Under current guidelines, a buffer distance of 3.2 kilometres is considered to be sufficient to have no significant impact on the likelihood of successful reproduction at that wetland. The guidelines do, however, acknowledge that Brolga spatial requirements during breeding are not well known, and site-specific buffers can be applied if these can be shown to have no significant impact on the likelihood of successful reproduction at a wetland (DSE 2012a).Buffer distances are applied to Brolga nesting areas to ensure that wind farm infrastructure has 'no significant impact on the likelihood of successful breeding' (DSE 2012a). Around this nesting site buffer, an additional 300 metre 'disturbance' buffer is recommended by the Brolga Scientific Panel (DSE 2012a). This disturbance buffer is in acknowledgement that brolgas may avoid or be less likely to use an area due to turbines or other infrastructure (e.g. Navarette 2011). Additionally, the US Fish and Wildlife Service suggest that whooping cranes a member of the same genus as the Brolga, will not use habitat within 804 metres of a wind turbine (US Fish and Wildlife Service 2009). In contrast, a range of ongoing human disturbances to within 400 metres of Florida sandhill crane nests another similar species, are recorded as having no detectable impact on their breeding success (Dwyer and Tanner 1992).

Brolga Flocking

In the non-breeding season, Brolgas often congregate in flocks (i.e. groups consisting of more than a single family) in southern Australia (Marchant and Higgins 1993). The timing of flock formation is influenced in part by rainfall and the availability of surface water (Marchant and Higgins 1993), however flocking usually occurs between December and May each year. Historically, flocks over 1000 have been recorded in Victoria (Sheldon 2004), however more recent counts rarely exceeded 200 individuals (SWIFFT 2013; Eremaea Birds 2013). Areas used by flocking Brolgas typically consist of large, deep freshwater marshes or permanent open water with little emergent vegetation and which are surrounded by grazed or cropped areas for feeding (Sheldon 2004). Although this habitat is widespread in Victoria, Brolgas appear to regularly and repeatedly use only a few of all apparently suitable sites (Sheldon 2004).

Many of the records in the flocking database (Sheldon 2004) do not occur at known flocking sites, nor do they meet the criteria as a flocking record (DSE 2012a). They may be included in the flocking database for a number of reasons 1) the observation occurred during the flocking period (traditionally December to May); 2).

The observation was of more than a pair (and their offspring); or, 3) The record was included because it was not a 'breeding' record. In some cases, the flocking record is located in habitat which is clearly not suitable as a flocking site (e.g. pasture, grain crop). For these records, the group recorded is likely to be a flock which has moved from their overnight flocking site to forage in the surrounding area. To acknowledge this fact, turbine-free buffers around flocking sites include sufficient areas for foraging.

Flocking habitat of Brolga consists of deep freshwater marshes (0.5-2 metres) and permanent open freshwater (Arnol et al. 1984; Marchant and Higgins 1993; Sheldon 2004). Saline wetland areas may also be utilised for roosting but are not considered to constitute main feeding habitat (Arnol *et al.* 1984; Sheldon 2004). In southwest Victoria, there are several known flocking sites including within 40 kilometres of the proposed Darlington Wind farm (Arnol et al. 1984; Sheldon 2004). These sites are:

- Lake Barnie Bolac;
- Lake Bolac;
- Lake Yuangmania;
- Lake Gellie;

- Lake Eyang;
- Lake Tuangmaroke;
- Nerrin Nerrin Wetlands;
- Lake Tooliorook; and
- Lake Bookar

Four additional Brolga flocking sites where five or more Brolgas have been recorded over more than one year were identified by DSE (Richard Hill pers. Com) and reported in Ecology and Heritage Partners (2009). These sites are:

- Pink Lake;
- Salt Lake;
- Lake Milangil; and
- Lake Sheepwash.

Brolga flocking sites are defined as areas where Brolgas regularly gather in groups during the non-breeding season. Brolga flocking sites require a five-kilometre buffer (DSE 2012).

Habitat assessments and roaming surveys as part of a Level 2 Assessment of breeding habitat for Brolgas was conducted during on 19 and 20 November 2020 in accordance with the '*Interim Guidelines for the Assessment, Avoidance, Mitigation and Offsetting of Potential Wind Farm Impacts on the Victorian Brolga Population*' (DSE 2011). The survey timing was aimed to capture observations during the breeding season.

Previous Brolga Surveys

Brolga have been surveyed previously, including Level 1, 2 and 3 assessments, for the proposed Darlington Wind Farm site (Brett Lane and Associates 2008a, 2008b, 2009, Ecology and Heritage Partners 2009, 2010, 2012, 2013a. 2013b, 2013c, 2015). Additional Brolga surveys were conducted in 2021 and 2022 to build on the previous Brolga and wetland assessments for the Darlington wind farm. Surveys involved Brolga nest searches, including focal and aerial searches).

All studies identified a number of Brolga breeding and flocking sites within the proposed wind farm boundary and surrounding areas. As part of these assessments all historical Brolga records were visited and the habitat of the site assessed for its suitability for Brolga habitat. Local experts and landholders were also engaged to discuss the potential presence of Brolga habitats and/or records not listed on available databases. This revealed additional breeding records within and adjacent to the proposed wind farm boundary.

While many Brolga breeding records fall within wetlands that have been previously assessed (Ecology and Heritage Partners 2013), many Brolga breeding records fall outside mapped wetlands. An accurate assessment of the habitat at these sites was conducted to inform turbine configuration and avoid or minimise any impact of a wind farm development on the local Brolga population.

The previous EES referral decision stated:

> *'Targeted surveys of the movements and behaviour of Brolgas in the vicinity of the Darlington Wind Farm site during the breeding, migration and flocking seasons for the species are to be undertaken and documented to the satisfaction of the Department of Sustainability and Environment, prior to any statutory decision whether or not to approve the wind farm proposal.*

There are opportunities to provide setbacks for turbines based on the findings of targeted surveys during the breeding, migration, and flocking seasons.

All observations of Brolga during the roaming habitat assessments were recorded along with additional data regarding location and behaviour

- Number of Brolgas
- Age of juvenile, if present (fledged or unfledged)
- Location of birds (e.g. in wetland or in surrounding grassland)
- Activity
- Presence of nests (yes/no)
- Any additional notes relevant

Mapped wetlands were assessed to:

- Identify and quantify the quality and extent of wetland habitats within the area of investigation for breeding and flocking purposes;
- Identify all breeding pairs of Brolga, nest sites and flocking sites within the area of investigation.

Three main Brolga habitat quality categories will be used, as described below:

High: Habitat components listed below are usually all present.

- Shallow freshwater marsh or shallow freshwater meadow less than 0.5m deep;
- Wetlands with large areas of aquatic and emergent vegetation (e.g. Annual herbs, rushes, Juncus spp. or tussock grass Poa spp.);
- Little or no signs of changed water regimes (e.g. drained wetlands);
- Little or no signs of disturbance (e.g. Cultivation, native vegetation removal, grazing).

Moderate: Some fauna habitat components are often missing although wetlands still provide some characteristics to provide nesting opportunities.

- Waterbody likely to hold water throughout breeding season (July-December) (i.e. permanent, or largely permanent);
- Waterbody with some aquatic and emergent vegetation (e.g. Annual herbs, rushes Carex spp. or Juncus spp. or tussock grass Poa spp.);
- Some changes to water regime may have occurred (drainage lines);
- Wetland shows some signs of disturbance (such as limited access to stock, cultivation, feral predators).

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

- Likely to be ephemeral or drained (only hold water for limited time of the year);
- Little or no aquatic or emergent vegetation.
- Changed water regime, little water present;
- Showing signs of disturbance (such as heavily grazed by stock, cultivated, feral predators).

2.4.4 *Brolga Nest Searches*

Three approaches were undertaken to ensure that all active Brolga nests were located during the study period. In the first instance, local landholders were consulted for their observations of nesting Brolgas. Following this, the study area and its surrounds were systematically searched by light aeroplane and car to record wetlands that might support active Brolga nests. When such a wetland was found its location was recorded and searched for either the presence of nest attendant Brolgas, or a large mound of debris characteristic of Brolga nests. Finally, combining these results the nests and potential nests were visited to ground-truth the data.

The car search consisted of driving all public roads and tracks within the study area, and to a radius of approximately 20 kilometres from the boundary of the study area. The aerial survey consisted of north/south transects flown in a Cessna 172 at approximately 150 metre above ground level, 1000 metres apart, at a speed of approximately 150kph. Two observers searched a distance of approximately 500 metres from the plane on either side of the plane. All wetlands that contained suitable habitat for Brolga were then marked with a GPS (eTrex H, Garmin Ltd.), with an estimation of their distance and direction from the transect. These GPS points were then related to wetlands based on aerial photography of the study area and visited on the ground, where possible, to look for Brolga nests.

2.4.5 *Focal Brolga Nest Surveys*

In 2012, three active Brolga nests, located immediately adjacent to the study area (Figure 2), were watched for a total of 19.5 hours, at both dawn and dusk (Ecology and Heritage Partners 2012). During this period, the nest was watched from a distance of approximately 50 metres by a zoologist in a car, assisted by 10 × 42 Binoculars and a Zeiss 85-millimetre Diascope, with a 20–60 millimetre eye piece. During these nest surveys, the observer would record the behaviour of the birds at least every 10–15 minutes. However, notable events, such as one bird leaving the nest area, were also recorded as they happened. Any flights that were recorded had the direction of the flight, the height and distance recorded.

2.4.6 *Targeted Migratory Shorebird Surveys*

Migratory shorebirds are a group of 36 species which have broad similarities in their breeding and non-breeding areas, movements and habitat requirements. In general, species breed in the northern hemisphere (China, Russia, Japan and Alaska) and migrate to Australia and New Zealand for their non-breeding season between October and March. They typically forage on exposed coastal tidal mudflats and muddy areas of freshwater wetlands for invertebrates and crustacea, and roost in mangroves, on sandy spits and low-lying coastal or inland areas adjacent to their feeding sites (Marchant and Higgins 1990).

All 36 species are listed as migratory under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and are considered a Matter of National Environmental Significance (MNES). Under the EPBC Act an action will require approval from the Commonwealth environment minister if it has, will have, or is likely to have a significant impact on a MNES.

The EPBC Act is also the key mechanism for meeting Australia's responsibilities under several international agreements relating to shorebird conservation to which Australia is a signatory, including the:

- Japan-Australia Migratory Bird Agreement (JAMBA);
- China-Australia Migratory Bird Agreement (CAMBA);
- Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA); and,

- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)

Under the EPBC Act, a significant population is defined as more than 0.1% of the estimated Australian population of individual species. Important sites are those that contain a significant population of any species, have recorded at least 2000 individuals (of any species) or have at least 15 species recorded (DEWHA 2009).

