ground and the implementation of a Bird and Bat Adaptive Management Plan. Ongoing monitoring of the camp will be required.</p>

MNES	Significant Impact Conclusion
	<p>Southern Bet-wing Bat (EPBC Act: critically endangered)</p> <p>The Southern Bent-wing Bat has been recorded at the Project site from treed and wetland habitats along Mustons Creek. Mitigation measures aimed at reducing potential impacts would include buffers from foraging habitat, a minimum blade tip height of 40 metres above the ground and the implementation of a Bird and Bat Adaptive Management Plan. Overall assessment of likelihood of significant impact was assessed as unlikely.</p>
	<p>Striped Legless Lizard (EPBC Act: vulnerable)</p> <p>The Project is expected to result in a very small reduction of suitable habitat for this species. The loss of 1.767 hectares of suitable habitat would not be expected to have a significant impact on local populations.</p>
	<p>Growling Grass Frog (EPBC Act: vulnerable)</p> <p>The Project is expected to result in a temporary reduction of important habitat for this species. The loss of 0.364 hectares of Growling Grass Frog habitat is considered to be temporary during construction activities. Disturbance of potential habitat such as banks, channels and nearby vegetation through essential tracks will be minimised and habitat restored to pre-construction condition where possible. Once construction is complete and wind farm operational, it is expected that the Growling Grass Frog would continue to use areas of suitable habitat. This would not be expected to have a significant impact on populations that reside at the Project site.</p>

An EPBC Act Referral is being submitted in conjunction with this report. It is envisioned that the project will be a controlled action with respect to the Grey-headed Flying Fox due to the lack of information and further survey requirements to determine whether the project could have a significant impact on this species and which mitigation measures could avoid this.

2 Introduction

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects listed threatened species and ecological communities and migratory species that are defined as Matters of National Environmental Significance (MNES). Any impacts on these matters that has the potential to have a significant impact requires the approval of the Australian Minister for the Environment. If there is a possibility of a significant impact on MNES, a Referral under the EPBC Act should be submitted. The Minister will decide after 20 business days whether the project will be a 'Controlled Action' under the Act, in which case it cannot be undertaken without the approval of the Minister.

This report assesses the preliminary potential impacts of the proposed Hexham Wind Farm (HWF) on any MNES present or with the potential to occur on site.

The Project covers approximately 16,104 hectares and the development footprint covers an area of 421 hectares.

The Project includes wind turbines, onsite access tracks, turbine footings and hardstands for cranes, temporary construction facilities, overhead powerlines, a terminal station, operations and maintenance facility, battery energy storage, underground cabling and wind monitoring masts. The feasibility of an onsite quarry will also be investigated.

Several fauna and flora assessments have been carried out by Ecology & Heritage Partners and Nature Advisory from 2010 until 2022, compiled in a Flora and Fauna Report (Report 18088 (10.4) that was submitted as part of the Project's Environment Effects Statement referral in March 2022.

This report is divided into the following sections.

Section 3 describes the existing information, including a description and the location of the proposed action, and the field surveys undertaken to date.

Section 4 presents the assessment results, including likelihood of occurrence of MNES.

Section 5 includes a significant impact assessment for those MNES considered likely to occur.

This investigation was undertaken by a team from Nature Advisory comprising Guille Mayor (Ecologist), Nhung Thi Hong Nguyen (GIS Analyst), Curtis Doughty (Senior Zoologist) and Inga Kulik (Senior Ecologist and Project Manager).

2.1 Overview or proposed action

The project involves the construction of a 108-turbine windfarm and associated grid connection infrastructure as well as associated tracks, cables and ancillary facilities.

Table 3 provides the project summary.

Table 3: Project summary

Infrastructure	Current Design (approximate dimensions)
Turbine dimensions	The turbine envelope proposed includes: <ul style="list-style-type: none"> ▪ Overall maximum tip height of up to 250 m ▪ Rotor diameter is up to 190 m ▪ Minimum tip height 40 m
On-site quarry	To be investigated post EPBC referral
Onsite access tracks	120 km of gravel access track. A 12 m wide disturbance area has been applied to the tracks within areas of native vegetation
Turbine Footings and Crane Hardstand and Assembly areas	Turbine footings 27 m x 27 m and crane hardstands and assembly areas 50 m x 60 m
Temporary Construction Facilities	<ul style="list-style-type: none"> ▪ Batching Plant (50 m x 100 m) ▪ Construction compound (200 m x 200 m) ▪ Storage/Laydown areas 300 m x 15 m
Internal overhead power Line	A 10m wide disturbance footprint has been applied. No external powerlines line will be required
Terminal station	22 ha
Operations and Maintenance Facility	100 m x 100 m
Battery storage	Approximately 2 ha
On-site cabling	Approximately 135 km of underground cabling with a 5 m wide work area
Wind Monitoring Masts	Up to five wind monitoring masts, each up to 170 m high

2.2 Location of proposed action

The locations of the Project is shown in Figure 1.

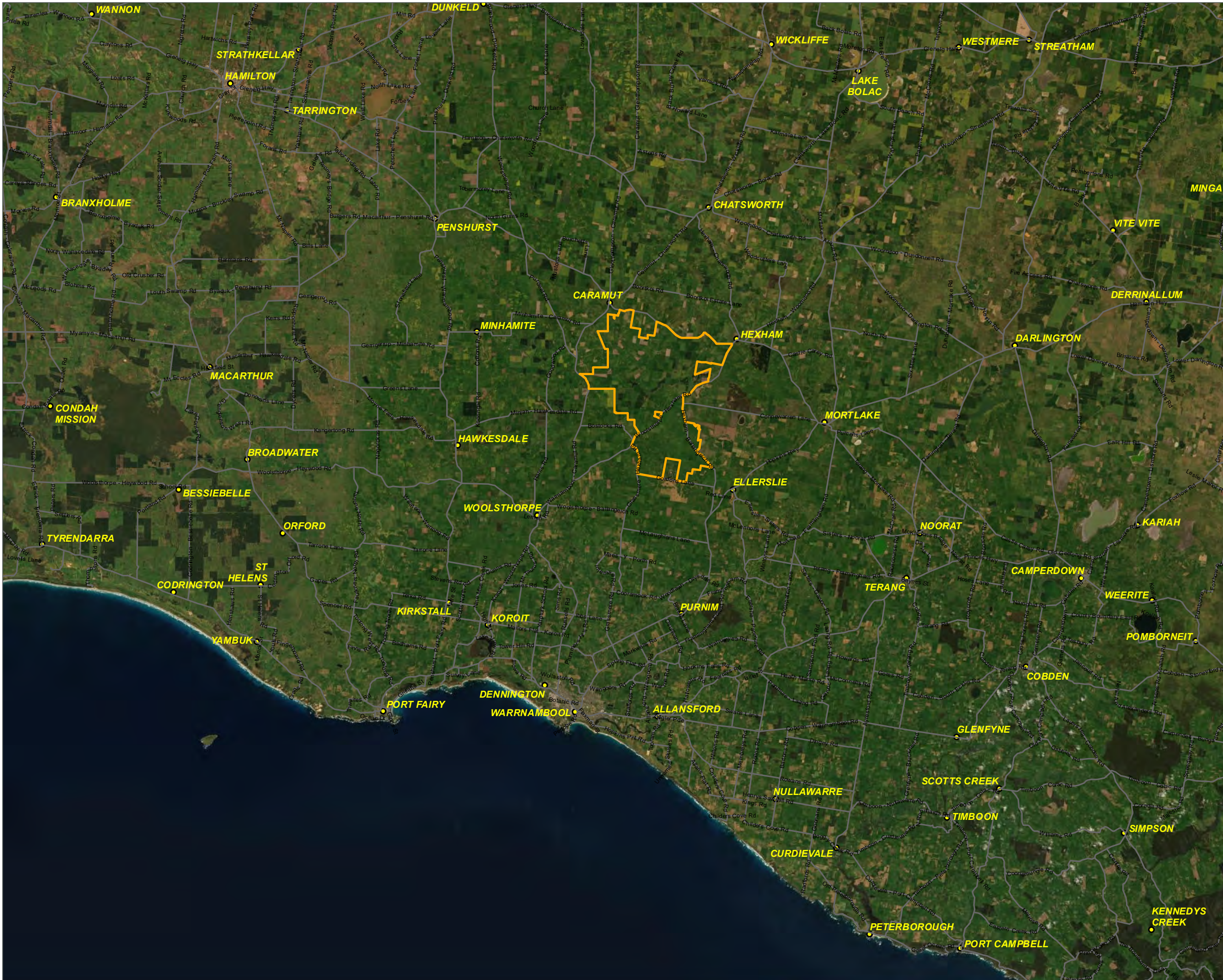

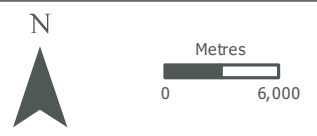


Figure 1: Location of Hexham Wind Farm

Project: Hexham Wind Farm
Client: Wind Prospect Pty Ltd
Date: 23/05/2022

 Wind farm boundary



PO Box 337, Camberwell, VIC 3124, Australia
www.natureadvisory.com.au
 03 9815 2111 - info@natureadvisory.com.au

3 Existing information and methods

Existing information used for this investigation is described below.

3.1 Sources of information

In addition to the assessments above, relevant information has been obtained from the following:

- Onshore Wind Farm – Interim guidance on bird and bat management, provided by the Commonwealth Department of Agriculture Water and the Environment (DAWE);
- Hexham Wind Farm – Detailed Flora and Fauna Investigations. Prepared for Hexham Wind Farm Pty Ltd (EHP 2014);
- Hexham Wind Farm – Flora and Fauna Assessment. Prepared for Hexham Wind Farm Pty Ltd (Nature Advisory 2022);
- Australian Wind Energy Association (AusWEA) 2005, *Wind Farms and Birds: Interim Standards for Risk Assessment*, Australian Wind Energy Association, Melbourne;
- Best Practice Guidelines for Wind Energy Developments in Australia (CEC 2018);
- Development of Wind Energy Facilities in Victoria – Policy and Planning Guidelines (DELWP 2021a);
- Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species (DoEE 2017);
- DSE’s Biodiversity Precinct Planning Kit (DSE 2010);
- Matters of National environmental Significance – Significant impact guidelines (DoE 2013);
- Victorian Biodiversity Atlas administered by the Department of Environment, Land, Water and Planning (DELWP 2022);
- Birddata administered by Birdlife Australia (Birdlife 2019);
- Dundonnell Wind Farm Flora and Fauna Assessment. Prepared for Trustpower Australia Pty Ltd. Report number 9184 (5.15) (BL&A 2015).
- Mount Fyans Wind Farm: Targeted flora and fauna survey report. Report for Hydro Tasmania. Authors: Gibson, M., Arber, S., Thomas, G. & Cable, T., Byrne, A., Venosta, M. & Sofo, K. Biosis Pty Ltd, Ballarat. Project no. 14369 (Biosis 2018);
- The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* Protected Matters Search Tool (DAWE 2022a);
- The Commonwealth National Flying-fox monitoring viewer (DAWE 2022b); and
- DELWP’s Native Vegetation Information Management system (NVIM) (DELWP 2021b).

Existing flora and fauna species records and information about the potential occurrence of listed matters was obtained from an area termed the ‘search region’, defined here as an area within a ten-kilometre radius of the Project site boundary.

A list of the flora and fauna species recorded in the search region was obtained from the *Victorian Biodiversity Atlas* (VBA), a database administered by DELWP (2022).

A list of bird species recorded in the search region was obtained from Birdlife Australia (Birdlife 2019).

The online EPBC Act *Protected Matters Search Tool* (DAWE 2022a) was consulted to determine whether nationally listed species or communities potentially occurred in the search region based on habitat modelling.

3.2 Methodology of field assessments

3.2.1 Survey summary and timings

A summary of the field assessments conducted to date and their timing is found in Table 4 below.

Table 4: Surveys completed (to February 2022)

Survey – field assessment	Date
Flora and vegetation assessments	
Targeted flora surveys and Net Gain Assessment (EHP)	<ul style="list-style-type: none"> ▪ 7-10 June 2011 ▪ 2-4 November 2011 ▪ 7-9 November 2011 ▪ 5-9 December 2011
Native vegetation Assessments	<ul style="list-style-type: none"> ▪ 13-28 November 2018 ▪ 8-11 November 2021
Targeted surveys for threatened ecological communities and listed flora species	<ul style="list-style-type: none"> ▪ 28-30 November 2018 ▪ 10-11 January 2019 ▪ 22-25 November 2021
Bird studies	
Bird utilisation surveys	<ul style="list-style-type: none"> ▪ 28 November – 2 December 2011 ▪ 20–22 February 2012 ▪ 29 October – 2 November 2018 ▪ 4 – 8 March 2019
Migratory water bird habitat assessment and targeted surveys	<ul style="list-style-type: none"> ▪ 18–20 December 2018 ▪ 9–11 January 2019 ▪ 30–31 January 2019 ▪ 26–28 February 2019 ▪ 27–29 February 2019
Bat studies	
Bat surveys – general and targeted Southern Bent-wing Bat Grey-Headed Flying Fox (GHFF)	<ul style="list-style-type: none"> ▪ 21 October– 23 November 2010 ▪ 10 February – 31 March 2011 ▪ 25 October – 18 December 2018 ▪ 5 February – 25 April 2019 ▪ 18 February 2020 – 1 May 2020 ▪ 14-16 February 2022 (GHFF targeted surveys) ▪ 23 March 2022 (GHFF targeted survey).

Survey – field assessment	Date
Reptile and mammal studies	
Striped legless Lizard and Fat-tailed Dunnart habitat assessment	<ul style="list-style-type: none"> ▪ 28 November – 2 December 2011 ▪ 20-22 February 2012
Aquatic fauna studies	
Growling Grass Frog habitat assessment	<ul style="list-style-type: none"> ▪ 21-24 November 2011 ▪ 13-28 November 2018
Aquatic surveys (fish)	<ul style="list-style-type: none"> ▪ 21-24 November 2011
Invertebrate studies	
Golden Sun Moth Surveys	<ul style="list-style-type: none"> ▪ 16, 19 December 2011 ▪ 6 January 2012

The findings of Nature Advisory's field assessments are documented in *Hexham Wind Farm - Flora and Fauna Assessment*, Report No. 18088 (10.4) (Nature Advisory 2022).

3.2.2 Flora and vegetation assessments

3.2.2.1 Native vegetation assessment 2018-2021

The native vegetation assessment was conducted from the 13th to 28th November 2018 for the initial development footprint. Additional native vegetation assessments for the current development footprint were undertaken from 8th to 11th November 2021. During each of these assessments, the investigation area (being the development footprint provided at the time of survey) was surveyed initially by vehicle and areas supporting native vegetation were inspected in more detail on foot.

Sites in the investigation area found to support native vegetation or with potential to support listed matters were mapped through a combination of aerial photograph interpretation and ground-truthing using a hand-held GPS (accurate to approximately five metres). Species and ecological communities listed as threatened under the EPBC Act were also mapped using the same method.

The potential for habitats to support listed flora species were assessed based on the criteria outlined below:

- The presence of suitable habitat for flora species such as soil type, floristic associations and landscape context; and
- The level of disturbance of suitable habitats by anthropogenic disturbances and invasions by pest plants and animals.

Wherever appropriate, a precautionary approach was adopted in determining the likelihood of occurrence or flora listed under the EPBC Act. That is, where insufficient evidence was available on the potential occurrence of a listed species, it is assumed that it could be in an area of suitable habitat.

3.2.2.2 Threatened ecological communities

The investigation area was assessed against published descriptions of relevant listed ecological communities modelled to potentially occur in the investigation area.

Reviewed ecological community descriptions comprised identification criteria and condition thresholds from listing advice for EPBC Act communities.

3.2.2.3 Targeted flora survey

Based on the results of the vegetation assessments, it was determined that four flora species listed under the EPBC Act had the potential to occur within areas of suitable habitat in the development footprint. These species were:

- Adamson's Blown-grass (*Lachnagrostis adamsonii*) EPBC Act: endangered
- Clover Glycine (*Glycine latrobeana*), EPBC Act: vulnerable
- Trailing Hop-bush (*Dodonaea procumbens*), EPBC Act: vulnerable
- White Sunray (*Leucochrysum albicans* subsp. *tricolor*), EPBC Act: endangered.

Targeted surveying for these four threatened flora species was undertaken across three separate site surveys (November 2018, January 2019 and November 2021) to coincide with the published flowering times for the target species. Targeted surveying for threatened flora was undertaken only in parts of the investigation area where native vegetation supporting suitable habitat for those species was proposed to be removed (i.e. where native vegetation supporting suitable habitat intersected with the proposed development footprint). As such, most areas included in the targeted surveys were small/linear/narrow bands of habitat, allowing very thorough visual searching of these areas to be undertaken.

This method, combined with the timing of the surveys (within the published flowering times of all species) was considered appropriate to determine whether the targeted species were present or absent in the impact areas.

Table 5 of this report outlines the areas of habitat assessed during each of the three targeted flora surveys.

These targeted surveys for threatened flora were conducted as described below.

- November targeted flora surveys (targeting spring flowering species namely Adamson's Blown-grass, Clover Glycine, and White Sunray): 28th to 30th November 2018 and 22nd to 25th November 2021. During these assessments, the following areas were surveyed:
 - All areas of proposed removal of Plains Grassy Wetland (EVC 125);
 - All areas of proposed removal of Plains Grassy Woodland (EVC 55_61 and 55_63) that supported a native ground layer; and
 - All areas of proposed removal of *Heavier-soils* Plains Grassland (EVC 132_61).
- January targeted flora survey (targeting Trailing Hop-bush): 10th and 11th January 2019. During this assessment, the following areas were surveyed:
 - Areas of proposed removal of Plains Grassy Woodland (EVC 55_61 and EVC 55_63) that supported a native ground layer; and
 - Areas of proposed removal of *Heavier-soils* Plains Grassland (EVC 132_61) with sufficient species and structural diversity to support Trailing Hop-bush.

All the above detailed targeted surveying for threatened flora involved visual searching on foot by qualified and experienced botanists along transects spaced 5 metres apart. Where any threatened flora species was observed, its location was recorded using a handheld GPS.

3.2.3 Fauna assessments

Several fauna assessments have been undertaken in the Project site. Early surveys were undertaken by Ecology & Heritage Partners Pty Ltd (EHP 2014) from 2011 to 2012 then by Nature Advisory Pty Ltd from 2018 onwards. Fauna assessments undertaken at the Project site are listed below with a summary of the methods used.

3.2.3.1 Bird utilisation survey

Bird utilisation surveys (BUS) were undertaken across the Project site using a fixed-point bird count method to characterise the use of the Project site by the region's avifauna. Habitat assessments and roaming surveys were also undertaken across the Project site. These surveys were undertaken on the dates listed below.

- 28th November – 2nd December 2011
- 20th – 22nd February 2012
- 29th October – 2nd November 2018
- 4th March – 8th March 2019.

During the surveys, eight counts were made at each of the eight-survey point. The schedule ensured that all points were visited at all times of day so that no time-of-day bird activity biases affected the pooled count data.

The fixed-point bird count method used to collect bird utilisation data involved an observer stationed at a survey point for 15 minutes. The adequacy of using 15 minutes as an interval to record the presence of birds during bird utilisation surveys was investigated in an earlier study at another wind farm site (BL&A, unpublished data). This showed that 82 to 100 percent (average 88 percent) of species actually seen in one hour of surveying were seen in the initial 15 minutes of observation.

During this period, all birds observed within 200 metres were recorded. The species, the number of birds and the height of the bird when first observed were documented.

For the purpose of this report, flight height relative to the rotor swept area (RSA) height is presented as described below. These heights were based on an assumed turbine height of up to 250 metres with a diameter of the turbine blades of 150 metres.

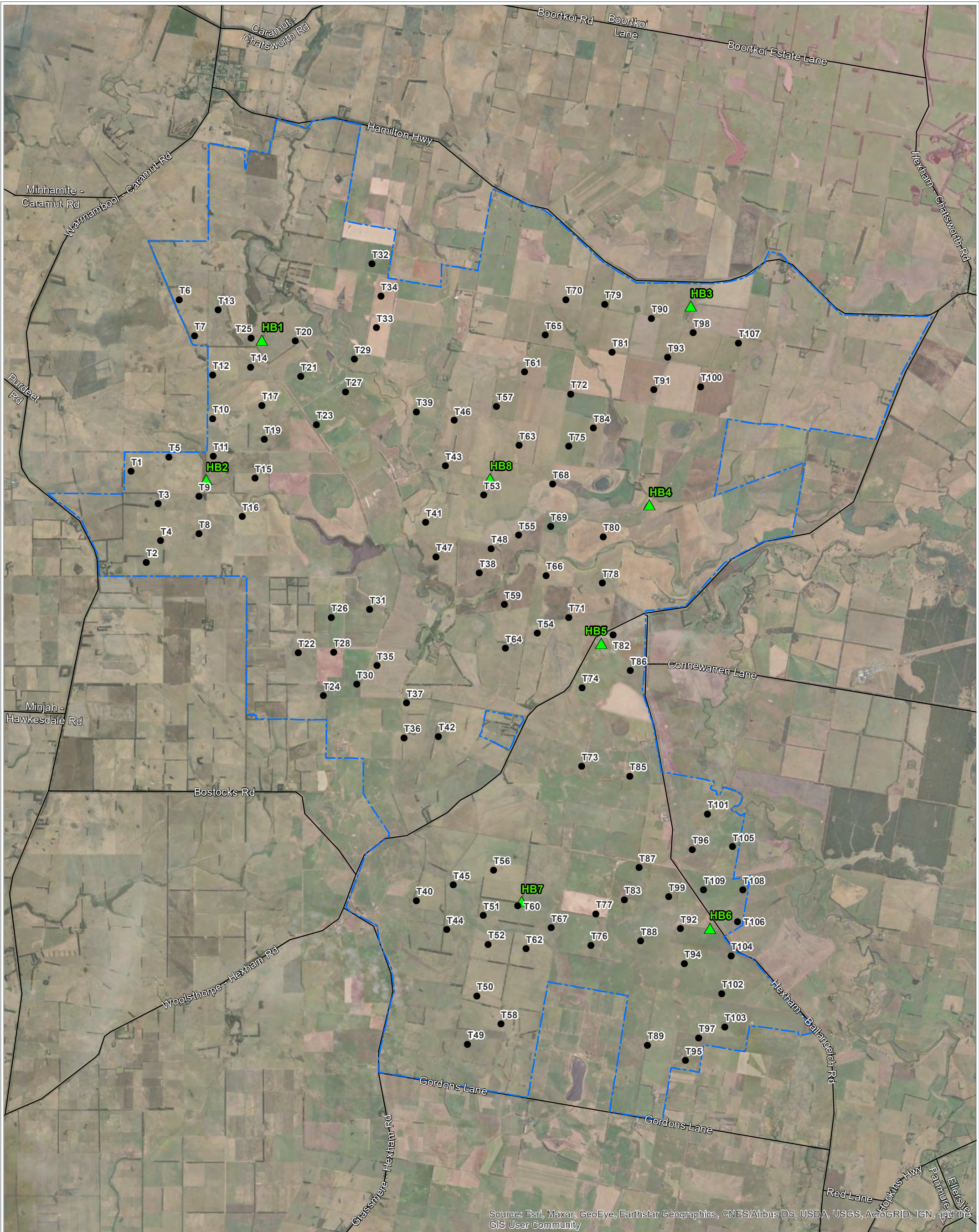
- **A** = Below RSA (< 40 metres above ground)
- **B** = At RSA (40 – 250 metres above ground)
- **C** = Above RSA (> 250 metres above ground)

During the BUS, heights were measured at 10 metres intervals between 0 and 60 metres and at 20 metres intervals between 60 and 100 metres and above 100 metres for those flying over the latter height. This allowed for a more precise description of bird flight heights.

