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Willatook Wind Farm

Brolga Impact Assessment

Revised to align with the
Minister's Recommendations
and the *Handbook for the
development of renewable
energy in Victoria* (DEECA 2025)

ADVERTISED PLAN

Prepared for
Willatook Wind Farm Pty Ltd

July 2026
Report No. 16087.28 (2.5)



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Nature Advisory acknowledges the traditional owners and sovereign custodians of the land on which we work from—the Wurundjeri people of the Woi Wurrung language group. We extend our respect to their Ancestors and all First Peoples and Elders past and present.

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The following table outlines the revisions made to this document.

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Executive summary

This report presents the assessment of potential impacts on the State-listed Brolga from the proposed Willatook Wind Farm in south-western Victoria. Building on more than a decade of studies, it applies the recently released Victorian Government's renewable energy guidelines; *Handbook for the Development of Renewable Energy in Victoria – Guidance to Avoid, Minimise, Mitigate and Compensate for Impacts on Threatened Bird and Bat Species* (the “Handbook”) (DEECA 2025). The *Handbook* comes with a species-specific guide for Brolga; *Appendix 2 – Species specific guidance for onshore wind energy facilities – Victorian Brolga* (DEECA 2025, Appendix 2). Together, these guidelines present an updated assessment process to manage impacts on the species, including detailing a mitigation hierarchy and compensation requirements. This assessment also responds to the Minister's Assessment of the Willatook Wind Farm EES (Minister for Planning, 2023).

The proposed Willatook Wind Farm, located in the Moyne Shire, will comprise up to 52 wind turbines, four permanent meteorological masts, an on-site substation, the option for an on-site quarry, a battery storage facility, approximately 55.8 km of trenches to house underground 33 kV electricity cables, 300 m overhead transmission line, 45.6 km of access tracks, three batching plants and associated infrastructure.

For more than a decade, substantial effort has been dedicated to assessing Brolga and its habitat in relation to the project. Between 2009 and 2025, Ecology and Heritage Partners and Nature Advisory undertook a wide range of Brolga studies, including reviews of existing database records, landowner consultations, on-ground field surveys during breeding and non-breeding seasons, aerial surveys, and assessments of habitat suitability. The key findings relevant to an assessment under the *Handbook* are summarised below.

Assessment methods

Over the last decade, extensive Brolga studies have been undertaken at Willatook Wind Farm and its surrounds. Assessments included the following:

- Desktop review of existing information on breeding and flocking Brolga, including:
 - Database searches, review of existing reports and peer-reviewed studies
- Community consultation
 - Initial consultation in 2011, with further detailed landholder surveys in 2018
- Flocking surveys
 - Four seasons in 2009/10, 2018, 2019 and 2020
- Breeding surveys
 - Two seasons of aerial surveys in October 2010 and 2018
 - Eleven seasons of on-ground surveys in 2009-2013, 2018-2020, 2022, and 2024-2025
- Wetland assessments
 - Hydrological assessments in 2021, 2024, and 2025
 - Observations from eleven seasons of on-ground breeding surveys

Assessment summary

A summary of the survey results includes:

Flocking

- The nearest known flocking site is located near Lake Bolac, approximately 28 km north of the project area.
- No unmapped Brolga flocking sites were identified within the 5 km investigation area through desktop review, community consultation, or field surveys. The project is, therefore, unlikely to impact any flocking areas for the species.
- *Conclusion*
 - The Willatook Wind Farm has been sited outside both mapped and unmapped Brolga flocking areas, thereby avoiding the most significant population-level risks associated with wind energy development. This strategic siting minimises potential impacts and means that no additional mitigation is required in relation to flocking behaviour.

Wetland habitat

- Seventy-one wetlands within the 5 km assessment area were considered **unsuitable**, having not met the criteria outlined in the *DEECA Handbook*.
- Fifty-one wetlands met the *Handbook* criteria as **Potential Brolga Breeding Wetlands**.
- Seven wetlands met the *Handbook's* criteria as **Brolga Breeding Wetlands**, which form five clusters of Brolga Breeding Wetland Buffers.

Breeding Wetlands

- Seven wetlands met the *Handbook's* criteria as **Brolga Breeding Wetlands**, which form five clusters of Brolga Breeding Wetland Buffers:
 - *Cockatoo Swamp-W4-6832 Cluster* – this buffer extends over central areas of the wind farm and includes 4 Breeding Wetlands and seven Potential Breeding Wetlands.
 - *Wild Dog Swamp Cluster* – this buffer extends into the eastern boundary of the wind farm and includes one Breeding and one Potential Breeding Wetland.
 - *Mt Misery Road Cluster* – this buffer does not overlap with the wind farm boundary and includes one Breeding and two Potential Breeding Wetlands.
 - *Wetland VWI 25741* – this is an isolated Breeding Wetland within the 5 km assessment area but outside the wind farm boundary.
 - *Wetland VWI 25729* – this is an isolated Breeding Wetland within the 5 km assessment area but outside the wind farm boundary
- *Conclusion:*
 - All proposed wind turbine locations, inclusive of wind turbine blades, are located outside of Breeding Wetland buffers.
 - The project design has largely avoided buffers around the Breeding Wetlands. Infrastructure has been positioned outside these buffers wherever possible, ensuring protection of the majority of critical breeding habitat. Placement of turbines and other infrastructure was further refined through hydrological assessments,

which confirmed the design maintains natural water flows and wetland inundation patterns. This substantially reduces indirect impacts on Brolga breeding habitat and the ecological function of wetlands across the site.

- Areas in which the proposed development does not allow for full buffers include:
- **Cockatoo Swamp-W4-6832 (infrastructure only overlap)** – intersected by approximately 1.6 km section of underground cabling and 800 m access track that connects to a formed road, both of which will be constructed outside the breeding season to reduce disturbance. This overlap is allowed under the Handbook, and the Proponent has implemented additional measures to reduce the potential for impacts.

Potential Breeding Wetlands

- Fifty-one wetlands met the *Handbook* criteria as **Potential Brolga Breeding Wetlands**.
- *Conclusion:*
 - The project design has largely avoided buffers around the Potential Breeding Wetlands. Infrastructure has been positioned outside these buffers wherever possible, ensuring protection of the majority of critical breeding habitat. Placement of turbines and other infrastructure was further refined through hydrological assessments, which confirmed the design maintains natural water flows and wetland inundation patterns. This substantially reduces indirect impacts on Brolga breeding habitat and the ecological function of wetlands across the site.
 - Areas in which the proposed development does not allow for full buffers include:
 - **Wetland 12a (turbine overlap)** – intersected by one turbine (T31), tracks, cables, and construction footprint. Avoidance of this wetland was not practical due to overlapping environmental and operational constraints. The Proponent has undertaken additional mitigation to minimise impacts, with potential for residual impacts addressed through compensation measures.

General conclusions

- *Collision risk*
 - Two key measures have been adopted to reduce collision risks. First, exclusion of turbines around confirmed Breeding Wetlands has been applied, ensuring turbines are located away from areas confirmed as supporting nesting, foraging, and movement.
 - Second, turbine design incorporates an increased minimum tip height, from 40 m to 60 m, which exceeds the flight height of 97 % of local Brolga flights, significantly reducing the likelihood of collisions. All turbine-to-substation cables will be trenched underground, and the overhead transmission line has been shortened by 4.2 km from the initial proposal, now ~300 m, positioned away from Breeding Wetlands. These changes substantially reduce collision risk. In addition, line-marking is proposed on this overhead section to enhance visibility for birds, providing further risk reduction consistent with the *Handbook* (DEECA 2025, Appendix 2).
 - Further mitigations of collision risks are proposed to be included within the development of a Bat and Avifauna Mitigation Plan (BAM Plan) in agreement with

DEECA. The BAMP should include, at a minimum, a carcass monitoring program, details of impact triggers, and adaptive management strategies.

- *Disturbance*
 - A 300 m disturbance buffer around Breeding and Potential Breeding Wetlands has been incorporated into the layout to minimise disturbance from construction and operation activities, with the exception of Wetland 12a and the Cockatoo Swamp cluster. Where infrastructure overlaps with the disturbance buffers, a level of disturbance is expected should Brolga utilise the specific wetland, particularly during the breeding season. Additional recommendations are provided to reduce disturbance from the construction of infrastructure near breeding buffers. Targeted monitoring is recommended to validate the effectiveness of these measures, ensuring adaptive management is possible if disturbance-related impacts are detected.
- *Conclusion*
 - Overall, the assessment concludes that, with the avoidance and mitigation measures in place, the proposed Willatook Wind Farm is not expected to result in significant impacts on the Victorian Brolga population. Some residual risk is expected due to the layout overlapping with the Breeding and Potential Breeding Wetland Buffers. The project, therefore, requires the development of a compensation plan. Implementation of these strategies will ensure that project development proceeds in alignment with current best-practice guidelines and the Victorian Government's renewable energy objectives.

Application of the Mitigation Hierarchy

The Minister for Planning (2023) made several recommendations to ensure potential impacts on the Brolga are acceptable and manageable, including:

- Application of buffers for Brolga Breeding Wetlands;
- Avoidance of buffers with wind turbines, including the sweep of turbine blades;
- Limiting construction activities to avoid disturbance during the breeding season; and
- Development of a collision mortality monitoring program and compensation plan.

In response to the Minister's Assessment and applying the *Handbook* (DEECA 2025a, 2025b), several measures have been undertaken by the proponent to meet both the Minister's Assessment and the guidance of the *Handbook*. These measures follow a proactive avoidance and mitigation hierarchy. These measures also account for the known ecology and behaviour of the Brolga.

A summary of avoidance, mitigation and compensation is provided in Table 1.

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Table 1: Summary of measures proposed for WWF to minimise impacts to Brolga

Principle	Measure and ID	Measure
Avoidance	AV01 Siting of wind farm	The Willatook Wind Farm has been located away from both known and potential flocking areas.
	AV02 Reduction in the size of the wind farm	Design of wind farm reduced from 190 turbines in 2010 down to 52 in the currently proposed layout.
	AV03 Breeding and Potential Wetland Buffers	Application of 900 m buffers around Breeding Wetlands and Potential Breeding Wetlands within 2 km, which includes a 600 m foraging corridor linking wetlands and a 300 m disturbance buffer around the corridor. Application of 300 m disturbance buffers around isolated Potential Breeding Wetlands.
	AV04 Siting of quarry	Locating the quarry so that it does not overlap with any Breeding or Potential Breeding Wetland buffer.
	AV05 Reduction in above-ground transmission line	Reducing the 4.5 km transmission lines to ~300 m of above-ground lines, with the balance being installed as underground cables.
Mitigation	MM01 Reducing hydrological alterations	Placing turbines and associated infrastructure outside of water flow paths to reduce impacts on existing hydrological processes, with the use of construction and design measures to retain hydrological integrity, minimise disturbance footprint, manage erosion and sediment, and rehabilitate disturbed areas.
	MM02 Construction Environmental Management Plan (CEMP)	Development of a management plan to limit the effects of construction, including the timing of activities and restoration of temporary impacts. Aimed at limiting impacts on wetland water quality.
	MM03 Sediment, Erosion and Water Quality Management Plan	Development of a management plan to reduce the impacts of sediment, erosion, and water quality to limit impacts on wetland water quality. In consultation with the Catchment Management Authority and EPA Victoria.
	MM04 Management of contaminated soils on waterways	Development of a risk-based approach to managing potential acid sulphate soils and contaminated material to limit impacts on wetland water quality.
	MM05 Management of potential waterway pollutants	Measures to manage potential pollutants (hydrocarbons, chemicals, etc.), to limit impacts on wetland water quality.
	MM06 Marking transmission lines and meteorological masts	Addition of markers to increase the visibility of above-ground powerlines and metmast lines for Brolga and other species.
	MM07 Scheduling construction	Timing of construction activities to reduce potential disturbance to Brolga during the breeding season.
	MM08 Reduce Quarry Disturbance	Development of a Blast Plan to reduce the likelihood of events that may disturb nearby Brolga during the breeding season.

Principle	Measure and ID	Measure
	MM09 Monitoring during construction and quarry blasting	Monitoring plan that can inform the efficacy of mitigation measures, including disturbance during construction and quarry blasting.
	MM10 Bat and Avifauna Management Plan (BAM Plan)	Development of a BAM Plan in agreement with DEECA, with the aim to: - Minimise the impacts from the WWF on threatened fauna listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and/or the Victorian Flora and Fauna Guarantee Act 1988 (FFG Act); - An informed understanding of the turbine collision risk to Brolga (and other listed fauna) that occurs on-site; - An informed understanding of how Brolga (and other listed fauna) use the site changes in response to wind farm construction and operation; - Monitoring for the timely identification of turbine collisions and the timely collection and analysis of data; - Responsive updates to, and regular validation of, the impact assessment framework for Brolga (and other listed fauna regularly recorded on site), using monitoring data to support a robust adaptive management approach to reducing impacts, where possible; and - Where applicable, the development and implementation of tangible, on-ground management actions to promote a long-term collision risk reduction on Brolga and other listed threatened and migratory bird and bat species.
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	MM11 Turbine height	Raise the minimum tip height from 40 m to 60 m above the ground. This is not a mitigation measure specifically contemplated in the <i>Handbook</i> , but is considered a consequential design mitigation, as evidence-based information suggests it may reduce Brolga collisions with wind turbines during local flights.
Compensation	C01 Identification of suitable Brolga breeding wetlands	Selection of potential breeding wetlands suitable for enhancement and protection.
	C02 Hydrological restoration and enhancement	Undertaking works to improve inundation frequency and duration to suit Brolga wetland requirements.
	C03 Habitat management and revegetation	Improve habitat conditions through actions such as grazing control, planting, and encouraging regrowth of vegetation.
	C04 Provision of nesting materials	Supplement materials used for nesting where they are limited.
	C05 Predator (fox and cat) control	Implement a control program focused on foxes and cats in the Brolga breeding season.