While a migratory shorebird, Latham's Snipe is considered separately as it does not typically aggregate in large flocks or use habitat similar to many of the other migratory shorebirds. It is a medium-sized, cryptic species which breeds in northern Japan, Sakhalin Island and the adjacent Asian mainland and migrates to eastern and south-eastern Australia between October and March each year (Higgins and Davies 1996). The species forages for soil invertebrates in the muddy margins of freshwater and brackish wetlands and associated inundated grassy areas (Todd 2000). It is primarily active at night – both for feeding activities and movement between sites, and roosts during the day in fringing vegetation and long grass around freshwater or brackish wetlands (Todd 2000).

For Latham's Snipe a significant population is considered 18 individuals, while an important site is that which supports a significant population and is a naturally occurring open freshwater wetland with vegetation cover nearby (DEWHA 2009).

As migratory shorebirds are rarely detected during traditional Bird Utilisation Surveys conducted at wind farms (Ecology and Heritage Partners 2012, AusWEA 2005), targeted surveys were undertaken within the study area to determine their presence and abundance. This information is used to assess if the area contains, or is likely to contain, a significant population of, or provides significant habitat for, any listed migratory species. Potential impacts to migratory shorebirds associated with wind farms include;

- Direct – individual fatalities as a result of collisions with turbine blades; and,
- Indirect – individuals may avoid the area (displacement) due to the presence of turbines or other infrastructure.

Migratory species listed under the EPBC Act are those protected under international agreements to which Australia is a signatory. These include the Japan Australia Migratory Bird Agreement (JAMBA), the China Australia Migratory Bird Agreement (CAMBA), the Republic of Korea Migratory Bird Agreement (ROKAMBA), and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. Migratory species are considered matters of NES under the EPBC Act.

Searches of the Victorian Biodiversity Atlas and the Birdlife Australia Atlas database were undertaken to determine any previous records of migratory shorebirds and Latham's Snipe in the area of interest. Previous consultant reports and other information pertaining to the area were also considered (Brett Lane and Associates 2009; DEWR 2008; Ecology and Heritage Partners 2012).

Targeted surveys for EPBC Act-listed Migratory and Marine birds (e.g. Latham's Snipe and Common Greenshank) were undertaken concurrently with bird utilisation surveys, and at other times during field work between 26-30 November 2012 when all wetlands, dams/lakes and low-lying areas within the proposed wind farm were thoroughly searched (Ecology and Heritage Partners, 2013). These surveys consisted of personnel visiting all wetlands both within the study area and within 10 kilometres of the study area and searching for migratory birds using 10 × 42 binoculars and a Zeiss 85mm Diascope, with a 20–60mm eye piece. Where access to a property could be arranged, the perimeter of the wetland was walked, and any birds flushed or heard were recorded.

Areas to search were guided by GIS mapping, prior knowledge of the area and locations derived from the initial database searches. In addition to the targeted surveys, opportunistic searches for these species were made between September and December 2012, when visiting wetlands, dams, lakes and low-lying areas within the study areas. While searching for migratory shorebirds a rapid assessment was undertaken of each wetland or other suitable habitat areas. During opportunistic surveys a single person scanned with binoculars areas of open water, water edge and exposed muddy areas for migratory shorebirds and Latham's Snipe. During the thorough searches two people undertook scanning as above, then walked 10-40 metres apart through low-lying areas and around the edges of all waterbodies to flush any migratory shorebirds or Latham's Snipe. Habitat assessment at wetlands was based on the presence or absence of suitable foraging and roosting areas for migratory shorebirds.

All sites were assessed as low, moderate or high suitability, as below;

- High suitability habitats containing extensive muddy, exposed shoreline or shallow inundated grassy areas.
- Moderate suitability habitats contained some of the high-quality habitat elements, or the potential for them to occur; and,
- Low quality habitats contained none of the high-quality habitat elements, and only limited potential for them to occur.

2.5 Assessment Qualifications and Limitations

This report has been written based on the quality and extent of the ecological values and habitat considered to be present or absent at the time of the field assessments being undertaken.

Data and information held within the ecological databases and mapping programs reviewed in the desktop assessment (e.g. VBA, PMST, Biodiversity Interactive Maps etc.) are unlikely to represent all flora and fauna observations within, and surrounding, the study area. It is therefore important to acknowledge that a lack of documented records does not necessarily indicate that a species or community is absent.

Due to the large scale of the study area, only native vegetation, and habitat within or adjacent to the proposed development footprint (impact area including buffers) was assessed with habitat hectare condition. Three properties were unable to be accessed for the initial vegetation surveys in 2012 (Ecology and Heritage Partners 2013), these properties were assessed in 2021 and native vegetation mapped.

Flora and fauna surveys were undertaken during the optimal flowering/breeding period for all targeted species to maximise the probability of detecting each species. Given that all areas of suitable habitat for significant flora and fauna species were extensively surveyed over multiple years, it is considered that sufficient effort has been employed to determine the likelihood of each target species occurring onsite, and to accurately characterise the flora and fauna values that occur on-site.

The motion detecting cameras were deployed for four consecutive nights in November 2018. This was to gather baseline, supplementary data on ground dwelling mammal species present in or adjacent to the impact area.

The purpose of deploying cameras was to gather baseline data, with the intention of further targeted surveys. Targeted camera surveys are scheduled for Winter 2019 and will be deployed for a minimum of 14 nights of detection according to the Survey Guidelines for Australia's threatened mammals (DSEWPaC 2011).

Bird utilisation surveys were undertaken at eight point-count locations (sites); six sites at the study area and two sites within two kilometres of the study area boundary. Sites were chosen to be representative of the habitat types present in the study area, as well as the wider locality.

To account for the limited number of survey locations, each site was surveyed eight times to increase the likelihood of counting and identifying the majority of bird species that use or fly-over the study area.

Ecological features identified on site were recorded using a hand-held GPS or tablet with an accuracy of +/-5 metres. This level of accuracy is considered adequate to provide an accurate assessment of the ecological features present within the study area.

Overall, it is considered that the terrestrial flora and fauna data collected during the field assessment, habitat assessments, and information obtained from relevant sources (e.g. biological databases and relevant literature) provides an accurate assessment of the fauna species and habitat values within the study area. However, due to the cryptic nature of many of the target species surveyed for, the precautionary principle has been applied when determining the likelihood of occurrence.

With regard to targeted Brolga surveys in 2012, the surveys were undertaken near the end of the breeding season, and therefore may have missed some early nesting attempts, especially nesting attempts that failed. However, all but the earliest of nesting attempts that succeeded would have been detected. Broad characterisation of nesting behaviour based on the limited time spent watching nests should be interpreted with caution. Each of the three nests were seen at specific times of their nesting attempt that may not be indicative of their behaviour throughout the nesting period as the chick gains independence.

Despite this, all three of the nests were at different stages of chick development giving a representation of different nesting stages in the data and the technique used here is the same technique used in other recent work (i.e.: Brett Lane and Associates 2008d)

With regard to the Brolga surveys conducted by Ecology and Heritage Partners in 2020, 2021/2022, the timing of the survey was considered appropriate, as Brolgas are known to move from breeding sites to flocking sites in December. Every effort was made to observe Brolgas at breeding and flocking sites at appropriate times of the day when they are most likely to be present. However, it is possible that due to the sheer size of the survey area (i.e. several kilometres surrounding the proposed wind farm site), and the presence of potentially suitable habitat in many areas, sites supporting Brolga pairs during the current surveys may have been overlooked.

Another limitation was the accessibility to wetlands in the region. Most wetlands are located on private property, and although many of these mapped wetlands were able to be surveyed from the roadside, it is likely that access to additional habitat present in the region was limited. Therefore, it is possible that the total number of Brolgas observed in the current study may have been slightly underestimated. In addition, the distance from the observation location to the wetland, and the presence of visual obstructions (e.g. wind breaks or topography) occasionally limited detailed observations of some sites.

Regarding bird surveys (including Brolga surveys) in 2012, (Ecology and Heritage Partners 2012) the following limitations were noted.

Due to the short period of time in which the surveys were undertaken, it is possible that vagrant and rare species were overlooked, however the surveys were undertaken during an optimal time of year (late Spring/early Summer) and during suitable weather conditions, and the calculations of completeness gives an indication that a high proportion of the species variation was detected. Weather during the study varied from hot and humid, to cold and windy.

In 2012, the fixed point bird counts have some biases because of the use of estimation in determining the distance of birds from the observer.

Horizontal distances became increasingly difficult to judge as the distance between the observer and the bird increased. Vertical distances were also difficult to judge, depending on structures and other landmarks that could be used a reference. However, the higher the bird, the higher the likelihood of error. In addition, this difficulty was not consistent across species, with small and large species biasing the results in unknown directions. To attempt to overcome these potential errors, and to calibrate the estimations of the observers, at each point count a distance of 200 metres was measured to use as a reference for the estimations that followed. To calibrate height, a landmark of known height (such as powerline poles) were used as a reference point. Whilst these precautions alleviated some of the bias in this process, the height and distance data need to be interpreted in a cautious manner, given the probability of a high degree of error in the data-set.

A further bias in the 2012 data-set is the over-representation of large birds. As the distance between the observer and the bird increases, smaller species are increasingly likely to be overlooked. This effect is also likely to be exacerbated by weather conditions with overcast, windy or wet conditions having a negative impact on the detectability of some birds (Ecology and Heritage Partners 2012).

Targeted migratory waterbird surveys were limited due to the concerns of some landholders adjoining the proposed development site about the potential spread of Chytrid fungus, and therefore access to some wetlands was not permitted. Given the size and sometimes cryptic behaviour of some migratory waterbirds, this resulted in some species presumably being overlooked as a result of scanning wetlands from the nearest road.

Regarding targeted bat surveys (Southern Bent-wing Bat surveys), Anabat sampling was conducted from ground level, which does not identify the species of bats flying within the RSA. Rigging systems which are installed on the wind farm's met mast were not operational at the time of either of these surveys and as such, attaching the high microphone at a height within the RSA was not possible. Bat activity is significantly reduced during periods of rainfall or strong winds. A greater number of bat species may have been detected over a longer sampling period in favourable conditions, and if the Anabat recording devices were able to be positioned up an anemometer tower so that they were sampling within the RSA. While Anabat bat detectors linked to CF Storage Zcaims are effective in determining the number of bat species present in an area, and the amount of bat activity in that area on a given night, it is not possible to use the bat call data they record to determine bat abundance, as the number of individuals making the calls is unknown.