Eight fixed survey points were established during both the spring and summer surveys. Survey points were located near and between proposed turbine locations.

The survey points were selected to ensure the sites were suitable (i.e. positioned on elevated ground where possible, allowing a clear view in all directions). Survey points were distributed as evenly as possible (subject to access constraints) across the Project site to maximise coverage in areas where wind turbines would be located (Figure 2).

In addition to the observations during formalised fixed-point counts, observations (if any) of threatened species and raptors made incidentally while moving across the Project site were also recorded (observations outside the formal BUS count). Emphasis was placed on observing birds that were moving through the Project site at RSA height or those crossing the Project footprint.

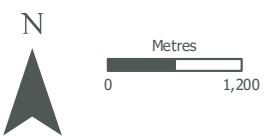


Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 2: Location of Bird Utilisation Survey points

Project: Hexham Wind Farm **Client:** Wind Prospect Pty Ltd **Date:** 14/12/2021

- - - - - Wind farm boundary
- ▲ BUS points



PO Box 337, Camberwell, VIC 3124, Australia
 www.natureadvisory.com.au
 03 9815 2111 - info@natureadvisory.com.au

3.2.3.2 Migratory bird survey

Wetlands in the Project site and surrounding areas were visited during spring and summer, and wetlands were assessed for suitable foraging habitat for migratory shorebirds in accordance with the EPBC Act survey guidelines for migratory species (DoEE 2015). Surveys were undertaken on the dates listed below.

- 18th – 20th December 2018
- 9th – 11th January 2019
- 30th – 31st January 2019
- 26th – 28th February 2019
- 27th – 29th February 2019.

An aquatic fauna habitat assessment was undertaken to assess the location and extent of suitable habitat for migratory species. The habitat assessment considered the characteristics of wetlands and waterways and whether they meet the habitat requirements. Wetlands within three kilometres of the Project site boundary were assessed to determine the status of their habitats and values.

Wetlands listed under the Victorian Wetland Index (VWI) and other wetlands and waterways identified within three kilometres of the Project site were assessed. At each wetland site, the vegetation type, structure and habitat quality, and amount and quality of water (temporary or permanent) were examined.

Wetlands listed under the VWI were visited and notes on habitat were recorded. Wetlands were considered potential habitat for migratory shorebird species and divided into low, medium and medium-high quality if they had the following:

- Habitat for most of these shorebird species, which is characterised by open, shallow wetlands (fresh or saline) with banks with shallow gradients and with no vegetation and open shorelines, or at most a shallow cover of aquatic herbs; or
- Habitat for Latham's Snipe, which comprises more heavily-vegetated, freshwater wetlands (e.g. comprising Water Ribbons *Triglochin procera*, Dock *Rumex* spp., Water Buttons *Cotula* sp., sedges and rushes), usually with soft muddy substrate and nearby dense vegetation (can include Austral Bracken *Pteridium esculentum* or dense heath, e.g. *Melaleuca* spp. or *Leptospermum* spp.).

Creek lines (i.e. Mustons Creek and Drysdale Creek) were also inspected for the presence of Latham's Snipe, as this species may use these narrow corridors for foraging or roosting in nearby areas of dense vegetation.

Surveys were undertaken by examining all possible and suitable wetlands within the Project site and within 3 km of the Project site boundary (Figure 3). Whenever habitat was visited, a detailed search was made using 10x binoculars and 20-60x telescope for migratory shorebirds. All listed migratory birds encountered were identified and the number of individuals were counted.

Five surveys were undertaken and each survey was for a duration of two days. Each wetland was visited at least once, and those suspected of or found to support migratory birds were visited more than once.

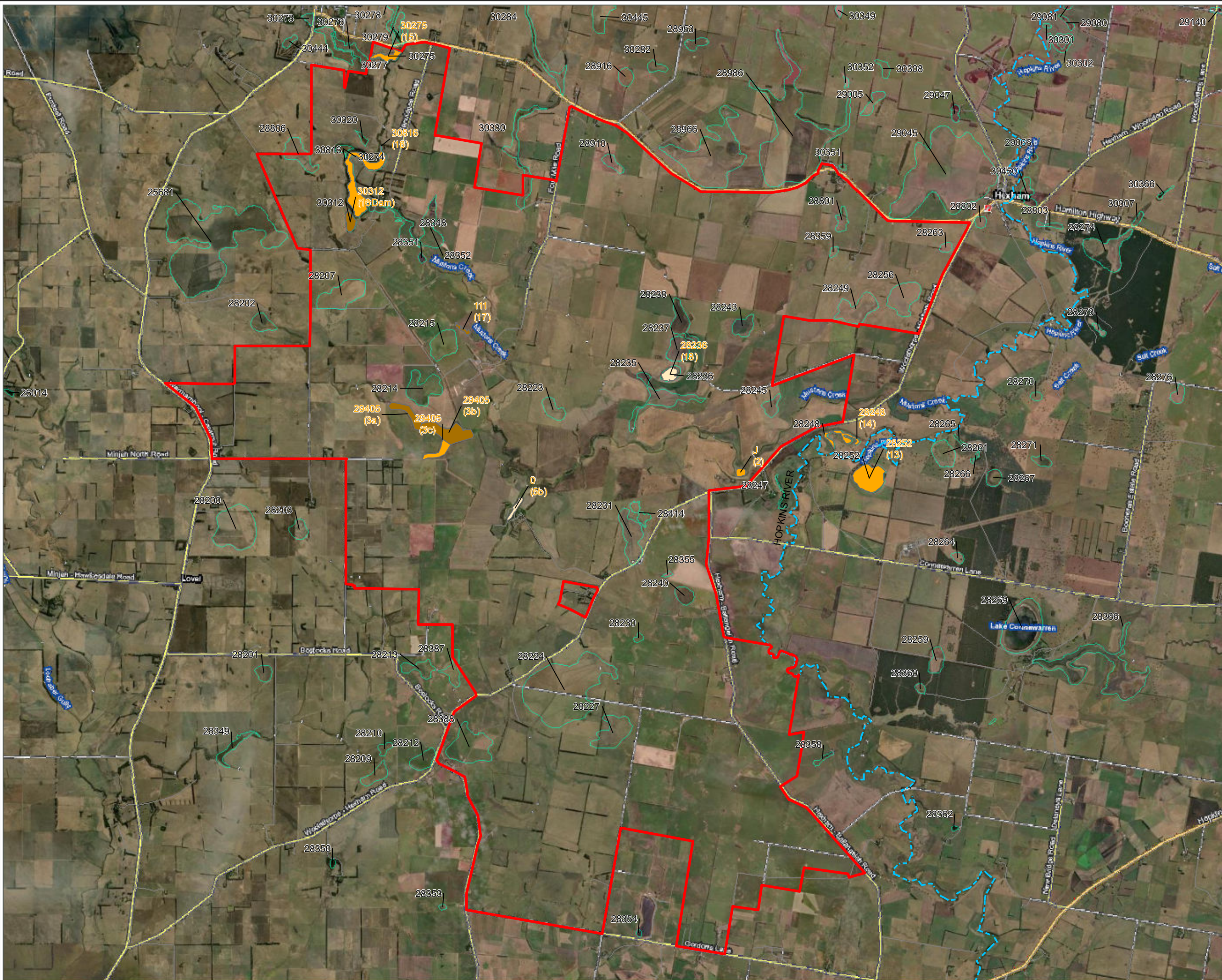
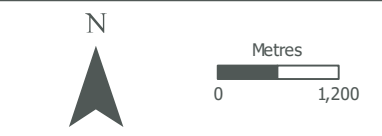


Figure 3: Wetlands assessed for migratory shorebird habitat

Project: Hexham Wind Farm
Client: Wind Prospect Pty Ltd
Date: 5/01/2022

- ▭ Wind farm boundary
- Habitat quality (with wetland number labelled)**
- ▭ Medium high
- ▭ Medium
- ▭ Low
- ▭ DELWP wetlands



18008 - Created by: ef - \\Nat-haw-rd-4\egis\2018\Jobs\18008\18008_6 Migratory shorebird_211214.mxd

3.2.3.3 Bat surveys

Microbats

Bat surveys were undertaken using ultrasonic bat detectors deployed remotely and recording the calls of bats that passed by them. Surveys were undertaken across the Project site and immediately adjacent areas in a range of habitat types representative of the Project site. Earlier surveys undertaken by EHP extended further to the east including areas that are now outside the wind farm boundary. The aim was to determine the location and levels of activity of the threatened bat species, such as the Southern Bent-wing Bat, listed as Critically Endangered under the EPBC Act. Surveys were undertaken during the periods listed below.

- 21st October – 23rd November 2010
- 10th February – 31st March 2011
- 25th October – 18th December 2018
- 5th February – 25th April 2019
- 18th February 2020 – 1st May 2020.

Detectors were deployed across the Project site to determine the spatial distribution of bats utilising the Project site and specifically to detect movements of Southern Bent-wing Bat across the Project site. The surveys were intended to provide data on the composition of the general microbat community within the Project site as well as resolving the status and distribution of the Southern Bent-wing Bat on and near the site. The survey effort in 2019 was developed in consultation with DELWP and implemented by the proponent. A total of over 3,776 detector nights of survey were undertaken seasonally in five out of 11 years, significantly more than historically required for impact assessment other proposed wind farm sites in Victoria.

Best-practice survey techniques were deployed in an effort to detect which bat species occur across the Project site. Ultrasonic detectors that detect and record echo-location calls emitted by micro-bat species were deployed to identify, through expert opinion, the species of bats occurring at the Project site and areas further to the east.

During the 2010–2011 survey period, Anabat detector units were deployed and in the 2018-2019 surveys, more advanced SongMeter (SM4 and SM2) detectors were deployed which had since become available. During the spring 2010 and the spring 2018 surveys all bat call data were analysed to determine every species present on site. During the summer/autumn 2011 and summer/autumn 2019, due to the volume of information collected and to provide a focus on species more likely to be significantly impacted, only the calls of threatened bat species and species complexes potentially including threatened bat species were analysed in detail. Species complexes comprise calls that cannot accurately be attributed to one species and may be from one of a number of species, because of similar call frequency range.

An increased survey effort was undertaken in summer-autumn 2019 and from February 2019 – May 2020 in response to recommendations from DELWP (Barwon, SW). This reflected current and evolving best practice survey methodology to build upon the previous survey efforts undertaken a decade prior. The recent surveys also sought to target a wider range of areas and habitats across the site, as opposed to only suitable habitats where, for example, threatened species may occur. This approach aimed to gain a complete understanding of bat usage across the Project site and where turbines are proposed, including areas of relatively poor habitat.

The survey effort and timeframes are described below (Table 4).

Table 4: Date ranges, number of days and sites for each survey period

Survey Period	No. of nights	No. of sites	Total detector nights
Spring 2010 21 Oct – 23 Nov	33	31	382
Summer/Autumn 2011 10 Feb – 31 Mar	49	18	413
Spring 2018 25 Oct – 18 Dec	54	19	385
Summer/Autumn 2019 5 Feb – 25 Apr	79	19	1,560
Summer/Autumn 2020 18 Feb – 1 May	74	14	1,036
Total			3,776

The 2010-2011 surveys were undertaken at the proposed wind farm by Ecology and Heritage Partners (EHP) during October–November (spring) 2010 and February–March (autumn) 2011 (EHP 2014). Records were made from 32 locations (sites) in the spring and from 15 locations during the autumn survey using Anabat detectors, some of which extended into an area further to the east near Hopkins River which is now outside the Project site. These locations were based on an older project boundary. The timing of the surveys was chosen to coincide with migration period of the threatened Southern Bent-wing Bat. For survey locations refer to Figure 4.

The detectors used during 2018-2020 surveys undertaken by Nature Advisory were SongMeter 4 (SM4BAT ZC), except for four detectors which were SongMeter 2 (SM2+). Detectors were programmed to commence operation approximately 30 minutes before dusk, and to cease approximately 30 minutes after dawn. Each SongMeter unit used a 64GB SDHC card that recorded bat echolocation calls, along with the date and time of each call. Batteries and storage cards were changed in each unit at approximate monthly intervals to maintain consistent recordings.

A habitat description was noted at each site where each SongMeter was deployed for all Nature Advisory surveys. Table 5 and Table 6 below present the habitat descriptions and the proximity of the SongMeters to treed habitat and permanent waterbodies for the spring 2018 and summer/autumn 2019 survey periods. Locations of surveys sites are shown in Figure 5 and Figure 6.

Summer/autumn 2020 surveys entailed a more specific approach to understanding threatened species present based on habitat preferences and usage. Survey aims and methods are described in more detail separately in the Nature Advisory Flora and Fauna report (18088 (10.4)).

In addition, as desktop assessment was undertaken based on existing information to determine existing roosting caves for the Southern Bent-wing Bat within 70 km of the Project site.

Table 5: Habitat descriptions of SongMeter sites during Spring 2018

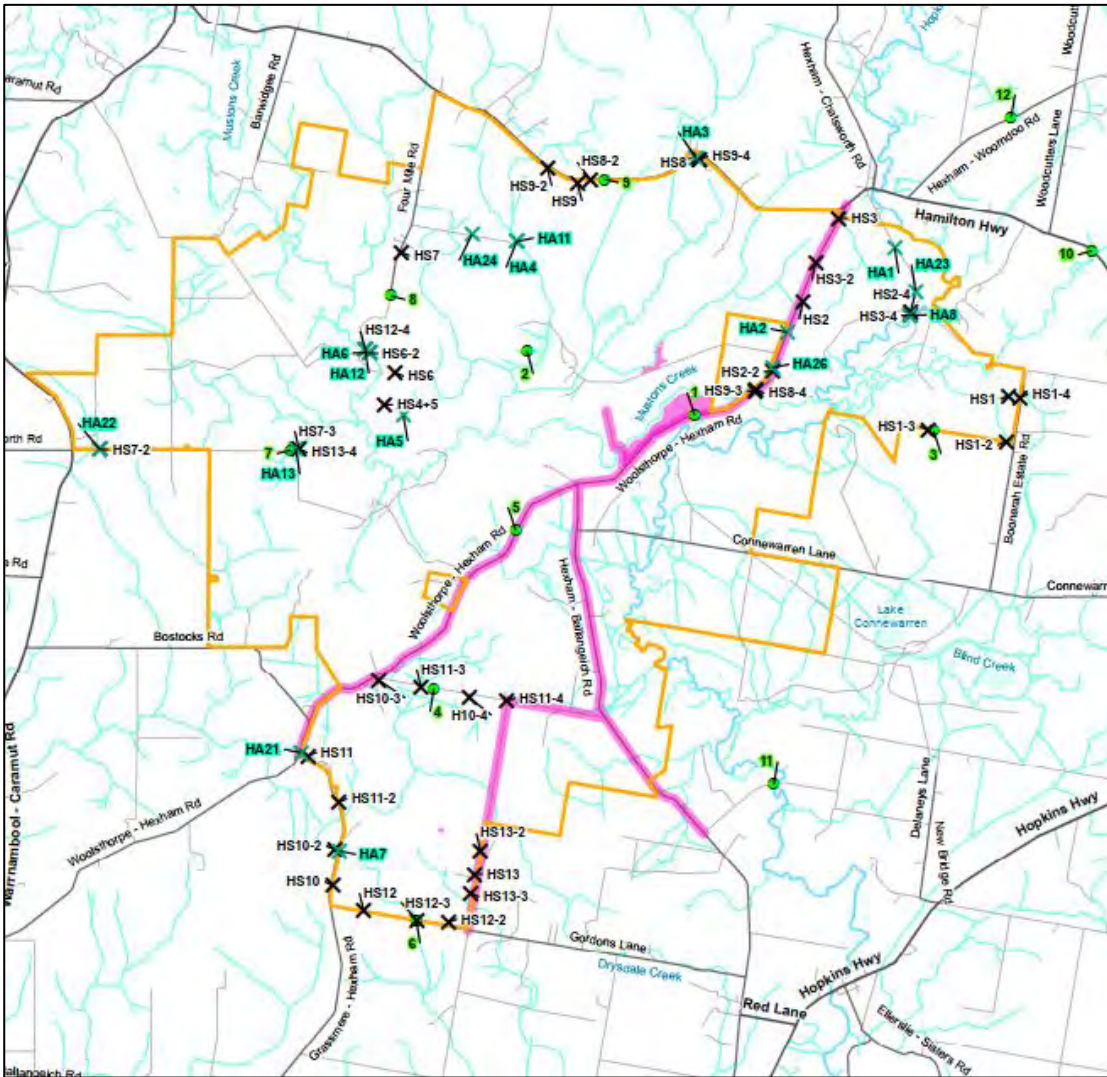
Site	General habitat description (within 30 metres)	Proximity to nearest treed habitat (metres)	Proximity to nearest permanent waterbody (metres)
HX1	Open paddocks, scattered planted trees, farm dam	30	40
HX2	Scattered remnant and scattered trees, open paddocks	230	1100
HX3	Wind row (sugar gums), open paddocks	40	1100
HX4	Open paddocks, small patch of acacia	150	620
HX5	Pine windrow, open paddocks	65	750
HX6	Muston's Creek line, riparian woodland, open paddocks	10	370
HX7-air	Open paddocks	500	500
HX7-ground	Open paddocks	500	500
HX8	Eucalypt windrow, open paddocks	0	380
HX9	Eucalypt woodland, open paddocks	0	340
HX10	Eucalypt windrow, open paddocks	0	450
HX11	Small Eucalypt windrow, open paddocks	0	580
HX12	Large dry wetland/creek line, wind row, open paddocks	10	1100
HX13	Open woodland, farm dam, open paddocks	0	90
HX14	Dry creek, open woodland, open paddocks	10	2000
HX15	Open paddocks	80	1200
HX16	Scattered trees, open paddocks	10	320
HX17	Eucalypt windrow, open paddocks	10	650
HX18	Eucalypt windrow, open paddocks	10	540
HX19	Open paddocks, scattered trees	120	390

Table 6: Habitat descriptions of Songmeter sites during Autumn 2019

Site	General habitat description (within 30 metres)	Proximity to nearest treed habitat (metres)	Proximity to nearest permanent waterbody (metres)
HS1	Open paddock, scattered trees, creek line w/large pools	160	25
HS2	Very large dam, scattered trees, open paddock	60	45
HS4	Farm dam, treed habitat, open paddock	0	30
HS5	Farm dam, open paddocks	320	5
HS6	Scattered remnant and scattered trees, open paddocks	230	1100
HS7 - ground	Open paddocks	500	500
HS7 - air	Open paddocks	500	500
HS8	Large old tree, open paddocks	75	75
HS9	Large dry wetland/creek line, wind row, open paddocks	10	1100
HS10	Wind row, open paddocks	10	1300
HS11	Dry creek, open woodland, open paddocks	10	2000
HS12	Scattered trees, open paddocks	10	320
HS13	Large old tree, open paddocks	300	910
HS14	Wind row (sugar gums), open paddocks	0	1100
HS15	Open paddocks, small patch of acacia.	130	620
HS16	Pine and acacia windrow, open paddocks	0	250
HS17	Acacia wind row, open paddocks	0	1200
HS18	Open paddocks	315	720
HS19	Open woodland, farm dam, open paddocks	0	90
*HG1-4	On a fence running parallel to northern section of large lake	60	60

Notes: *four recorders were placed in 60 m intervals perpendicular from a lake in a preliminary test of a gradient study

Figure 4: Bat survey sites 2010 - 2011, Golden Sun Moth Survey Locations (EHP 2014)



Legend

-  BUS Point Count Locations
-  Anabat Survey Locations (Autumn 2011)
-  Anabat Survey Locations (Spring 2010)
-  Golden Sun Moth Survey Locations
-  Study Area