Alignment with the Minister's Recommendations and DEECA Handbook

The proposed Willatook Wind Farm was assessed in 2023 under an *Environment Effects Statement* (EES), which produced several Brolga-related recommendations from the Minister for Planning. These were originally informed by earlier guidance documents, which have since been superseded by DEECA's 2025 *Handbook* for the Development of Renewable Energy in Victoria and its Appendix 2, providing species-specific guidance for Brolga at onshore wind facilities.

The Willatook Wind Farm has been developed to align with both the Minister's Recommendations and *Handbook*. Where inconsistencies exist between the Minister's Recommendations and the *Handbook*, the project has applied the *Handbook* as the most current Brolga guidance. This report details the application of the *Handbook's* mitigation hierarchy (avoidance, mitigation, and compensation) and its alignment with both the Minister's Recommendations and the *Handbook's* guidance.

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1. Introduction

Willatook Wind Farm Pty Ltd engaged Nature Advisory Pty Ltd to assess the impacts of the proposed Willatook Wind Farm (WWF) in south-western Victoria on the state-threatened Brolga (*Antigone rubicunda*). The project is located approximately 22 km north of Port Fairy and 32 km north-west of Warrnambool, and more locally about 3 km north-east of Orford and 10 km south-west of Hawkesdale. It is situated south of the Woolsthorpe–Heywood Road, between the Penhurst–Warrnambool Road to the east and the Hamilton–Port Fairy Road to the west.

The project site covers approximately 3.645 ha of private and public land that is mainly used for agriculture (predominantly sheep and cattle grazing) in the Moyne Shire. As a result of historical clearing for agriculture, native vegetation within the project site is largely restricted to roadside reserves and along watercourses. The proposed wind farm comprises up to 52 wind turbine generators and a battery storage facility and associated infrastructure.

For more than a decade, significant effort has been made to assess Brolga and its habitat for the project. This has included reviewing existing database records and landowner consultations, conducting field surveys for Brolga during breeding and non-breeding seasons, undertaking aerial surveys, and assessing habitat suitability through wetland field assessments and hydrological modelling. The present report documents the Brolga assessment for the proposed wind farm project and is informed by investigations and surveys conducted by Ecology and Heritage Partners Pty Ltd from 2009 to 2013 (EHP 2018) and by Nature Advisory between 2018 and 2024. The aim is to evaluate potential impacts on the Victorian Brolga population and avoid and mitigate them prior to construction and operations.

Expanding on prior assessments, this report also updates the previous version (April 2022, Report No. 16087 v.10.9), which was based on the superseded *Interim Brolga Guidelines* (DSE 2012). It incorporates the Minister’s Assessment (Minister for Planning, 2023) with findings from the 2025 Brolga breeding season surveys and aligns the assessment with the updated *Handbook for the Development of Renewable Energy in Victoria – Guidance to Avoid, Minimise, Mitigate and Compensate for Impacts on Threatened Bird and Bat Species* (hereafter the “Handbook”; DEECA 2025). These updated guidelines reflect the Victorian Government’s commitment to achieving net-zero emissions by 2045 and aim to facilitate the implementation of renewable energy projects whilst ensuring that impacts on threatened species are appropriately managed.

1.1. Report outline

This report is divided into the following sections.

Section 2 provides a background to the proposed wind farm development.

Section 3 provides information on regulatory requirements.

Section 4 describes the assessment methods used.

Section 5 presents and discusses the assessment results.

Section 6 provides a discussion on potential impact pathways.

Section 7 describes the application of the mitigation hierarchy to the project.

Section 8 investigates alignment with the Minister’s Assessment and Recommendations.

This investigation was undertaken by a team from Nature Advisory, comprising Dion Iervasi (Ecologist), Beau Meney (Zoologist), Teisha Lay (Zoologist), Plaxy Barratt (Zoologist), Guille Mayor

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(Zoologist), Jackson Clerke (Zoologist), Peter Lansley (Senior Zoologist), Curtis Doughty (Senior Zoologist), Emma Wagner (GIS Analyst), James Bennie (GIS Analyst), Bernard O'Callaghan (Senior Ecologist & Project Manager), Brett Lane (Principal Consultant and Project Director), Dr Sergio Nolasco Plasier (Senior Zoologist), Mike Hitchcock (Senior Zoologist & Project Manager) and Dr Inga Kulik (Project Director).

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2. Overview

2.1. Proposed development

The proposed development is a wind energy facility that will connect turbines with an on-site substation and battery energy storage system to the national grid through the existing Moorabool to Heywood 500 kV transmission line. It is expected to produce over 1,200 gigawatt hours annually. The development includes:

- Up to 52 wind turbines – with a minimum and maximum rotor swept area of 60 to 254 m
 - 1.3 ha construction disturbance footprint containing the hardstand and foundations for each turbine
- Transmission lines
 - Approximately 55.8 km of trenches to house underground 33 kV lines to connect turbines and on-site substation
 - 300 m above-ground 132 kV lines to connect to the on-site substation to the Tarrone Terminal Station
- On-site quarry – 16.2 ha
- Operations and maintenance facility – 1.5 ha
- Four permanent meteorological masts – up to 166 m high
- Battery Energy Storage System – 5.5 ha
- Five site access points and 45.6 km of internal access tracks with a construction footprint of 20 m and a final width of 6 m
- Temporary components (e.g. construction laydowns, batching plants, office and amenities, etc.)

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2.2. Study area

The location of the proposed wind farm is approximately 32 kilometres to the north-west of Warrnambool and extends across both sides of the Woolsthorpe-Heywood Road, between Penhurst-Warrnambool Road and Hamilton-Port Fairy Road (Figure 6). The area is located in the Victorian Volcanic Plain bioregion of western Victoria.

Budj Bim National Park (formerly known as Mount Eccles National Park), recently added to the World Heritage list, and Mount Napier State Park are located approximately 12 kilometres and 20 kilometres north-west of the project site, respectively. Other reserves within 20 kilometres of the project include Yambuk Coastal Reserve, Woolsthorpe Nature Conservation Reserve, Yambuk Wetlands Nature Conservation Reserve, Tower Hill Wildlife Reserve, as well as other smaller bushland and flora reserves.

2.2.1. Geology

The WWF site falls on the southern margin of the Western Plains of Victoria. The Western Plains is a landscape developed mainly on volcanic rocks with enclaves of older sedimentary rocks. The geology across the WWF site is basaltic lava with a regolith of basalt stones, weathered basalt and a variable thickness of alluvial and swamp deposits. Over most of the areas of the younger lava flows, basalt is exposed at the surface as blocks, boulders and locally continuous outcrop. The site is relatively

flat, supporting soils of volcanic origin on a dissected landscape featuring many rocky outcrops and wet depressions.

The geology of the WWF site is described in detail in the *Proposed Willatook Farm Geoheritage Assessment* (Environmental GeoSurveys Pty Ltd 2022).

2.2.2. Hydrology

The WWF site falls within the Shaw River catchment in the west, and the Moyne River catchment in the east. Major aquatic systems within the WWF site include the Moyne River at the eastern extremity, Back Creek (a tributary of the Moyne River) in the east of the site, the Shaw River in the north and west of the site, and the Cockatoo Swamp complex in the centre of the site. Several other smaller ephemeral drainages occur within the site. The site receives an average annual rainfall in excess of 700 mm (BoM, 2021). Much of the site is low-lying and has a poorly defined drainage system, resulting in numerous small, ephemeral wetlands.

Characterisation of the existing hydrology of the site, including modelling of peak flow events, was conducted by Water Technology (2022, 2024, 2026).

2.2.3. Land-use history

The WWF site has been used for sheep and cattle farming for over 150 years. It comprises several properties owned by individuals and companies. The site has been subject to extensive removal of native vegetation in the past. Fertiliser has been extensively applied on the site, and, in places, the site has been cultivated for pasture improvement.

2.3. Ecology of Victorian Brolga

The Brolga is listed as endangered under the FFG Act. Brolgas belong to the family Gruidae (cranes), of which two species (including the Brolga) occur in Australia (Marchant and Higgins 1993). Cranes are generally large-bodied, long-legged and long-lived, with Brolga being very similar to other cranes in general ecology and biology.

Adults can range in weight between four and eight kilograms and stand up to 1.8 metres tall with a wingspan of two metres. During the non-breeding season, Brolga can form large flocks (occasionally as large as 200 birds) but typically are seen in small groups (10 - 20 individuals). Breeding pairs can form long-term bonds and, if one of the pair dies, the remaining individual can take several seasons to find another mate (Marchant and Higgins 1993). The Brolga pair will aggressively maintain their breeding territory (Arnol et al. 1984) and have been observed to destroy other Brolga nests that attempt to nest within their breeding home range.

Typically, pairs only produce one or two offspring per breeding season, and therefore recruitment into the population is low.

The Brolga's annual cycle is divided into two principal periods, as follows.

- The breeding season, from July to December, during which territorial pairs nest in shallow freshwater wetlands that are often ephemeral, holding water reliably only in winter and spring
- The non-breeding (or flocking) season, from December to June, when Brolga disperse from drying Breeding Wetlands to larger, often permanent wetlands to congregate with others to form flocks that roost at the wetland and move out to forage in adjacent terrestrial and wetland habitats (DSE 2012).

In between the breeding and flocking seasons, Brolga move about the landscape between breeding and flocking sites or vice versa during two migration periods that can overlap with the months above.

The Brolga is a secure species nationally, numbering in the tens of thousands across northern Australia (Marchant and Higgins 1993). However, in Victoria the range of the Brolga has contracted since European settlement because of wetland drainage, loss of habitat due to agricultural development and predation of eggs and young by the introduced Red Fox (*Vulpes vulpes*). Its former range included northeast Victoria, Gippsland, and the formerly extensive wetlands of the Melbourne region. Currently, birds are found in the south-west and in the north of the state in parts of the Murray River basin (Du Guesclin 2003).

2.3.1. Distribution in Victoria

The distribution of the Brolga in the main part of its Victorian range, the south-west, varies seasonally. In the breeding season adult pairs disperse to small and moderately sized seasonal or semi-permanent wetlands to breed as territorial pairs. At this time, small numbers of non-breeding birds can form flocks on larger wetlands. In the flocking season, birds congregate in larger wetlands as the smaller, seasonal wetlands dry out over summer.

Brolga movements in south-west Victoria are not yet completely understood. The limited tracking data indicate that some individuals remain resident, whilst others undertake long-distance seasonal movements up to 111 km, referred to as migration movements, between flocking and breeding sites (Veltheim et al. 2022). Local movements can also take place when birds are moving between roosting and feeding sites, generally within 2 km of night roosts (Veltheim et al. 2019, 2022). Long-distance movements may take place in very dry years, and populations may move from dry inland wetlands to wetlands associated with the Murray River (Marchant and Higgins 1993). In very wet seasons, birds may remain at breeding sites throughout the year and not move to flocking sites. Therefore, Brolga movements and distribution are heavily dependent on climate and foraging opportunities.

Consistent Brolga flocking sites in south-west Victoria that account for a significant proportion of the population occurs in the locations listed below, based on information compiled by Sheldon (2004) and provided by DELWP (now DEECA).

- The Grampians region
- Strathdownie
- Cressy
- Streatham (mainly on Lake Wongan and in the Skipton area)
- Hamilton, Dunkeld and Penshurst areas
- Edenhope area
- Toolondo
- Willaura and Stavely areas and
- Darlington.

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2.3.2. Population size

The 1984 estimate of the Victoria brolga population was 600 – 650 birds, with approximately 550 – 600 of these birds (c. 92%) in south-west Victoria (Arnol et al. 1984). This and subsequent estimates are noted in Table 2. Much higher numbers were recorded in 2024 and 2025, with up to 856 birds and a proportion of 20% young (<2 years old).

Table 2: Brolga population estimates, south-west Victoria

Month/ year	Est. no.	% ≤2 yrs. old	Same-day counts	Source
2025	856	20	Yes	SWIFFT (2025)
2024	836	19	Yes	SWIFFT (2025)
2023	521	14	Yes, subset of main flocking sites	SWIFFT (2025)
2022	552	14	Yes, subset of main flocking sites	SWIFFT (2025)
2021	413	9	Yes, subset of main flocking sites	SWIFFT (2022)
2019	635	6	Partial	SWIFFT (2022)
2018	377	13	Partial	SWIFFT (2022)
2017	278	18	Partial	SWIFFT (2022)
2016	348	8	Partial	SWIFFT (2022)
2015	449	10	Partial	SWIFFT (2022)
2013	907	17	Yes	SWIFFT (2022)
2012	448	16	Partial	SWIFFT (2022)
2011	250	20	No	SWIFFT (2022)
2010	401	10	No	SWIFFT (2022)
2004	675	-	No	Sheldon (2004)
2002	402	-	No	DSE (2007)
1984	550-600	-	No	Arnol <i>et al.</i> (1984)

2.3.3. Habitat

In Victoria, Brolga occur in a variety of habitats and utilise different habitats in the breeding season compared with the non-breeding season (Arnol *et al.* 1984). In the breeding season, territorial pairs nest in shallow freshwater wetlands that are often ephemeral, holding water reliably only in winter and spring (Herring 2005). During the non-breeding season, Brolga congregate together at larger, often permanent waterbodies where they roost, drink and forage and venture out across the landscape to forage in terrestrial habitats (Johnsgaard 1983, Arnol *et al.* 1984).