In addition, only four Songmeters were installed for bats in 2012 (Ecology and Heritage Partners 2012) which limits the ability to detect bat presence over such a large study area. This limitation was reduced with the additional bat surveys undertaken in 2021/2022 which involved 15 Songmeters.

3 RESULTS

3.1 Overview

The Darlington Wind Farm study area mostly comprises agricultural land used as grazing and cropping, eucalyptus plantations, wetlands and waterbodies, and some fragmented and modified remnant native vegetation in the form of five EVCs:

- Plains Grassy Wetland (EVC 125)
- Plains Sedgy Wetland (EVC 647)
- Aquatic Herbland (EVC 653)
- Plains Grassland (EVC 132_61)
- Plains Grassy Woodland (EVC 55_61)

Some patches of these EVCs meet the thresholds to be considered the National (two communities) and State (one community) significant ecological communities

- Natural Temperate Grassland of the Victorian Volcanic Plain (EPBC Act- listed)
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (EPBC Act-listed)
- Western (Basalt) Plains Grasslands Community (FFG Act-listed).

A total of 161 vascular flora species including 90 indigenous species and 71 non-indigenous flora species were recorded within the study area. These flora species include four Nationally listed flora species Hoary Sunray *Leucochrysum albicans* ssp. *tricolor,* Matted Flax-lily *Dianella amoena,* Clover Glycine *Glycine latrobeana,* and Spiny Rice-flower *Pimelea spinescens* ssp. *spinescens* and three State-listed species Wavy Swamp Wallaby-grass *Amphibromus sinuatus,* Pale Swamp Everlasting *Coronidium gunnianum*, and Small Milkwort *Comesperma polygaloides*.

There is suitable habitat for other significant flora species particularly along the road reserves and the previously FFG Act-listed Slender Bindweed *Convolvulus angustissimus ssp. omnigracilis* has also been recorded. Targeted surveys have not been undertaken on all areas within the study area boundary only within the development footprint and the associated buffers. So, there is likely to be some other small patches of remnant vegetation that support significant flora species that are outside of the development footprint and the associated buffers. There are also records of FFG Act protected species present (Appendix 1.2).

The study area provides habitat for an array of fauna species, with over 120 fauna species recorded, including: 113 native, nine introduced species. These fauna species also include three Nationally listed species, Striped Legless Lizard, Southern Bent-wing Bat, and Growling Grass Frog recorded within the study area. In addition to the three EPBC Act listed fauna species, eight State listed fauna species including the Brolga *Antigone rubicunda*, Little Eagle *Hieraaetus morphnoides*, Tussock Skink *Pseudemois pagenstecheri,* Musk Duck *Biziura lobate*, Australian Shoveler *Anas rhynchotis*, Australian Gull-billed Tern *Gelochelidon macrotarsa,* Wood Sandpiper *Tringa glareola* and Common Greenshank *Tringa nebularia,* use habitat within the study area.

Four migratory/ marine bird species listed under the EPBC Act Latham's Snipe *Gallinago hardwickii,* Clamorous Reed Warbler, Common Greenshank and Sharp-tailed Sandpiper *Tringa nebularia* have also been recorded within the study area (Figure 4).

One wetland of international importance is listed within 10 kilometres of the proposed Darlington Wind Farm. The Western District Lakes are located within the buffer area and not within the study area (DCCEEW 2022).

3.2 Native Vegetation

Remnant native wetland vegetation is confined to areas where there has been moderate disturbance from agricultural activities, with wetlands dominated by native species in drainage lines and seasonally inundated depressions in the heavy clay soil. Remnant native vegetation in the study area is mostly present in drainage lines, ephemeral depressions and other areas that have not been disturbed through embedded rock removal, ploughing or direct seeding of pasture grasses. The study area supports five EVCs: Plains Grassy Wetland (EVC 125), Plains Sedgy Wetland (EVC 647), Aquatic Herbland (EVC 653), Plains Grassland (EVC 132_61), and Plains Grassy Woodland (EVC 55_61). Specific details relating to mapped EVCs identified in or adjacent to the study area and within the development footprint and their Bioregional Conservation Status (BCS) are provided below.

The presence of these EVCs is generally consistent with the modelled pre-1750s native vegetation mapping (DEPI 2014b). These EVCs all have a Bioregional Conservation Status (BCS) of Endangered, except for the Plains Sedgy Wetland which is listed as Vulnerable (DELWP 2022i). This assessment is broadly consistent with (Pre-1750s) DELWP modelled EVCs for the locality (DELWP 2022b) (Figure 2). A total of 494.60 hectares of mapped native vegetation (excluding scattered trees) was mapped within the study area. The study area is approximately 7,600 hectares in size, so native vegetation covers less than 7% of the study area.

The dominant wetland EVC is Plains Grassy Wetland, with 473.38 hectares, mapped within the study area boundary. There is a small amount (0.0713 hectares) of Plains Sedgy Wetland (EVC 647) and small area (0.5097 hectares) of the Aquatic Herbland EVC on one property (Figure 2).

A summary of the extent of each vegetation type provided below (Table 5). A total of 31.35 hectares of current wetlands (DELWP modelled) are proposed to be impacted by the development. 1.04 hectares of Plains Grassy Wetland (PGWe) (EVC 125) may be impacted by the proposed development (as part of the impact area or the associated buffer areas) and 0.04 hectares of Plains Grassy Woodland (55_61). Several wetlands mapped in previous studies in 2007 and 2014 have since been drained and ploughed and so are no longer considered remnant patches (Ecology and Heritage Partners 2014).

Table 5. Extent of mapped EVCs and their Bioregional Conservation Status (BCS) within the surveyed area.

EVC	BCS	Mapped area (ha) within the study area	Mapped area (ha) within the development footprint
Plains Grassy Wetland (EVC 125)	Endangered	473.38	1.04
Aquatic Herbland (EVC 653)	Endangered	0.51	0
Plains Sedgy Wetland (EVC 647)	Vulnerable	0.071	0
Plains Grassland (EVC 132_61),	Endangered	19.64	0
Plains Grassy Woodland (EVC 55_61)	Endangered	1.00	0.04
Total extent all EVCs	-	**494.60**	**1.08**
Total Extent of Endangered EVCs	Endangered	494.53	1.08
Current Wetlands (DELWP Modelled)	-	***951.30**	***31.35**

*Where current wetlands (DELWP modelled) overlap with mapped EVC vegetation the current wetlands override this EVC in the EnSym report and this accounts for differences in the impacted vegetation totals and by EVC. The development footprint includes the associated buffers applied to the construction areas.

3.2.1 Plains Grassy Wetland (EVC 125)

Plains Grassy Wetland has a disjunct but extensive distribution in the study area (Figure 2). Extensive areas of the EVC are present in three properties, varying from poor to good quality (Figure 2).

Plains Grassy Wetland in the study area is characterised by the dominance of Common Tussock-grass *Poa labillardierei* var. *labillardierei*, as well as other grasses, particularly Common Swamp Wallaby-grass *Amphibromus nervosus*, Australian Sweet-grass *Glyceria australis,* Common Blown-grass *Lachnagrostis filiformis* s.s and Brown-back Wallaby-grass *Rytidosperma duttonianum* (Plate 5).

Partially inundated wetlands support various herb species including Austral Mudwort *Limosella australis*, White Purslane *Montia australasica,* Pondweed *Potamogeton* spp., Swamp Starwort *Stellaria angustifolia* and Purple Bladderwort *Utricularia beaugleholei.* Sedge and rush species occur in most of the wetlands, with Common Spike-sedge *Eleocharis acuta*, Knob Sedge *Carex inversa*, Joint-leaf Rush *Juncus holoschoenus* and Finger Rush *Juncus subsecundus* being the most common.

Lower quality wetlands generally have high indigenous grass cover (40% to 60%), however they lack herb species characteristic of higher quality, less disturbed wetlands. Common weed species in Plains Grassy Wetland include Flatweed *Hypochoeris radicata*, Paspalum *Paspalum dilatatum,* Annual Meadow-grass *Poa annua* and various species of Clover *Trifolium* spp. Some native wetlands are a mosaic between Plains Grassy Wetland and Plains Grassland, as they contain species representative of both EVCs that cannot be reasonably separated into distinct entities. Although mostly dry at the time of assessment, such areas were classified as Plains Grassy Wetland due to the dominant cover of Brown-back Wallaby-grass and herb species associated almost exclusively with wetlands. Such areas differ from the Kangaroo Grass dominated areas in the nearby road reserves that are more characteristic of grassland, rather than wetland vegetation.

Wetland vegetation was also observed in ploughed areas that have been seeded with exotic pasture grasses or recolonising the verges of artificial farm dams. These areas were assigned to the Plains Grassy Wetland EVC if the percentage cover of wetland vegetation exceeded the required 25% cover. These examples of Plains

Grassy Wetland are very modified, generally consisting of a solitary recolonising grass (Common Blown-grass *Lachnagrostis filiformis*.) or sedge (Tall Spike-sedge *Eleocharis sphacelata*) species (Plate 6) and so are of lower condition as they have few indigenous species present and more weeds present.

3.2.2 Plains Sedgy Wetland (EVC 647)

Plains Sedgy Wetland (PSWe) typically occurs in seasonally wet areas (DELWP 2017). The vegetation is dominated by sedges and herbs and some fringing shrubs in areas with higher rainfall (DELWP 2017). PSWe has a bioregional conservation status of Vulnerable.

Within the Darlington study area there was only one small patch of Plains Sedgy Wetland mapped (Figure 2), and this was not within the development footprint. There may be more areas of this EVC within the Darlington study area, but vegetation mapping has focused on the construction footprint and the immediate surrounds.

3.2.3 Aquatic Herbland (EVC 653)

Aquatic Herbland (EVC 653) is a vegetation community dominated by sedge and aquatic herb species in permanent to semi-permanent wetlands (DELWP 2022c, Oates and Taranto 2001). It generally occurs where creeks and rivers broaden and have a decrease in the flow of water through them (Oates and Taranto 2001). Tall aquatic species present in low densities, included Tall Rush *Juncus procerus*.

Submerged and floating aquatic species include Ferny Azolla *Azolla pinnata*, Round Water-starwort *Callitriche muelleri* and Slender Knotweed *Persicaria decipiens*. Species present along the fringes of the waterbodies include Common Spike-sedge *Eleocharis acuta*, Swamp Club-sedge *Isolepis inundata* and Billabong Rush *Juncus usitatus* (Plate 8). One patch of good quality Aquatic Herbland occurs immediately south of the Hamilton Highway (Figure 2). Common Water-ribbons *Triglochin procera*. are the dominant species in the inundated portions of the patch, with Common Tussock-grass and Common Swamp Wallaby-grass are present. The annual grassy weed, Squirrel-tail fescue *Vulpia bromoides* is widespread around this patch. As with the Plains Sedgy Wetland community above there may be more areas that support this EVC within the Darlington study area boundary.