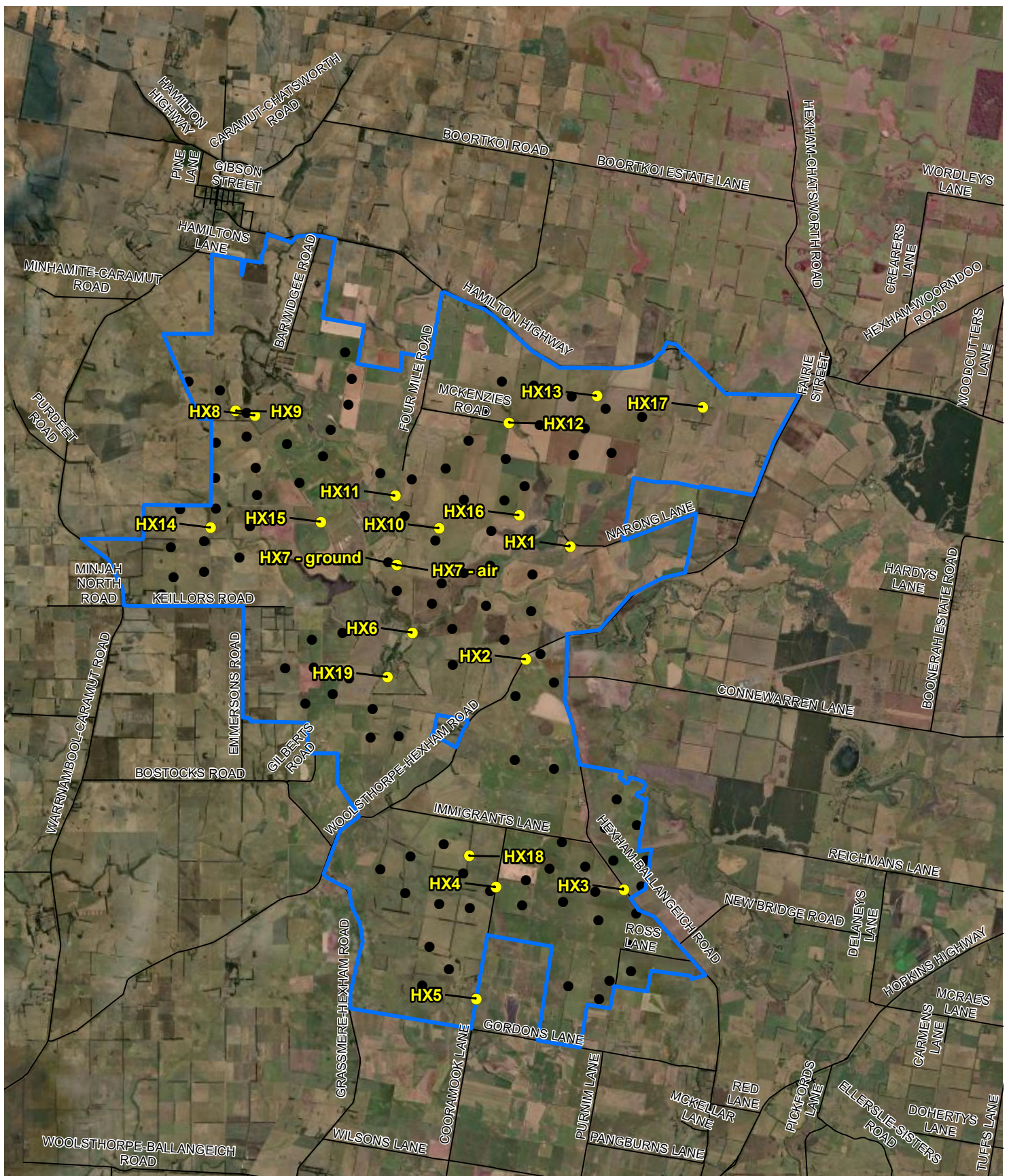


Figure 5: Bat survey sites - Spring 2018

Project: Hexham Wind Farm **Client:** Hexham Wind Farm Pty Ltd **Date:** 1/03/2022

- ▭ Wind farm boundary
- Turbines
- Spring songmeter locations



PO Box 337, Camberwell, VIC 3124, Australia
www.natureadvisory.com.au
 P: 03 9815 2111 - info@natureadvisory.com.au

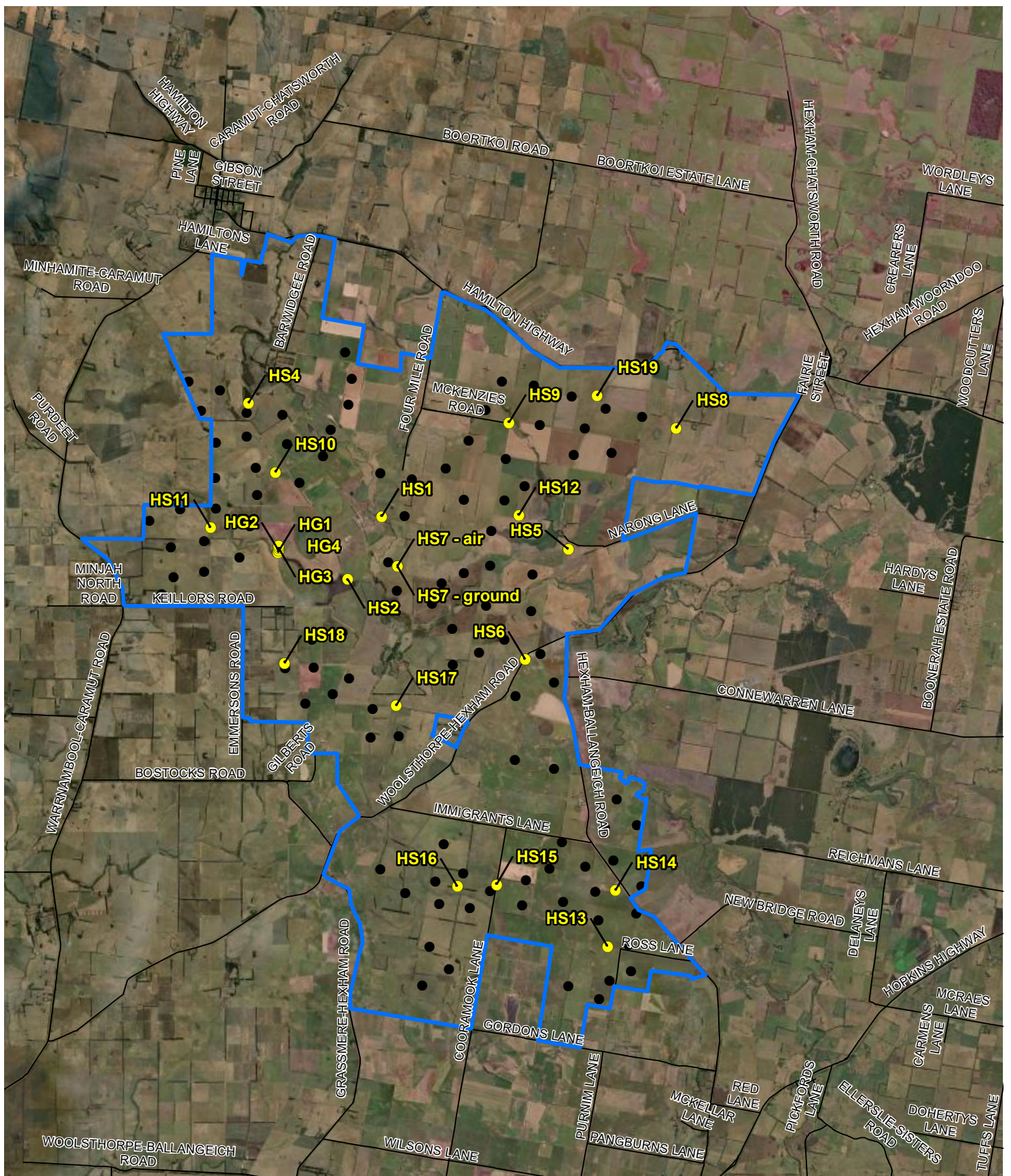


Figure 6: Bat survey sites - Summer/Autumn 2019

Project: Hexham Wind Farm **Client:** Hexham Wind Farm Pty Ltd **Date:** 1/03/2022

- ▭ Wind farm boundary
- Turbines
- Autumn songmeter locations



PO Box 337, Camberwell, VIC 3124, Australia
 www.natureadvisory.com.au
 P: 03 9815 2111 - info@natureadvisory.com.au

Calls from the units were downloaded and sent to Rob Gration (ECOAERIAL Ecological Services, Newport, Victoria) for identification. The files from the recording sites were viewed in Kaleidoscope® software (Wildlife Acoustics, USA), which provides a sonogram display of frequency versus time. Call identification was based on a key developed by comparing the characteristics of bat calls with reference calls from known species recorded from Victoria. Identification is largely based on changes to frequency patterns over time, especially as the characteristic frequency changes. Only those recordings that contained at least two definite and discrete calls were classified as bat calls. For most species, a call sequence of several seconds in duration is required before identification can be made confidently. The call characteristic graphs and identification was then provided to Greg Ford (Balance! Environmental, Toowoomba, QLD) as a second reviewer for confirmation of the assignment into species and/or complexes.

During Spring 2018 as well as Summer-Autumn 2019 surveys, the presence-absence of bats were used to evaluate the presence, and activity of the common bats in the Project site. The actual number of calls of each bat species was only taken for the threatened species.

The 2018 and 2019 Southern Bent-wing Bat calls were peer reviewed by Greg Ford (Principal Ecologist of Balance Environmental, QLD) Greg Ford has over 25 years' experience in ecological research, impact assessment, biodiversity monitoring and land use planning throughout eastern Australia. He is a recognised expert on bats, with specialist expertise in acoustic analysis of bat echolocation calls for species identification. Greg is active member of the Australasian Bat Society since 1996, having served in the past as President and Vice-president and received the highly esteemed award of Life Membership of the Society in April 2018. All Southern Bent-wing Bat calls were confirmed as such via email (21/7/2020).

Using ultrasonic bat detectors, it is not possible to census bat numbers. For example, 10 calls of a particular species may be recorded but it is not known if this represents 10 individuals of that species or one individual of that species flying past the bat recorder 10 times. Therefore, it is not possible to determine utilisation rates, only activity levels.

Occasionally, recording devices such as those used in the survey experience technical difficulties. As a result, short periods of time may not be recorded and total hours of recording varies between the different recorders. The bat detectors used during this survey sample a limited airspace to a distance of approximately 20-30 metres from the detectors.

Two Songmeters were placed at a height of 50 metres (on temporary wind monitoring masts) which was above minimum turbine blade tip height. All remaining detectors were placed at ground level.

Bat activity levels vary in response to weather variables such as air temperature, relative humidity, barometric pressure, wind speed, direction & gusts, rain and moonlight. Typically, bats are found to be less active during the following circumstances:

- During periods of full moon, and when the moon is high in the sky;
- At wind speeds of over 10 metres per second; and
- During moderate to heavy rainfall.

The identification of echolocation calls from microbats in south-eastern Australia is facilitated by the fact that many calls are species-specific; however, not all species can be consistently or reliably identified using this technique. The identification of Southern Bent-wing Bat calls using ultrasonic bat detectors is difficult and often key, salient call characters may not feature prominently in all recordings. Such calls were attributed to the Southern Bent-wing/Forest Bats/Chocolate Wattled Bat complex as it was not

possible to distinguish the call as belonging to any of these species, which have calls within the same frequency range.

The ultrasonic calls of Long-eared bats (*Nyctophilus* spp.) are difficult to distinguish at a species level, and hence are grouped under their generic name as a species complex. The species that are likely to occur at the Project site are *Nyctophilus geoffroyi* and *N. gouldi*. These species are not listed as threatened.

Similarly, calls of species of Forest Bats (*Vespadelus* spp.) can be difficult to differentiate and therefore some of their calls have been combined into the species complex for the purposes of analysis. None of these species are threatened.

Gould's Wattled Bat and forest bats also have similar calls and have been attributed to a species complex. None of these species are listed as threatened.

Although several species belonging to the Freetail Bat (*Ozimops* spp.) have recently been identified (Reardon *et al.* 2014), their calls are still difficult to identify; hence they are grouped together in the analysis. None of these species are threatened.

Grey-headed Flying-fox

In addition, targeted surveys were undertaken in February and March 2022 for the Grey-headed Flying-fox (GHFF). A zoologist undertook two dawn and three dusk surveys to determine the presence, number and flight direction of Grey-headed Flying-foxes observed flying and feeding between the 14th and 16th February 2022 as well as 22nd and 23rd March 2022.

While undertaking the dawn and dusk surveys, the observer scanned the sky looking for and listening for GHFF. The observer undertook visual searches of the area with their eyes, binoculars and when it became too dark to see GHFF with these, used thermal binoculars. Searches consisted of the observer scanning the sky from the horizon vertically and horizontally in all directions.

3.2.3.4 Striped Legless Lizard

DELWP provided advice that the Striped Legless Lizard (SLL) should be assumed as present in areas of suitable habitat. Habitat assessments were undertaken for SLL. Areas of Plains Grassland, Plains Grassy Woodland and Stony Knoll Shrubland have been identified as suitable habitat for SLL and mapped accordingly. Ploughed and cultivated paddocks and other areas that contained unsuitable habitat were excluded from the assessment and mapping exercise.

This methodology was considered a reliable means of representing potential suitable habitat for the Striped Legless Lizard (EHP 2014).

3.2.3.5 Growling Grass Frog

A survey to map suitable habitat for the Growling Grass Frog was undertaken across the Project site, checking all wetlands and waterways (e.g. Mustons Creek). Habitat mapping was used to inform the layout of the wind farm to ensure suitable habitats were avoided wherever possible. Habitat assessments were undertaken on the dates listed below.

- 21st – 24th November 2011
- 13th – 28th November 2018

Assessments were based on the presence or absence of suitable habitats within or near the Project site, and records of the species from previous studies and the VBA data base.

Aquatic habitats in and near the Project site were assessed for their suitability for the Growling Grass Frog using the following criteria (see Figure 14):

High: Habitat components listed below are usually all present.

- Permanent, or largely permanent, still water body;
- Slow-flowing stream with dense in-stream vegetation;
- Water body with large areas of fringing and aquatic vegetation (e.g. Common Reed, Bulrush, Sedges, Rushes (*Juncus* spp.) and Water Ribbon);
- Thick ground cover vegetation, or rocks, for shelter;
- Connectivity with other areas of suitable habitat.

Moderate: Some fauna habitat components are often missing although linkages with other remnant habitats in the landscape are usually intact.

- Water body likely to hold water for most of the year (i.e. permanent, or largely permanent);
- Water body with some fringing and aquatic vegetation (e.g. Common Reed, Bulrush, Sedges, Rushes (*Juncus* spp.) and Water Ribbon);
- Some ground cover vegetation, or rocks;
- Some connectivity with other areas of suitable habitat.
- Water body shows some signs of disturbance (such as erosion, access to stock, feral predators and pets)

Low: Many habitat elements have been lost. Aquatic habitats that are:

- Likely to be ephemeral (only hold water for part of the year);
- Little or no fringing or in-stream aquatic vegetation;
- Isolated (little or no connectivity);
- Showing signs of disturbance (such as erosion, access to stock);
- Thick ground cover vegetation or rocks absent.

While visiting the wetlands and undertaking the habitat assessment, the zoologist spent some time listening for frog calls.

3.2.3.6 Fish survey

Native freshwater fish surveys were undertaken using fyke nets, dip netting, and collapsible bait traps. No electrofishing was used due to high water salinity at all survey sites. The aquatic survey was undertaken during the following dates.

- 21st – 24th November 2011.

The location of the fish surveys is presented in **Figure 7**.

3.2.3.7 Golden Sun Moth

Targeted Golden Sun Moth surveys were undertaken by Ecology & Heritage Partners within suitable habitat during the following dates.

- 16th and 19th December 2011
- 6th January 2012.

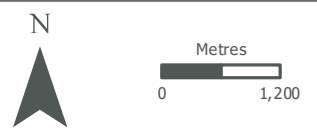
Suitable habitat was present in road reserves (see Figure 4) with many of the land parcels providing little or no suitable habitat for Golden Sun Moth. Surveys were undertaken in accordance with the survey

guidelines (DEWHA 2009) during days when moths were known to fly at nearby reference sites (EHP 2014).

Figure 7: Fish survey locations

Project: Hexham Wind Farm
Client: Wind Prospect Pty Ltd
Date: 19/05/2022

- Wind farm boundary
- Fish survey location



PO Box 337, Camberwell, VIC 3124, Australia
www.natureadvisory.com.au
03 9815 2111 - info@natureadvisory.com.au

4 Assessment results and likelihood of occurrence

4.1 Site description

The Hexham Wind Farm (HWF) project covers approximately 16,000 hectares of land located between the Western Victoria localities of Hexham, Caramut, Ellerslie, Minjah and Woolsthorpe, approximately 20 kilometres west of Mortlake and 200 kilometres west of Melbourne's CBD. The wind farm site is bound by the Hamilton Highway to the north, the Woolsthorpe-Hexham and Hexham-Ballangeich roads to the east, Gordons Lane to the south and the Warrnambool-Caramut Road to the west. The proposed HWF site is referred to herein as the 'Project site'.

The Project site supported basaltic soils derived from newer volcanic flows, with alluvium associated with watercourses. The landscape was gently undulating with a number of permanent watercourses, the most major of which is Mustons Creek in the northern portion of the site, which flows into the Hopkins River to the east of the Project site, and Drysdale Creek in the south, which continues to the coast near Warrnambool. Numerous tributaries (many of them unnamed) of Mustons and Drysdale creeks occur within the Project site.

The Project site and surrounding land supports agriculture, including dryland cropping and sheep and cattle grazing, with a relatively low density of associated residences. Widespread historical clearing of the Project site and surrounds for agriculture has resulted in native vegetation being largely restricted to roadside reserves and watercourses.

Vegetation in the investigation area consists primarily of exotic pasture or dryland crops, with several planted wind-breaks on the edge of paddocks, some of which include native species. Within private property native vegetation comprised small patches of species depauperate grassland, wetland and woodland along the edges of farm tracks, in lower-lying areas in pasture and along watercourses. Most (if not all) woody vegetation had been removed in these patches. Patches of native vegetation along roadsides included grassland and woodland, which lacked canopy species but did support some woody species (primarily wattles, including Black Wattle and Blackwood). The highest quality native vegetation was found along the wide road reserve of the Hexham-Ballangeich Road.

The majority of the Project site has been highly modified by past and on-going agricultural practices. Most private properties have been cleared of original native vegetation in favour of grazing and cropping lands and associated planted wind rows. This provides habitat for common and widespread fauna species typically occurring in farmland landscapes.

Native vegetation and fauna habitat is primarily restricted to roadsides, waterways and wetland areas. Many of these are also highly modified and contain a high abundance of invasive plant species.

4.2 Listed flora species

The EPBC Protected Matters Search Tool (DAWE 2022a) indicated that within the search region there were records of, or there occurred potential suitable habitat for, 18 flora species listed under the Commonwealth EPBC Act.

The likelihood of occurrence in the Project Site of flora species listed under the EPBC Act is addressed in Appendix 1. Species considered 'likely to occur' are those that have a very high chance of being in the Project Site based on numerous records in the search region and suitable habitat in the Project Site. Species considered to have the 'potential to occur' are those for which suitable habitat exists, but recent records are scarce. Flora species assessed as potential or likely to occur are listed below.

- **Adamson's Blown-grass (*Lachnagrostis adamsonii*)** EPBC Act: endangered

- **Clover Glycine (*Glycine latrobeana*)**, EPBC Act: vulnerable
- **Trailing Hop-bush (*Dodonaea procumbens*)**, EPBC Act: vulnerable
- **White Sunray (*Leucochrysum albicans* subsp. *tricolor*)**, EPBC Act: endangered.

Targeted surveys for these four species were undertaken across three separate surveys (November 2018, January 2019 and November 2021) to coincide with the published flowering times for the target species. None of these species were recorded within suitable habitat of the development footprint.

The location of previous records of threatened flora sourced from the Victorian Biodiversity Atlas (VBA) are presented in Figure 8. None of these previous records are located within the Project site.

4.3 Listed Ecological Communities

The EPBC Protected Matters Search Tool (DAWE 2022a) indicated that five ecological communities listed under the EPBC Act had the potential to occur in the investigation area (Appendix 2). Three of these ecological communities were found to occur within the Project site (Figure 8).

- **Grassy Eucalypt Woodland of the Victorian Volcanic Plain** – listed as Critically Endangered under the EPBC Act (DA, DI, DK, DM, DP, DR and DV)

Seven patches of Plains Grassy Woodland (EVC 55_61) within the Project site, along the Hexham-Balangeich Road, were found to meet the condition thresholds for this community (TSSC 2008a). These were Habitat Zones DA, DI, DK, DM, DP, DR and DV, all of which were patches bigger than or equal to 0.5 hectares in which 50% or more of the perennial ground layer vegetation comprises native species (TSSC 2008a).

- **Natural Temperate Grassland of the Victorian Volcanic Plain** – listed as Critically Endangered under the EPBC Act (BE, CE, DC, DE, DG, EU, EV, FA, GB, G, HI, II, XAD, XAF, XAU and XAV).

A total of 11 patches of Heavier-soils Plains Grassland (EVC 132_61) within the investigation area, along the Woolsthorpe-Hexham Road, the Warrnambool-Caramut Road, the Hexham-Balangeich Road, Cooramook Lane and the Hamilton Highway, were found to meet the condition thresholds for this community (TSSC 2008c). These were Habitat Zones BE, CE, DC, DE, DG, EU, EV, FA, GB, GE, HI, II, XAD, XAF, XAU and XAV, all of which were patches bigger than or equal to 0.05 hectares in which the dominant native species represented at least 50% of the native species and the perennial tussock cover (TSSC 2008b).

- **Seasonal Herbaceous Wetland of the Temperate Lowland Plain** – listed as Critically Endangered under the EPBC Act (XBS and XBT)

The listed community occurs in the investigation area along the proposed overhead power line north and east of proposed turbine T37. Habitat Zone XBS and XBT, met the key diagnostic of having more than 50% of the total cover of plants in the ground layer of the wetland dominated by native species characteristic of the Seasonal Herbaceous Wetlands ecological community (TSSC 2012).