Brolgas rely on hydrologically and ecologically functional wetlands for nesting, and/or food resources and/or night-time roosting sites (Johnsgaard 1983). In the breeding season (July-December), this species nests in shallow freshwater marshes less than 50 cm deep and with emergent vegetation and freshwater meadows less than 30 cm deep dominated by annual herbs, rushes, or tussock grass (Marchant and Higgins 1993). Emergent vegetation at these functional wetlands plays a crucial role in providing Brolga habitat as it provides nesting material (Myers 2001, Du Guesclin 2003), food resources (tubers, aquatic animals) (Herring 2018), provides shelter for prey (vertebrates and invertebrates) (Herring 2005) and cover from predators for young chicks (Johnsgaard 1983, Herring 2018).

A Brolga family will spend most of its time in the Brolga Breeding Wetland foraging but will move to other functional wetlands nearby to forage and/or roost as the chicks develop and food resources are depleted in the original Brolga Breeding Wetland. Brolga also forage in pasture and to a lesser degree (during the breeding season) cereal and canola crops in the vicinity of the Brolga Breeding Wetland and night-time roost. Brolga roost at a wetland during the night and move about during the day within, around and between them to forage (Veltheim 2018).

A study by Veltheim et al. (2019) at nine breeding sites in south-west Victoria tracked 11 pre-fledged Brolga chicks using GPS transmitters. The researchers found that pre-fledged Brolgas moved an average of 442 m between night roosts and daytime foraging areas, with maximum movements reaching 1.9 km. Nesting wetlands may be used as night roosts once chicks leave the nest, but Brolgas also use other nearby wetlands as night roosts that were not the original nest site. Breeding home-range areas varied substantially among individuals, from 70 ha to 523 ha, encompassing night roosts, day roosts and foraging habitat. The core use area extended approximately 1.6 km from the night roost, while the full home-range radius reached about 2 km. Based on these findings, the authors recommended a 1.6 km turbine-free buffer to cover mostly nesting and night-roost wetlands, and a 2 km buffer to include broader areas of foraging habitat and movement corridors necessary for successful fledging.

Brolgas in this study used an average of 2.82 wetlands (range 1–7), with most utilised wetlands being less than 15 ha. The average size of night-roost wetlands was 7.62 ha (range 0.60–40.74 ha), and the average size of all wetlands used was 8.38 ha. Wetlands between 1 and 10 ha were the most frequently used. Five known nesting wetlands averaged 13.2 ha, although sizes varied widely (2.96–40.74 ha), suggesting that wetland characteristics may be more influential than size alone in determining nesting suitability. Within their home ranges, Brolgas also relied heavily on cropping and grazing paddocks for foraging, whilst avoiding buildings (e.g., farmhouses and sheds) and watercourses such as creeks and rivers. Activity near buildings may cause disturbance and lead to avoidance, while watercourses can act as movement barriers or pose drowning risks for chicks.

The key threat to Brolga is the drainage and alteration of the hydrology of wetlands (Du Guesclin 2003). Wetlands that have been permanently drained, partially drained, hold water only for brief periods during the breeding season, and small, unvegetated farm dams have little habitat value for Brolga, as they do not provide the physical and biotic resources the Brolga requires.

2.3.4. Threats

Key threats to the species outlined in the Action Statement (Du Guesclin 2003) are summarised below. The major threats that impact Brolga breeding sites are as follows.

- Drainage and alteration to the hydrology of wetlands;
- Altered flood regime;
- Modification of vegetation structure and species composition, water quality or soil structure at Breeding Wetlands and terrestrial foraging areas;
- Widespread use of herbicides and pesticides, especially near breeding sites;
- Disturbance by hunting activities where young birds are still in the Breeding Wetland;
- Introduced predators, feeding on eggs and chicks;
- Wildlife and burning programs, which remove nest material;
- Grazing by stock degrading wetlands;
- Subdivision and fencing large private landholdings as chicks can caught in fences;
- Erection of structures such as overhead powerlines that can cause collisions; and
- Use of wetlands for irrigation and/or re-use systems.

Some of the key threats impacting the Brolga flocking sites are as follows.

- Disturbance by hunters during the duck season and deposition of lead shots in wetlands;

- Loss of habitat due to changes in vegetation, for example, changes in agricultural practices;
- Catchment degradation resulting in changes in water quality, including increased salinity, siltation or flooding;
- Poisoning of agricultural pests, e.g., locus; and
- Erection of structures such as overhead powerlines.

Turbine collision is noted as a potential risk by DEECA (2025b). Although turbine collision is not considered a major overall threat, at least one fatality has been reported as the result of a turbine strike at Dundonnell Wind Farm (Aurecon 2025).

Other wind farm-specific threats include disturbance. Disturbance effects are thought to arise primarily from human presence and activity rather than from the physical presence of turbines or other structures. This is supported by observations of Brolgas nesting as close as ~100 m from operating turbines (Wood 2014, 2017), while avoiding areas with frequent human activity, such as buildings, which are likely associated with human presence (Veltheim et al. 2019). Direct habitat loss is generally avoided at Victorian wind farms, as both current and previous guidelines require turbine layouts to exclude known breeding and flocking wetlands.

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3. Regulatory context

3.1. Previous assessment and background

The Willatook Wind Farm *Environment Effects Statement* (EES) was prepared between 2019 and 2022. The EES included an assessment of effects on the Victorian population for Brolga. The Brolga assessment at this time followed the *Interim Guidelines for the Assessment, Avoidance, Mitigation and Offsetting of Potential Wind Farm Impacts on the Victorian Brolga Population* (Interim Guidelines; DSE 2012), but assessments were also informed by research by Veltheim et al. (2019). At the time of the EES, the *Victorian Brolga Assessment and Mitigation Standards* (“Draft Standards”; DELWP, 2020) were in draft form and were exhibited for comment, but were not finalised. The Willatook Wind Farm would have qualified under the ‘transitional provisions’ outlined in the Draft Standards (if it were finalised). And due to the extensive work that was conducted for the project in accordance with the Interim Brolga Guidelines, the Draft Standard was not adopted.

The EES was publicly exhibited from 4 July to 12 August 2022. An independent Inquiry and Panel was appointed by the Minister for Planning to hear submissions and assess environmental effects under both the *Environment Effects Act 1978* and the *Planning and Environment Act 1987*. The public hearing ran from 11 October to 7 November 2022. In July 2023, the Minister for Planning released their Minister’s Assessment of the EES (Minister for Planning, 2023). This included a range of recommendations relating to the Brolga and specifically how turbine-free areas or habitat buffers are calculated.

The Minister supported the IAP’s recommendations for modifying the project and strengthening proposed avoidance and management measures to reduce the project’s potential environmental effects. They concluded that the project could proceed with acceptable environmental effects, provided the recommended modifications are implemented together with environmental management measures (EMMs). In particular, the turbine-free buffers for Brolga need to be increased and revised buffers should be mapped, in consultation with DEECA, before amended development plans are resubmitted to the Minister as the responsible authority for approval. See more on the Minister’s recommendations in Section 3.3.

As outlined within the Minister’s Assessment, the Draft Standards informed the IAP’s panel report and subsequently the Minister’s Assessment:

“The approach in the Draft Standards to identify wetlands as Potential Breeding Wetlands based on geographical characteristics rather than solely on historical breeding records is an advance relative to the approach in the Interim Guidelines, while noting that wetlands with acceptable historical records should also be regarded as Breeding Wetlands even if their geographical characteristics might not match the model.”

Since the publication of the Willatook Wind Farm Minister’s Assessment and the publication of the Draft Standards, DEECA has developed a new biodiversity policy, the *Handbook for the Development of Renewable Energy in Victoria* and its Brolga-specific Appendix 2 (DEECA 2025), to guide the management of potential impacts by wind farm developments on Brolga. The *Handbook* has included further targeted research and development of a new spatial model of Brolga breeding habitat suitability and accompanying guidelines for onshore wind farm development. These guidelines replace both the Interim Brolga Guidelines and the Draft Standards. The latter document has been withdrawn.

The new *Handbook* Brolga-specific guidelines provide clarity regarding the Victorian Government’s position with respect to the assessment and management of onshore wind farms within the range

of the Victorian Brolga population. The required methods outlined within the guidelines are materially different from the Draft Standards, specifically regarding the classification of Brolga nesting and the turbine-free buffer requirements around confirmed breeding habitats. The guideline also provides guidance related to minimising potential disturbance during construction. The guideline came into effect on 28 May 2025, with a transitional agreement for projects assessed in the intervening period.

This assessment re-analyses previous results regarding Brolga at the site, adds further data from subsequent (post-EES) investigations and then uses *Appendix 2: Species Specific Guidance for Onshore Wind Energy Facilities – Victorian Brolga* (DEECA 2025b) as the basis for the assessment, including the definition of turbine-free areas around habitats suitable for Brolga breeding. This aims to refine the understanding of Brolga’s habitat use, breeding behaviour, mitigation measures, and align the intent of the Minister’s recommendations with the current best-practice guidance of the Handbook. This approach represents an iterative refinement of WWF and has been undertaken in consultation with the Department of Energy, Environment and Climate Action (DEECA).

Post-EES investigations

Following the Minister’s Assessment (Minister for Planning, 2023), further work has been undertaken to address Brolga at WWF. This work improved the spatial and temporal resolution of Brolga habitat use and further informed the design of the proposed WWF to align with the most current knowledge and policies regarding Brolga. Specifically, post-EES investigations were:

- Additional targeted field surveys on breeding behaviour and wetland habitats;
- Updated habitat modelling of key wetlands, informed by both field surveys and updated hydrological modelling;
- Refinement of turbine-free areas around breeding and potential breeding wetlands, and their associated habitats and movement corridors; and
- Iteratively refined turbine and infrastructure design layouts, informed by both pre-EES and post-EES studies.

The methods used to these ends are provided in detail within Section 4 of this report. How the Minister’s recommendations align with the approach taken by this project are discussed in Section 8 of this report, with further detail provided in *Willatook Wind Farm Project: Application of the Victorian Renewable Energy Handbook and Response to the Minister’s Assessment* (Wind Prospect 2026).

3.2. Flora and Fauna Guarantee Act 1988

The Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act) lists threatened and protected species and ecological communities (DEECA, 2023a; DELWP, 2019). The Environment Effects Statement (EES) process in Victoria requires that impacts on FFG Act-listed species be assessed.

The FFG Act-listed Brolga are present in the WWF study area. As such, the policy and planning guidelines for wind farms in Victoria (DTP 2023) require that the potential impacts of wind farms on Brolga be assessed.

3.3. Environmental Effects Act 1978

The WWF was referred to the Minister for Planning (the Minister) in October 2018 under the *Environment Effects Act 1978* (EE Act). On 27 December 2018, the Minister determined that an EES was required for the project due to the potential for the project to have significant effects on environmental and social values.

Following consideration of the EES referral and public submissions on the draft scoping requirements, the final *Scoping Requirements for Willatook Wind Farm Environment Effects Statement* (scoping requirements) were issued by the Minister for Planning in August 2019 (DELWP 2019). The scoping requirements specify the specific matters to be investigated and documented in the EES, including the draft evaluation objectives for each of the topics to be addressed.

The EES scoping requirements (DELWP 2019) specify the following draft evaluation objective relevant to biodiversity, including Brolga, which has guided this assessment:

“To avoid or minimise potential adverse effects on biodiversity values within and near the site including native vegetation, listed threatened species and ecological communities, and habitat for these species. Where relevant, offset requirements are to be addressed consistent with state and Commonwealth policies.”

The Minister’s assessment concluded the following regarding Brolga (Minister for Planning, 2023):

- The project has potential for unacceptable residual impacts on Brolga if it is constructed and operated as proposed. However, subject to exclusion of turbines, meteorological masts and powerlines from Brolga breeding home ranges and disturbance buffers as recommended above, the effects of development and operation of the wind farm on Brolga can be managed acceptably.
- All wetlands for which historical Brolga breeding records exist, or which meet the criteria for suitable Breeding Wetlands in the Draft Standards, and which have not been shown to have been permanently drained, are to be considered Brolga Breeding Wetlands for the purposes of mapping breeding home ranges.
- In consultation with DEECA BSW, Wind Prospect should map turbine-free buffers for Brolga Breeding Wetlands within the proposed wind farm, adopting home range dimensions of 600 m from the margins of all Breeding Wetlands and extending up to 2 km in the direction of other wetlands, and applying a further 300 m disturbance buffer to aggregated home ranges thus mapped.
- Isolated Breeding Wetlands with no other wetland within 2 km should also be mapped on the basis of a 600 m home range from the margins of the Breeding Wetland and a further 300 m disturbance allowance.
- All parts of a wind turbine, including the sweep of turbine blades, should be excluded from turbine-free buffers.
- Construction works are to be avoided during the Brolga breeding period of July-November to avoid disturbance effects.
- The collision casualty monitoring program proposed for the BAM Plan and the proposed Brolga Compensation Plan should respond to the specific findings in this assessment.
- This assessment should be provided to the Minister for Environment to consider the findings with respect to defining “permanently drained” wetlands, finalising the Draft Standards and considering reviewing the FFG Act Brolga Action Statement.