Plate 5 Good quality Plains Grassy Wetland in the southwest of the study area, dominated by Brown-back-Wallaby-grass (Ecology and Heritage Partners 2021).

Plate 6 Modified Plains Grassy Wetland dominated by recolonising Common Blown-grass (straw-coloured areas) (Ecology and Heritage Partners 2021).

Plate 7. State significant Wavy Swamp Wallaby-grass present in an ephemeral wetland on one property in the south-east within the study area (Ecology and Heritage Partners 2021).

Plate 8. Wetland areas within the study area support a few herbaceous species but may not constitue a patch (Ecology and Heritage Partners 2021).

3.2.4 Plains Grassland (EVC 132_61)

Plains Grassland EVC within the Darlington study area is Heavier-soils Plains Grassland (EVC 132_61). This vegetation is typically treeless and dominated by grasses and herbs on basalt soils in areas where annual rainfall is usually between 500-600mm (DELWP 2022c).

Plains Grassland is distinguished from Plains Grassy Wetland by the presence of indigenous grass and/or herb species in more elevated areas of the landscape that are subject to infrequent inundation. This EVC occurs in areas that are grazed but have not been extensively ploughed. The condition of Plains Grassland ranges from poor to good depending on grazing intensity and species composition and diversity.

Good quality Plains Grassland (PG) occurs within two properties within the study area and along the Hamilton Highway (Figure 2)., These patches are characterised by the presence of Kangaroo Grass *Themeda triandra* and other native grasses including Common Wheat-grass *Anthosachne scabra*, Common Wallaby-grass *Rytidosperma caespitosum*, Bristly Wallaby-grass *Rytidosperma setaceum* var. *setaceum* and Brown-back Wallaby-grass. Characteristic herbs species Blue Devil *Eryngium ovinum,* Pale Sundew *Drosera peltata* s.l. and Chocolate Lily *Arthropodium strictum* s.l. are present but have a low cover (<5%) in these sites (Plate 9). Along the Hamilton Highway within the study area there are records of four EPBC Act listed flora species (Figure 2 and Figure 3).

Comparatively lower quality PG areas that lack the diversity of characteristic grass and herb species occur in the study area in laneways and on two properties. These grasslands generally contain Blue Devil as the solitary indigenous herb, with Brown-back Wallaby-grass and Common Wallaby-grass as the dominant grass species. Grassy weeds, in particular Cocksfoot *Dactylis glomerata*, Sweet Vernal-grass *Anthoxanthum odoratum*, Brown-top Bent *Agrostis capillaris* var. *capillaris* and Meadow Fox-tail *Alopecurus pratensis* are widespread in all areas of Plains Grassland (Plate 10). Areas of Plains Grassland identified by Brett Lane and Associates (areas 2 and 29 [Brett Lane and Associates 2007]) no longer constitute remnant native vegetation due to having less than 25% cover at the time of the 2014 assessment. Scattered native species, including Kangaroo Grass and Brown-back Wallaby-grass were observed in these areas.

Plate 9 Plains Grassland composed of Common Wheat-grass and Kangaroo Grass within the study area (Ecology and Heritage Partners 2013).

Plate 10 Recolonising Plains Grassland consisting of wallaby-grasses within the study area Ecology and Heritage Partners 2013).

3.2.5 Plains Grassy Woodland (EVC55_61)

Plains Grassy Woodland occurs on one property in the north of the study area (Figure 2). The patch consists of a group of River Red-gum Eucalyptus camaldulensis and lacks an indigenous understorey layer. Localised areas of Plains Grassy Woodland are also present in road reserves adjacent to the study area, in particular on Darlington-Woorndoo Road and Darlington-Terang Road. Most of these areas consist solely of Blackwood Acacia melanoxylon with occasional River Red-gum over an understorey of exotic grasses and are of poor to moderate quality as a result.

3.2.6 Scattered Trees

Ten scattered River Red-gum trees were recorded in the study area, with the majority occurring in one property in the north-east of the study area. These trees are representative of what would have previously been Plains Grassy Woodland EVC, but the trees no longer form a patch (Figure 2, Plate 12). All trees are small in size based on their diameter at breast height (<60 centimetres). One tree (Tree 7)- point 11 on the Figure 2 is impacted by the proposed development footprint and associated buffers. There are likely some additional scattered trees within the study area, but they were not within the proposed development footprint so may have been missed by previous assessments that focused on these areas.

Plate 11 Plains Grassland composed of Kangaroo Grass and wallaby-grasses in the study area (Ecology and Heritage Partners 2013).

Plate 12 Small scattered River Red-gum within the study area (Ecology and Heritage Partners 2013).

3.3 DELWP Modelled Wetlands

There are 951.30 hectares (32 wetlands) of modelled Current Wetlands within the Darlington study area. Of these 32 wetlands, 12 wetlands (31.36 hectares) are within the proposed wind farm development footprint (Figure 2). Areas modelled as DELWP current wetlands (Figure 2) override areas of mapped native vegetation patches where the two overlap (Figure 2). The condition score for these areas also becomes that of the modelled wetland rather than the habitat condition score given to the patch. Some of the DELWP modelled wetlands have been drained and developed (i.e. cropped or dammed) for agricultural purposes and many no longer support native vegetation patches. Some of the Current Wetlands (DELWP Modelled) have been modified and no longer constitute natural wetland EVCs, as they only have a few indigenous aquatic herbs, sedges and rushes and are dominated by exotic vegetation or have been drained so have little or no surface water to support aquatic species. Four small, isolated wetlands identified by Brett Lane and Associates (wetlands 7, 10, 28, 30: Brett Lane and Associates 2007) have been removed through ploughing and direct seeding since their assessment in 2007. Some evidence of the previous presence of these wetlands remains in the form of scattered wetland grass species, however these areas did not have 25% cover to be considered a remnant patch.

3.4 Introduced Vegetation

Introduced vegetation in the study area consists of grasslands comprised of non-native pasture grasses (Plate 13), crops including Canola (Plate 14), and planted trees and shrubs, and weed species including seven noxious weed species. Areas not supporting remnant native vegetation area have a high cover (>80%) of exotic grass species, most commonly Toowoomba Canary-grass *Phalaris aquatica*, Rye-grass *Lolium* spp. And Meadow Fox-tail which have been direct-seeded for use as pasture.

Removal of embedded rock has also been undertaken to facilitate the direct seeding of pasture grasses.

Seven noxious weeds, listed under the CaLP Act are scattered throughout these areas, the most common being Variegated Thistle *Silybum marianum* and Spear Thistle. Scattered native grasses are generally present in these areas, however they did not have the required 25% cover to be considered a remnant patch.

Planted vegetation in the study area also consists of exotic and non-Victorian tree species, commonly Sugar Gum *Eucalyptus cladocalyx* and Pine *Pinus* spp. In windrows around dwellings, sheds and laneways. A variety of shrubs have also been planted around sheds and dwellings.

Plate 13 Toowoomba Canary-grass in a paddock. Such areas are common occurrences around patches of remnant native vegetation and often contain scattered recolonising native grasses (Ecology and Heritage Partners 2013).

Plate 14 Canola *Brassica sp.* crop beside a farm track within the study area (Ecology and Heritage Partners 2022).

3.5 Fauna Species

In 2012/13, 28 Fauna species were recorded within the study area during the general observations of (Ecology and Heritage Partners 2014). These fauna species included 26 bird species of which 23 were native (Ecology and Heritage Partners 2014). No Nationally significant fauna species were recorded during the 2012/2013 assessment; however suitable habitat was identified within the study area for several fauna species of national significance including Striped Legless Lizard *Delma impar*, Corangamite Water Skink *Eulamprus tympanum marnieae,* Growling Grass Frog *Litoria raniformis* and Southern Bent-wing Bat *Miniopterus schreibersii bassanii*.

In 2012, 79 bird species were recorded during Bird Utilisations surveys of the study area including three State significant species: Brolga *Antigone rubicunda*, Musk Duck *Biziura uncta* and Australian Shoveler *Anas rhynchotis* (Ecology and Heritage Partners Pty Ltd 2012). Fifteen EPBC Act-listed Migratory/Marine species were recorded in the study area (Ecology and Heritage Partners 2012).

In 2009, nine bat species were recorded within the proposed wind farm boundary including Southern-Bent-wing Bat (Brett Lane and Associates 2009). In 2010, Southern-Bent-wing Bat was also detected on one of the four song meters, this song meter was located near Mt Fyans Lane just north of the proposed wind farm boundary (Ecology and Heritage Partners 2010). In 2021/22, SBWB was detected at eight of the 15 Songmeter locations (Figure 2).

In 2021, Striped Legless Lizard was detected in the south east of the study area and the surrounding boundary in the road reserve (Grids 3, 4 and 5) (Figure 5) and Growling Grass Frog was detected from a single farm dam.

In the 2021/22 ecological surveys two State listed Fauna species were also recorded: Tussock Skink *Pseudemoia pagenstecheri* located under tiles within and alongside the study area (Grids 2, 5, 7, 8, 10, 11 and 12) (Figure 5) (Plate 5), and Little Eagle *Hieraaetus morphnoides* was recorded twice within the study area, this species has recently been listed as vulnerable under the FFG Act.

Nesting Brolga were observed both within the study area and surrounding wetland areas (Plate 6).

Plate 5. Tussock Skink within the study area (Ecology and Heritage Partners 30/09/2021).

Plate 6. Nesting Brolga pair observed north of the study area (Ecology and Heritage Partners 01/10/2021).

3.6 Fauna Habitat

The habitat types described above (Plains Grassland, Plains Grassy Woodland, Plains Grassy Wetland, Plains Sedgy Wetland, and Aquatic Herbland) are common in the wider landscape of south-west Victoria and provide habitat for a wide range of common fauna species.

Listed species may use these habitats on occasion, however due to the widespread extent of these habitats in the landscape, their presence within the wind farm does not represent significant fauna habitat for any species. Fauna habitats within the wind farm which are likely to be key habitat for significant species

Wetlands within the study area and surrounds provide potential habitat for a range of wetland and water-dependent species, including Commonwealth listed migratory shorebirds, Growling Grass Frog *Litoria raniformis* and Brolga *Antigone rubicunda*.