Figure 8: Listed flora and ecological communities recorded in the search region


Project: Hexham Wind Farm
Client: Wind Prospect Pty Ltd
Date: 23/05/2022

- Wind farm boundary
- Search region (10km from boundary)
- Listed flora and ecological communities recorded in the search region**
- Adamson's Blown-grass
- Button Wrinklewort
- Clover Glycine
- Fragrant Leek-orchid
- Spiny Peppercross
- Spiny Rice-flower
- Spiral Sun-orchid
- White Sunray
- EPBC Act listed community**
- Grassy Eucalypt Woodland of the Victorian Volcanic Plain
- Natural Temperate Grassland of the Victorian Volcanic Plain
- Seasonal Herbaceous Wetland of the Temperate Lowland Plain



N

Metres
0 2,200



Nature Advisory
 PO Box 337, Camberwell, VIC 3124, Australia
 www.natureadvisory.com.au
 03 9815 2111 - info@natureadvisory.com.au

Layers - Created by: - [Nat-haw-d04]e[GIS]2018_Jobs[18088]18088.16 EPBC Flora 220505.mxd

4.4 Listed fauna species

The EPBC Protected Matters Search Tool (DAWE 2022a) indicated that within the search region there were records of, or there occurred potential suitable habitat for 24 fauna species listed as threatened and 12 fauna species listed as migratory under the Commonwealth EPBC Act. The likelihood of occurrence of these species in the investigation area was assessed in Appendix 3.

This analysis of potential occurrence of listed fauna species excludes:

- Marine fauna given the Project Site is inland; and
- Migratory oceanic bird species (such as albatrosses and petrels) given the Project site is inland.

Species considered ‘likely to occur’ are those that have a very high chance of being in the Project site given the existence of numerous records in the search region and suitable habitat in the Project site. Using the precautionary approach, species considered to have the ‘potential to occur’ are where suitable habitat exists for the species, but recent records are scarce.

A total of seven species were recorded (R) and a further five species have the ‘potential to occur’ at the Project site.

Species listed under the EPBC Act that have been previously recorded or assessed as having the potential to occur are listed below. Locations of listed species records is presented in Figure 9.

Birds

- Common Greenshank (*Tringa nebularia*) (EPBC Act migratory)
- Common Sandpiper (*Actitis hypoleucos*) (R) (EPBC Act migratory)
- Curlew Sandpiper (*Calidris ferruginea*) (EPBC Act critically endangered and migratory)
- Double-banded Plover (*Charadrius bicinctus*) (R) (EPBC Act migratory)
- Fork-tailed Swift (*Apus pacificus*) (EPBC Act migratory)
- Latham's Snipe (*Gallinago hardwickii*) (R) (EPBC Act migratory)
- Red-necked Stint (*Calidris ruficollis*) (EPBC Act migratory)
- Sharp-tailed Sandpiper (*Calidris acuminata*) (R) (EPBC Act migratory)
- White-throated Needletail (*Hirundapus caudacutus*) (EPBC Act vulnerable and migratory).

Bats

- Grey-headed Flying-Fox (*Pteropus poliocephalus*) (R) (EPBC Act vulnerable)
- Southern Bent-wing Bat (*Miniopterus orianae bassanii*) (R) (EPBC Act critically endangered).

Reptiles

- Striped Legless Lizard (*Delma impar*) (EPBC Act vulnerable).

Amphibians

- Growling Grass Frog (*Litoria raniformis*) (R) (EPBC Act vulnerable).

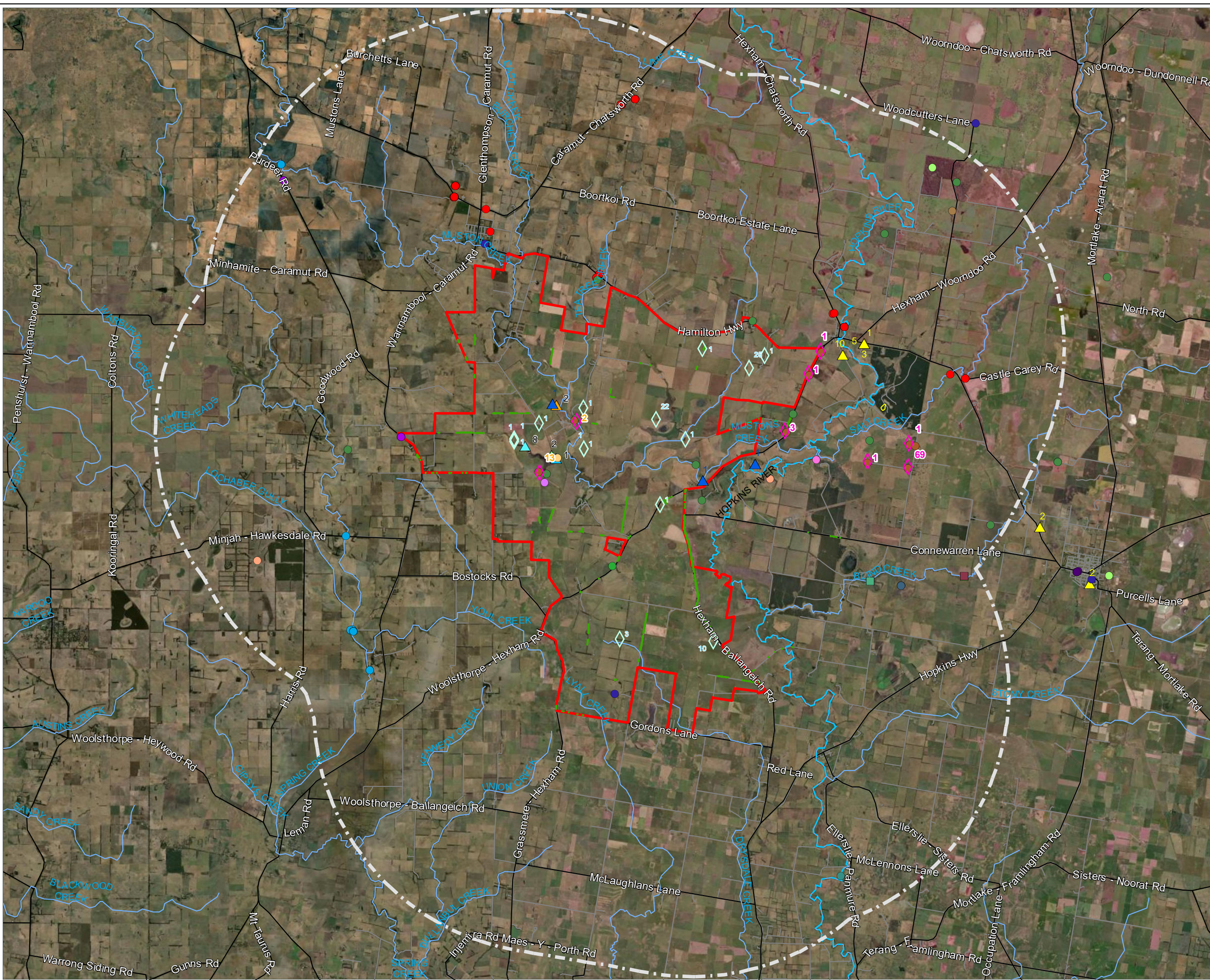
Targeted surveys for listed fish and the Golden Sun Moth were undertaken by EHP (2014).

The fish survey failed to confirm the presence of any fish species listed under the EPBC Act (EHP 2014) and were considered unlikely to occur in the Project area (Nature Advisory 2022) (Appendix 3).


Targeted Golden Sun Moth surveys failed to confirm the presence of this species within the Project area (EHP 2014). Given the current poor condition of areas of suitable habitat, the lack of nearby previous records and history of disturbance of habitat in the Project area it was concluded that the Golden Sun Moth is unlikely to occur (EHP 2014, Nature Advisory 2022) (Appendix 3).

Figure 9: Locations of listed fauna species within the search region

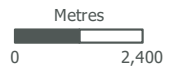
Project: Hexham Wind Farm
Client: Wind Prospect Pty Ltd
Date: 23/05/2022




- Wind farm boundary
- Search region (10km from boundary)
- EPBC listed fauna from VBA**
- Australian Grayling
- Common Greenshank
- Common Sandpiper
- Curlew Sandpiper
- Eastern Barred Bandicoot
- Gang-gang Cockatoo
- Golden Sun Moth
- Grey-headed Flying-fox
- Growling Grass Frog
- Latham's Snipe
- Little Stint
- Macquarie Perch
- Red-necked Stint
- Sharp-tailed Sandpiper
- Southern Bent-winged Bat (southern ssp.)
- Striped Legless Lizard
- Yarra Pygmy Perch
- EPBC listed fauna from Birdata**
- Common Greenshank
- Curlew Sandpiper
- Double-banded Plover
- Latham's Snipe
- Red-necked Stint
- Sharp-tailed Sandpiper
- Southern Bent-wing Bat calls (EHP)**
- ◇ Southern Bent-wing Bat calls (number of calls recorded)
- Southern Bent-wing Bat calls (NA)**
- ◇ Southern Bent-wing Bat calls (number of calls recorded)
- NA record (number of records labelled)**
- ▲ Common Sandpiper
- ▲ Double-banded Plover
- ▲ Latham's Snipe
- ▲ Sharp-tailed Sandpiper
- ▲ Grey-headed Flying-fox (number of records labelled)
- ▭ Grey-headed Flying-fox likely camp
- ▲ Growling Grass Frog (number of records labelled)
- ▨ Potential Striped Legless Lizard habitat



N



Metres
0 2,400



Nature Advisory

PO Box 337, Camberwell, VIC 3124, Australia
www.natureadvisory.com.au
 03 9815 2111 - info@natureadvisory.com.au

5 Significant impact assessment

To determine impacts to native vegetation, the proposed development envelope was overlaid with the native vegetation mapped as part of this investigation. Native vegetation occurring in the following locations was considered to be removed based on the Project's development footprint.

5.1 Listed flora species

Targeted surveys were undertaken in areas of suitable habitat for threatened flora. The EPBC Act-listed flora species listed in Section 4.2 with the potential to occur have not been recorded in the development footprint and therefore will not be impacted by the proposed project.

5.2 Listed ecological communities

Three EPBC Act listed ecological communities were recorded within the Project site listed below.

- *Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP)*
- *Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)*
- *Seasonal Herbaceous Wetland of the Temperate Lowland Plain (SHWTLP)*.

Avoidance has been the primary measure to mitigate potential impacts on listed ecological communities within the site as shown in Table 7.

Table 7: Avoid and minimisation of threatened ecological communities

Ecological community	Total recorded in the Project site (ha)	Total initially proposed for removal (ha)	Total currently proposed for removal (ha)
<i>Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP)</i>	8.573	7.733	0
<i>Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)</i>	4.339	0.499	0.218
<i>Seasonal Herbaceous Wetland of the Temperate Lowland Plain (SHWTLP)</i>	0.662	0	0.225
Potential SHWTLP	14.616	3.525	0

GEWVVP has been 100% avoided and all of this community will be retained. GEWVVP was mapped along the Hexham-Ballangeich Road and none of this will be removed.

The vast majority of NTGVVP within the Project site has been avoided by selectively placing infrastructure away from Plains Grassland. Approximately 95% of the NTGVVP ecological community has been avoided and will be retained. Impacts have been minimised as 0.499 ha were originally proposed for removal based on the previous design and this has been reduced to 0.218 ha through updates to the design aimed at reducing impacts.

The majority of SHWTLP including potential SHWTLP within the Project site has been avoided by selectively placing infrastructure away from mapped Plains Grassy Wetland, more than 66% of the confirmed SHWTLP ecological community, and 100% of the potential community will be retained (Table 7). A total of 3.525 ha of potential SHWTLP was originally proposed for removal based on the previous design. Changes in the development footprint to minimise impacts on this community has resulted in the total area of SHWTLP proposed for removal being reduced to only 0.225 ha.

Figure 10 shows the key changes in the project design that demonstrate where measures were taken that avoid areas of listed ecological communities. The creation of the turbine free buffer around wetlands as part of the mitigation of impacts on the Brolga ensures that most potential areas for the *Seasonal Herbaceous Wetland of the Temperate Lowland Plain* are well beyond areas of disturbance (Figure 10).

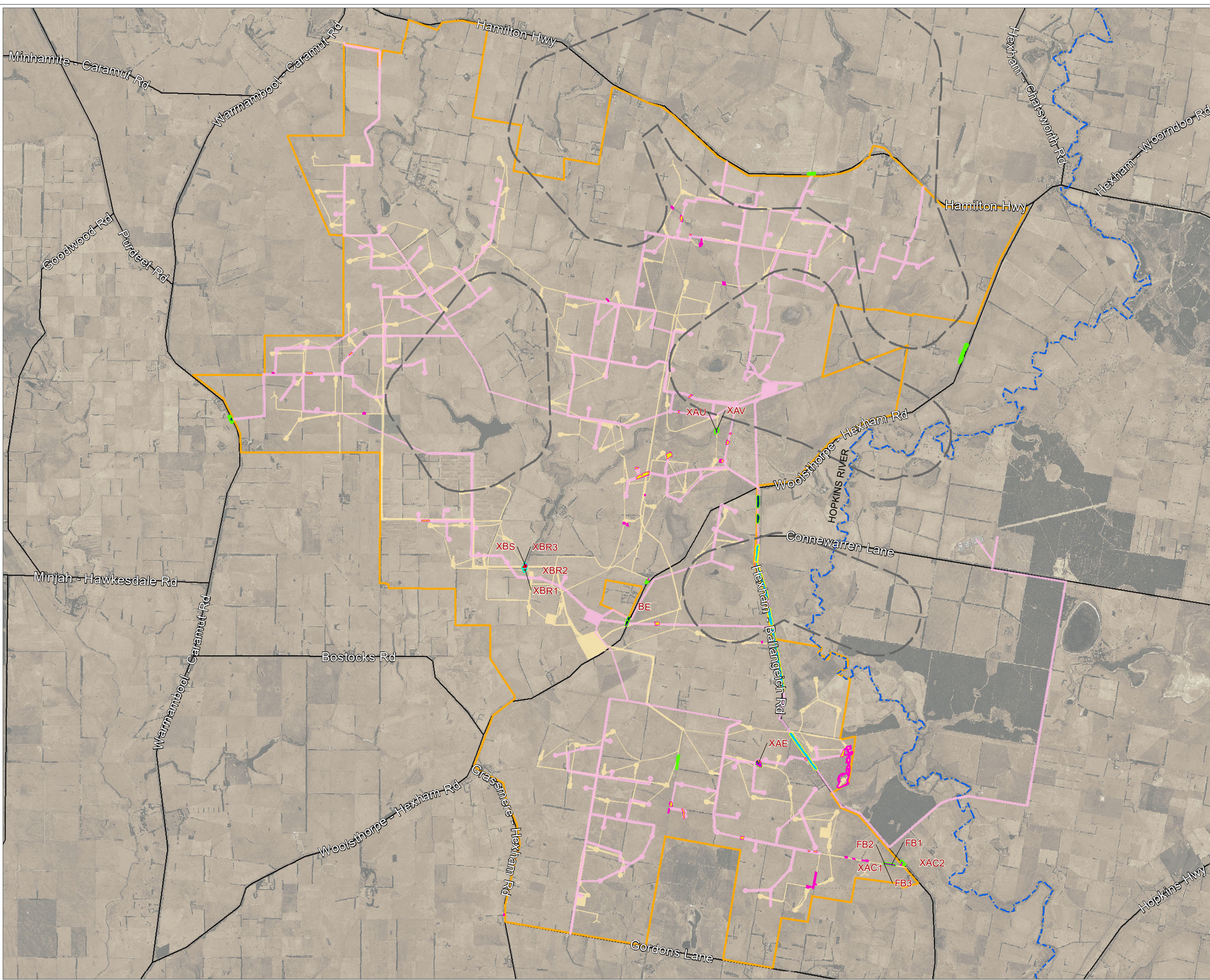
The proposed development footprint will result in the following losses.

- 0.218 hectares of *Natural Temperate Grassland of the Victorian Volcanic Plains* (NTGWVP)
- 0.225 hectares of potential *Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains* (SHWTLP).

Figure 10: Avoid and minimise process of listed ecological communities

Project: Hexham Wind Farm
Client: Wind Prospect Pty Ltd
Date: 23/05/2022

- Legend**
- Wind farm boundary
 - Current concept design
 - Initial concept design
- EPBC Act listed community**
- Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP)
 - Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)
 - Seasonal Herbaceous Wetland of the Temperate Lowland Plain (SHWTLP)
 - Potential Seasonal Herbaceous Wetland of the Temperate Lowland Plain (SHWTLP)
 - Avoided clearance of GEWVVP
 - Avoided clearance of NTGVVP
 - Avoided clearance of potential SHWTLP
 - Proposed clearance of NTGVVP
 - Proposed clearance of SHWTLP
 - Turbine free buffers protecting wetlands



PO Box 337, Camberwell, VIC 3124, Australia
 www.natureadvisory.com.au
 03 9815 2111 - info@natureadvisory.com.au

Layers - Created by: - \\Nat-haw-d04\c\GIS\2018_Jobs\18088\18088.16 EPBC avoidance 220506.mxd

Impacts to the threatened ecological community *Natural Temperate Grassland of the Victorian Volcanic Plains* are assessed against the EPBC Act significant impact criteria for threatened communities, below in Table 8.

Table 8: Significant impact criteria assessment for NTGVVP

Significant impact criteria	Assessment of impacts
<p>An action is likely to have a significant impact on a critically endangered community if there is a possibility that it will:</p>	
<p>Reduce the extent of an ecological community</p>	<p>The proposal will reduce the extent of this community from 4.339 hectares by 0.218 hectares to 4.121 hectares, equating to a 5% loss. While a reduction, it is a limited impact on a primarily linear roadside reserve remnants and three patches on private land. The remainder of the linear strip and patches will nonetheless persist after works are completed. The consequence for this occurrence of the community is no significant impact.</p>
<p>Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines</p>	<p>Potential areas of impact to habitat are not wide and will not fragment communities more than the current environment, which is transected by a variety of roads, farms tracks and other infrastructure - no significant impact.</p>
<p>Adversely affect habitat critical to the survival of an ecological community</p>	<p>While the extent of the community will be reduced, the impacts will occur as small patches along the edge of the community, totalling 5% of the area of the 4.339 ha leaving the remainder of the community (4.121 hectares) intact. The scale of this removal will have a negligible impact on habitat that supports the remaining patches of this community - no significant impact.</p>
<p>Modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of ground water levels, or substantial alteration of surface water drainage patterns</p>	<p>As the Project will permanently alter small patches of the community within the footprint, abiotic factors necessary for the ecological community's survival will be modified or destroyed on a small scale; however, given the expanse of the community within and surrounding the Project site, it is considered unlikely that the Project would modify or destroy abiotic factors necessary for the persistence of the ecological community on the Project site - no significant impact.</p>

Significant impact criteria	Assessment of impacts
<p>Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting</p>	<p>The impact will occur to small areas along the edge of a narrow linear strips of remnant native vegetation along a road reserve and to three patches on private property and is not expected to substantially change the species composition of the community or result in the decline or loss of any functionally important species - no significant impact.</p>
<ul style="list-style-type: none"> • Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: <ul style="list-style-type: none"> ▫ Assisting invasive species, that are harmful to the listed ecological community ▫ Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which will kill or inhibit the growth of species in the ecological community, or • Interfere with the recovery of an ecological community. 	<p>Works will be undertaken consistent with a best practice environmental management plan that will ensure the retained 95% of the 4.339 ha community will not be damaged or subject to indirect impacts that will compromise its integrity. This will include:</p> <ul style="list-style-type: none"> ▪ Temporary marking/fencing of retained areas of the community; ▪ Strict no-go zone protocols for the retained area; ▪ Implementation of strict vehicle and construction equipment washdown prior to arrival on site to avoid the introduction of invasive weeds and disease; ▪ Careful site rehabilitation, including monitoring for and controlling any outbreaks of weeds that may invade the retained areas of the community. <p>In conclusion the works will result in no significant impact</p>

Impacts to the threatened ecological community *Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (SHWTLP)* are assessed against the EPBC Act significant impact criteria for threatened communities, below in Table 9.

Table 9: Significant impact criteria assessment for SHWTLP

Significant impact criteria	Assessment of impacts
<p>An action is likely to have a significant impact on a critically endangered community if there is a possibility that it will:</p>	

Significant impact criteria	Assessment of impacts
Reduce the extent of an ecological community	The proposal will reduce the extent of this community from 15.278 ha of potential and confirmed SHWTLP by 0.662 hectares to 14.616 ha of potential and confirmed SHWTLP. This equates to 95.7% avoidance of potential and confirmed SHWTLP. While a reduction, it is a limited impact (0.662 ha) on four remnant patches of this community that will nonetheless persist after works are completed. The consequence for this occurrence of the community is no significant impact .
Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	Potential areas of impact to habitat are not wide and will not fragment communities more than the current environment, which is transected by a variety of farm tracks and other infrastructure - no significant impact .
Adversely affect habitat critical to the survival of an ecological community	While the extent of the community will be reduced, the impacts will occur as small sections along the edge of four patches of the community. All of the potential SHWTLP will be retained and 0.225 ha of 0.662 ha of confirmed SHWTLP is proposed to be removed (0.437 ha retained). The scale of this removal will have a negligible impact on habitat that supports the remaining patches of this community - no significant impact .
Modify or destroy abiotic (non-living) factors (such as water, nutrients or soil) necessary for an ecological community's survival, including reduction of ground water levels, or substantial alteration of surface water drainage patterns	As the Project will permanently alter small patches of the community within the footprint, abiotic factors necessary for the ecological community's survival will be modified or destroyed on a small scale; however, given the expanse of the community within and surrounding the Project site, it is considered unlikely that the Project would modify or destroy abiotic factors necessary for the persistence of the wetlands in the Project site - no significant impact .
Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting	The impact will occur along the edge of four patches of the community and is not expected to substantially change the species composition of the community or result in the decline or loss of any functionally important species - no significant impact .