The Draft Standard was the key document on which the Minister undertook the assessment. The Draft Standard has since been superseded by the *Handbook* for the Development of Renewable Energy in Victoria (2025). Where assessment methods reflect updated guidance, including the Renewable Energy Development Handbook and supporting species-specific guidelines, this is clearly

identified. In these instances, the intent of the Minister’s Recommendations has been retained, with contemporary guidance used to inform how those recommendations are implemented.

3.4. The Handbook for the Development of Renewable Energy in Victoria

The *Handbook for the Development of Renewable Energy in Victoria*, released by the Department of Energy, Environment and Climate Action (DEECA 2025) on 29 May 2025, provides comprehensive guidance for assessing and managing the environmental impacts of renewable energy projects, particularly on threatened bird and bat species. It introduces a risk-based approach to planning and approval processes, incorporating a mitigation hierarchy (avoid, minimise, mitigate, and compensate) to address biodiversity concerns associated with onshore wind energy facilities. The *handbook* applies to all approval pathways for such projects, including Development Facilitation Programs and Environmental Effects Statements.

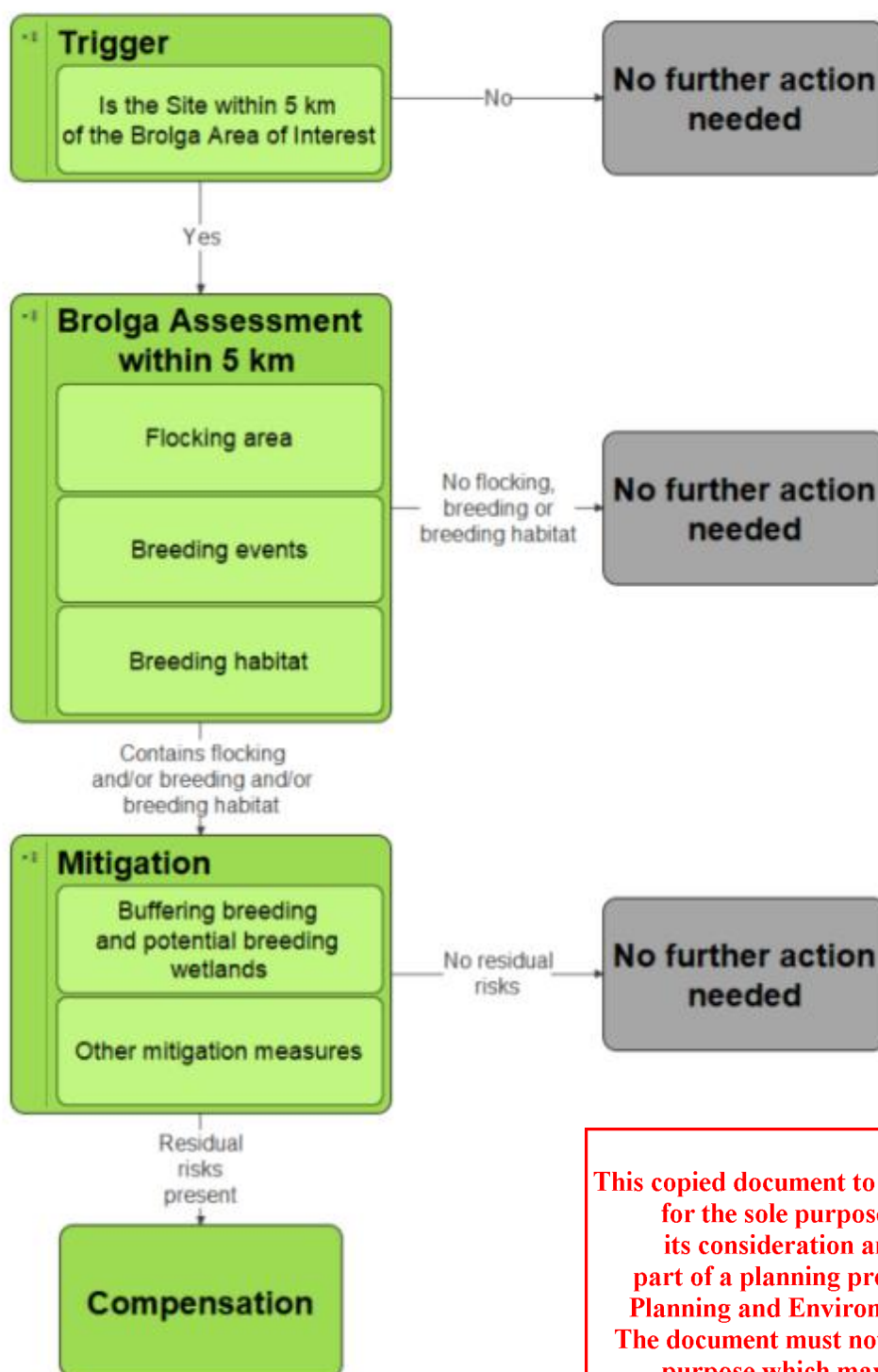
The *Handbook* (DEECA 2025) includes *Appendix 2: Species specific guidance for onshore wind energy Facilities – Victorian Brolga* (DEECA 2025, Appendix 2). Appendix 2 provides detailed species-specific guidance for managing impacts on the Victorian Brolga (*Grus rubicundus*) resulting from onshore wind energy facilities. This guidance only applies to projects within the ‘Brolga Area of Interest’, under which the proposed project falls (Figure 1).

Appendix 2 (DEECA 2025b) outlines the process under which wind energy facilities must assess, mitigate, and compensate impacts on Brolga. The process is displayed in Figure 2 and Table 3.



Figure 1: Brolga area of interest, where the Handbook (DEECA 2025) and where Brolga species-specific guidance apply.

Note: the yellow star denotes the approximate location of Willatook Wind Farm.



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Figure 2. Assessment process for applying the Brolga assessment guidance (adapted from DEECA 2025, Appendix 2)

Table 3: Implications under the Handbook (DEECA 2025b) as applied to the Willatook Wind Farm

Area of concern	Handbook guidance (DEECA 2025b)
Flocking areas	Brolga flocking areas are to be identified and avoided. Proposals are required to undertake due diligence to ensure there are no unmapped flocking areas within (wholly or in part) the assessment area.
Identification of breeding events and habitat	A project must identify all wetlands mapped in the assessment area from the Brolga Breeding Habitat Suitability Model (BBHSM), with due diligence required to identify any other wetlands that are not mapped. These wetlands must be assessed for potential for Brolga breeding records and breeding habitat, including a combination of desktop data review, field studies, hydrological analysis, and consultation with local residents, representatives of local environmental agencies, council and community environment groups.
Application of Brolga Breeding and Potential Breeding Wetland Buffers	Breeding Wetland Buffers and Potential Breeding Wetland Buffers are designed to protect three key habitat elements related to pre-fledging chick and adult breeding pair movements: ▪ Wetlands used for nest, egg incubation and night roosting; ▪ Non-wetland areas around Breeding Wetlands that are used for foraging; and ▪ Non-wetland areas used as movement corridors between nesting and night roost wetlands. These buffers must be applied under the process outlined in DEECA (2025b).
Mitigation and compensation measures	Proponents must apply at a minimum the Brolga Breeding and Potential Breeding Wetland Buffers. Other mitigation measures can be implemented to reduce the impacts of the proposed wind energy facility on Brolga. If the avoidance and mitigation measures outlined in DEECA (2025b) are applied to the Brolga Breeding Wetlands and Potential Breeding Wetlands, there should be no or minimal residual risk. However, compensation may be required if the project siting does not allow for the application of these mitigation measures.

3.5. Other Guidelines

In addition to the foregoing policy and legislative instruments, a number of wind farm-specific guidelines have been consulted, and key directions from these have been applied in formulating the investigations of potential impacts to fauna described in this report. These include:

- *Best Practice Guidelines for Implementation of Wind Energy Projects in Australia* (Clean Energy Council, 2018).
- *Planning Guidelines for Development of Wind Energy Facilities* (DTP, 2023).

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4. Methods

This assessment occurred within what is referred to as the Brolga ‘assessment area’ that covered the boundary of the proposed wind energy facility with a 5 km buffer. The assessment area overlaps with the Brolga Area of Interest (Figure 1) and was therefore assessed in accordance with the requirements outlined in the *Handbook* (DEECA 2025).

A variety of survey methods were used to gather information on the occurrence of the Brolga in the 5-km assessment area. The following methods were used in this assessment:

- Desktop studies to analyse existing records related to flocking and breeding activity;
- Detailed community consultation;
- Comprehensive aerial survey for breeding Brolga;
- Ground-based breeding surveys; and
- Wetland assessments, including hydrological models and on-ground assessments.

All methods and relevant survey dates are summarised below.

4.1. Sources of existing information

Database searches were undertaken for the study area. The following sources of information were reviewed to collate existing information:

- Victorian Biodiversity Atlas (DEECA);
- *NatureKit* (DEECA);
- Brolga Flocking Areas (DEECA)
- Brolga breeding habitat suitability model (DEECA)
- Victorian Wetland Inventory (DEECA)
- Birddata database (Birdlife Australia);
- Atlas of Living Australia (ALA);
- Previous Brolga study reports:
 - Willatook Wind Farm: 2018 Brolga Flocking Season Survey Results. Brett Lane & Associates Pty Ltd. Ref. 16087.4 8, August 2018 (BL&A 2018);
 - Willatook Wind Farm: Progress Report on Brolga Assessment. Brett Lane & Associates Pty Ltd. Report No. 16087 (6.4), May 2019 (BL&A 2019);
 - Willatook Wind Farm: Turbine Free Buffer Zones from Brolga Wetlands. Nature Advisory Pty Ltd. Ref. 16087.17, 3 March 2021 (Nature Advisory 2021a);
 - Willatook Wind Farm: 5 Km Buffer Review – As Provided in Email 29 April 2021. Nature Advisory Pty Ltd. Ref. 16087.12, 18 June 2021 (Nature Advisory 2021b);
 - Brolga Habitat Assessment. Prepared for Wind Prospect Pty Ltd, Nature Advisory Pty Ltd. Report No. 16087(9.2), February 2022 (Nature Advisory 2022a);
 - Brolga Impact Assessment. Prepared for Willatook Wind Farm Pty Ltd, Nature Advisory Pty Ltd. Report No. 16087 (10.9), April 2022 (Nature Advisory 2022b);

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- Brolga Breeding Survey October 2022. Nature Advisory Pty Ltd. Ref. 16087.24, 4 November 2022. (Nature Advisory 2022c);
- Brolga Breeding Survey September 2022. Nature Advisory Pty Ltd. Ref. 16087.24, 17 September 2022 (Nature Advisory 2022d);
- Brolga Breeding Survey 2024. Prepared for Wind Prospect Pty Ltd, Nature Advisory Pty Ltd. Report No. 16087.26 (1.0), January 2025 (Nature Advisory 2025a); and
- Wetland Assessment. Prepared for Wind Prospect Pty Ltd, Nature Advisory Pty Ltd. Report No. 16087.26 (1.0), February 2025 (Nature Advisory 2025b);
- Previous hydrological reports:
 - Willatook Wind Farm – Wetland Analysis, Prepared by Water Technology Pty Ltd (Water Technology Pty Ltd 2022);
 - Wetland assessment – Wetland 25668 and 25698. Water Technology Pty Ltd. Memorandum 22 January 2024 (Water Technology 2024);
 - Willatook Wind Farm – Wetland Analysis, Prepared by Water Technology Pty Ltd (Water Technology Pty Ltd 2026).

4.2. Community consultation

An initial community consultation was conducted in 2011, during which landholders who provided records of Brolga sightings were contacted to gather information about Brolga habitat and to request permission to access relevant locations. Landowners involved in the Project were surveyed, and neighbours were invited to participate through a mailout activity.

In 2018, detailed landholder surveys combined with historical data enabled a complete and longer-term picture to be assembled of Brolga activity in a 10 km radius from the project boundary to supplement and provide context for the field investigations (Nature Advisory 2022b). Extensive interviews were held with landholders within the wind farm and up to a 10 km radius from 3 to 7 December 2018. As the area is extensive, those landowners within five kilometres of the wind farm were prioritised for contact, although a number of landholders beyond this distance also participated in interviews. Information gathered can be seen in the community questionnaire in Appendix 1.

Landholder surveys were undertaken to identify additional Brolga flocking and breeding sites that may not be recorded in the available databases. All landowners, including absent landowners, and dwelling owners within 10 kilometres of the boundary of the wind farm were contacted by letter and invited to take part. Where possible and if information was available, follow-up calls were made with the landowners. If the phone numbers were not available, it was not possible to contact these additional landholders.