Rocky knolls and outcrops, rock piles and stone walls provide habitat for a range of significant species, including Striped Legless Lizard *Delma impar* (Plate 6), and the Corangamite Water Skink *Eulamprus tympanum marnieae*.

In 2012, a total of 236 wetlands within the proposed wind farm and surrounding five kilometres were identified for evaluation (Ecology and Heritage Partners 2013). Of these wetlands, 16 were assessed as high-quality Brolga breeding habitat, 16 of medium quality, 57 of low quality, seven were not suitable and 140 were not assessed (Figure 5). Wetlands not assessed were primarily on private property with no access and were not visible from publicly accessible areas. With the exception of two wetlands (one each in the north-west and north-east corners of the proposed wind farm), all wetlands within the proposed wind farm were assessed. In 2021, these wetlands were again assessed to update the data and check wetlands that had previously be unable to be assessed.

3.6.1 Habitat Connectivity

The native vegetation within the study area is fragmented and patchy, much of it is connected to riparian areas or road reserves, some of which have native vegetation present, or planted windrows or plantations.

Riparian habitat acts as important dispersal corridors for native flora and fauna. Such connectivity is important in a landscape that has largely been cleared for agricultural purposes. Wildlife corridors and 'stepping stones' of vegetation have numerous benefits to native flora and fauna populations, particularly in modified landscapes where much of the surrounding vegetation is restricted to linear strips along roadsides. Some of the key benefits of habitat patches and wildlife corridors associated with the maintenance of biodiversity on a local and landscape level include:

- Protection and ongoing maintenance of ecosystem functionality through the reduction of threatening processes (erosion, weed spread, hydrological alterations);
- Protection for populations of threatened species, or disturbance sensitive species (e.g. orchids) that may have been lost from the surrounding landscape;
- Provision of habitat (refuge, shelter, breeding opportunities) for a range of fauna either residing within corridors, or moving through the landscape;
- Maintenance of species richness and diversity;
- A source of seed dispersal for flora species sensitive to moderate levels of disturbance;
- Immigration of animals to supplement declining populations, thus reducing the likelihood of local extinctions;
- Availability of habitat for reintroduction following extinction events;
- Prevent demographic changes occurring in populations that may result from prolonged isolation from other populations of the same species by aiding gene flow, thus enhancement of genetic variation and prevention of inbreeding; and,
- Facilitating fauna movement through modified landscapes to more optimal habitats.

3.7 Nationally Significant Features

3.7.1 Flora

There are 34 significant flora species, including eight Nationally listed species (EPBC Act) and 26 State listed (FFG Act) within 10 kilometres of the study area (Figure 3 and Appendix 1.2) (DELWP 2022f). In addition, there are 13 nationally listed flora species in the PMST (DCCEEW 2022) within 10kms of the study area. So, a total of 21 nationally listed flora species (EPBC Act) and 26 State listed flora species.

Four nationally significant species Hoary Sunray *Leucochrysum albicans* ssp. *tricolor*), Matted Flax-lily *Dianella amoena,* Clover Glycine *Glycine latrobeana,* and Spiny Rice-flower *Pimelea spinescens* ssp. *spinescens* were recorded within the study area. The Spiny Rice-flower was a record within the VBA within the study area. Although not recorded during the field surveys there is also suitable habitat (Plains Grassy Wetland, modified wetland vegetation and drainage lines) within the study area for Curly Sedge *Carex tasmanica,* Salt-lake Tussock-grass *Poa sallacustris* and Adamson's Blown-grass *Lachnagrostis adamsonii* (Figure 2).

Areas of Plains Grassland support moderate to good quality habitat for Spiny Rice-flower *Pimelea spinescens* subsp. *Spinescens*, Spiny Peppercress *Lepidium aschersonii*, Matted Flax-lily *Dianella amoena*, Clover Glycine *Glycine latrobeana* and Hoary Sunray *Leucochrysum albicans* var. *tricolor* (recorded along the Hamilton Hwy (Figure 2) and Figure 3, Appendix 1.2 and Appendix 1.5).

Orchid species previously recorded in the local area (10 kilometres) include Basalt Rustyhood *Pterostylis basaltica*, Small Golden Moths *Diuris basaltica,* and Fragrant Leek-orchid *Prasophyllum suaveolens*. However, based on the field assessment and very localised occurrences of previous orchid records, much of the study area is under-surveyed, which may explain the lack of previous records in the study area.

Good quality habitat for these species is also present in adjacent road reserves that support Kangaroo Grass dominated grassland, particularly the Hamilton Highway and sections of Darlington-Terang Road supporting the Plains Grassland EVC. All other areas are unlikely to support habitat for nationally listed species due to the high level of soil and vegetation disturbance from rock removal, agricultural use and ploughing practices.

There are four nationally listed flora species (EPBC Act) located within the study area and three State listed flora species (Figure 2 and Appendix 1.5). Five native vegetation communities are present within the study area Plains Grassy Wetland (EVC 125), Plains Sedgy Wetland (EVC), Aquatic Herbland (EVC 653), Plains Grassland (EVC 132_61), and Plains Grassy Woodland (EVC 55_61) (Figure 2).

These EVCs are also considered to be of national and state conservation significance as Natural Temperate Grassland of the Victorian Volcanic Plain (EPBC Act-listed), Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains (EPBC Act-listed), and Western (Basalt) Plains Grasslands Community (FFG Act-listed

From the VBA there are previous records within the study area of one Nationally significant flora species (Spiny Rice-flower) (Figure 3) within the study area. The Spiny Rice-flower records are recent (2018) and are in the east of the study area on the Hamilton Highway. This area was not surveyed during targeted flora surveys as it is well outside of the construction footprint and so will not be impacted by the proposed development.

Hoary Sunray

Hoary Sunray (also called the White Sunray) is listed as Critically Endangered under the EPBC Act (DCCEEW 2022). The Hoary Sunray is a perennial everlasting daisy species that flowers from November to December in Victoria (DAWE 2021; Sinclair 2010).Hoary Sunray was found within the study area (Figure 2 and Appendix 1.5) in Plains Grassland EVC which is equivalent to the Natural Temperate Grassland and the Western (Basalt) Plains Grassland. More than 200 Hoary Sunray plants were observed along the Hamilton Highway Rod Reserve and two other locations had 12 and 13 plants respectively (Appendix 1.5). There are no impacts proposed for the Hamilton Highway Road Reserve.

Plate 5. Hoary Sunray (EPBC Act-listed) within the study area along the Hamilton Hwy (Ecology and Heritage Partners December 2021).

Matted Flax-lily

Matted Flax-lily *Dianella amoena* is listed as Endangered under the EPBC Act (DCCEEW 2022) and Critically Endangered under the FFG Act (DELWP 2022f). Matted Flax-lily is a perennial, tufted lily which can form patches of mats. The plant can grow vegetatively, through sending underground rhizomatous roots, which rise above the ground with a tiller of several leaves, spread over a distance from the parent plant (Carter 2010). The leaves of the Matted Flax-lily are generally glaucous, blue green in colour but may be red at the base and usually have small hooks (teeth) along the margins and midrib. Matted Flax-lily generally flowers between November and February but may continue flowering with summer and autumn rains. It has pale blue to violet flowers with bright yellow stamens and berries, which are generally purple in colour (Carter 2010).

Matted Flax-lily generally occurs in grassland and grassy woodland habitats, on well drained to seasonally wet fertile sandy loams to heavy cracking clay soils (Carter 2010). Most populations of Matted Flax lily are thought to be small and highly fragmented, and there is estimated to be only around 2,500 plants remaining in the wild (Carter 2010). Most remaining sites are located in less than secure locations such as on roadsides, railway lines, private land or in small reserves within the urban landscape (Carter 2010).

Matted Flax-lily records within the study area (2021 surveys) are from along the Hamilton Highway and are not within the construction footprint so will not be impacted by the proposed development (Point #230 and #232 on Figure 2) (Appendix 1.5).

Spiny Rice Flower

Spiny Rice-flower *Pimelea spinescens* ssp. *spinescens* is listed as Critically Endangered under the EPBC Act (DCCEEW 2022) and the FFG Act (DELWP 2022f).

Spiny Rice-flower plants are perennial, small shrubs with spinescent branches that grow to a height of approximately 30 centimetres (Walsh and Entwisle 1996). Plants are dioecious (separate males and females) and bear small yellow/cream flowers from April to August (Carter and Walsh 2006; CoA 2009). Spiny Rice-flower plants are slow growing and are known to produce a long tap root (DEWHA 2009b). Individual plants may live for longer than 100 years (Mueck 2000; Carter and Walsh 2006).

Spiny Rice-flower plants are typically associated with Grassland vegetation including grasslands that are Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP). Spiny Rice-flower plants are typically found in undisturbed areas dominated by native grasses. The is endemic to Victoria, where it is known from about 20 populations (Cater and Walsh 2006). It is estimated that 12,000 plants remain in the wild (Carter and Walsh 2006).

Spiny Rice-flower was not recorded from our targeted surveys of the construction footprint. The species has been recorded in the VBA along the Hamilton Highway in the east of the study area along the Hamilton Highway (Figure 3) (DELWP 2022d). This area is not within the construction footprint and will not be impacted by the proposed development.

Clover Glycine

Clover Glycine *Glycine latrobeana* is listed as Vulnerable under the EPBC Act (DCCEEW 2022). Clover Glycine is a small perennial herb endemic to south-eastern Australia (Carter and Sutter 2010).

Clover Glycine typically grows in grasslands and grassy woodland vegetation communities and populations are known to fluctuate between seasons and with disturbance (Carter and Sutter 2010). Seeds of the species can remain dormant in the soil for years and germinate following disturbances such as fire (Carter and Sutter 2010). There is also reports that flowering is increased following flooding (Carter and Sutter 2010).

In the National Recovery Plan, it is noted that there are 140 known populations recorded since 1980 and the plan estimates that 7,000 plants are known from these populations (Carter and Sutter 2010). The species has declined in abundance due to habitat loss and degradation.

Clover Glycine was recorded within the study area along the Hamilton Highway in 2021. The species will not be impacted by the proposed development as it is not located within the construction footprint (Figure 2).

3.7.2 Fauna

Eleven nationally significant fauna species have previously been recorded from within 10 kilometres of the study area (DELWP 2022d) (Appendix 2.2) (Figure 4). The PMST nominated an additional 15 nationally significant species which have not been previously recorded but have the potential to occur in the locality (DCCEEW 2022). Three nationally listed fauna species (Southern Bent-wing Bat, Striped Legless Lizard and Growling Grass Frog), and six migratory/ marine bird species Latham's Snipe, Clamorous Reed Warble, Sharp-tailed Sandpiper, Double-banded Plover, Wood Sandpiper and Common Greenshank have been recorded within the study area (Figure 2 and 4). Migratory species are discussed below (Section 3.7.3) (Appendix 2.3).