Significant impact criteria	Assessment of impacts
<ul style="list-style-type: none"> • Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: <ul style="list-style-type: none"> ▫ Assisting invasive species, that are harmful to the listed ecological community ▫ Causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological community which will kill or inhibit the growth of species in the ecological community, or • Interfere with the recovery of an ecological community. 	<p>Works will be undertaken consistent with a best practice environmental management plan that will ensure the retained 100% potential and 0.437 ha of the community will not be damaged or subject to indirect impacts that will compromise its integrity. This will include:</p> <ul style="list-style-type: none"> ▪ Temporary marking/fencing of retained areas of the community; ▪ Strict no-go zone protocols for the retained area; ▪ Implementation of strict vehicle and construction equipment washdown prior to arrival on site to avoid the introduction of invasive weeds and disease; ▪ Careful site rehabilitation, including monitoring for and controlling any outbreaks of weeds that may invade the retained areas of the community. <p>In conclusion the works will result in no significant impact</p>

5.3 Listed fauna species

The analysis of susceptibility of listed fauna species to impacts presented below, supported by the field assessments, identified that the following species could be impacted by any development in the Project site.

Birds

- Common Greenshank (*Tringa nebularia*) (EPBC Act migratory)
- Common Sandpiper (*Actitis hypoleucos*) (R) (EPBC Act migratory)
- Curlew Sandpiper (*Calidris ferruginea*) (EPBC Act critically endangered and migratory)
- Double-banded Plover (*Charadrius bicinctus*) (R) (EPBC Act migratory)
- Fork-tailed Swift (*Apus pacificus*) (EPBC Act migratory)
- Latham's Snipe (*Gallinago hardwickii*) (R) (EPBC Act migratory)
- Red-necked Stint (*Calidris ruficollis*) (R) (EPBC Act migratory)
- Sharp-tailed Sandpiper (*Calidris acuminata*) (R) (EPBC Act migratory)
- White-throated Needletail (*Hirundapus caudacutus*) (EPBC Act vulnerable and migratory).

Bats

- Grey-headed Flying-Fox (*Pteropus poliocephalus*) (R) (EPBC Act vulnerable)
- Southern Bent-wing Bat (*Miniopterus orianae bassanii*) (R) (EPBC Act critically endangered).

Reptiles

- Striped Legless Lizard (*Delma impar*) (EPBC Act vulnerable).

Amphibians

- Growling Grass Frog (*Litoria raniformis*) (R) (EPBC Act vulnerable).

5.3.1 Migratory Shorebirds

Three migratory shorebird species listed under the EPBC Act were detected at two sites on the wind farm during the 2018/19 surveys.

- **Sharp-tailed Sandpiper:** Up to eight on 18th December 2018 on the northern end of the large wetland (Wetland 3a, Figure 11)
- **Latham's Snipe:** Two on 9th January 2019 on the Mustons Creek (Wetland 17, Figure 11)
- **Double-banded Plover:** A pair on 26th February 2019 on the muddy shores of the large lake (Wetland 3b, Figure 11)

One additional migratory shorebird species was recorded incidentally in 2020:

- **Common Sandpiper:** An individual was observed on the 18th February 2020 near the boathouse at in the Project site (Wetland 3b, Figure 11).

Migratory shorebirds were not observed frequently at the Project site and were observed in low numbers, 1-8 individuals. Most wetlands were found to be ephemeral and too well vegetated with dense growth of reed, rush, sage, and introduced grasses on the edges and dense growth of water ribbon and emergent and submerged vegetation, particularly the sections that are expansions of the Muston Creek. In most cases vegetation was taller than 30 cm and as such were unsuitable for most migratory shorebirds, which require more open shorelines and shallow open water or mud in which to forage.

Wetland 3 was frequented the most by migratory shorebirds. The Latham's Snipe was observed at Wetland 17 which was a vegetated wetland.

Impacts of the project on migratory shorebirds were assessed against EPBC Act Policy Statement 3.21 *Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species* (DoEE 2017).

Important habitats in Australia for migratory shorebirds under the EPBC Act include those recognised as nationally or internationally important. The widely accepted approach at identifying internationally important shorebird habitat throughout the world has been through criteria adopted under the Ramsar Convention on Wetlands.

According to this approach, wetland habitat should be considered internationally important if it regularly supports (DoEE 2017):

- 1% of the individuals in a population of one species or subspecies of waterbird; or
- A total abundance of at least 20,000 waterbirds.

Nationally important habitat for migratory shorebirds is similarly defined if it regularly supports (DoEE 2017):

- 0.1% of the flyway population of a single species of migratory shorebird; or
- A minimum of 2,000 migratory shorebirds; or
- A minimum of 15 migratory shorebird species.

Wetlands at the Project site are not already identified as internationally important habitats (RAMSAR wetland). The wetlands also do not meet the above criteria for internationally or national important habitat for migratory shorebirds.

It was determined that there is very little suitable habitat within the Project site for most species of migratory shorebird owing to the ephemeral nature of the majority of waterbodies, and the lack of muddy shoreline. Most shorebirds would therefore not be affected by the Project.

The Latham's Snipe is treated a little differently to the other migratory shorebirds as it does not regularly aggregate in large flocks or use the same habitats as many other migratory shorebird species. Consequently, important habitat for Latham's Snipe uses different criteria. Important habitat for Latham's Snipe is described as (DoEE 2017):

- Areas that have previously been identified as internationally important for the species; or
- Areas that support at least 18 individuals of the species.

Areas within the Project site have not been previously identified as internationally important for Latham's Snipe and have not recorded at least 18 individuals in any particular area. Therefore, it is considered unlikely that any areas of the Project site contain important habitat for the Latham's Snipe.

Based on the current survey results, it is considered that migratory shorebirds would only be present in small numbers and habitats on site do not meet the criteria for important habitat for migratory shorebirds (DoEE 2017).

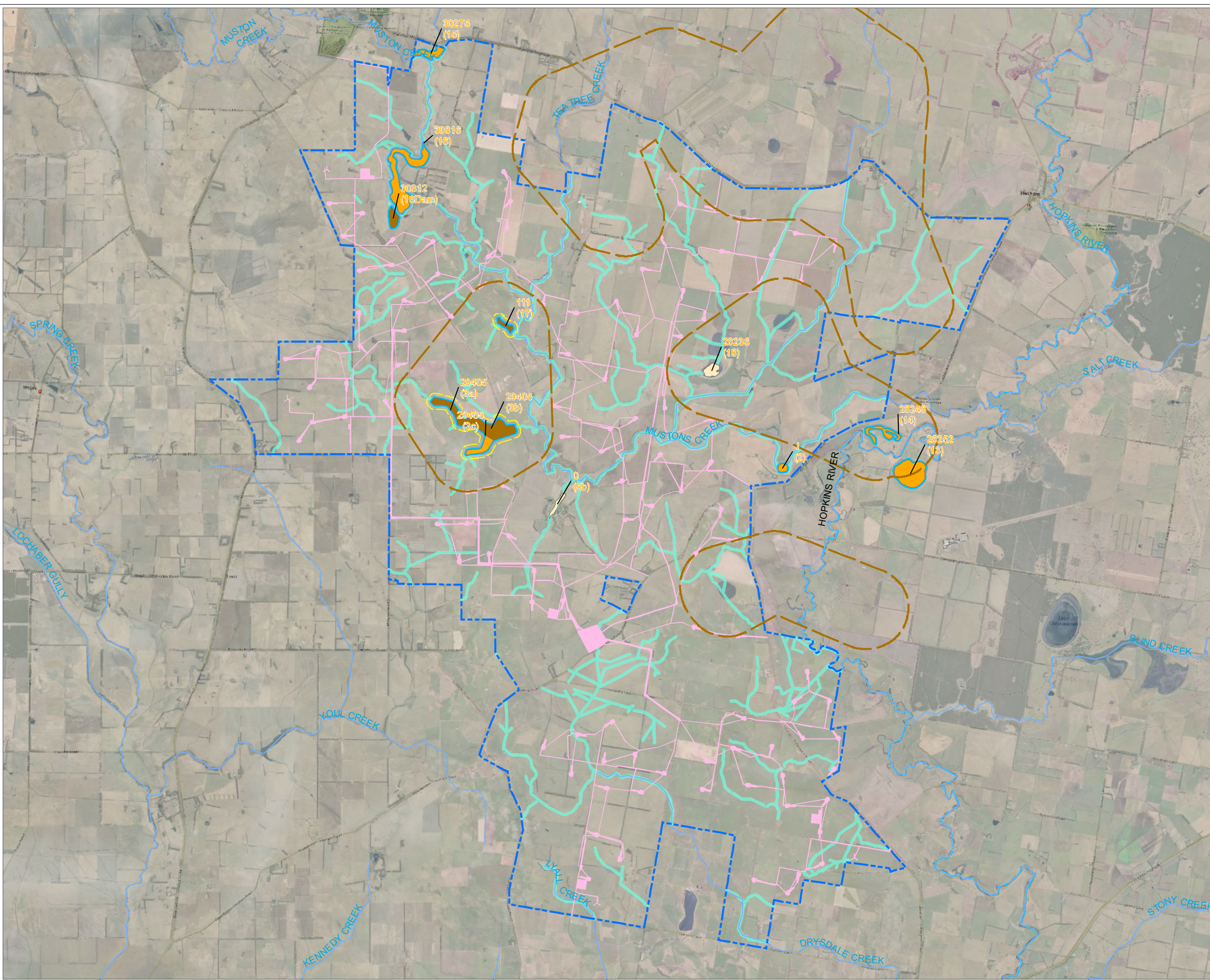
A study was undertaken by Lilleyman *et al.* 2016 looking at disturbance to shorebirds. It was found that the mean flight-initiation distance due to human disturbance was 56 metres and recommended a 100 metre disturbance buffer to shorebird roosting sites. This 100 metre disturbance buffer of all potential shorebird habitat has been implemented at the Project site. In most cases (as shown in Figure 11) this buffer distance is much greater.

To maximise the effectiveness of mitigation measures to avoid impact on migratory species, the following will be implemented.

- Avoid siting wind turbines and associated hard stands, within 100 metres of confirmed habitat, as identified in this report. Two wetlands were confirmed to provide habitat for migratory shorebirds; wetlands 3 and 17. A buffer greater than 100 metres has been applied to these wetlands as a result of a Brolga breeding habitat buffer methodology at these wetlands adopted at the Project site. This is shown in Figure 11.
- Avoid disturbance of banks, channels and vegetation in nearby areas (within 100 meters of centre line of streams or within 100 meters from the edge of wetlands) identified as potential habitat (i.e. marked as 'medium quality'), as identified in Figure 3 and shown in Figure 11.
- Where essential wind farm infrastructure (e.g. access road) crosses a creek line or wetland identified as potential habitat of a listed aquatic fauna species, disturbance of banks, channels and nearby vegetation will be kept to a minimum and if feasible, restored or enhanced to at least its pre-construction condition.
- Install sediment fencing during construction to protect riparian zones if works are to be undertaken (within 30 metres) near creek crossings.

Buffers aimed at protecting wetland habitat are presented in Figure 11 below.

Figure 11: Mitigation measures to avoid impacts on migratory shorebirds
Project: Hexham Wind Farm
Client: Wind Prospect Pty Ltd
Date: 23/05/2022



- Wind farm boundary
- Current concept design
- Broilga breeding habitat buffer
- Migratory shorebird habitat quality (with wetland numberlabelled)**
- Medium high
- Medium
- Low
- 100m buffer from confirmed migratory shorebird habitat
- 30m buffer from migratory shorebird habitat
- 30m buffer from creeks and drains
- 29405 VWI wetland number (3a) (NA wetland number)

N

Metres

0 1,200

Nature Advisory

PO Box 337, Camberwell, VIC 3124, Australia
 www.natureadvisory.com.au
 03 9815 2111 - info@natureadvisory.com.au

Despite habitats at the Project site not providing important habitat for migratory shorebirds, a conservative approach was taken, and a significant impact assessment undertaken below in Table 10.

Table 10: Assessment against MNES Significant Impact Criteria for migratory shorebirds

Significant impact criteria	Assessment of impacts
Loss of habitat	<p>Migratory shorebirds were only detected at two wetlands within the Project site and these wetlands were not considered to be important habitat to any of migratory shorebirds. In addition, all wetlands that provide migratory shorebird habitat are to be buffered by a minimum of 100 m to prevent construction from affecting these areas. All construction works will be subject to CEMPs which will have water run-off and sediment controls to prevent impacts from these sources occurring in any wetlands. Given this, it is unlikely that there will be any loss of habitat.</p>
Degradation of habitat leading to a <i>substantial</i> reduction in migratory shorebird numbers	<p>All wetlands that provide migratory shorebird habitat are to be buffered by a minimum of 100 m, where possible, to prevent construction from affecting these areas. All construction works will be subject to CEMPs which will have water run-off and sediment controls to prevent impacts from these sources occurring in any wetlands. Given this, there expected to be no degradation of migratory shorebird habitat and no related reduction in migratory numbers.</p> <p>In addition, it is unlikely that there are significant population levels, defined as 1% of the population, of any of the species given the very low number detected or absence of each species on the Project site, so a significant reduction in numbers is unlikely.</p>
Increased disturbance leading to a <i>substantial</i> reduction in migratory shorebird numbers	<p>Most disturbance would occur to potential shorebird habitat during the construction phase of the Project, during which they would be able to move to alternative suitable habitat. Therefore, impacts would be minor and temporary, and would not involve modification of available habitat.</p> <p>Disturbance during operation of the windfarm is also unlikely given the low numbers of migratory species present and additional and higher quality habitat available in the surround region.</p>
Direct mortality of birds leading to a <i>substantial</i> reduction in migratory shorebird numbers	<p>Direct mortality of shorebird during construction is highly unlikely given the mobility of avian species.</p> <p>During operation there will be a higher chance of direct mortality through collision with turbines. This is likely to be a very uncommon occurrence given the low numbers of migratory species present and low numbers of records in the immediate region.</p> <p>The Project will also be subject to a bird and bat management plan during operation which will involve monitoring and mitigation procedures aimed at reducing any residual risk that will be posed to migratory, and other species.</p> <p>Given the above it is not expected that there will be a substantial reduction in migratory species' numbers from the Project.</p>

5.3.2 Migratory birds: White-throated Needletail and Fork-tailed Swift

Neither of these species was recorded in the surveys however their occurrence is expected occasionally given their extensive ranges.

White-throated Needletail and Fork-tailed Swift are aerial foragers, spending most of their time flying in search of aerial insect prey and rarely roosting (Higgins 1999). They usually occur in Victoria in summer or early autumn and may be expected to forage over the Project site on several days each year. They move large distances in a short time and their use of the site is transitory and brief when moving these long distances.

These migratory species were found to have the potential to occur over the Project site. There are few regional records to date. This low level of historical occurrence, coupled with the suboptimal habitat on the site (primarily farmland with few forested areas), suggests the frequency of occurrence of these species over the site is likely to be low.

Observations at operating wind farms in south-eastern Australia indicate that these species may occasionally collide with wind turbines (Nature Advisory data). Collisions at the Project site are expected to be low in number (up to one or two per year), based on experience at wind farms elsewhere in its range. Both species remain common and widespread throughout eastern Australia during summer and early autumn (DAWE 2022c). The population of White-throated Needletail numbers 10,000 or more (Higgins 1999), so the loss of the occasional individual is expected to have negligible consequences for the species' population. While the population of Fork-tailed Swift is unknown in Australia, it is believed to be stable, and the species is listed as least concern by the IUCN (DAWE 2022c).

Table 11 provides an assessment of potential impacts to White-throated Needletail and Fork-tailed Swift against the MNES significant impact criteria for species listed as Migratory under the EPBC Act.

Table 12 provides an assessment of potential impacts to White-throated Needletail against the MNES significant impact guidelines for species listed as Vulnerable under the EPBC Act.

Table 11: Assessment of White-throated Needletail and Fork-tailed Swift against MNES Impact Criteria for migratory species

Significant Impact Criteria	Assessment of impacts
<p>Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species.</p>	<p>The proposed works will not impact important habitat for these species as they are predominately aerial and rarely roost. Their breeding habitat exists internationally also.</p>
<p>Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.</p>	<p>As these species are almost exclusively aerial (Higgins 1999), the proposed works will not result in any invasive species that is harmful to these species becoming established in an area of important habitat. The temporary and short-term nature of the species' occurrence on the site means any infestations of invasive species would have a negligible impact on them.</p> <p>That said, the adoption of best practice construction environmental management measures will ensure monitoring and adaptive control of any infestation of an invasive plant or animal species.</p>

Significant Impact Criteria	Assessment of impacts
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	These species do not breed in Australia and the wind farm site does not represent important non-breeding habitat. Direct mortality by collision may happen incidentally however this is not regarded as a cause of decline of the species globally (Tarburton 2014). Therefore, the proposed works will not seriously disrupt the life-cycle of the White-throated Needletail.

Table 12: Assessment of White-throated Needletail against MNES Impact Criteria for vulnerable species

Significant impact criterion	Assessment	Significant impact likelihood
<i>Lead to a long-term decrease in the size of an important population</i>	The population of White-throated Needletail numbers 10,000 or more (Higgins 1999), so the loss of the occasional individual due to collision is expected to have negligible consequences for the species' population.	Unlikely
<i>Reduce the area of occupancy of an important population</i>	The proposed Project site supports highly modified habitat that is not the preferred habitat for the species and it is expected to visit the Project site infrequently. The Project will therefore not reduce the extent of the species range.	Unlikely
<i>Fragment an existing population into two or more populations</i>	The Project will not fragment the population. Even if flying across the site, birds will be able to pass over or between turbines.	Unlikely
<i>Adversely affect habitat critical to the survival of a species</i>	Habitat critical to the survival of the species are breeding grounds in Asia and some forested habitats with high reporting rates. These will not be impacted by the Project.	Unlikely
<i>Disrupt the breeding cycle of an important population</i>	Breeding grounds are located in Asia. The Project will not disrupt the breeding cycle.	Unlikely
<i>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i>	For the reasons outlined above, the site does not support habitat of importance to the species. For this reason, the Project will not decrease the availability or quality of any suitable habitat. The species will therefore not decline as a result.	Unlikely
<i>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</i>	The Project will be constructed and operated in accordance with a detailed environmental management plan that will include monitoring and adaptive control of weed and pest animal infestations and agricultural and plant diseases. It will therefore not result in an outbreak of any invasive species or diseases on the site.	Unlikely

Significant impact criterion	Assessment	Significant impact likelihood
Introduce disease that may cause the species to decline	See previous comment.	Unlikely
Interfere substantially with the recovery of the species	The site is not considered prime habitat for the recovery of this species. It will continue to be used for intensive grazing.	Unlikely
Overall assessment of likelihood of significant impact		Unlikely

5.3.3 Bats

Two Commonwealth EPBC Act-listed species have been recorded at or near the Project site. Southern Bent-wing Bat (SBB) being an echolocating microbat and aerial insect hunter and Grey-headed Flying-fox being a large frugivore bat. Individuals of both species are at risk of collision with wind turbines given they might fly at the Rotor Swept Area (RSA) height.

Southern Bent-wing Bat

Out of tens of thousands of recorded bat calls 168 were attributable to the SBB with 76 calls recorded in spring 2010 and 72 calls in summer/autumn 2019. The majority of attributable SBB calls were from treed and wetlands habitat along Muston's Creek. The SBB was not recorded at the two survey locations at height, mounted on meteorological masts approximately 40 metres above ground during the surveys. It cannot be determined whether SBB calls detected during the survey season represent different bats or a single bat as these calls were recorded utilising ultrasonic detectors.

SBB was recorded from 24 different sites across the Project site from 2010 to 2019 (see Figure 9). Spring 2010 had the highest number of positively identified calls with 77 calls, 69 (89%) of these were recorded at a single site, which lies outside the current Project site to the north-east. Autumn 2019 had the next highest with 72 calls which were less concentrated than the Spring 2010 calls, but primarily distributed across three sites. During the 2010-2011 and 2018-2019 survey periods covering the SBB migration periods, only one season per year had high numbers of calls with the other season yielding comparatively low numbers of calls. For 2010-2011 it was autumn and in 2018-2019 it was spring. This may indicate that while SBB occasionally migrates through the Project site, they likely take different paths with each migration.

The results of the Project bat utilisation study suggests that the species preferred wetland and treed areas in the centre of the Project site and further east along Hopkins River outside the Project site (see Figure 9). It is likely that Southern Bent-wing Bat will preference foraging and migrating through these areas as opposed to the treeless habitat and unvegetated farm dams where the majority of turbines are proposed to be located.

While Southern Bent-wing Bat are capable of flying at great height, their typical behaviour is to fly closer to the ground. As there is little treed habitat across the Project site, Southern Bent-wing Bat are unlikely to fly at turbine rotor swept area (RSA) height frequently in areas proposed for turbines. The proposed turbine blade lower tip height is to be a minimum of 40 metres above the ground, which is higher than most wind turbine RSAs currently installed in Australia. This higher minimum RSA height will reduce the risks of collisions.

The Southern Bent-wing Bat draft recovery plan (Lumsden and Jemison 2015) outlines that at least 50 roost sites are known across the species range. Many of these are not listed publicly and exist on private land and while there are a large number of known SBB roost sites throughout Victoria's southeast, a knowledge gap exists surrounding the characteristics and number of caves that are critical to the subspecies lifecycle and survival (Thompson 2018).

Two caves, Panmure and Grasmere, which are known to support roosting SBB occur within 30 kilometres of the Project site. These caves lie to the south of the wind farm, closer to the Warrnambool maternity caves. The investigation identified another six important roosting sites within the 70-kilometre radius of the wind farm site and four more outside the 70-kilometre radius, but none within the project site or nearby.

Grey-headed Flying-fox

A temporary Grey-headed Flying-fox (GHFF) camp has recently established itself in a pine plantation within four kilometres of the Project site. Monitoring was undertaken by Nature Advisory in February and March 2022 in an effort to determine how many Flying-fox may be utilising the camp. Grey-headed Flying Fox have been recorded in small numbers (5-10 individuals) during these surveys in February 2022. A local member of the public approached the observer and mentioned that the camp has been present on and off since 2019. The species is attracted to the area when Sugar Gum are in flower and the camp is likely only used for a brief period of the year when their food source is in flower (Sugar Gum flower from January to March). Recently published numbers by the National Flying-fox monitor viewer (DAWE 2022b) indicate that numbers of GHFF in this camp vary between 500 to 2,499 (Feb 2022) and 2,500 to 9,999 (August 2021) based on surveys undertaken by volunteers in August 2021 and February 2022. The pine plantation management have initiated monitoring of the camp and have verbally agreed to share the report with HWF once it is complete.