Interviews were undertaken with landholders at the Willatook Community Hall from 3 to 7 December 2018. During the interviews, each participant was questioned for a period of up to 30 minutes. Additional consultations were held by telephone on 4 and 6 February 2019 with landowners. Efforts are ongoing to engage participants not been interviewed to date. Information sought from landholders is noted below.

Table 4 presents the extension of areas held by local landholders that participated in the consultations (up to mid-February 2021). Note Table 4 also includes areas of land within the 5 and 10-kilometre boundary from the wind farm from unsurveyed landholders, but that have been identified as timber plantations from current aerial imagery. These areas are assumed not to be

current Brolga breeding areas, given the species avoids wetlands that are surrounded by heavy treed vegetation or are treed themselves (Herring 2005, DSE 2012, DEECA 2025).

The Landholders were questioned about their current and past farming history to provide a more accurate picture of land use/type within the local landscape Figure 3. In addition to the presence and location of historic and current Brolga activity on their property, landholders were queried about broader historical and current land use, and the other biodiversity values of their properties and surrounding properties.

Table 4: Percentage by area of wind farm and surrounding area surveyed by landholder interviews

Area	Area of land surveyed (ha)	Total area of land (ha)	Percentage of area surveyed
Within wind farm boundary	3,225	4,154	78 %
Within 5 km of wind farm boundary	14,777	32,743	45 %
Within 10 km of wind farm boundary	22,362	74,289	30 %

In addition to landholders, representatives from Australian Blue Gum Plantations and Trust for Nature were interviewed. Data was provided for Pallisters Reserve managed by Friends of Pallisters Reserve Inc. and owned by Trust for Nature for Brolga records from 1995 to 2018. Pallisters Reserve is a 254-ha bushland reserve with multiple wetlands. It is situated approximately 6 km south-west of WWF. Wetlands in Pallisters Reserve provided high-quality habitat for Brolga breeding.

The quality of landholder survey data is likely to vary due to landholder interest and length of residency; however, the data obtained has added information to the overall picture of Brolga activity and, importantly, provided evidence on Brolga activity from a much longer period than the period of the current project-specific field investigations. While not all landowners provided input into the assessment, and therefore there is uncertainty regarding the potential for Brolga breeding on these properties, a range of other methods, including review of databases, aerial surveys, field observations and wetland assessments were used to consider these areas.

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Figure 3: Landholder survey

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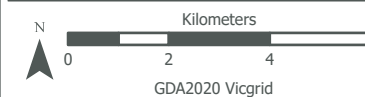
Project location: Willatook Wind Farm, VIC

Date: 31/07/2026

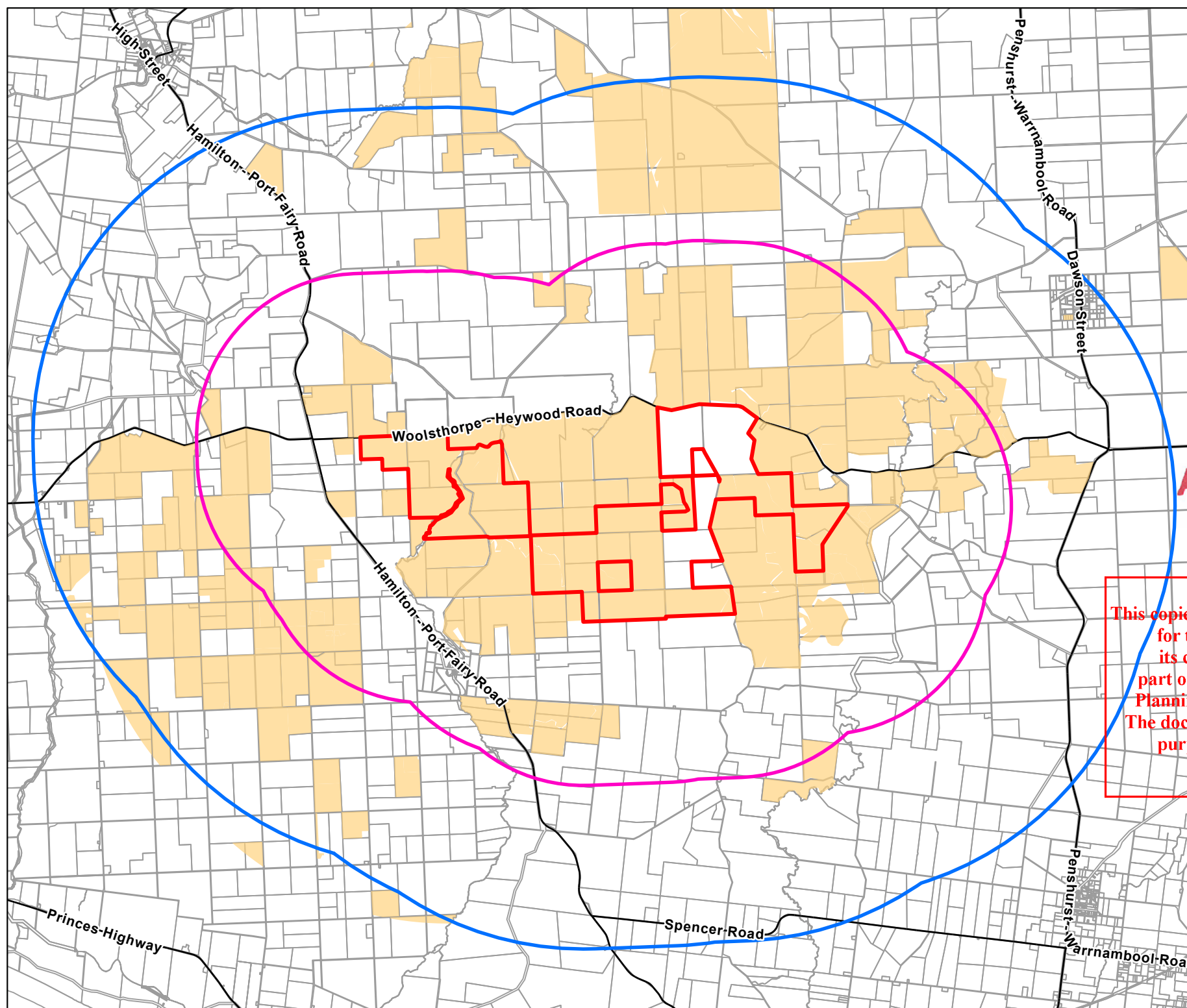
-  Willatook WF boundary
-  Willatook WF 5km buffer
-  Willatook WF 10km buffer
-  Surveyed areas

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4.3. Field surveys

4.3.1. Aerial surveys

An initial aerial survey for Brolga was conducted by Ecology and Heritage Partners in October 2010 using a light aircraft to survey the project area and a surrounding 20 km radius for potential Brolga nests. Identified nest locations were recorded and ground-truthed where access allowed.

A subsequent aerial survey was conducted on 25 and 26 October 2018 under fine weather conditions, during what is typically an optimal period for detecting Brolga breeding activity. In the 2018 season, many wetlands dried out prematurely due to the below-average rainfall. However, from observations in and around the site, breeding attempts were continuing where water remained.

The aerial survey covered the complete wind farm area up to a 10 km radius, except where this overlapped with the Macarthur Wind Farm (excluded due to flight height constraints). The aerial survey was designed to identify Brolga breeding sites within the proposed wind farm site and its surroundings. Prior to undertaking the survey, east-west flight lines were defined throughout the area at 500 m (north-south) intervals.

The survey was undertaken in a fixed-wing, four-seat Cessna 182 RG (retractable undercarriage) flying an average of 180 m above ground, at a speed ranging between 209 and 240 km/h. Variations were made in height and speed, depending on flight safety and regulatory requirements near powerlines and towns.

The survey team comprised the pilot, a navigator and two observers. The two observers (Plaxy Barratt and Brett Lane) were experienced aerial wildlife surveyors who had undertaken aerial surveys of Brolga and other waterbirds in the past. Transect details were provided to the observers by the navigator (Domenic Peake, Wind Prospect). One observer was located on each side of the plane. Observers scanned an area approximately 250 m on either side of the plane, using binoculars when necessary. When Brolga were observed, their location was recorded on an aerial photograph and transect information was noted. This included the transect number, the direction and distance of the birds from the observer, a general description of the habitat and the wetland ID on which the Brolga was sighted.

Limitations

Aerial surveys can miss individuals of the targeted species. Flight speed means that some nests and birds may be missed; the distance at which aerial observers operate may miss birds hidden in vegetation. Notwithstanding this, at 250 m, most Brolga are visible in wetlands. Furthermore, the observers involved in the survey are experienced at detecting birds during aerial surveys; experience is a significant factor in the accuracy of such surveys.

The combination of the initial on-ground assessment and the aerial surveys provided information consistent with historical records of breeding Brolga. Therefore, the combination of ground and aerial survey results is considered to generate representative data on breeding locations and Brolga numbers.

4.3.2. On-ground surveys

Initial field surveys for the project were completed by Ecology and Heritage Partners between 2009 and 2013. Brolga breeding season roaming surveys (EHP 2018) were undertaken during the 2009, 2010, and 2011 breeding seasons. In addition, surveys during the flocking season (November 2009 to February 2010) involved driving all accessible roads within a 20 km radius of the project area to search for Brolga in potential wetland habitat. Where access could be arranged, all historical Brolga breeding records were visited and habitat assessed for its suitability as Breeding habitat.

Subsequent Brolga breeding season searches were conducted in 2012 and 2013, where five wetland areas within the project site were surveyed to identify Brolga breeding activity.

Between 2018 and 2021, Nature Advisory (formerly Brett Lane & Associates Pty Ltd) conducted ground-based searches for breeding Brolga (Nature Advisory 2022b) and assessed wetland quality (Nature Advisory 2022a) across the WWF and its surroundings, and all wetlands not subject to private land access limitations were visited and surveyed. All wetlands within the wind farm boundary were assessed in the field. Within a 5 km radius, 112 wetlands were assessed in the field. Further searches between 5 and 10 km from the boundary focused on areas where breeding had been recorded in the past, e.g. Pallisters Reserve and the St. Helen area to the SW and Muddy Dam Road to the west of the proposed WWF. All remaining wetlands that were not visited in the field were assessed using aerial photography imagery and notes collected from the aerial survey to determine the suitability to provide Brolga breeding habitat. Wetlands were visited multiple times throughout the survey period if they continued to hold water. Once they were dry, they were no longer surveyed for breeding Brolga. If a wetland was initially classified as drained, it was not surveyed again for breeding activities. During the flocking season, searches were focused on areas that had records from databases of four or more Brolga within the wider area and at permanent wetlands that held water throughout the year.

Further breeding surveys were conducted in 2024 and involved monthly monitoring of select wetlands within a 5 km radius of the project boundary. An additional survey was undertaken in September 2025, with observers visiting 16 “likely breeding wetlands” within 5 km of the wind farm site. During these surveys, observers first visited wetlands with historical breeding records, then, if time permitted, surveyed other wetlands constituting Brolga habitat as described in *the Willatook Wind Farm – Brolga Impact Assessment* (Nature Advisory 2022b). Each surveyed wetland was visited twice per survey period, once in the morning and once in the afternoon, unless the wetland was observed as being dry, in which case it was only visited once, as Brolga were unlikely to use it as habitat. Wetlands were accessed by vehicle or on foot and were checked from nearby vantage points with good visibility (such as roadsides or tracks). The presence and activity of Brolgas at each visited wetland were checked using high-powered optics (binoculars and/or telescopes) and drone cameras. Brolgas were also searched for incidentally while in transit between wetlands by vehicle and on foot.

During the breeding season, surveys were undertaken monthly. This survey frequency is generally considered appropriate for detecting pairs utilising a wetland for a concerted breeding attempt¹, and aligns with the recommended approach outlined in DEECA (2025). Brolgas will typically spend a few days at a wetland performing mating rituals and making their nest. This is followed by a further 28-31 days in which eggs are incubated (Archibald et al. 2020). Once the young hatch from the egg, they typically fledge after three months (Herring 2018). After fledging, they usually remain at the Breeding Wetland and within nearby wetlands up to 2 km away (Veltheim et al. 2019). Failed nesting attempts are common; thus, breeding behaviour could be overlooked between surveys. However, past observations indicate that birds will continue to utilise a wetland for a period after egg loss and often attempt to nest again if conditions are suitable. Monitoring at potentially suitable wetlands

¹ The average duration of breeding events monitored in south-western Victoria across wind farm projects on which Nature Advisory has worked is 50 days and only in six out of 36 breeding attempts were young successfully raised (Nature Advisory unpub. data).

continued even after breeding pairs were no longer present to determine if they would return for a second breeding attempt. When Brolgas were detected at a wetland, then an effort was made to observe *breeding activity* (courtship behaviour, nest building, egg incubation, rearing chicks) through prolonged observation, without disturbing birds (i.e., at a minimum distance of 300 m to reduce any disturbance caused by the surveyor).

Non-breeding (flocking) season surveys were conducted in five years between 2009 and 2020, and breeding season surveys in ten years between 2009 and 2024. This is considered to provide a reliable indication of Brolga breeding activity on the proposed wind farm site and in the surrounding area. Table 5 summarises the timing of all surveys conducted.