There is potential for another three EPBC Act-listed fauna species (Grey-headed Flying-fox, White-throated Needle-tail *Hirundapus caudacutus* and Corangamite Water Skink) to occur within or fly over the study area. A brief description of EPBC Act-listed fauna species is provided.

Southern Bent-wing Bat

Southern Bent-wing Bat is likely to forage within the wind farm in small numbers. Previously in 2009, Southern Bent-wing Bat had been recorded from just to the north-east of the study area near Mt Fyans Lane, but not from within the wind farm (Ecology and Heritage Partners 2010, 2012), on one of the four Anabat detectors installed (Figure 2 and Figure 4). In 2021/21 Ecology and Heritage Partners recorded SBWB at eight of the 15 Songmeter locations within the study area (Figure 2 and Figure 4 and Appendix 2.4). SBWB call nights for the first seven week period (Spring survey) October-November 2021, were detected at three of the 15 Songmeter sites: site #1 (two nights) , site #7 (one night), and site #10 (two nights), so a total of five call nights over the seven week period. SBWB call nights for the second seven week period (Summer) from December to March 2021/2022, were detected at seven of the 15 locations. Site 1 (three call nights), and one call night each at the following six sites: 3, 5, 8, 9, 10 and 15.

Striped Legless Lizard

Striped Legless Lizard are known from five records, all 11 kilometres to the north-east, with the most recent record from 2013 (Appendix 2.2). This species occurs in rocky outcrops with surface rock and tussock grasses. There are significant areas of this habitat spread over the wind farm, with large areas particularly in the north (Figure 2). In 2021/22, Striped Legless Lizard were recorded within the study area and the surrounding road reserves at three of the 12 tile grid locations (Grids 3, 4, and 5) (Figure 2 and 4).

Plate 6. Two Striped Legless Lizards under one tile in Plains Grassland vegetation within the study area (Ecology and Heritage Partners December 2021).

Corangamite Water Skink

Corangamite Water Skink was not recorded during targeted surveys within the study area. The species has been recorded from both four kilometres north and north-east of the study area, most recently in 1998. It inhabits rocky outcrops surrounding permanent water. Within the study area, there is a small area of potential habitat in the far north surrounding a wetland, and several rock piles near dams where the embedded rock from the surrounding paddocks has been piled. The locations of Corangamite Water Skink targeted surveys are shown below (Figure 5).

Growling Grass Frog

Growling Grass Frog has been recorded eight times within 15 kilometres of the study area, with the closest record approximately four kilometres to the east, and the most recent record from 2000 (Appendix 2.2). All dams, wetlands and drainage lines within the study area provide potential dispersal habitat for the species, however during field assessments only man-made dams contained water and these were all of low quality, and unlikely to represent breeding habitat. In years of good rainfall Growling Grass Frog are likely to move into the study area and breed opportunistically, however there is not suitable habitat for a large, permanent population within the study area.

Growling Grass Frogs were heard calling during the day at one dam location in the south of the study area (Figure 2). No individuals were sighted, however based on calling frequency and volume, a low density of Growling Grass Frogs was present and using the habitat for breeding.

3.7.3 Migratory and Marine Species

The EPBC Act provides for the protection of migratory and marine species (DCCEEW 2022). The Wildlife Conservation Plan for Migratory Shorebirds (DoE 2015) outlines the national protection that covers these 35 migratory species that regularly visit Australia and provides a framework to guide their conservation.

The Protected Matters Search Tool (PMST) for the proposed Darlington Wind Farm lists 12 listed migratory species for the study area including one migratory marine bird, four migratory terrestrial species including one that is listed as Vulnerable under the EPBC Act and seven migratory wetland species (DCCEEW 2022). A further 19 marine species are listed for the study area in the PMST (DCCEEW 2022). Some of these species occur in more than one of the groupings (Table 6).

Table 6. Protect Matters Search Tool (PMST) listed of migratory and marine species predicted to occur in the study area. Species that were recorded in the study area are indicated in bold.

Species	Migratory Marine Birds	Migratory Terrestrial Species	Migratory Wetland Species	Marine Species	Migratory Shorebird
Fork-tailed Swift *Apus pacificus*	Y	-	-	Y	-
White-throated Needletail *Hirundapus caudacutus* (VU)	-	Y	-	Y	-
Yellow Wagtail *Motacilla flava*	-	Y	-	Y	-
Satin Flycatcher *Myiagra cyanoleuca*	-	Y	-	Y	-

Species	Migratory Marine Birds	Migratory Terrestrial Species	Migratory Wetland Species	Marine Species	Migratory Shorebird
Rufous Fantail *Rhipidura rufifrons*	-	Y	-	Y	-
Common Sandpiper *Actitis hypoleucos*	-	-	Y	Y	-
Sharp-tailed Sandpiper *Calidris acuminata*	-	-	Y	Y	Y
Curlew Sandpiper *Calidris ferruginea*	-	-	Y	Y	-
Pectoral Sandpiper *Calidriis melanotos*	-	-	Y	Y	-
Latham's Snipe *Gallinago hardwickii*	-	-	Y	Y	Y
Eastern Curlew *Numenius madagascariensis*	-	-	Y	Y	-
Common Greenshank *Tringa nebularia*	-	-	Y	Y	Y
Cattle Egret *Bubulcus ibis*	-	-	-	Y	-
Black-eared Cuckoo *Chalcities osculans*	-	-	-	Y	-
White-bellied Sea-Eagle *Haliaeetus leucogaster*	-	-	-	Y	-
Swift Parrot *Lathamus discolor*	-	-	-	Y	-
Rainbow Bee-eater *Merops ornatus*	-	-	-	Y	-
Blue-winged Parrot *Neophema chrysostoma*	-	-	-	Y	-
Australian Painted Snipe *Rostratula australis*	-	-	-	Y	-
Double-banded Plover *Charadrius bicinctus*	-	-	-	-	Y
Little Curlew *Numenius minutus*	-	-	-	-	Y
Sanderling *Calidris alba*	-	-	-	-	Y
Red-necked Stint *Calidris ruficollis*	-	-	-	-	Y
Wood Sandpiper *Tringa glareola*	-	-	-	-	Y
Pacific Golden Plover *Pluvialis fulva*	-	-	-	-	Y

Of the nine migratory shorebird species that had been previously recorded in the study area and surrounds (Appendix 2.3) (Ecology and Heritage Partners 2013), four species Wood Sandpiper, Latham's Snipe Common

Greenshank, and Sharp-tailed Sandpiper were recorded within the Darlington study area. In addition to the species nominated by the PMST, Double-banded Plover was also recorded in the study area (Birdlife Australia).

In 2012 one migratory species (Latham's Snipe *Gallinago hardwickii*) and four marine species were detected within the study area (Ecology and Heritage Partners 2013a, 2014):

- Straw-necked Ibis *Threskiornis spinicollis*,
- Stubble Quail *Coturnix pectoralis*,
- Swamp Harrier *Circus approximans*, and
- Australasian Pipit *Anthus novaeseelandiae*

In the 2009 one migratory species (Clamorous Reed Warbler *Acrocephalus stentoreus*) was recorded (Ecology and Heritage Partners 2010). In 2012, 15 EPBC Act-listed migratory and or marine species, only one of which has a threatened conservation status, were recorded in the study area (Ecology and Heritage Partners 2012). These 15 species are:

- Stubble Quail *Coturnix pectoralis;*
- Purple Swamphen *Porphyrio porphyrio*
- Whiskered Tern *Chliodonias hybridus*
- Silver Gull *Chroicocephalus novaehollandiae*
- Black-winged Stilt *Himantopus himantopus*
- Red-necked Avocet *Recurvirostra novaehollandiae*
- Australian White-ibis *Threskiomis molucca*
- Straw-necked Ibis *Threskiormis spinicollis*
- Musk Duck *Biziura lobata* (Vulnerable)
- Swamp Harrier *Circus approximans*
- Welcome swallow *Hirundo neoxena*
- Magpie-lark *Grallina cyanoleuca*
- Clamorous Reed Wabler *Acrocephalus stentoreus*
- Australasian Pipit *Anthus novaeseelandiae*
- Little Raven *Corvus mellori*

Latham's Snipe

One species Latham's Snipe recognised under the migratory provisions of the EPBC Act was recorded during field surveys in 2012 (Figure 6) (Ecology and Heritage Partners 2013). The habitat for Latham's Snipe was also assessed as high and moderate for the study area and surrounds (Figure 6). During targeted searches in late November 2012, two Latham's Snipe were flushed from wet areas within the proposed wind farm: one from wetland #22, north of the Darlington-Woorndoo Road, and another in a low-lying roadside runoff area along the main Hamilton Highway. An opportunistic sighting of a single Latham's Snipe was also made to the south-west of the proposed wind farm in 2012 (Figure 6).

One wetland within the proposed wind farm was considered suitable habitat for Latham's Snipe at the time of the surveys (note that the record S02 occur in a roadside run-off area and not in a mapped wetland).

All other wetlands were dry and/or overgrown with pasture grasses, thus supporting low quality habitat for the species. Two wetlands south of the Hamilton Highway (wetlands #45 and #46) were of moderate habitat quality due to the vegetation cover and open areas present, although these did not contain water during the site surveys (Ecology and Heritage Partners 2013). For Latham's Snipe a significant population is considered 18 individuals, while an important site is that which supports a significant population and is a naturally occurring open freshwater wetland with vegetation cover nearby (DEWHA 2009).

Sharp-tailed Sandpiper

Regular observations of Sharp-tailed Sandpiper were made opportunistically at Mortlake N17 Lake Reserve, approximately four kilometres south-west of the study area, the same lake as Latham's Snipe observation. A maximum flock size of 200 individuals was recorded at this site on 1st November 2012 (Ecology and Heritage Partners 2013). Flocks of up to 50 Sharp-tailed Sandpipers were also present at Lake Barnie Bolac during the survey period (Ecology and Heritage Partners 2013).

In 2012, Sharp-tailed Sandpiper was the only migratory shorebird recorded within five kilometres of the proposed wind farm. There was no high-quality habitat for the other 35 migratory shorebirds within the proposed wind farm, with very few wetlands containing exposed mud flats or shoreline. To the south-west of the proposed wind farm, Mortlake N16 and N17 Lake Reserves contained extensive suitable shorebird habitat, as did a lake immediately to their north (Figure 6). Wetlands #18 (un-named) and #128 (Lake Barnie Bolac) (to the north-west and north-east of the proposed wind farm respectively, also contained suitable habitat for migratory shorebirds with large areas of open mudflats and shoreline (Figure 2 and Figure 6).