Habitat mapping has been undertaken at the Project site and few habitats were observed. Preliminary studies in February and March 2022 of the Grey-headed Flying-fox have found that the Flying-foxes observed did not fly toward the Project site to forage during these surveys as they moved in a northerly or north-westerly direction from their camp. The Project site is located to the west. GHFF have been observed foraging in planted trees including fruit trees and Sugar Gum to the north of the Project site.

A review of the pine plantation's monitoring report when available and further monitoring of the camp when the flying-fox are present is recommended to gain an understanding of their nightly movements.

Mitigation Measures

Mortalities due to collision and altered access to foraging areas are possible and mitigation measures to prevent these impacts are described below.

- Turbines being positioned at least 120 metres away from major foraging habitat (patches of treed vegetation, see Figure 12). These habitats are more favoured by the species in the Project site and studies at Dundonnell wind farm showed the activity levels of bats dropped considerably at 120 metres from treed areas compared with the treed area itself (BL&A 2015). Any turbines that are currently located within these buffers will be moved through micro-siting to avoid these buffered areas, including the turbine blades.
- Turbines having a minimum height of 40 metres above the ground, a height at and above which the species is unlikely to fly on a regular basis.

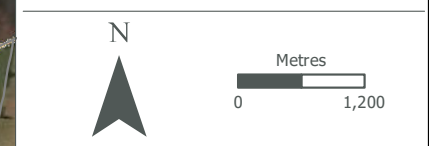
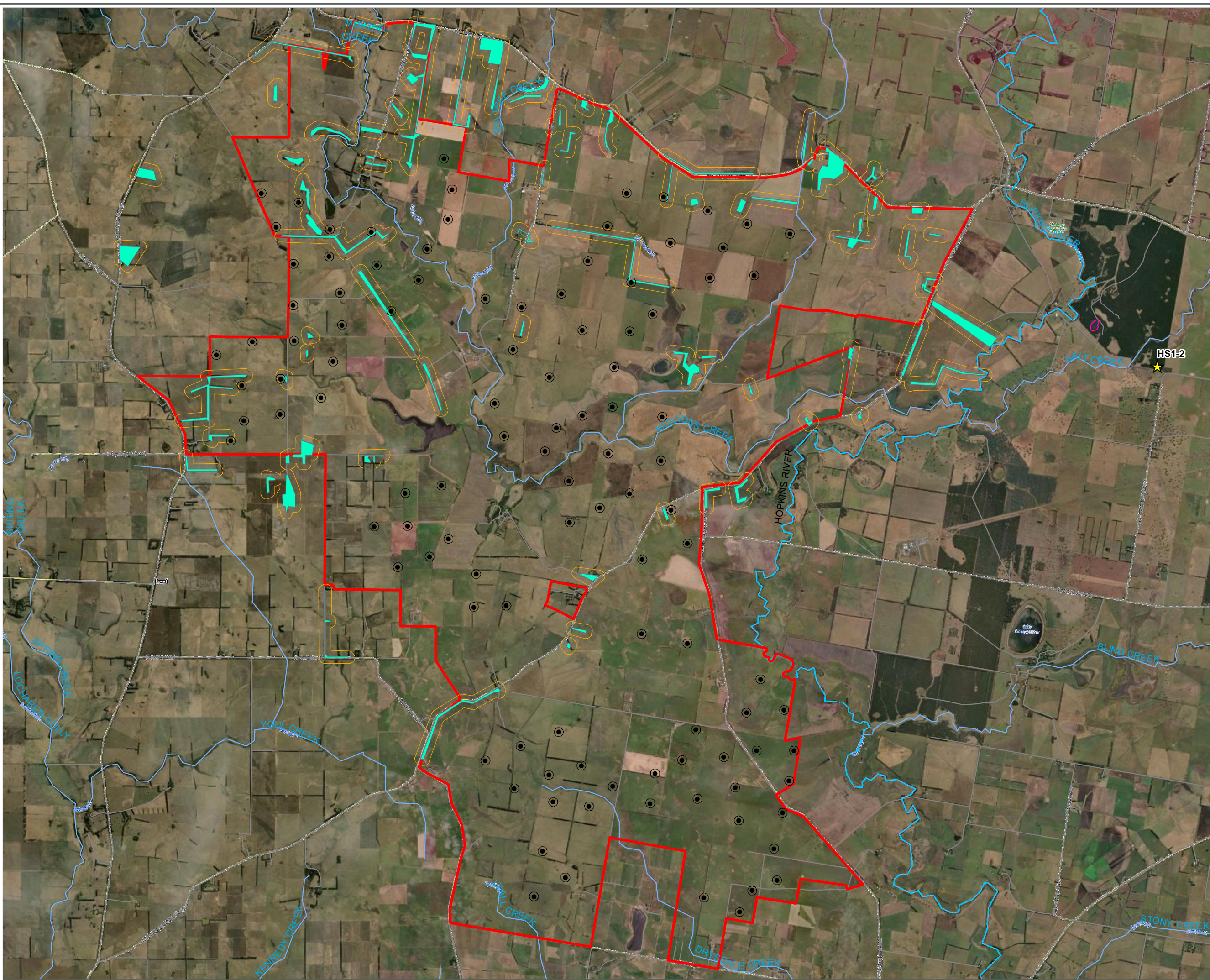
A bat and avifauna adaptive management plan (BAMP) will be prepared for the Project once a planning permit is received. This will outline monitoring responsibilities, trigger responses in the event that a listed

species is impacted by the wind farm, and reporting requirements. Adaptive management measures to reduce impacts would be considered as part of such a plan, if required.

Figure 12: Mitigation measures for reducing potential impacts to Southern Bent-wing Bat (SBB) and Grey-headed Flying-fox (GHFF)

Project: Hexham Wind Farm
Client: Wind Prospect Pty Ltd
Date: 23/05/2022

- ▭ Wind farm boundary
- Turbines
- Turbine buffer (95m)
- Grey-headed Flying-fox likely camp
- GHFF and SBB foraging habitat
- 120m buffer from foraging habitat
- ★ Site with high SBB activity



PO Box 337, Camberwell, VIC 3124, Australia
www.natureadvisory.com.au
 03 9815 2111 - info@natureadvisory.com.au

Given their different EPBC Act status and biology the significant impact assessment presented separately below in Table 13 for Southern Bent-wing Bat Table 14 for the Grey-headed Flying-Fox.

Table 13: Assessment of Southern Bent-wing Bat against MNES Impact Criteria

Significant Impact Criteria	Assessment of impacts	Significant impact likelihood
Lead to a long-term decrease in the size of a population	<p>The population of SBB migrating from the Warrnambool maternity cave is estimated to be approximately 17,000-18,000 individuals. The total species' population is estimated to be approximately 47,700 overall (TSSC 2021).</p> <p>While electronic bat recordings cannot give an accurate representation of numbers of individuals in an area, the low numbers of confirmed SBB calls recorded in the survey indicates that it is unlikely that a significant proportion of SBB individuals migrate through or utilise the area regularly.</p> <p>Most calls concentrated around large waterbodies, creeks, and treed areas. There is little treed habitat across the Project site. A 120 m buffer will be applied around foraging habitat and turbines are proposed in treeless paddocks away from wetlands.</p> <p>The minimum lower blade tip height of the turbines will be 40 metres. The SBB are not known to fly regularly at this height. Thus, the unlikely events of turbine strikes would not significantly impact the population in the long term.</p>	Unlikely
Reduce the area of occupancy of the species	<p>The proposed Project site supports mostly highly modified habitat and surveys show SBB infrequently use the area. The proposed turbine locations and associated infrastructure will not affect the areas with the highest numbers of calls, such as wooded areas and large wetlands with fringing vegetation.</p> <p>Any habitat being removed during construction is unlikely to be key habitat for SBB and a 120 m buffer is applied to SBB foraging habitat. Therefore, the project will not reduce the area of occupancy of the species.</p>	Unlikely
Fragment an existing population into two or more populations	<p>The Project will not fragment the population. Even if flying across the site, bats will be able to pass between turbines.</p>	Unlikely
Adversely affect habitat critical to the survival of a species	<p>Habitat critical to the survival of the species is primarily the breeding caves locations in South Australia and Warrnambool, both a considerable distance from the site. Other habitat critical to the species are over-winter roosting caves, the closest known of these are at Byaduk approximately 50-55 kilometres NW from the site and Yambuk, approximately 50-55 kilometres SW from the site. There are no other known caves closer to the site and no caves are to be impacted by the construction of the Project.</p> <p>Foraging habitat in proximity to the above-mentioned caves is also critical habitat to the species. The two most likely areas of important foraging habitat close to the Project site are the two areas with the</p>	Unlikely

Significant Impact Criteria	Assessment of impacts	Significant impact likelihood
	highest numbers of recorded calls close to Mustons Creek and Hopkins River (see Figure 9), which will not be impacted by the Project. Therefore, no critical habitat for the SBB will be adversely affected.	
Disrupt the breeding cycle of a population	The wind farm lies 40-45 km from the nearest maternity cave (near Warrnambool), which is within the limit of nightly flying distance (approximately 70 km) of breeding adults and juvenile bats using these caves. Though this upper limit of 70 km is not the usual flying distance and it is more common that the bats would fly out to 35-40 km per night. The project will therefore not disrupt the breeding cycle of this species.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	For the reasons outlined above, the site does not support habitat of importance to the species. For this reason, the Project will not decrease the availability or quality of any suitable habitat. The species will therefore not decline as a result.	Unlikely
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat	The Project will be constructed and operated in accordance with a detailed environmental management plan that will include monitoring and adaptive control of weed and pest animal infestations and agricultural and plant diseases. It will therefore not result in an outbreak of any invasive species or diseases on the site.	Unlikely
Introduce disease that may cause the species to decline	See previous comment.	Unlikely
Interfere with the recovery of the species	The site is not considered prime habitat for the recovery of this species. It will continue to be used for intensive grazing and will not be available for revegetation that might increase the area of habitat within the species' range.	Unlikely
Overall assessment of likelihood of significant impact		Unlikely

Table 14: Assessment of Grey-headed Flying Fox against MNES Impact Criteria

Significant Impact Criteria	Assessment of impacts	Significant impact likelihood
<i>Lead to a long-term decrease in the size of an important population</i>	The numbers of GHFF at the temporary camp are not known yet but may be above the threshold for a nationally important camp (>2,500). Further investigations and monitoring of the camp are required. Mitigation measures such as a 120 m turbine-free buffer around foraging habitat will be applied to avoid a long-term decrease of the size of this population.	unknown
<i>Reduce the area of occupancy of an important population</i>	The population near the site might be an important population but the habitat of this species is not proposed to be reduced as only a few scattered trees are proposed to be removed.	Unlikely
<i>Fragment an existing important population into two or more populations</i>	The Project will not fragment the camp site of GHFF.	Unlikely
<i>Adversely affect habitat critical to the survival of a species</i>	The Project site and surrounds support low-quality habitat for the species due to the lack of wooded habitat, this being restricted to blue gum plantations, roadside vegetation, and ornamental and fruit trees in farm gardens. Wooded habitat will not be affected significantly by the works proposed.	Unlikely
<i>Disrupt the breeding cycle of an important population</i>	GHFF only use the plantation as a temporary camp for feeding on nearby flowering gum trees. This is not a breeding site for GHFF.	Unlikely
<i>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i>	The Project site does not support critical habitat for the species, and the works will not involve removal of wooded habitat.	Unlikely
<i>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</i>	The Project will be constructed and operated in accordance with a detailed environmental management plan that will include monitoring and adaptive control of weed and pest animal infestations and agricultural and plant diseases. It will therefore not result in an outbreak of any invasive species or diseases on the site.	Unlikely
<i>Introduce disease that may cause the species to decline</i>	See previous comment.	Unlikely
<i>Interfere substantially with the recovery of the species</i>	The site is not considered prime habitat for the recovery of this species. It will continue to be used for intensive grazing and will not be available for revegetation that might increase the area of habitat within the species' range.	Unlikely
Overall assessment of likelihood of significant impact		Unlikely

5.3.4 Striped Legless Lizard

Striped Legless Lizard has not been recorded within the Project site however it has been recorded in the surrounding search region along roadside reserves and other areas of suitable habitat. Suitable habitat is present in areas of Plains Grassland, Plains Grassy Woodland and Stony Knoll Shrubland mostly within road reserves of the Project site excluding ploughed and cultivated paddocks, which were considered not suitable due to the lack of tussock-forming grasses and crevices in the ground (Figure 13). No targeted surveys have been undertaken based on early advice from the Department of Environment and Primary Industry (DEPI) now the Department of Environment, Land Water and Planning (DELWP) to assume presence within areas of suitable habitat (EHP 2014).

The presence of suitable habitat, within the Project site means that there may be resident populations of the species within the Project site. Potential direct and indirect impacts to Striped Legless Lizard, as a result of the proposed development include:

- Direct mortality of lizards and associated habitats in areas of suitable habitat (i.e. areas of Plains Grassland and their immediate surrounds); and
- Displacement of lizards and as a result of removal of habitat (i.e. areas of Plains Grassland and their immediate surrounds) (EHP 2014).

To mitigate against such potential impacts, micro-siting of turbines and infrastructure to avoid potential Striped Legless Lizard habitat (areas identified in Figure 13) is recommended. Given that such habitat can often be a small and clearly defined area, the careful placement of infrastructure to avoid these areas is often possible and will minimise impacts on this species. It is recommended that mitigation measures to avoid impacting on suitable habitat be discussed in detail in the Construction Environmental Management Plan (CEMP).

Avoidance has been the primary measure to mitigate potential impacts on Striped Legless Lizard within the site as shown in Table 15.

Table 15: Avoid and minimise impacts in Striped Legless Lizard







Suitable habitat	Total recorded in the Project site	Total initially proposed for removal	Total currently proposed for removal
Plains Grassland, Plains grassy woodland, Stony knoll shrubland	30.966	16.388	1.768

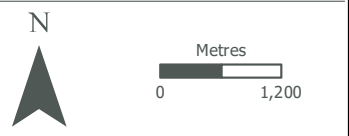
There are not likely to be any cumulative impacts from the proposed wind farm on Striped Legless Lizard within the broader area. A small amount of potential habitat may be removed, however this will have little impact on the population of the species on a broader scale. Potential areas of impact to habitat are not wide and will not fragment populations more than the current environment, which is transected by a variety of roads and other infrastructure which represents unsuitable habitat (EHP 2014).

Table 16 provides an assessment of potential impacts to Striped Legless Lizard against the MNES significant impact guidelines for species listed as Vulnerable under the EPBC Act.

Figure 13: Mitigation measures to reduce the potential impacts on Striped Legless Lizard

Project: Hexham Wind Farm
Client: Wind Prospect Pty Ltd
Date: 23/05/2022

-  Wind farm boundary
-  Current concept design
-  Initial concept design
-  Potential Striped Legless Lizard habitat
-  Proposed clearance of suitable habitat
-  Avoided clearance of suitable habitat



PO Box 337, Camberwell, VIC 3124, Australia
www.natureadvisory.com.au
 03 9815 2111 - info@natureadvisory.com.au

Table 16: Assessment of Striped Legless Lizard against MNES Impact Criteria

Significant Impact Criteria	Assessment of impacts	Significant impact likelihood
<i>Lead to a long-term decrease in the size of an important population</i>	A small amount of potential habitat (1.768 ha) may be removed, however this will have little impact on the population of the species on a broader scale.	Unlikely
<i>Reduce the area of occupancy of an important population</i>	Areas of suitable habitat are located along the road reserve. Only small patches of suitable habitat are proposed to be removed. These areas are unlikely to support an important population.	Unlikely
<i>Fragment an existing important population into two or more populations</i>	Potential areas of impact to habitat are not wide and will not fragment populations more than the current environment, which is transected by a variety of roads and other infrastructure which represents unsuitable habitat.	Unlikely
<i>Adversely affect habitat critical to the survival of a species</i>	Small patches of suitable habitat are proposed for removal. These areas are unlikely to affect habitat critical to the survival of the species.	Unlikely
<i>Disrupt the breeding cycle of an important population</i>	The removal of suitable habitat is unlikely to disrupt the breeding cycle of the species.	Unlikely
<i>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</i>	The small patches of suitable habitat Proposed to be removed is unlikely to result in a large reduction of available habitat or reduce the quality as the habitats are currently in a fragmented and linear landscape.	Unlikely
<i>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</i>	The Project will be constructed and operated in accordance with a detailed environmental management plan that will include monitoring and adaptive control of weed and pest animal infestations and agricultural and plant diseases. It will therefore not result in an outbreak of any invasive species or diseases on the site.	Unlikely
<i>Introduce disease that may cause the species to decline</i>	See above.	Unlikely
<i>Interfere substantially with the recovery of the species</i>	The site is not considered prime habitat for the recovery of this species. It will continue to be used for intensive grazing and will not be available for revegetation that might increase the area of habitat within the species' range.	Unlikely
Overall assessment of likelihood of significant impact		Unlikely

Suitable habitat for Striped Legless Lizard occurs on the Project site and this species was considered likely to occur, but only a small amount of potential habitat will be impacted.

5.3.5 Growling Grass Frog

Growling Grass Frog has been recorded on three occasions at the Project site as indicated in Figure 9. Mustons Creek and Hopkins River are considered likely to provide wildlife corridors for the Growling Grass Frog. It could also move along the small tributaries of the Mustons Creek or occupy a small number of dams and ephemeral wetlands during periods of inundation.

Provided appropriate avoidance and minimal removal of its wetland habitat can be achieved (e.g. at access track crossing points of watercourses), there is no reason to expect that the frog would be adversely affected in the long term by the Project. Table 17 below outlines how the avoid and minimise process has been implemented at the Project site.

Table 17: Avoid and minimise process to reduce potential impacts on Growling Grass Frog

Suitable habitat	Total recorded in the Project site (ha)	Total initially proposed for removal (ha)	Total currently proposed for removal (ha)
Mustons Creek, Hopkins River and medium to high quality wetlands	208.10	0.527	0.123

To maximise the effectiveness of mitigation measures to avoid impact on GGF, the following will be applied:

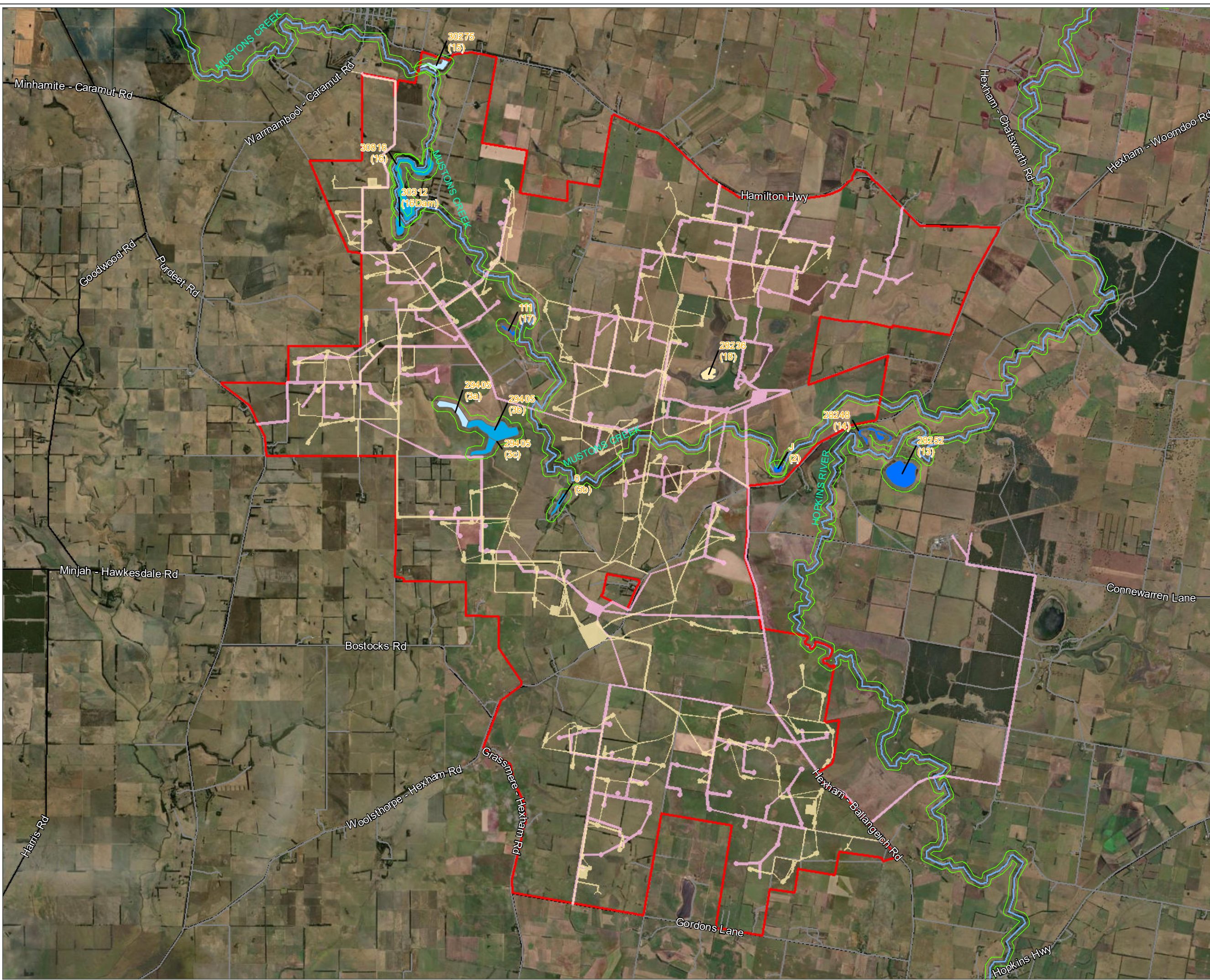
- Avoid siting wind turbines and associated hard stands, within 100 metres of confirmed habitat, as identified in this report (Mustons Creek);
- Avoid disturbance of banks, channels and vegetation in nearby areas (within 100 meters of centre line of Hopkins River or within 100 meters from the edge of wetlands) identified as potential habitat (i.e. classified from medium to high quality habitat), as identified in Figure 14.
- Where essential wind farm infrastructure (e.g. access road) crosses a creek line or wetland identified as potential habitat of a listed aquatic fauna species, disturbance of banks, channels and nearby vegetation shall be kept to a minimum and if feasible, restored or enhanced to at least its pre-construction condition;
- Install sediment fencing during construction to protect riparian zones if works are to be undertaken (within 30 metres of) near creek crossings.