Table 5: Timing of Brolga flocking and breeding surveys

Survey type	Consultant	Dates
Flocking surveys	EHP	2009–2010
	BL&A (now called Nature Advisory)	2018–2020 (48 days): 2 – 3 May 2018 31 May – 1 Jun. 2018 23 – 24 Jan. 2019 5 – 6 Feb. 2019 25 Feb. – 1 Mar. 2019 25 – 27 Mar 2019 30 Apr. – 2 May 2019 25 – 27 May 2019 19 – 20 Jun. 2019 21 – 24 Jan. 2020 17 – 21 Feb. 2020 10 – 13 Mar. 2020 27 Apr. – 1 May 2020 19 – 22 May 2020 15 – 18 Jun. 2020
Breeding	EHP	2009 2010 2011
	EHP	2012–2013
	BL&A (now called Nature Advisory)	2018–2020 (70 days): 30 Jul – 3 Aug. 2018 13 – 17 Aug. 2018 24 – 27 Sep. 2018 22 – 26 Oct. 2018 19 – 23 Nov. 2018 4 – 7 Dec. 2018 15 – 18 Jul. 2019 12 – 15 Aug. 2019 16 – 19 Sep. 2019 15 – 18 Oct. 2019 11 – 14 Nov. 2019 9 – 12 Dec. 2019 27 – 28 Jul. 2020 29 – 31 Aug. 2020 27 – 29 Sep. 2020 27 – 29 Oct. 2020 16 – 17 Nov. 2020 14 – 15 Dec. 2020 2 – 4 Aug. 2021
	BL&A (now called Nature Advisory)	2022 (4 days): 25 – 28 Oct.
	Nature Advisory	2024 (13 days): 13 – 15 Aug. 11 – 13 Sep.

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Survey type	Consultant	Dates
		14 – 17 Oct. 11 – 13 Nov.
	Nature Advisory	2025 22 – 24 Sep.

Limitations

Rainfall and runoff during autumn, winter, and spring of 2018 were below average, causing many wetlands to dry out prematurely. Similarly, the 2024 survey coincided with a particularly dry period, with relatively low rainfall recorded between February and June (Bureau of Meteorology 2025). Winter 2024 rainfall totalled 184 mm, below the average of 223 mm (1994–2023). Although spring 2024 saw higher rainfall (192 mm), much of it fell on already dry wetlands and was more likely to evaporate or be absorbed into the soil. As a result, both survey periods were considered to reflect below-average conditions for Brolga breeding. However, this limitation was overcome by favourable environmental conditions during the subsequent monitoring years. Rainfall and runoff in autumn, winter and spring 2019 were considered to be average, with most wetlands being inundated up until December. This was a wetter year than the previous and considered better breeding conditions of the two years of surveying for Brolga due to wetlands holding water for a longer period. The 2020 breeding season experienced higher-than-average rainfall across the region during spring, which led to flooding. Wetlands were full throughout the breeding season, extending into summer. At the beginning of the breeding season surveys in August 2021, all wetlands were full of water, and Brolga had begun nesting in the study area. In contrast, 2024 and 2025 had below-average rainfall.

Surveys in 2025 were conducted over a three-day period and did not cover the entire breeding season. As a result, some breeding attempts that subsequently failed early in breeding may have been missed. However, this limitation is not expected to affect the survey's conclusions because surveys were undertaken within a few months of the season's start, conditions remained suitable at the time of surveys, and all visited potentially suitable Breeding Wetlands contained both water and emergent vegetation. Moreover, the primary objective of the survey was to undertake due diligence on breeding activity within the area, rather than to provide a comprehensive breeding season assessment. Therefore, the survey timing is considered acceptable for the intended purpose.

4.4. Wetland assessments

Initial assessments for the WWF included assessment of all wetlands within 10 km, as per Interim Guidelines. The current assessment uses guidance from the *Handbook*, where wetlands within 5 km of the site boundary were assessed, including those captured by the Brolga Breeding Habitat Suitability Model (BBHSM) and the Victorian Wetland Inventory (VWI). In addition, hydrological analysis included several unmapped wetlands that were not captured by either BBHSM or VWI. This assessment process is in accordance with guidance within the *Handbook*, including the due diligence of investigating unmapped wetlands.

To assess wetlands as suitable for breeding, all relevant ecological and hydrological information was collected in accordance with the *Handbook* criteria (DEECA 2025, Appendix 2). This information included, but was not limited to:

- Presence of breeding records over the last 20 years;
- Hydrological and field evidence that a wetland meets the ≥ 120 days inundation criterion at least once in a 10-year period;

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- Presence/cover of emergent vegetation, including vegetation not over one metre in height, including the presence of low wetlands plants that respond to shallow flooding that allow for food, nest construction and cover (e.g., sedges, *Poa Tussock Grass*);
- Presence of trees and other tall vegetation;
- Presence of other waterbirds;
- Presence of drainage lines and other human activities; and
- Descriptions of the type of wetland and its physical characteristics (e.g., wetland type, size, water regimen, water sources, origin, etc).

Hydrological wetland assessment

Hydrology investigations were commissioned across the project area and immediate surroundings (within 2 km of proposed turbine locations) to develop a surface water model to accurately determine the water-holding capacity of wetlands within the BBHSM, VWI, and (for due diligence) any unmapped wetlands.

As per the *Handbook* (DEECA 2025, Appendix 2), wetland boundaries were redefined using these hydrological studies to ensure a robust application of Breeding and Potential Breeding Wetland Buffers.

These reports utilised several lines of evidence to produce a robust hydrological assessment, including (Water Technology 2022, 2024, 2026):

- A 'Rain on Grid' hydraulic model using 1% Annual Exceedance Probability 72-hour event to assess overland flow paths, wetland interrelationships and wetland extents;
- A Source hydrologic model to determine the daily water level series between 2010 to 2019
- Assessment of all current DEECA-mapped wetlands (both BBHSM and VWI) within 2 km of the site boundary;
- Manual assessment of wetlands ≥ 0.1 ha, screening those for detailed analysis if they:
 - Were permanently drained,
 - Relatively small size (only slightly above 0.1 ha), or
 - Incorrect topographic representation.

These hydrological assessments are provided in Appendix 8, which provides more details on the methodology used by Water Technology to assess inundation suitability for Brolga. Photography and satellite imagery for permanently drained wetlands are also included within these reports.

Field-based information was used to ground-truth the hydrological modelling, resolve any inconsistencies, and support more robust conclusions regarding the classification of wetlands suitable for Brolga. Wetland boundaries were redefined as detailed in the *Handbook* (DEECA 2025, Appendix 2), using data from the Hydrological assessments (Water Technology 2022, 2024, 2026).

Further hydrological assessments were undertaken in 2025 and 2026 (Water Technology 2026). These assessments used the same methodology and included additional detailed analysis of several wetlands.

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Limitations

The hydrological model (Water Technology 2022, 2024, 2026) is closely aligned with field observations of all assessed wetlands, except for two sites.

Wetland 25974 was initially classified as drained due to a large visible drain running to the west. Subsequent review identified a blockage in this drain, and field notes confirmed that the wetland retained standing water for more than 120 days during the 2018 breeding season. Additional water balance modelling was then undertaken (Water Technology, 2026), which also demonstrated that the wetland met the 120-day inundation requirement. Given this evidence, together with field notes of Black Swan nesting, use by deeper-water birds such as Hardheads and Cormorants, and adequate emergent vegetation, Wetland 25974 was included as a Potential Breeding Wetland.

Wetland 6832 was determined by early hydrological assessments to have been drained due to the presence of extensive drains (Water Technology 2022, 2024). In 2025, a small and perched portion of the wetland (0.3 ha in size) was recorded with an active Brolga nest. This small subsection is connected to the drains but is marginally lower than a high point in the drain, allowing water to pool within it (Water Technology 2026). Further modelling of this subsection was completed, and demonstrated that it is capable of holding water for 120 days.

4.5. Wetland buffers

All wetlands within 5 km of the proposed site boundary were assessed for their suitability for Brolga breeding. Identification of breeding and potential Breeding Wetlands followed the process outlined in the *Handbook Appendix 2* (DEECA 2025):

- **Breeding Wetland** – the nest of a Brolga breeding pair and the perimeter of the surrounding wetland, with movement corridors to other Breeding/Potential Breeding Wetlands within 2 km. Around each of these Breeding Wetlands and associated wetlands within 2 km, there was a:
 - A movement corridor consisting of 600 m foraging buffer, around each Breeding Wetland and other Breeding/Potential Breeding Wetland within 2 km, with these movement corridors linked in straight lines between the widest sections,
 - A 300 m disturbance buffer around the linked movement corridors, and
 - 87.5 m turbine-free buffer around these movement corridors to account for the swept area of blades (blade lengths are proposed as 87.5 m).
- **Potential Breeding Wetland** – wetlands that met the criteria in Table 9 (DEECA 2025b). Around each isolated Potential Breeding Wetland, there was a:
 - 300 m disturbance buffer.

Wetlands that did not meet either of these criteria, as outlined in Tables 10 and 11 of the *Handbook* (2025b), were classed as unsuitable and were not provided with buffers.

Buffers around Breeding and Potential Breeding Wetlands were applied as per the process outlined in the *Handbook* (DEECA 2025, Appendix 2). This included an assessment of all wetlands within the assessment area against the exclusion criteria in Tables 10 and 11 (DEECA 2025b).

In some situations, the BBHSM/VWI modelled wetland perimeters did not match the hydrological data (Water Technology 2022, 2024, 2026). In these situations, as per guidance (DEECA 2025, Appendix 2), the hydrological data were used to update the actual boundaries of wetland areas.

4.1. Impacts and impact pathways

The *Handbook* (DEECA 2025) lists both direct (collision with turbines/transmission lines) and indirect (disturbance, habitat loss) pathways to impact the species. The *Handbook* states that cumulative impacts must be considered along with these direct and indirect pathways. Further, the scoping requirements for the WWF Environmental Effects Statement (DELWP 2019, p. 11) state that:

“Assess the potential cumulative effects on relevant listed threatened species and communities of flora and/or fauna, in particular Brolga ... from the project in combination with the construction and operations of other energy facilities”.

Cumulative impacts were investigated by reviewing all wind energy projects that are operational, approved, or under construction within 100 km.

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5. Assessment results

5.1. Community consultation

A total of 38 landholders/managers participated in the interviews, occasionally representing multiple properties or multiple family owners of properties (Figure 3). These were built upon the landholder consultations conducted in 2010 (EHP 2018). Landholder observations of Brolga are summarised below.

- Twenty-one landholders reported not having seen a Brolga on their property;
- Four landholders reported observing breeding events on wetlands on their property or their neighbour's property (five different wetlands);
- No landholders reported flocking events or groups larger than four on their property; and

The results from these interviews and informal discussions with other landholders identified additional Brolga sightings up to 10 km from the project boundary. The majority of landholders commented that if recorded, Brolgas would forage in their paddocks over several days before dispersing into the wider landscape.

Landholder reports of breeding events that aligned with historic breeding records included:

- Macarthur Wind Farm and Pallisters Reserve (both located more than five kilometres from the proposed wind farm and therefore outside the assessment area).
- Wetland 25741 (within two kilometres of the proposed wind farm boundary along Nagorckas Road).

Landholders also identified additional breeding sites at the following locations:

- A breeding pair in the St. Helens area (confirmed in August 2021 at wetland 25894); and
- A wetland within a Blue Gum plantation before the plantation was planted at St. Helens (wetland 5, not to be confused with W5).

Landholders within the proposed wind farm site were questioned about the current and past farming history of their property to provide a more accurate picture of land use/type within the local landscape. The survey found that the majority of the area is dominated by a mixture of stony outcrops and cleared/semi-cleared land for pasture, either cut to hay or grazed (cattle and/or sheep).

In addition to landholders, representatives from Australian Blue Gum Plantations and Trust for Nature were interviewed. The distribution of Blue Gum plantations was generally located to the west and south-west of the wind farm. Habitats in the area included plantations, patches of Messmate, Swamp Gum and Manna Gum woodland, derived grasslands and wetlands.

Pallisters Reserve is a 254-hectare wetland reserve. It is situated approximately six kilometres south-west of WWF. Wetlands in the reserve provided high-quality habitat for Brolga breeding, and breeding has been recorded at this site in the past.

Five statutory declarations were provided to the WWF project and forwarded to Nature Advisory. The statutory declarations were reviewed, and where additional information was required, the person who made the statutory declaration was contacted.

The following breeding records were included:

- A statutory declaration was completed by the landholder for Wetland 25741 on 31 July 2019, at the Honorary Justice Office in Melbourne. It stated that Brolgas have nested at a wetland

on his farm for most years since he has owned it (25 years). This same breeding event has also been added to the VBA and was reported during the formal consultation surveys. Photos were provided of Brolga at **Wetland 25741** from 2017. Nature Advisory visited the farm and assessed the wetland condition, and it met the criteria described earlier for a suitable Brolga breeding habitat and was accepted as a Brolga breeding site. However, we note that Brolga were not reported as breeding at this site during the field monitoring period, which lasted until 2025.