The flock of 200 Sharp-tailed Sandpipers recorded at Mortlake N17 Lake Reserve represents over 0.1% of the flyway population (160 individuals: DEWHA 2009), and as such this wetland should be recognised as an important site for the species. The Australian population of Sharp-tailed Sandpiper is estimated at 141,000, which comprises almost 90% of the world population (DEWHA 2009). The species regularly inhabits the edges of brackish and freshwater wetlands and is one of the most common migratory shorebirds away from coastal areas (Higgins and Davies 1996). Small flocks of this species are expected to be highly mobile within the local area, flying between wetlands with suitable habitat on a regular basis.

Wood Sandpiper

A single record of the Wood Sandpiper within the study area was made from the review of databases. The species is a small wader species that may use waterbodies in and around the Darlington study area on an occasional basis.

Common Greenshank

Common Greenshank was recorded in the study area in the VBA database, the latest record was in 2010. The record is the south of the study area and is not within the proposed construction footprint (Figure 4).

Other Migratory species

The detailed surveys of wetland habitat within the proposed wind farm and opportunistic searches detected individuals of only a couple of bird species. These findings are not unexpected given the general lack of suitable habitat recorded for migratory shorebirds within the proposed wind farm.

These observations reveal that the proposed wind farm is likely to, at best, support low numbers of migratory shorebirds, and does not contain extensive high-quality habitat for any migratory shorebirds.

Five migratory bird species have been previously recorded at Lake Barnie Bolac, highlighting the importance of this area to migratory shorebirds (Ecology and Heritage Partners 2013). The area south from Lake Barnie Bolac to the Hamilton Highway and east to Darlington has been reported to contain significant numbers of a range of migratory shorebird species (DEWR 2008).

While specific location details for these records are lacking, and none of the observations have been verified these records would represent some of the largest populations and greatest species diversity of migratory shorebirds in the study area.

The low number of migratory shorebirds recorded during surveys is supported by the results of previous surveys undertaken for the proposed Darlington Wind Farm. In wetter years there would be a greater area of suitable habitat, especially for Latham's Snipe, however it is unlikely this would lead to an increase in numbers of any species as similar conditions would occur simultaneously over much of south-west Victoria. The one wetland of high-quality habitat for Latham's snipe occurs in an area likely to be part of a turbine-free buffer around Brolga flocking sites. Any movements from this site would likely be to existing high-quality habitat to the east which also lies within the turbine-free buffer. The two medium quality wetlands were already dry at the end of November, and in most years will not be used by Latham's Snipe.

Surveys were timed to ensure that all migratory shorebirds and Latham's Snipe had returned to Australia from their northern hemisphere breeding grounds. Latham's Snipe was first reported in Victoria on 22 August 2012, although they were not regularly reported until the middle of October (Eremaea Birds 2013). Surveys conducted much earlier in the season may have meant more suitable habitat (more wetlands, higher water levels), but not all birds may have arrived from the breeding grounds. Surveys later in the season may have recorded fewer wetlands and lower water levels, meaning any individuals present may have already deserted the area to find suitable habitat elsewhere.

Areas external to the proposed wind farm, but within the study area did contain significant areas of suitable migratory shorebird habitat, primarily to the south-west (Mortlake Lake Reserves area) and the north-east (Lake Barnie Bolac and surrounding wetlands). Lake Bookar, to the south-east, but outside the study area, also had significant migratory shorebird habitat. All of these areas had records of migratory shorebirds, either during the current work, or prior records from existing data sources.

3.7.4 Ecological Communities

The Critically Endangered Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains ecological community was recorded within the study area (DSEWPaC 2012). Plains Grassland (EVC 132_61) which corresponds to the Western (Basalt) Plains Grassland ecological community, occur within the study area and are both listed under the Victorian *Flora and Fauna Guarantee* (*FFG) Act* 1988. Along the road reserve along the Hamilton Highway the Plains Grassland vegetation community meets the thresholds of Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) that is listed nationally.

Three other EVCs, Plains Grassy Wetland (EVC 125), Aquatic Herbland (EVC 653), and Plains Sedgy Wetland (EVC) also occur within the study area (Figure 2). These EVCs all have a Bioregional Conservation Status (BCS) of Endangered in the Victorian Volcanic Plain bioregion. TLocations of significant flora and fauna species, and ecological communities results, and targeted fauna survey locations is shown below (Figures 2).

Based on the PMST search, four nationally listed ecological communities are predicted to occur within 15 kilometres of the study area (DCCEEW 2022)

- Grassy Eucalypt Woodland of the Victorian Volcanic Plain;
- Natural Temperate Grassland of the Victorian Volcanic Plain;
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains; and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

The EPBC Act listed critically endangered Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains ecological community (DSEWPac 2012a), was recorded within the study area, primarily in good quality, species rich wetlands in seven properties. Wetlands with at least one indigenous wetland herb species and a cover of at least 50% of relevant indigenous grasses qualify for the ecological community (Figure 2 and Table 6). Some wetlands meet the criteria for 'high quality wetlands' due to the presence of three or more key herb species, as per Table 1 of the Listing Advice for the community (DSEWPaC 2012a).

Plains Grassland (EVC 132_61) which corresponds to the Western (Basalt) Plains Grassland ecological community occurs within the study area and is listed under the Victorian Flora and Fauna Guarantee (FFG) Act 1988. In the road reserve along the Hamilton Highway the Plains Grassland vegetation community meets the thresholds of Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) that is listed Nationally.

The critically endangered Natural Temperate Grassland of the Victorian Volcanic Plain ecological community is not present in the private property within study area due to the small size of grassland patches (<0.05 hectares) or less than 50% cover of key grass genera (*Themeda, Rytidosperma, Austrostipa* or *Poa*).

The total perennial native grass cover of key grass genera is greater than 50% and they are over 0.05 hectares in size, thus qualifying the roadside areas for the ecological community.

No other ecological communities were recorded during the field assessment, as native vegetation did not correspond to the description and condition thresholds of any additional communities.

Table 6 Extent of significant communities within the study area and within the proposed development footprint.

Community	Category	Listing Conservation Status	Mapped Area (ha) within the study area	Mapped area (ha) within the development footprint including buffers
Natural Temperate Grassland of the Victorian Volcanic Plain	EPBC	Critically Endangered	19.64	0
Seasonal Herbaceous Wetlands of the Temperate Lowland Plains	EPBC	Critically Endangered	108.06	0
DELWP Modelled Current Wetlands	-	-	951.30	31.35
Total extent EPBC Communities	**EPBC**	**Critically Endangered**	**127.70**	**0**

3.7.5 OtherMatters of NES

One Ramsar site (i.e. wetland of international importance) is located 12.7 kilometres from the study area boundary; The Western District Lakes (Figure 1) (DCCEEW 2022).

3.8 State Significant Features

3.8.1 Flora

Twenty-six State significant (listed under the FFG Act) have previously been recorded within 10 kilometres of the study area (Figure 3) (DELWP 2022d) (Figure 3) (Appendix 1.2).

Three State significant flora species were detected within the study area during the recent surveys across the study area (Figure 2 and Appendix 1.5):

- Small Milkwort *Comesperma polygaloides* (FFG Act-listed)
- Pale Swamp Everlasting *Coronidium gunnianum* (FFG Act-listed)
- Wavy Swamp Wallaby Grass *Amphibromus sinuatus* (FFG Ac -listed)

Populations of Slender Bindweed *Convolvulus angustissimus* subsp. *Omnigracilis* occurs within the study area in the Hamilton Highway. This species was previously FFG Act listed but has recently been removed from the list. There is also one record of Pale Flax-lily *Dianella longifolia* within the study area on the Hamilton Highway (Figure 2). There is one ssp. Pale Flax-lily (ssp. *grandis* that is FFG listed as Critically Endangered). It has not been confirmed if this record is for that ssp, or for the common ssp. *longifolia*. This record is outside of the construction footprint so will not be impacted by the proposed development.

The VBA and FIS contain records of an additional 23 State-significant flora species within the locality, of which six species (Small Milkwort, Purple Blown-grass *Lachnagrostis punicea* subsp. *filifolia*, Dense Greenhood *Pterostylis* sp. aff. *bicolor* (Woorndoo), Leprechaun Greenhood *Pterostylis conferta*, Basalt Sun-orchid *Thelymitra gregaria* and Hairy Tails *Ptilotus erubescens)* have been recorded within 10 kilometres of the study area (Appendix 1.2).

Good quality suitable habitat is present for terrestrial species in all areas of Plains Grassland and modified native grassland, including Small Milkwort, Slender Bindweed, Hairy Tails and Arching Flax-lily *Dianella* sp. aff. *longifolia* (Benambra). There is limited habitat for terrestrial orchid species in these areas including Golden Cowslips *Diuris behrii,* Short Sun-orchid *Thelymitra exigua*, Basalt Sun-orchid, Dense Greenhood, Leprechaun Greenhood mainly due to the constant grazing pressure that may mean orchid species no longer persist within the study area. Most of the good quality habitat for terrestrial orchids is confined to the less disturbed and comparatively more diverse Plains Grassland in road reserves adjacent to the study area.

All other areas are unlikely to support habitat for State listed species due to the high level of soil disturbance from rock removal and ploughing practices.

Small Milkwort

Small Milkwort *Comesperma polygaloides* is listed as Critically Endangered under the FFG Act. Small Milkwort were found in one location within the study area in a Plains Grassland patch within the Hamilton Highway Road Reserve (significant flora point #10 on Figure 2o and in Appendix 1.5).

Wavy Swamp Wallaby Grass

Wavy Swamp Wallaby Grass *Amphibromus sinuatus* is listed as Endangered under the FFG Act -listed (DELWP 2022f). This species was found in two locations within the study area (significant flora points 1 and 16 on Figure 2, and in Appendix 1.5). Point 16 is located within DELWP Current Wetlands on private property in the south-east of the study area along a boundary of the study area (Figure 2r). Point #1 is located in a patch of Plains Grassy Wetland in the south east of the study area (Figure 2v).

Pale Swamp Everlasting

Pale Swamp Everlasting *Coronidium gunnianum* is listed as Critically Endangered under the FFG Act. Pale Swamp Everlasting were recorded in four locations within the study area (significant flora Points 2, 9, 15 and 17 on Figure 2n (Appendix 1.5). Point 9 is located under the existing powerline on private property north of the Hamilton Highway beside a mapped PGWe patch.