The Department of Environment Land Water and Planning (DELWP) recommends a minimum 50 m buffer around Growling Grass Frog breeding wetlands in which major infrastructure (i.e. roads, buildings) is avoided. Minor infrastructure (shared use path, passive recreation) must not be placed within 30 m of a breeding wetland (DELWP 2017). As such a 100 m buffer as a precautionary buffer around all *potential* Growling Grass Frog habitat was considered sufficient.

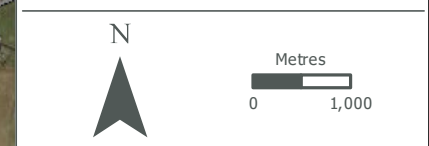
Table 18 provides an assessment of potential impacts to Growling Grass Frog against the MNES significant impact guidelines for species listed as Vulnerable under the EPBC Act.

Figure 14: Mitigation measures to reduce the potential impacts on Growing Grass Frog

Project: Hexham Wind Farm
Client: Wind Prospect Pty Ltd
Date: 25/05/2022



- ▭ Wind farm boundary
- ▭ Current concept design
- ▭ Initial concept design
- GGF habitat quality (with wetland number labelled)**
- ▭ High
- ▭ Medium-high
- ▭ Medium
- ▭ Low
- ▭ 100m from suitable habitat



18088 - Created by: ef - E:\GIS\2018 Jobs\18088\18088.16 FIG13 GGF Avoidance 220506.mxd

Table 18: Assessment of Growling Grass Frog against MNES Impact Criteria

Significant Impact Criteria	Assessment of impacts	Significant impact likelihood
Lead to a long-term decrease in the size of an important population	Project construction will not lead to a long-term decrease in the population size of Growling Grass Frogs as turbines are set back 100 metres from the potential habitat along Mustons Creek, Hopkins River and other suitable wetland habitat. Any upgrading of the creek crossing will be completed without impacts on flows or water quality and there will be no impacts on aquatic habitats from construction and operation of the Project. Crossings and management measures will be included in an CEMP, such as culvert design and erosion control etc. Significant impacts on this species are not expected.	Unlikely
Reduce the area of occupancy of an important population	The proposed works associated with the Project site will not reduce the area of occupancy of an important population as turbines are set back 100 metres from the potential habitat and the upgrading of the creek crossing will be completed in a sensitive manner. There will be no impacts on flows or water quality on aquatic habitats from construction and operation of the proposed wind farm, significant impacts on this species are not expected.	Unlikely
Fragment an existing important population into two or more populations	The proposed works associate with the Project will not fragment important populations as the mapped habitat is mainly contiguous along creeks and stream as turbines are set back 100 metres from the potential habitat and any upgrading of the creek crossing will be completed without impacts on connectivity.	Unlikely
Adversely affect habitat critical to the survival of a species	Project works will not adversely affect habitat critical to the survival of the species. Suitable and important habitat is available and will not be impacted by the Project.	Unlikely
Disrupt the breeding cycle of an important population	The Project will not disrupt the breeding cycle of an important population as turbines are set back 100 metres from the potential habitat and any upgrading of the creek crossing will be completed without impacts on connectivity.	Unlikely
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The Project will not modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, as turbines are set back 100 metres from the potential habitat and any upgrading of the creek crossing will be completed without impacts on connectivity. Crossings and management measures will be included in an CEMP, such as culvert design and erosion control etc.	Unlikely
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Invasive species which are a threat to Growling Grass Frog include species such as Gambusia (Mosquito Fish) which predate on tadpoles. The proposed development does not pose the threat of introducing a new invasive species that would affect Growling Grass Frogs, as mitigation measures during construction will be implemented and monitored as stated in the CEMP.	Unlikely
Introduce disease that may cause the species to decline	The Growling Grass Frog is susceptible to a highly infectious disease caused by the amphibian chytrid fungus <i>Batrachochytrium dendrobatidi</i> . Management measures will be enforced to prevent such	Unlikely

	harmful diseases to be introduced. Actions will be undertaken during the construction phase to control the spread of disease between waterbodies and adjacent waterways. Crossings and management measures will be included in an CEMP, such as culvert design and pest control etc.	
<i>Interfere substantially with the recovery of the species</i>	Project works will not interfere substantially with the recovery of the species as infrastructure is set back 100 metres from the potential habitat and any upgrading of the creek crossing will be completed without impacts on connectivity.	Unlikely
Overall assessment of likelihood of significant impact		Unlikely

5.4 Implications under the EPBC Act

The assessment determined that it is unlikely that the project will result in a significant impact to Matters of National Environmental Significance. Insufficient data is available on the temporary camp of Grey-headed Flying-foxes within 4 km of the Project site and further investigations are required to determine potential impacts. No other threatened flora or fauna species or listed ecological communities will be significantly affected.

No EPBC Act-listed flora species have been recorded in the development footprint and therefore will not be impacted by the proposed project.

Three EPBC Act listed ecological communities were recorded within the Project site listed below.

- *Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP)*
- *Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP)*
- *Seasonal Herbaceous Wetland of the Temperate Lowland Plain (SHWTLP)*.

Avoidance has been the primary measure to mitigate potential impacts on listed ecological communities within the site as shown in Table 7.

GEWVVP has been 100% avoided and all of this community will be retained.

The vast majority of NTGVVP within the Project site has been avoided by selectively placing infrastructure away from Plains Grassland. Approximately 95% of the NTGVVP ecological community has been avoided and will be retained. Impacts have been minimised as 0.499ha were originally proposed for removal based on the previous design and this has been reduced to 0.218ha through updates to the design aimed at reducing impacts.

The majority of potential and confirmed SHWTLP within the Project site has been avoided by selectively placing infrastructure away from mapped Plains Grassy Wetland, more than 98.5% of the potential and confirmed SHWTLP ecological community will be retained (Table 7). A total of 3.525ha of potential SHWTLP was originally proposed for removal based on the previous design. Changes in the development footprint to minimise impacts on this community has resulted in the total area of SHWTLP proposed for removal being reduced to 0.225ha.

Based on the current survey results, it is considered that migratory shorebirds would only be present in small numbers and habitats on site do not meet the criteria for important habitat for migratory shorebirds (DoEE 2017). Design mitigation measures have been implemented to protect areas suitable for migratory shorebirds.

The Southern Bent-wing Bat and Grey-headed Flying-fox have been recorded in the Project site. Mitigation measures to reduce the impacts on these species have been recommended including turbine free buffers

from foraging habitats, ensuring a minimum turbine blade tip height of at least 40 metres above ground level and implementing a Bird and Bat Adaptive Management Plan. The plan would include a monitoring program and management strategies that will be implemented in the unlikely event that one of these species collides with a turbine.

Suitable habitat for Striped Legless Lizard occurs on the Project site and this species was considered likely to occur, but only a small amount of potential habitat will be impacted.

Removal of suitable habitat for Growling Grass Frog has been avoided or minimised. Disturbance to Growling Grass Frog habitat will be minimal and temporary. Growling Grass Frog will be able to continue to utilise habitats once construction has finished and the wind farm is operational. Any upgrading of the creek crossing will be completed without impacts on flows or water quality and there will be no impacts on aquatic habitats from construction and operation of the proposed wind farm. Management measures will be included in a CEMP, such as culvert design and erosion control requirements.

6 References

- Allen GR, Midgley SH & Allen M 2002, *Field Guide to the Freshwater Fishes of Australia*, Western Australian Museum, Perth.
- Australian Wind Energy Association (AusWEA) 2005, *Wind Farms and Birds: Interim Standards for Risk Assessment*, Australian Wind Energy Association, Melbourne.
- Bates RJ 1994, 'Prasophyllum', in Walsh NG & Entwisle TJ (eds), *Flora of Victoria Volume 2: Ferns and Allied Plants, Conifers and Monocotyledons*, Inkata Press, Melbourne.
- Biosis 2018. Mount Fyans Wind Farm: Targeted flora and fauna survey report. Report for Hydro Tasmania. Authors: Gibson, M., Arber, S., Thomas, G. & Cable, T., Byrne, A., Venosta, M. & Sofo, K. Biosis Pty Ltd, Ballarat. Project no. 14369
- BirdLife Australia 2019, *Birddata*, <https://birddata.birdlife.org.au/>, accessed 16th March 2019.
- BL&A 2015, *Dundonnell Wind Farm Flora and Fauna Assessment*. Prepared for Trustpower Australia Pty Ltd. Report number 9184 (5.15)
- Cadwallader PL & Backhouse GN 1983, *A Guide to the Freshwater Fish of Victoria*, F.D. Atkinson Government Printer, Melbourne.
- Carter O 2010, *National Recovery Plan for the Curly Sedge (Carex tasmanica)*, Department of Environment, Land, Water and Planning, East Melbourne.
- Carter O & Walsh N 2006, *National Recovery Plan for the Wrinkled Cassinia (Cassinia rugata)*, Department of Environment, Land, Water and Planning, East Melbourne.
- Clean Energy Council (CEC) 2018, *Best Practice Guidelines for Implementation of Wind Energy Projects in Australia*. Clean Energy Council, Melbourne, Victoria.
- Clemann N and Gillespie GR 2004. 'Recovery Plan for *Litoria raniformis* 2004 – 2008. Department of Environment and Heritage, Canberra.
- DAWE 2022a, *EPBC Act Protected Matters Search Tool*, Department of the Environment and Energy, Canberra, viewed 4th April 2022, <https://www.environment.gov.au/epbc/pmst/index.html>.
- DAWE 2022b, *National Flying-fox monitoring viewer*. Department of Agriculture, Water and the Environment, Canberra, viewed 20th May 2022 <https://www.environment.gov.au/webgis-framework/apps/ffc-wide/ffc-wide.jsf>
- DAWE 2022c, *Species Profile and Threats Database*, Department of Agriculture, Water and the Environment, Canberra, viewed 5th April 2022 <https://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>.
- DELWP 2017, *Growling Grass Frog Habitat Design Standards*, Melbourne Strategic Assessment, The State of Victoria Department of Environment, Land, Water and Planning, 2017.
- DELWP 2021a, *Policy and planning guidelines for the development of wind energy facilities in Victoria*, Department of Environment, Land, Water and Planning, East Melbourne, Victoria.
- DELWP 2021b, *Native Vegetation Information Management system*, Department of Environment, Land, Water and Planning, East Melbourne, Victoria, viewed 5th February 2021, <https://nvim.delwp.vic.gov.au/>.
- DELWP 2022, *Victorian Biodiversity Atlas 3.2.5*, Department of Environment, Land, Water and Planning, East Melbourne, Victoria, viewed April 2022, <https://vba.dse.vic.gov.au>.

- Department of Sustainability and Environment (DSE) 2010, *Biodiversity Precinct Structure Planning Kit*, Department of Sustainability and Environment East Melbourne, Victoria.
- Department of the Environment (DoE) 2013, *Matters of National Environmental Significance – Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*. DoE, Canberra.
- Department of the Environment and Energy (DoEE) 2017, *EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species*, Commonwealth of Australia 2017.
- Department of the Energy and Environment (DoEE) 2018, *Approved Conservation Advice (including Listing Advice) for the Assemblages of species associated with open-coast salt-wedge estuaries of western and central Victoria ecological community*, Department of the Environment and Energy, Canberra.
- Department of Agriculture, Water and the Environment 2022, *Species Profile and Threats Database*, Department of Agriculture, Water and the Environment, Canberra, accessed 2022, <http://www.environment.gov.au/sprat>.
- Department of Environment, Water, Heritage and the Arts (DEWHA) 2009, 'Background Paper to EPBC Act Policy Statement 3.12 – Nationally Threatened Species and Ecological Communities. Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (*Synemon plana*)'.
- Ecology and Heritage Partners Pty Ltd (EHP) 2014, *Hexham Wind Farm – Detailed Flora and Fauna Investigations*, consultant report prepared for Hexham Wind Farm Pty Ltd.
- Emison WB, Beardsell CM, Norman FI Loyn RH, & Bennett SC 1987, *Atlas of Victorian Birds*, Department of Conservation, Forests and Lands & Royal Australasian Ornithologists Union, Melbourne.
- Entwisle TJ 1996, 'Casuarinaceae', in Walsh, NG & Entwisle, TJ (eds), *Flora of Victoria, Volume 3: Dicotyledons Winteraceae to Myrtaceae*, Inkata Press, Melbourne, pp. 90-101.
- Higgins, PJ & Davies, SJJF (eds) 1996, *Handbook of Australian, New Zealand & Antarctic Birds*, Volume 3 Snipe to Pigeons, Oxford University Press, Melbourne.
- Higgins, PJ, Peter, JM & Steele, WK (eds) 2001, *Handbook of Australian, New Zealand and Antarctic Birds*, Volume 5: Tyrant-flycatchers to Chats, Oxford University Press, Melbourne.
- Higgins, PJ, Peter, JM & Cowling, SJ (eds) 2006, *Handbook of Australian, New Zealand and Antarctic Birds*, Volume 7: Boatbill to Starlings, Oxford University Press, Melbourne.
- Higgins, PJ (ed) 1999, *Handbook of Australian, New Zealand and Antarctic Birds*, Volume 4: Parrots to Dollarbird, Oxford University Press, Melbourne.
- Jones DL 1994, 'Pterostylis', in NG Walsh & TJ Entwisle (eds), *Flora of Victoria, Volume 2: Ferns and Allied Plants, Conifers and Monocotyledons*, Inkata Press, Melbourne, pp. 798-830.
- Kennedy, SJ & Tzaros, CL 2005, 'Foraging ecology of the Swift Parrot *Lathamus discolor* in the Box-ironbark forests and woodlands of Victoria', *Pacific Conservation Biology* 11, 158 – 173.
- Lilleyman A, Franklin DC, Szabo JK and Lawes MJ 2016. Behavioural responses of migratory shorebirds to disturbance at high-tide roost. *Emu*, 116: 111-118.
- Lumsden, L. F. and Jamieson, M. L. 2015. National Recovery Plan for the Southern Bent-wing Bat *Miniopterus schreibersii bassanii*. Department of Environment, Land, Water and Planning.

- Marchant, S & Higgins, PJ (eds) 1990, *Handbook of Australian, New Zealand and Antarctic Birds, Volume 1: Ratites to Ducks*, Oxford University Press, Melbourne.
- Marchant, S & Higgins, PJ (eds) 1993, *Handbook of Australian, New Zealand and Antarctic Birds, Volume 2, Raptors to Lapwings*, Oxford University Press, Melbourne.
- Menkhorst, P 1995, *Mammals of Victoria*, Oxford University Press, Melbourne.
- Naarding, J.A. 1983, Latham's Snipe in Southern Australia. Wildlife Division Technical Report 83/1. Tasmania National Parks and Wildlife Service.
- NSW Office of Environment and Heritage (NSW OEH) 2012, *National Recovery Plan for Button Wrinklewort (*Rutidosia leptorrhynchoides*)*, NSW Office of Environment and Heritage, Hurstville.
- Olsen P 1995, *Australian Birds of Prey*, University of NSW Press, Sydney, NSW.
- Reardon TB, McKenzie NL, Cooper SJB, Appleton B, Carthew S & Adams M 2014, 'A molecular and morphological investigation of species boundaries and phylogenetic relationships in Australian free-tailed bats *Mormopterus* (Chiroptera: Molossidae)', *Australian Journal of Zoology* 62: 109-136.
- Scarlett NH 1999, 'Taraxacum', in Walsh NG and Entwisle TJ (eds) *Flora of Victoria, Volume 4: Dicotyledons, Cornaceae to Asteraceae*, Inkata Press, Melbourne, pp. 688-694.
- Tarburton M.K., 2014, Status of the White-throated Needletail *Hirundapus caudacutus* in Australia: Evidence for a marked decline. *Australian Field Ornithology*, 31, 122–140.
- Thompson, R. 2018. Review and Revision of the Southern Bent-winged Bat (*Miniopterus orianae bassanii*) Regional Action Plan for the South East of South Australia: 2018-2028. Report prepared for the Department for Environment and Water, Government of South Australia. Nature Glenelg Trust, Mount Gambier, South Australia.
- Threatened Species Scientific Committee (TSSC) 2008a, *Commonwealth Listing Advice on Grassy Eucalypt Woodland of the Victorian Volcanic Plain*, Department of the Environment, Water, Heritage and the Arts, Canberra.
- Threatened Species Scientific Committee (TSSC) 2008b, *Commonwealth Listing Advice on Natural Temperate Grassland of the Victorian Volcanic Plain*, Department of the Environment, Water, Heritage and the Arts, Canberra.
- Threatened Species Scientific Committee (TSSC) 2008c, Approved Conservation Advice for *Senecio psilocarpus* (Swamp Fireweed).
- Threatened Species Scientific Committee (TSSC) 2012, *Commonwealth Listing Advice on Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains*, Commonwealth of Australia.
- Threatened Species Scientific Committee (TSSC) 2021, *Commonwealth listing advice on *Miniopterus orianae bassanii* Southern Bent-wing Bat*, Commonwealth of Australia.
- Tzaros, C 2005, *Wildlife of the Box-Ironbark Country*. CSIRO Publishing, Melbourne.
- Walsh NG 1994, 'Poaceae', in NG Walsh & TJ Entwisle (eds), *Flora of Victoria, Volume 2: Ferns and Allied Plants, Conifers and Monocotyledons*, Inkata Press, Melbourne, pp. 356-627.
- Weber JZ & Entwisle TJ 1994, 'Thelymitra', in NG Walsh & TJ Entwisle (eds), *Flora of Victoria, Volume 2: Ferns and Allied Plants, Conifers and Monocotyledons*, Inkata Press, Melbourne, pp. 840-854.

Appendix 1: EPBC Act listed flora species and likelihood of occurrence.

Common Name	Scientific Name	EPBC	FFG	Habitat	Number of records	Date of last record	Likelihood of occurrence
River Swamp Wallaby-grass	<i>Amphibromus fluitans</i>	VU		River Swamp Wallaby-grass grows mostly in permanent swamps and also lagoons, billabongs, dams and roadside ditches. The species requires moderately fertile soils with some bare ground; conditions that are caused by seasonally-fluctuating water levels (DoEE 2018).	None	N/A	Suitable (but sub-optimal) habitat along watercourses. No records within 10 km. Unlikely to occur.
Bell-flower Hyacinth-orchid	<i>Dipodium campanulatum</i>	EN	EN	Reported from only a few scattered localities west of Melbourne to Portland (Entwisle 1994). Typically found on deep grey sands or limestone in stringybark (<i>Eucalyptus baxteri</i> /arenacea) woodland with an understorey of bracken fern, Acacia species (Bates, 2011), cranberry heath and magenta storks bill. It is also found in South Australian blue gum (<i>E. leucoxyton</i>) and pink gum association woodlands. These areas have wet winters and long dry mild summers (DoEE 2018).	None	N/A	No suitable habitat. Unlikely to occur.
Trailing Hop-bush	<i>Dodonaea procumbens</i>	VU		Grows in low lying, often winter wet areas in woodland, low open-forest heathland and grasslands on sands and clays. Largely confined to SW of Victoria (DoEE 2018).	None	N/A	Suitable habitat within EVCs 132_61 and 55. No records within 10 km. Potential to occur. Not recorded during targeted surveys, and therefore now considered unlikely to occur.
Clover Glycine	<i>Glycine latrobeana</i>	VU	VU	Found across south-eastern Australia in native grasslands, dry sclerophyll forests, woodlands and low open woodlands with a grassy ground layer. In Victoria, populations occur in lowland grasslands, grassy woodlands and sometimes in grassy heath (DoEE 2018).	11	17/12/1998	Suitable habitat in EVCs 132_61 and 55. Potential to occur. Not recorded during targeted surveys, and therefore now considered unlikely to occur.
Adamson's Blown-grass	<i>Lachnagrostis adamsonii</i>	EN	EN	Confined to slow moving creeks, swamps, flats, depressions or drainage lines that are seasonally inundated or waterlogged and usually moderately to highly saline. Appear to favour sites that have some shelter from the wind (DoEE 2018).	4	9/06/2001	Suitable habitat along drainage lines. Potential to occur in EVCs 125, 641 and 821. Not recorded during targeted surveys, and therefore now considered unlikely to occur.
Spiny Peppercross	<i>Lepidium aschersonii</i>	VU	EN	The Spiny Peppercross occurs in periodically wet sites such as gilgai depressions and the margins of freshwater and saline marshes and shallow lakes, usually on heavy clay soil. Almost all sites receive some degree of soil waterlogging or seasonal flooding (Carter 2010).	3	1/06/1983	No suitable habitat. Unlikely to occur.
White Sunray	<i>Leucochrysum albicans</i> subsp. <i>tricolor</i>	EN	EN	Occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils. Plants can be found in natural or semi-natural vegetation and grazed or ungrazed habitat. Bare ground is required for germination. The unpalatability of this species is likely to protect it in heavily grazed areas where patches of bare ground are likely to develop, favouring recruitment (DoEE 2018).	3	11/11/2008	Suitable habitat in EVCs 132_61 and 55. Potential to occur. Not recorded during targeted surveys, and therefore now considered unlikely to occur.
Spiny Rice-flower	<i>Pimelea spinescens</i> subsp. <i>spinescens</i>	CR	CR	Occurs in grassland or open shrubland on basalt derived soils, usually comprising black or grey clays. Plants from more northerly populations occur on red clay complexes, while plants from southern populations occur on heavy grey-black clay loams. Topography is generally flat but populations may occur on slight rises or in slightly wettish depressions (Carter & Walsh 2006).	None	N/A	Suitable (but sub-optimal) habitat in EVC 132_61. No records within 10 km. Unlikely to occur.
Salt-lake Tussock-grass	<i>Poa sallacustris</i>	VU	CR	Margins of brackish to salt lakes (Walsh 1994).	None	N/A	No suitable habitat. Unlikely to occur.