- A statutory declaration was completed by a local landholder on 6 August 2019, at the Warrnambool Police Station. In it, it was stated that Brolga were nesting at **Wild Dog Swamp (BBHSM 6903, VWI 25816)**, a large wetland on the property considered to provide suitable breeding habitat for Brolga. While breeding was not confirmed at this site during the Brolga field monitoring period, a pair was observed foraging there during 2020 surveys.
- A statutory declaration was completed on 22 August 2019, at the Hawkesdale Post Office. It stated that Brolga visit **Wetland 25729** on the property annually, and coordinates were provided. Nature Advisory contacted the landowner on 18th September 2019 to follow up on his observations. He explained that a pair of Brolga with a young chick were seen at the wetland five to six years earlier. Brolga field monitoring did not confirm any Brolga activity at the wetland.

The following wetland breeding record was not included:

- A statutory declaration was completed by a landholder on 12 August 2019, at the Koroit Pharmacy. It stated that her family has owned a property along the Woolsthorpe-Heywood Rd for over 30 years, and during this time, they have seen Brolga on the farm. It was acknowledged that Brolga are in the vicinity and are likely to occur anywhere across the landscape at any given time. There was no indication of Brolga breeding activities at the farm.
- A statutory declaration was completed on 12 August 2019, at the Hawkesdale Post Office. It stated that Brolga have nested on the property in **Wetland 25932** and provided coordinates. The wetland indicated is isolated from other wetlands. Photographs were provided of an immature Brolga at the wetland, with no nest. This immature Brolga was not with its adult parents, indicating that it had moved from its natal wetland and was independent. The photos of the wetland were not typical of Brolga breeding habitat, as it lacked the emergent vegetation needed for nesting, which also provides more foraging opportunities. No Brolga were observed at this wetland during any of the Brolga breeding season surveys. A conservative inundation estimate, using modelling from 1900 to June 2019, showed that the wetland could maintain 0.02 m for 107 days (Water Technology 2026). The wetland has significant drains running through it that, while allowing some pooling of water up to 0.6 m deep, failed to retain sufficient water to meet the 120 d requirements (Water Technology 2026). Further, aerial imagery shows limited water in the wetland on most dates, including in December 2016, which is noted as a very wet year in south-west Victoria, with the Hawksdale (Post Office) gauge recording 241.6 mm of rainfall across September and October – 100 mm greater than the average monthly total for all months (Water Technology 2026). Imagery showed the wetland retained some water in November 2022, which followed a significant rainfall and flooding event across Victoria. However, modelling suggests that this wetland was not able to reach 120 days of consecutive inundation through any part of the year (Water Technology 2026). Due to the lack of sufficient corroborating evidence, this wetland was not defined as a Breeding Wetland. Also, given its current condition, supported

by hydrological and survey evidence, the wetland was assessed as not meeting the criteria as a Potential Breeding Wetland in the Handbook.

Considering all the information gained from community consultation and statutory declarations, four breeding/potential breeding wetlands were identified that are within the 5 km assessment area: wetlands 25741, 25816, 25932, and 25729.

5.2. Flocking areas

No Brolga flocking sites were identified within the assessment area through examination of existing records, additional desktop study, or community consultations. Furthermore, no Brolga flocking activity was observed in the surveys undertaken during the flocking season (December to June). Given this, there is no evidence that the assessment area is used as a Brolga flocking site.

The nearest mapped flocking site is located near Lake Bolac, approximately 28 km north of the project area (Figure 4). A single observation of 3 Brolga were recorded in 2002 during the flocking season (April), approximately 6.3 km to the southwest (VBA site ID 1211814). This observation does not qualify as a potential flocking record under the *Handbook* criteria (DEECA 2025, p. 34), and is outside the assessment area (Figure 5).

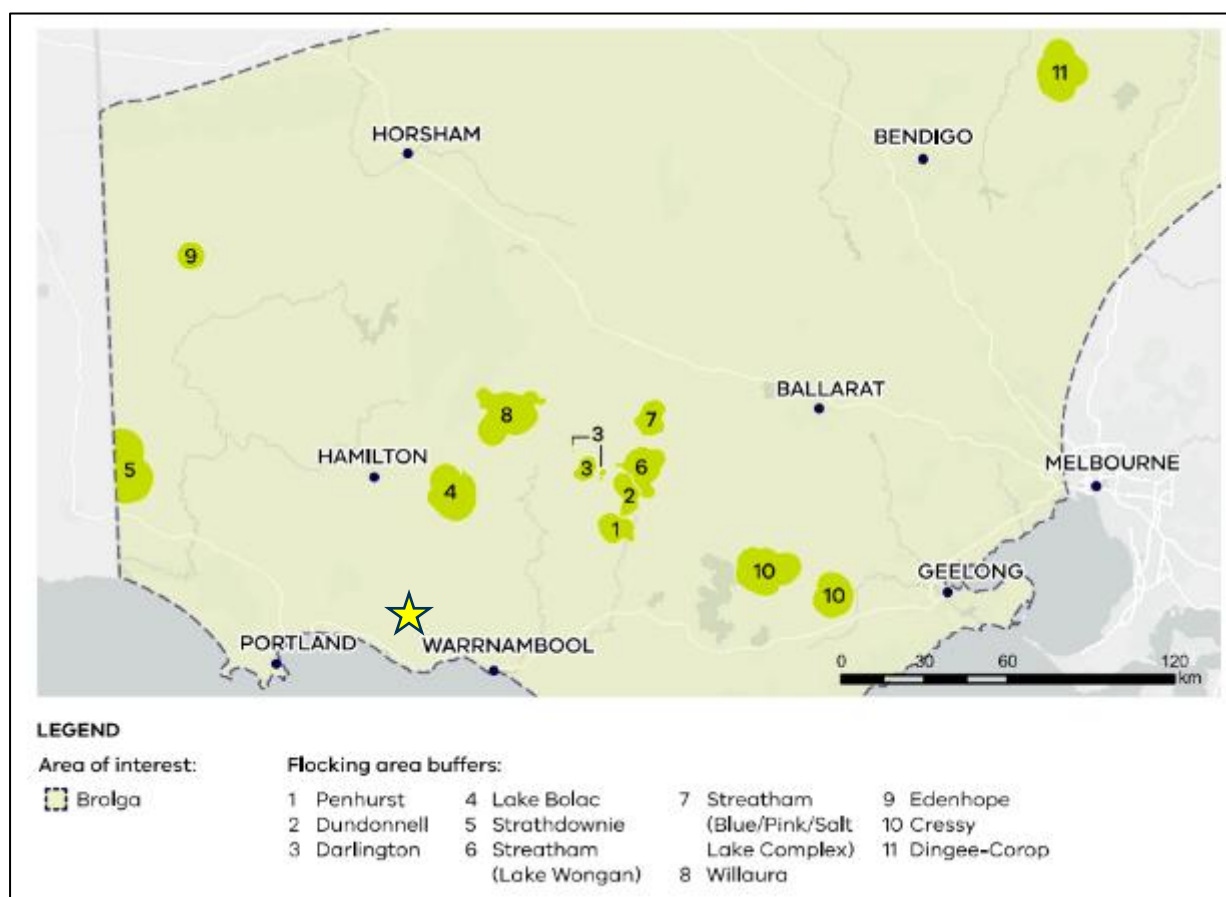


Figure 4: Identified Brolga flocking areas (DEECA 2025)

Note: The yellow star denotes the approximate location of Willatook Wind Farm.

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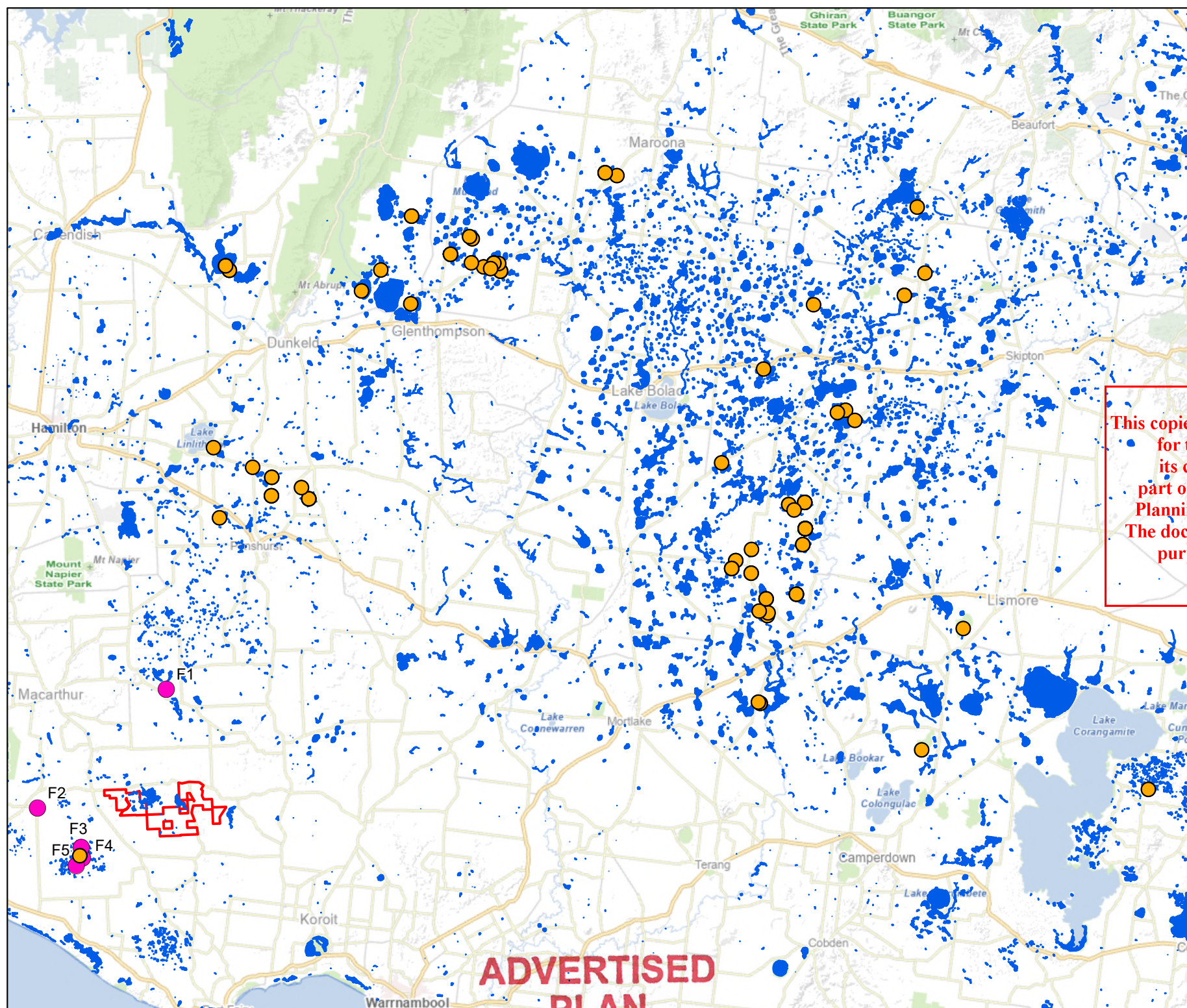


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Project No: 16087.28
Project location: Willatook Wind Farm, VIC
Date: 31/07/2026

 Willatook WF boundary
 DEECA BBHSM modelled habitat
 BL&A identified potential flocking sites surveyed

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5.3. Breeding records

5.3.1. Existing breeding records

Existing records showed 10 recorded breeding events within the assessment area (Table 6). These were attributed to six wetlands according to the *Handbook* (see also Appendix 2). Figure 6 shows the location of these Breeding Wetlands.

Table 6: Historical VBA records of breeding Brolga and associated wetlands.

Survey/ Observation ID	Survey Date(s)	Accuracy (m)	Associated wetland ID(s)
944310	1/01/1984 to 31/12/1984	900	Cockatoo Swamp (W12e/c) BBHSM 6727 / VWI 26028
944313	1/01/1984 to 31/12/1984	900	W4 BBHSM 6829 / VWI 25721
944321	1/01/1984 to 31/12/1984	900	W1 BBHSM 6681 / VWI 25944
944319	1/01/1984 to 31/12/1984	900	Bartlett Swamp VWI 25841
1812597	1/10/2017	10	VWI 25741
1759062	14/08/2018	25	W4 BBHSM 6829 / VWI 25721
1759064	23/10/2018	25	Mt Misery Road VWI 25867
2014991	17/09/2019	25	W4 BBHSM 6829 / VWI 25721
1852021	28/09/2019	100	W4 BBHSM 6829 / VWI 25721
2014992	15/10/2019	25	W4 BBHSM 6829 / VWI 25721

In accordance with the *Handbook*, breeding records from more than 20 years ago were not considered for defining Breeding Wetlands and subsequent buffers around these sites. Consequently, only six breeding records are considered here to contribute towards evidence to define Brolga Breeding Wetlands.

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Figure 6: VBA records of Brolga breeding

Project No: 16087.28

Project location: Willatook Wind Farm, VIC

Date: 31/07/2026

- Willatook WF boundary
- Willatook WF 5km buffer
- DEECA BBHSM modelled habitat
- VWI wetland

Brolga breeding records

- ★ Nature Advisory brolga breeding records
- ★ VBA Brolga breeding records (Less than 20 years old)
- ★ VBA brolga breeding records (More than 20 years old)
- ★ Community consultation brolga breeding records

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5.3.2. Aerial surveys

During the aerial surveys, only one Brolga nest was identified, located at Wetland W4 and adjacent to the current wind farm boundary, during the 2010 breeding season. This record was later confirmed through ground-truthing. Several unoccupied nests were found, with all later being attributed to Black Swans.