3.8.2 Fauna

There is suitable habitat within the study area for all state listed species, however most species are highly mobile and habitat within the wind farm is likely to be used irregularly, and on a seasonal basis. This applies for highly mobile species (e.g. Black Falcon *Falco subniger* Grey Goshawk *Accipiter novaehollandiae novaehollandiae*), and wetland-reliant species including ducks (seven species), migratory shorebirds (four species), Gull-billed Tern *Gelochelidon nilotica macrotarsa* and the Eastern Great Egret.

Brolga

Brolga is listed as under Endangered under the FFG Act (DELWP 2022f). Brolga have been recorded within the study area previously including breeding records. Brolga area discussed in Section 3.9 Brolga of this report.

Musk Duck

Musk Duck *Biziura lobata* is listed as Vulnerable in Victoria under the FFG-Act (DELWP 2022f). Musk Duck typically occupy deep, still freshwater lakes and wetlands with areas of open water and reed beds. They are rarely seen on land and tend to nest on trampled vegetation hidden amongst reed beds (Birdlife Australia 2022). The species was detected within the study area during the site surveys in small numbers as incidental observations, and are likely to travel over the study area and occasional use wetlands within the study area and the surrounds.

Little Eagle

Little Eagle *Hiraaetus morphnoides* is listed as Vulnerable in Victoria under the FFG-Act (DELWP 2022f). The preferred habitat of Little Eagle includes woodland, forest and open country, although dense vegetation is typically avoided (Birdlife Australia 2022). The species was detected within the study area during the site surveys on three occasions and is likely to use the study area to forage. Suitable habitat is present in the study area, which contains both woodland and vast areas of open space across various farm properties, over which the Little Eagle may hunt for prey.

Australasian Shoveler

Australasian Shoveler *Spatula rhynchotis* is listed as Vulnerable in Victoria under the FFG-Act (DELWP 2022f). Australasian Shoveler typically inhabit a wide variety of wetlands, ranging from terrestrial swamps and lakes to estuaries and sheltered inshore waters.

Australasian Shovelers are often found in mixed-flocks with other duck species (e.g. Pink-eared Duck) and prefer open water areas with fringing aquatic vegetation (Birdlife Australia 2022). The species was detected within the study area during the ecological surveys in small numbers. The species is likely to occasionally use suitable habitat within the study area and surrounds for foraging.

The waterways and waterbodies (dams) within the study area provide potential foraging habitat for the species, and individuals have been observed in some of the farm dams within the study area. The species may also visit the study area on occasion when dispersing through the local area to higher quality habitat (e.g. larger wetland or lake systems to the north or east).

Australian Gull-billed Tern

Australian Gull-billed Tern *Gelochelidon nilotics macrotarsa* is listed as Endangered in Victoria under the FFG-Act (DELWP 2022f). They typically inhabit shallow wetland areas, including coastal or inland lakes, swamps, lagoons, and sheltered bays and estuaries. They are rarely found over the ocean, and often utilise habitat such as irrigated cropland, grasslands or sewage farms (Birdlife Australian 2022). The species was detected within the study area during the site surveys. Suitable habitat is present within the study area, with extensive areas of irrigated croplands, wetlands or pasture that may be subject to inundation, in which the species may forage for insects or other prey.

Common Greenshank

Common Greenshank is listed as Endangered under the FFG Act (DELWP 2022f) and as a Migratory Wetland species under the EPBC Act (DCCEEW 2022). Common Greenshank were not observed during the field assessments but have been recorded within the study area in 2010 in the VBA database (DELWP 2022e). This record is within private property in the south of the proposed study area (Figure 4). The record is not within the proposed construction footprint (Figure 2).

Tussock Skink

Tussock Skink is listed as Endangered under the FFG Act (DELWP 2022f) and was detected at six of the 12 tile grids (grids 2, 7, 8, 10, 11 and 12) (Figure 2) (Appendix 2.4).

Wood Sandpiper

Wood Sandpiper *Tringa glareola* is listed as Endangered under the FFG Act (DELWP 2022f). Wood Sandpiper was recorded in the study area (Figure 4).

3.8.3 Ecological Communities

One FFG Act listed ecological community [Western (Basalt) Plains Grasslands Community] (19.64 hectares in total) occurs within the study area.

3.9 Brolga

Below we have consolidated the previous Brolga assessments for Darlington based on if they looked at flocking, wetland and habitat suitability and collision risk.

3.9.1 Flocking

Brolga flocking sites, or groups of sites, are difficult to identify from habitat assessment alone due to their similarity with many environmentally similar sites, for which no flocking records exist. Three wetlands were identified as flocking sites, based on published records and discussion with DEPI and local landholders. As these three sites are close (maximum distance of approximately six kilometres between Long Dam and Lake Sheepwash) it is likely that the same flock of Brolga are likely to regularly move between these sites during the flocking season. A fourth site (flocking location #16) may also be part of this group of flocking sites, although habitat suitability at the site and its status was not determined. The nearest known flocking sites to the three identified in the north of the study area are at Lake Bolac (40 kilometres north-west), and around Cressy (50 kilometres east). Infrequent movements are likely between flocking sites, as birds banded around Skipton / Streatham have been recorded around Darlington (I. Veltheim pers. comm. 16 Jan 2013).

In 2008 and 2009 flocking season surveys (February-May) in the Darlington area were constrained, as Brolgas were only flocking in low numbers, with a maximum of 14 individuals recorded at one site (Brett Lane and Associates 2008b). Six historical Brolga flocking sites were identified within 20 kilometres of the proposed wind farm (Brett Lane and Associates, 2008b). A Brolga flocking site is located north of the Darlington study area at Lake Barnie Bolac (Arnol *et al.* 1984; Biosis 2009; Sheldon 2004).). In addition, there are two historical Brolga flocking locations, one with a record of 18 flocking birds and the other with two records each of 11 birds, to the west of Lake Barnie Bolac (Biosis 2009).

In 2012/2013 a desktop assessment of Brolga flocking locations within and surrounding study area was undertaken (Ecology and Heritage Partners 2013c). The assessment led to 18 potential flocking sites being identified from a compilation of records from published information reports including the existing flocking database (Sheldon 2004), with local landholder reports from community consultation, information from DEPI staff (Ecology and Heritage Partners 2013c). These 18 potential flocking sites were then assessed in the field to confirm. Three of the potential flocking records were located within the proposed wind farm boundary and five records were in the Lake Barnie Bolac area (Ecology and Heritage Partners 2013c). The three potential flocking records within the study area are of single records of less than 10 individuals and so do not meet the flocking criteria (Ecology and Heritage Partners 2013c). The Barnie Bolac area is a confirmed flocking site and needs to be buffered (five kilometres) to avoid impacts of the proposed development.

Two flocking sites were identified in discussion with staff at DEPI and local landholders for which no flocking records existed in the flocking database (Sheldon 2004). These two sites are known as Long Dam and Lake Sheepwash and were identified as flocking sites in the Mortlake Wind Farm panel hearing and subsequent report (Wimbush *et al.* 2010).

3.9.2 Breeding, Home Ranges, Movement and Flights

In 2007 and 2008, detailed studies of Brolga behaviour and movements during the breeding season were undertaken and several breeding pairs of Brolgas were identified in the Darlington area, including four breeding sites within the study area north of the Hamilton Hwy, and a further two within three kilometres of the boundary (Brett Lane and Associates 2008, 2009).

In addition, flocking sites in relatively close proximity to the proposed Wind Farm site were identified and identification of 311 wetlands within 20 kilometres of the proposed site which were assessed for presence of Brolga and their quality as Brolga wetlands (Brett Lane and Associates Pty. Ltd. 2008). Most wetlands were assessed to be of low quality for Brolga, and Brolga were found nesting in wetlands of varying habitat quality (Brett Lane and Associates 2009).

Brolga movement from breeding sites ranged up to 3.2 kilometres, but most movement was up to 200 metres from the nest (Brett Lane and Associates 2009). The majority of Brolga flights observed were at less than 30 metres above the ground and most at less than ten metres above the ground (Brett Lane and Associates, 2009). The longest distance flight observed was five kilometres (Brett Lane and Associates 2009). Interestingly, most Brolgas observed did not flock or forage together in larger groups as would be expected from during the flocking season (Jan-May), with most remaining in their pairs or singles as more typical of the breeding season behaviour (July-Nov) (Brett Land and Associates 2009).

In 2013 a desktop assessment was conducted, and a database of all brolga breeding records was compiled using data from the Victorian Biodiversity Atlas (VBA), local landholders through community consultation, DEPI staff, other reports from the area and our unpublished data from earlier studies (Ecology and Heritage Partners 2013c). A total of 332 Brolga breeding sites were reported in the database.

During the 2012/2013 Brolga breeding season there were extensive surveys conducted in areas within and around the proposed Darlington wind farm for active brolga nests based on all the locations compiled in the Brolga breeding database (Ecology and Heritage Partners 2013b, 2013c). All sites were assessed in terms of the wetland quality and habitat for Brolga (see Figure 2d).

Of the 332 Brolga breeding sites in the database, 156 had wetland habitat suitable for Brolga or they were unable to be assessed so were presumed to be suitable. Eight confirmed Brolga nests were found within the study area and surrounding areas and 16 other waterbodies were identified as suitable for Brolga nesting, and seven of those contained nests however no Brolgas were observed using those nests (Ecology and Heritage Partners 2012). This led to the monitoring of four pairs of Brolga during their breeding attempt. Three of these pairs were within 10 kilometres of the wind farm, with the fourth 35 kilometres south-east. Each brolga nest was visited up to three times a day, and during each visit the location of both birds and the chick (where relevant) was recorded (note that individuals were not always observed). These locations were translated into GPS co-ordinates for movement analysis by Symbolix (2013). All four breeding attempts failed at various stages prior to chicks fledging. All had adequate data for analysis, although the amount of data from each nest was variable due to nests failing at different stages. Due to the small dataset (four nests with breeding pairs), no breakdown of the data into different breeding stages (e.g. incubating or brooding) was possible. Home range estimation found the Brolga remained within 80 hectares of the nest (to 99% confidence) and the home ranges are complex in shape and difficult to create buffer regions for risk mitigation management recommendations (Symbolix 2013). Symbolix (2013) report expected that nesting Brolga with an average home range size would be found within 711 metres from their nest 99% of the time. And for the Brolga with the largest home range this value increase dup to 770 metres from the nest, 99% of the time (Symboix 2013). Symbolix (2013) note in their report that circular buffer radii (measured from the nests) normally contains a larger area than the true home range, as a circular buffer will contain large areas which may not be used by Brolga. These values represent the full range of movements, rather than an average and so smaller analysis would not increase these values (Ecology and Heritage Partners 2013b, 2013c).