Common Name	Scientific Name	EPBC	FFG	Habitat	Number of records	Date of last record	Likelihood of occurrence
Maroon Leek-orchid	<i>Prasophyllum frenchii</i>	EN	EN	Grows mainly in open sedge swampland or in wet grassland and wet heathland generally bordering swampy regions. Sites are generally low altitude, flat and moist. Soils are generally moderately rich damp sandy or black clay loams. Climate is mild, with an annual rainfall of 600–1100 mm, occurring predominantly in winter and spring (DoEE 2018).	None	N/A	Suitable (but sub-optimal) habitat along watercourses. No records within 10 km. Unlikely to occur.
Fragrant Leek-orchid	<i>Prasophyllum suaveolens</i>	EN	CR	Occurs in open, species rich native grassland dominated by Themeda triandra with perennial herbs and lilies on poorly drained red-brown soil derived from basalt (DSE 2003).	2	21/10/2010	No suitable habitat. Unlikely to occur.
Leafy Greenhood	<i>Pterostylis cucullata</i>	VU	EN	Tea-tree scrubs on tall sandy and calcareous dunes, in moist, open or even deep shaded locations (Jones 1994).	None	N/A	No suitable habitat. Unlikely to occur.
Button Wrinklewort	<i>Rutidosis leptorhynchoides</i>	EN	EN	In Victoria restricted to open stands of plains grassland and grassy woodlands, on fertile clays to clay loams, usually in areas where the grass cover is more open, either as a result of recurrent fires or grazing by native macropods or stock. It also occurs on low rises with shallow, stony soils at less than 100 m above sea level (NSW OEH 2012).	None	N/A	Suitable (but sub-optimal) habitat in EVC 132_61. No records within 10 km. Unlikely to occur.
Swamp Fireweed	<i>Senecio psilocarpus</i>	VU		Herb-rich winter-wet swamps on volcanic clays or peaty soils (Walsh 1999). Known from approximately 10 sites between Wallan, about 45 km north of Melbourne, and Honans Scrub in south-eastern South Australia (TSSC 2008c).	None	N/A	No suitable habitat. Unlikely to occur.
Coast Dandelion	<i>Taraxacum cygnorum</i>	VU	CR	Woodland and scrub on limestone (Scarlett 1999).	None	N/A	No suitable habitat. Unlikely to occur.
Metallic Sun-orchid	<i>Thelymitra epipactoides</i>	EN	EN	Grows primarily in mesic coastal heathlands, grasslands and woodlands, but is also found in drier inland heathlands, open forests and woodlands. Substrates may be moist or dry sandy loams or loamy sands. Critical habitat has not been determined but the species is likely to require open conditions, which may be created by soil disturbance or fire, for recruitment (DoEE 2018).	None	N/A	Suitable (but sub-optimal) habitat in EVCs 132_61 and 55. No records within 10 km. Unlikely to occur.
Spiral Sun-orchid	<i>Thelymitra matthewsii</i>	VU	EN	Slightly elevated sites to 300m in well-drained soils (sandy loams to gravelly limestone soils) in light to dense forest; sometimes in coastal sandy flats (Weber & Entwisle 1994).	1	29/08/1998	No suitable habitat. Unlikely to occur.
Swamp Everlasting	<i>Xerochrysum palustre</i>	VU	CR	Grows in wetlands including sedge-swamps and shallow freshwater marshes, often on heavy black clay soils. Commonly associated genera include Amphibromus, Baumea, Carex, Chorizandra, Craspedia, Eleocharis, Isolepis, Lachnagrostis, Lepidosperma, Myriophyllum, Phragmites australis, Themeda triandra and Villarsia (DoEE 2018).	None	N/A	Suitable (but sub-optimal) habitat along watercourses. No records within 10 km. Unlikely to occur.

Notes:

EPBC = threatened species status under EPBC Act

FFG = threatened species status under the FFG Act

CR = critically endangered; EN = endangered; VU = vulnerable

Appendix 2: EPBC Act listed ecological communities and likelihood of occurrence in the investigation area

Ecological Community	EPBC	Occurrence in the investigation area
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	CR	Potential to occur in areas of Plains Grassy Woodland (EVC 55_61) and High Rainfall Plains Grassy Woodland (EVC 55_63). Occurs in the investigation area along the Hexham-Ballangeich Road. Habitat zones DA, DI, DK, DM, DP, DR and DV. 8.57 hectares in total.
Natural Temperate Grassland of the Victorian Volcanic Plain	CR	Potential to occur in areas of <i>Heavier-soils</i> Plains Grassland (EVC 132_61). Occurs in the investigation area along the Woolsthorpe-Hexham Road, the Warrnambool-Caramut Road, the Hexham-Ballangeich Road, Cooramook Lane and the Hamilton Highway. Habitat zones BE, CE, DC, DE, DG, EU, EV, FA, GB, GE, HI, II, XAD, XAF, XAU and XAV. 4.34 hectares in total.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	CR	Potential to occur in areas of Plains Grassy Wetland (EVC 125). Occurs in the investigation area along the proposed transmission line north and east of proposed turbine T37. Habitat Zones XBS and XBT. 0.662 hectares in total.
Grey Box (<i>Eucalyptus microcarpa</i>) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	EN	Does not occur in the investigation area.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CR	Does not occur in the investigation area.

Appendix 3: Listed fauna species from the search region and likelihood of occurrence in the investigation area

Common Name	Scientific Name	EPBC-thrt	EPBC-mig	FFG	Habitat	Number of records	Date of last record	Likelihood of occurrence
Birds								
Australasian Bittern	<i>Botaurus poiciloptilus</i>	EN		CR	Terrestrial wetlands, including a range of wetland types but prefers permanent water bodies with tall dense vegetation, particularly those dominated by sedges, rush, reeds or cutting grass (Marchant & Higgins 1990).	None	N/A	Unsuitable habitat, lack of records - Unlikely to occur
Australian Painted-snipe	<i>Rostratula australis</i>	EN		CR	Generally inhabits shallow terrestrial freshwater wetlands, including temporary and permanent lakes, swamps and claypans. They also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Typical sites include those with rank emergent tussocks of grass, sedges, rushes or reeds, or samphire; often with scattered clumps of lignum <i>Muehlenbeckia</i> or canegrass or sometimes tea-tree (<i>Melaleuca</i>). Sometimes utilises areas that are lined with trees, or that have some scattered fallen or washed-up timber (DoEE 2022).	None	N/A	Most suitable habitat present in the Project site has been drained - Unlikely to occur
Common Greenshank	<i>Tringa nebularia</i>		M (Bonn A2H, ROKAMBA, JAMBA, CAMBA)	EN	Inhabits wide range of coastal or inland wetlands with varying levels of salinity; mainly muddy margins or rocky shores of wetlands (Higgins & Davies 1996).	6	2/10/2018	Recorded incidentally during surveys - Likely to occur
Common Sandpiper	<i>Actitis hypoleucos</i>		M (Bonn A2H, JAMBA, CAMBA)	VU	Inhabits a wide range of coastal or inland wetlands with varying levels of salinity; mainly muddy margins or rocky shores of wetlands. In Vic. Mostly found Westernport and Port Phillip Bay. (Higgins & Davies 1996).	None	N/A	Recorded on one of the wetlands within the Project site - Does occur
Curlew Sandpiper	<i>Calidris ferruginea</i>	CR	M (Bonn A2H, ROKAMBA, JAMBA, CAMBA)	CE	Inhabits wide range of coastal or inland wetlands with varying levels of salinity; mainly muddy margins or rocky shores of wetlands (Higgins & Davies 1996).	2	5/02/1988	Suitable habitat in wetlands - Potential to occur
Double-banded Plover	<i>Charadrius bicinctus</i>		M (Bonn A2H)		Inhabits wide range of coastal or inland wetlands with varying levels of salinity; mainly muddy margins or rocky shores of wetlands (Marchant & Higgins 1993).	2	2/10/2018	Recorded incidentally during BL&A surveys - Likely to occur
Eastern Curlew	<i>Numenius madagascariensis</i>	CR	M (Bonn A1, ROKAMBA, JAMBA, CAMBA)	CR	Inhabits sheltered coasts, especially estuaries, embayment, harbours, inlets and coastal lagoons with large intertidal mudflats or sandflats, often with beds of sea grass (Higgins & Davies 1996).	None	N/A	Unsuitable habitat - Unlikely to occur
Fork-tailed Swift	<i>Apus pacificus</i>		M (CAMBA, ROKAMBA, JAMBA)		The species can occur in wet sclerophyll forest but mainly prefers open forest or plains. It is almost exclusively aerial and feeds up to hundreds of metres above the ground, but can feed among open forest canopy. The species breeds internationally and seldom roosts in trees (Higgins et al 2006b).	None	N/A	Potential to fly over site - Potential to occur

Common Name	Scientific Name	EPBC-thrt	EPBC-mig	FFG	Habitat	Number of records	Date of last record	Likelihood of occurrence
Grey Falcon	<i>Falco hypoleucos</i>	VU		VU	Inhabits arid and semi-arid zones; mainly on sandy and stony plains of inland drainage systems, lightly timbered with acacia. Hunt far into open areas, over spinifex, tussock grasslands and low shrublands. In Victoria, few records mostly in north and northwestern regions (Marchant & Higgins 1993).	None	N/A	Unsuitable habitat - Unlikely to occur
Latham's Snipe	<i>Gallinago hardwickii</i>		M (Bonn A2H, ROKAMBA, JAMBA, CAMBA)		Occurs in wide variety of permanent and ephemeral wetlands; it prefers open freshwater wetlands with dense cover nearby, such as the edges of rivers and creeks, bogs, swamps, waterholes. The species is wide spread in southeast Australia and most of its population occurs in Vic. Except in the northwest of the state. (Naarding 1983; Higgins and Davies 1996).	2	2/10/2018	Recorded incidentally during surveys - Likely to occur
Osprey	<i>Pandion cristatus</i>		M (Bonn A2S)		Rare vagrant to Victoria (Marchant & Higgins 1993). Littoral and coastal habitats and terrestrial wetlands. They are mostly found in coastal areas but occasionally travel inland along major rivers (Johnstone & Storr 1998; Marchant & Higgins 1993; Olsen 1995). They require extensive areas of open fresh, brackish or saline water for foraging (Marchant & Higgins 1993).	None	N/A	Unsuitable habitat, coastal, no records - Unlikely to occur
Painted Honeyeater	<i>Grantiella picta</i>	VU		VU	Inhabits box-ironbark forests and woodlands and mainly feeds on the fruits of mistletoe. Strongly associated with mistletoe around the margins of open forests and woodlands. Occurs at few localities. Uncommon breeding migrant from further north, arriving in October and leaving in February. (Higgins et al. 2001; Tzaros 2005).	None	N/A	Unsuitable habitat, no records - Unlikely to occur
Pectoral Sandpiper	<i>Calidris melanotos</i>		M (Bonn A2H, ROKAMBA, JAMBA)		Inhabit shallow fresh to saline wetlands, usually coastal to near-coastal, but occasionally farther inland. Wetlands often have open fringing mudflats and low emergent or fringing vegetation (Higgins & Davies 1996).	None	N/A	Unsuitable habitat, no records - Unlikely to occur
Plains-wanderer	<i>Pedionomus torquatus</i>	CR		CR	This species inhabits native grasslands with sparse cover, preferring grasslands that include wallaby grass and spear grass species (Marchant & Higgins 1993).	None	N/A	Unsuitable habitat - Unlikely to occur
Red-necked Stint	<i>Calidris ruficollis</i>		M (Bonn A2H, ROKAMBA, JAMBA, CAMBA)		Inhabit shallow fresh to saline wetlands, usually coastal to near-coastal, but occasionally farther inland. Wetlands often have open fringing mudflats and low emergent or fringing vegetation (Higgins & Davies 1996).	2	28/11/2011	Suitable habitat in wetlands - Potential to occur
Rufous Fantail	<i>Rhipidura rufifrons</i>		M (Bonn A2H)		In east and south-east Australia, mainly inhabits tall wet sclerophyll forests, often in gullies. When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands, as well as parks and gardens (Higgins et al. 2006).	None	N/A	Unsuitable habitat - Unlikely to occur
Satin Flycatcher	<i>Myiagra cyanoleuca</i>		M (Bonn A2H)		Tall forests and woodlands in wetter habitats but not in rainforest (Higgins et al. 2006)	None	N/A	Unsuitable habitat - Unlikely to occur
Sharp-tailed Sandpiper	<i>Calidris acuminata</i>		M (Bonn A2H, ROKAMBA, JAMBA, CAMBA)		Inhabit shallow fresh to saline wetlands, usually coastal to near-coastal, but occasionally farther inland. Wetlands often have open fringing mudflats and low emergent or fringing vegetation (Higgins & Davies 1996).	50	24/10/2018	Recorded in Project site during surveys - Likely to occur

Common Name	Scientific Name	EPBC-thrt	EPBC-mig	FFG	Habitat	Number of records	Date of last record	Likelihood of occurrence
Swift Parrot	<i>Lathamus discolor</i>	CR		CR	Prefers a narrow range of eucalypts in Victoria, including White Box, Red Ironbark and Yellow Gum as well as River Red Gum when this species supports abundant 'lerp'. Breeds in Tasmania and migrates to the mainland of Australia for the autumn, winter and early spring months. It lives mostly north of the Great Dividing Range, passing through two areas of Victoria on migration: the Port Phillip district and Gippsland. (Emison et al. 1987; Higgins 1999; Kennedy and Tzaros 2005).	None	N/A	Unsuitable habitat - Unlikely to occur
White-throated Needletail	<i>Hirundapus caudacutus</i>	VU	M (CAMBA, ROKAMBA, JAMBA)	VU	Aerial, over all habitats, but probably more over wooded areas, including open forest and rainforest. Often over heathland and less often above treeless areas such as grassland and swamps or farmland (Higgins 1999).	None	N/A	Potential to fly over site - Potential to occur
Yellow Wagtail	<i>Motacilla flava</i>		M (JAMBA, CAMBA, ROKAMBA)		Extremely uncommon migrant. Few sightings in Victoria. Mostly occurs in well-watered open grasslands on the fringes of wetlands. Roosts in mangroves and other dense vegetation (DoEE 2022).	None	N/A	Rare vagrant Unlikely to occur
Mammals								
Eastern Barred Bandicoot	<i>Perameles gunnii</i>	EN		EN	The habitat of the Eastern Barred Bandicoot (mainland) is perennial tussock grassland and eucalypt woodland with a grassy ground layer (Menkhorst 1995). Drainage lines and areas of high vegetative cover have been identified as prime habitat. The key determining factor for persistence of this species appears to be high structural complexity and heterogeneity within the environment, reflected in its absence from agricultural areas but persistence in rubbish dumps and other variable habitats	5	14/08/1997	Regionally extinct - Unlikely to occur
Long-nosed Potoroo	<i>Potorous tridactylus trisulcatus</i>	VU		VU	in Victoria coastal heathy woodland; in Tasmania moist forest with dense shrub layer; in the north edge of rainforest (Menkhorst 1995).	None	N/A	Unsuitable habitat - Unlikely to occur
Southern Brown Bandicoot	<i>Isodon obesulus obesulus</i>	EN		EN	Species experts define suitable habitat for Southern Brown Bandicoots (eastern) to be any patches of native or exotic vegetation, within their distribution, which contains understorey vegetation structure with 50–80% average foliage density in the 0.2–1 m height range. In areas where native habitats have been degraded or diminished, exotic vegetation, such as Blackberry (<i>Rubus</i> spp.), can and often does, provide important habitat (DoEE 2022).	None	N/A	Unsuitable habitat - Unlikely to occur
Spot-tailed Quoll	<i>Dasyurus maculatus maculatus</i>	EN		EN	Rainforest, wet and dry forest, coastal heath and scrub and River Red-gum woodlands along inland rivers (Menkhorst 1995).	None	N/A	Unsuitable habitat - Unlikely to occur
Swamp Antechinus	<i>Antechinus minimus maritimus</i>	VU		VU	Dense wet heath, tussock grassland, sedgeland heathy woodland and coastal heath and scrub (Menkhorst 1995).	None	N/A	Unsuitable habitat - Unlikely to occur
Southern Bent-wing Bat	<i>Pseudophryne semimarmorata</i>	CR		CR	Roosts in caves during the day, dispersing over a range of habitats at night. Its feeding areas tend to be associated with major drainage systems (Menkhorst 1995).	13	26/04/1979	Recorded during bat surveys - Does occur
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	EN		EN	Roosts in aggregations of various sizes on exposed branches. Roost sites are typically located near water, such as lakes, rivers or the coast. Roost vegetation includes rainforest patches, stands of <i>Melaleuca</i> , mangroves and riparian vegetation, but colonies also use highly modified vegetation in urban and suburban areas (DoEE 2022). A 'satellite camp' (small temporary roosting colony) was	1	27/2/2019	Recent records in the region and recorded - Does occur

Common Name	Scientific Name	EPBC-thrt	EPBC-mig	FFG	Habitat	Number of records	Date of last record	Likelihood of occurrence
					observed in the region on private property near Cobra Kullic reserve in 2018 (Nature Advisory unpub. data).			
Reptiles								
Corangamite Water Skink	<i>Eulamprus tympanum marnieae</i>	EN		EN	Found in grassy open woodland and cleared pastures dotted with ephemeral swamps and lakes, on rocky basaltic soils. The preferred habitat is a geographically peculiar landform comprising basalt ridges and boulder heaps resulting from the collapse of lava tunnels (DoEE 2022).	None	N/A	Unsuitable habitat - Unlikely to occur
Striped Legless Lizard	<i>Delma impar</i>	VU		EN	Grassland specialist. Known to occur in some areas dominated by introduced species such as <i>Phalaris aquatica</i> , Serated Tussock (<i>Nasella trichotoma</i>) and <i>Hypochaeris radicata</i> and at sites with a history of grazing and pasture improvement. Shelter in grass tussocks, thick ground cover, soil cracks, under rocks, spider burrows, and under debris such as timber. The majority of sites in Victoria and NSW occur on cracking clay soils with some surface rock which provide shelter for the species (DoEE 2022).	58	15/11/2013	Some suitable habitat may occur, specifically in road reserves - Potential to occur
Fish								
Australian Grayling	<i>Prototroctes maraena</i>	VU		EN	Large and small coastal streams and rivers with cool, clear waters with a gravel substrate and altering pools and riffles (Cadwallader & Backhouse 1983).	1	1/01/1981	Some suitable habitat but not detected during targeted surveys - Unlikely to occur
Dwarf Galaxis	<i>Galaxiella pusilla</i>	VU		EN	Barwon River to Mitchell River. Vegetated margins of still water, ditches, swamps and backwaters of creeks, both ephemeral and permanent (Allen <i>et al.</i> 2002).	None	N/A	Some suitable habitat but not detected during targeted surveys - Unlikely to occur
Macquarie Perch	<i>Macquaria australasica</i>	EN		EN	Cool, clear water of rivers and lakes. Favours slower moving water (Allen <i>et al.</i> 2002).	3	1/12/1920	Some suitable habitat but not detected during targeted surveys - Unlikely to occur
Murray Cod	<i>Maccullochella peelii</i>	VU		EN	Slow flowing turbid water of rivers and streams of low elevation; also fast flowing clear upland streams (Allen <i>et al.</i> 2002).	None	N/A	Unsuitable habitat - Unlikely to occur
Yarra Pygmy Perch	<i>Nannoperca obscura</i>	VU		VU	Streams and small lakes, prefers flowing water with abundant aquatic vegetation (Allen <i>et al.</i> 2002).	10	15/11/2007	Some suitable habitat but not detected during targeted surveys - Unlikely to occur
Amphibians								
Growling Grass Frog	<i>Litoria raniformis</i>	VU		VU	Permanent, still or slow flowing water with fringing and emergent vegetation in streams, swamps, lagoons and artificial wetlands such as farm dams and abandoned quarries (Clemann & Gillespie 2004).	14	19/11/2018	Heard calling in Project site during surveys - Likely to occur

Common Name	Scientific Name	EPBC-thrt	EPBC-mig	FFG	Habitat	Number of records	Date of last record	Likelihood of occurrence
Invertebrates								
Golden Sun Moth	<i>Synemon plana</i>	CR		VU	Areas that are, or have been native grasslands or grassy woodlands. It is known to inhabit degraded grasslands with introduced grasses being dominant, with a preference for the native wallaby grass being present (DEWHA 2009).	6	21/12/2009	Suitable habitat occurs, but in poor condition and species not detected during EHP (2014) targeted surveys - Unlikely to occur

Notes:

EPBC-T = threatened species status under EPBC Act; **EX** = presumed extinct in the wild; **CR** = critically endangered; **EN** = endangered; **VU** = vulnerable;

EPBC-M = migratory status under the EPBC Act; **M** = listed migratory taxa; Bonn Convention (A2H) - Convention on the Conservation of Migratory Species of Wild Animals – listed as a member of a family; Bonn Convention (A2S) - Convention on the Conservation of Migratory Species of Wild Animals - species listed explicitly; **CAMBA** - China- Australia Migratory Birds Agreement; **JAMBA** - Japan-Australia Migratory Birds Agreement; **ROKAMBA** - Republic of Korea Australia Migratory Birds Agreement;

FFG = threatened species status under the FFG Act; ; **CR** = critically endangered; **EN** = endangered; **VU** = vulnerable.