5.3.3. On-ground surveys

On-ground surveys confirmed the ongoing breeding of Brolga, but did not find breeding occurred in any wetlands that were not already flagged in existing records (Table 6).

During the initial surveys conducted by EHP between 2009 and 2013, the only confirmed Brolga breeding record during this period was a nest at Wetland W4, initially identified during aerial surveys. Additionally, one potential nest was recorded 6 km away (outside the *DEECA Handbook's* assessment area), which was not confirmed as Brolga, and the wetland (VWI 26055) did contain suitable habitat.

An extensive survey effort was undertaken between 2018 and 2025 by Nature Advisory, with several observations of breeding Brolga confirmed within 10 km of the wind farm (see detailed summary in Appendix 3: Summary of on-ground surveys by Nature Advisory 2018 to 2025). These surveys covered all variations of weather conditions, including years of high and low rainfall.

Brolga were observed to be breeding during the 2018 - 2025 period within the 5-km assessment area at the following wetland sites:

- **Cockatoo Swamp complex W12e/c (BBHSM: 6727, VWI: 26028):** A pair was observed nesting within the Cockatoo Swamp complex in 2024. This pair is suspected to have been those that typically nest at W4, having likely moved due to the lack of inundation at W4 in 2024. The latest surveys in 2025 found a pair foraging within this complex. During the monitoring period, Brolga were rarely present in the Cockatoo Swamp complex area during the non-breeding season from December to May, with one exception when a pair of Brolga was seen in April 2020 foraging in a flood plain at W12w.
- **Wetland 6832 (BBHSM: 6832, VWI: 25956):** Two adult Brolga were observed breeding on the eastern side of the wetland, one sitting on a nest containing a single egg. The wetland was visited the following day (24/09/25), and an additional egg had been laid (2 in total). This wetland was initially deemed a non-breeding wetland due to not fulfilling the minimum inundation period requirements. Observations during this survey showed that only the easternmost portion of this wetland held water.
- **Mt Misery Road (VWI 25867):** A pair nested at a felled Blue Gum plantation during 2018, where they successfully raised a chick.
- **Wetland W4 (BBHSM 6829, VWI 25721):** This wetland has the most consecutive breeding records, having had breeding recorded in 2018-2020, along with existing records from 1984. This wetland, however, did not support breeding in 2024 due to insufficient inundation. A pair that bred in Cockatoo Swamp in 2024 was likely the same pair that used wetland W4 in previous years, likely moving due to W4 being dry and Cockatoo Swamp being inundated.

In addition, other breeding records, nearby but outside the 5-km assessment area, included:

- **Wetland 25650 (Macarthur Wind Farm):** A pair nested at Macarthur wind farm during 2018 and successfully raised one chick. They did not nest at this wetland in 2019, though they

did breed nearby in that year, as they were sighted later in the breeding season with a young bird at this wetland. This nesting site was not monitored during 2020. A pair of Brolga were observed incubating eggs early in the 2021 breeding season.

- **Pallisters Reserve:** A pair was observed in the area during the 2020 surveys, though the actual Breeding Wetland was not confirmed. Though historical data suggests that they breed here year after year.
- **Wetland 25894 (St. Helens area):** A pair of Brolga was regularly seen in this area. Locals reported a chick during 2019, and Nature Advisory confirmed a chick in the 2020 breeding season. A Breeding Wetland was confirmed early in the 2021 breeding season at wetland 25894, where nesting was observed.

5.4. Brolga flight behaviour

Attempts were made to monitor the pair of Brolga breeding at Wetland W4 in 2018 to gain some understanding of their home range and areas they used around the Cockatoo Swamp complex. Unfortunately, the pair abandoned their nest after it was flooded and departed the area soon after, resulting in a very short monitoring period. As it was not feasible to gather enough site-specific data on Brolga movements, this discussion centres on a combination of pre-existing behavioural data (Nature Advisory *unpublished data*) and research presented by Veltheim et al. (2019).

Work by Nature Advisory over the last 15 years at wind farms in Victoria showed that of the 67 observed flights, the majority of flights by breeding Brolga were below 40 m, though there were a few observations above 60 m (3 % of all flights; Figure 7).

Veltheim et al. (2019) used GPS-tracking data to determine movement patterns of breeding Brolga pairs. This was based on the location of fledged chicks, with the assumption that they were accompanied by adult birds. The satellite records were made every six hours from midnight (4 points per 24 hours). Data showed that Brolga remained relatively close to Breeding Wetlands, with 95% of observations less than 1.4 km from roost sites. This suggests that breeding Brolga primarily make local flights. Accordingly, the buffer requirements outlined in the *Handbook* (DEECA 2025, Appendix 2) are designed to ensure these local movement corridors remain free of turbines near Breeding Wetlands.

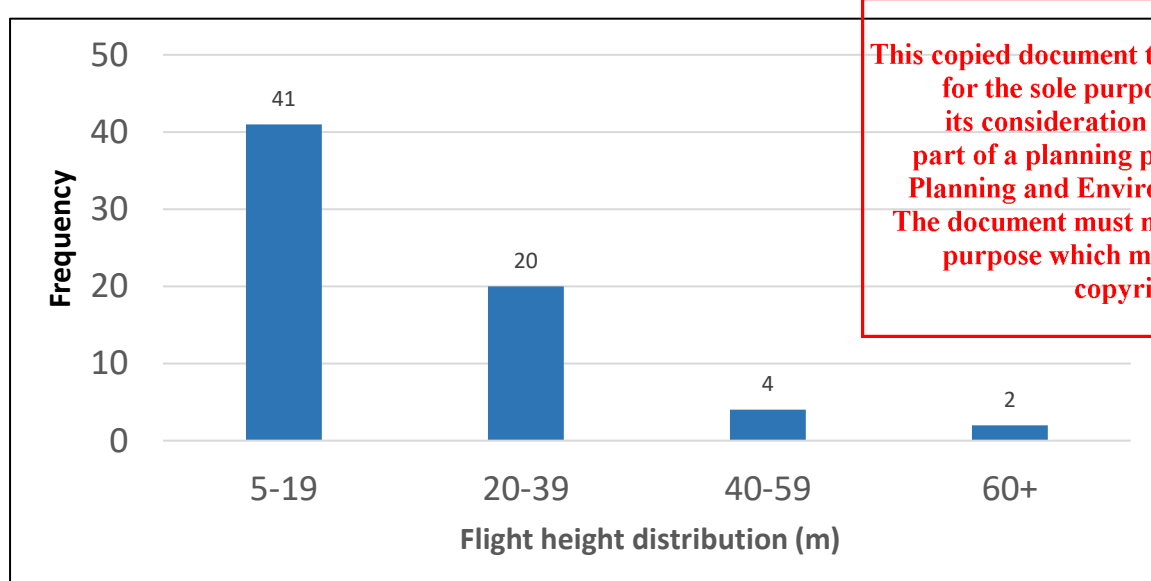


Figure 7: Flight height distribution of Brolga flights from Breeding Wetlands across Victorian wind farms (N = 67; Nature Advisory unpublished data).

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5.5. Wetland assessment

Previous assessments (2022)

Previous assessments under the Interim Guidelines assessed 335 VVI wetlands within 10 km of the site boundary (Nature Advisory 2022). Most (226 or 67.5 %) of these wetlands were deemed unsuitable to provide breeding habitat. A portion was deemed functional wetlands (109 or 32.5 %), with 32 identified as having had records of breeding Brolga. Of these, 30 were tentatively identified as currently (as at 2022) or able to continue to provide habitat into the future (Table 8 in Nature Advisory 2022). Most of these were located further than 5 km from the WWF site boundary.

Due to the nature of the volcanic geology of the site, there are numerous floodplain wetlands connected to the Shaw River, south of the Woosthorpe-Heywood Road, collectively termed the Cockatoo Swamp. These wetlands receive water when the Shaw River exceeds its channel capacity and spills onto the floodplain and/or from local catchment runoff contributions. These wetlands are hydraulically separate from one another but linked via the Shaw River (pers comm Ben Hughes). The inundation regime/characteristics of each wetland are not influenced by the adjacent wetlands but are driven by the same hydrologic influences, i.e. local catchment rainfall and high streamflow in the Shaw River. From a hydrologic perspective, each wetland is separate. As such, the main Cockatoo Swamp area was separated into three distinct wetland basins termed W12e, W12c, and W12w, based on the hydrological modelling (Water Technology, 2022). The latter two (W12c and W12w) have either historical or contemporary evidence of Brolga nesting.

Assessment under the Handbook

The current update to wetland assessments follows the *Handbook's* 5 km investigation area. This assessment uses the data from the previous assessment, which is further built upon with additional investigations (see Methods in Section 4.4).

Within the 5 km investigation area, seven wetlands meet the criteria as Breeding Wetlands under the *Handbook's* criteria (Table 7). A further 50 wetlands were identified as Potential Breeding Wetlands according to the *Handbook* (see detailed analysis in Appendix 4). Of the potential wetlands, six were not mapped under the BBHSM or VMI, but were found onsite to meet the *Handbook's* criteria.

Thirty-one potential wetlands were precautionarily assumed to meet the inundation criterion in a conservative approach when there was insufficient information available to support their exclusion. These included wetlands that were not assessed in the hydrological modelling, which focused on a 2-km area around the site boundary (see Methods in Section 4.4). Their inclusion is a conservative approach that reduces the risk of falsely excluding a potentially suitable wetland.

A total of 72 wetlands within the 5-km assessment area were considered unsuitable as they did not meet the criteria outlined in the *Handbook* (DEECA 2025, Appendix 2). These wetlands were excluded from requiring buffering because one or more of the following conditions listed in the *Handbook* guidance were not met:

- Did not contain records of breeding Brolga within the last 20 years (all 72 wetlands);
- Wetlands did not have at least one 120-day inundation period during any breeding season in the last 10 years (30 wetlands);
- Not a wetland, i.e. incorrect topographic representation or planted with trees (three sites);
- Permanently drained (six wetlands);

- Less than 0.1 ha in size (four wetlands); and/or
- Farm dams with no known Brolga breeding records (27 sites).

A complete summary of the wetland analysis, including classification and decisions regarding suitability against the criteria, is provided in Appendix 4 and Appendix 5. Those wetlands that were included within the BBHSM layer, but that were excluded based on the assessment process (19 wetlands), are provided with additional detail on the reasons for their exclusion in Appendix 6.

The boundary of wetlands, including both Breeding and Potential Breeding Wetlands, was updated with those derived from hydrological modelling (Water Technology, 2022, 2024, 2026). This was done in accordance with guidance from the *Handbook* (DEECA 2025b).

Several wetlands were found to exist within the site, which were not captured within either the BBHSM or the VWI layers. Five of these were identified as Potential Breeding Wetlands (12a, FD16, W13, FD23, and Orford 100), with the others not meeting criteria for inclusion. See all details within Appendix 4.

Alignment with the Minister's recommendations

Several wetlands were named within the Minister's recommendations (Minister for Planning, 2023) to be listed as Brolga breeding wetlands. The intent of this was to ensure that confirmed Brolga breeding wetlands, and other wetlands with demonstrated suitability for breeding, are appropriately identified and incorporated within the delineation of breeding home ranges and turbine-free buffers, such that these wetlands remain suitable for continued breeding and are not adversely affected by turbine siting, disturbance or cumulative landscape effects. The recommendation reflects the Minister's emphasis on adopting a habitat-based approach to wetland classification and buffer delineation, informed by the Draft Brolga Standard.

In response to the Minister's recommendations, wetlands within the 5 km assessment were reassessed in accordance with the *Handbook* (DEECA 2025b). This approach used several lines of evidence to identify wetlands suitable for Brolga breeding, including historical breeding records, targeted surveys, landholder consultations, and detailed hydrological modelling. This process classifies wetlands as either (DEECA 2025b):

- **Breeding wetlands** – The nest of a Brolga breeding pair and the perimeter of the surrounding wetland. A breeding wetland also includes wetlands with previously verified records of Brolga breeding nests from the Victorian Biodiversity Atlas (VBA) and Birdlife in the last 20 years.
- **Potential Breeding Wetlands** - wetlands that do not have an associated Brolga breeding record in the past 20 years, do have at least 120 days of inundation throughout the breeding season in any of the last ten breeding seasons, and that do have sufficient emergent vegetation within/surrounding the wetland to allow for nest building.

All wetlands listed in the Minister's recommendation were reviewed under the current guidelines, with all but four wetlands being classed as either breeding or potential breeding wetlands. Three wetlands did not meet the requirements of either Breeding or Potential Breeding Wetlands (25932, 25710, 25731; DEECA 2025b), and one wetland (25241) was confirmed as an error in the Minister's list of wetlands.

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Table 7: Brolga Breeding Wetlands

Wetland ID(s)	Description	Emergent vegetation <1m	Meets 120d Inundation Criterion (10yr span)	Breeding record source	Breeding record year	Breeding records details
Cockatoo swamp (W12c/e) BBHSM 6727 VWI 26028	This wetland system forms part of the Cockatoo Swamp complex, through which the Shaw River flows, including its associated floodplain. The hydrology assessment revised its boundaries, which also reflect this extent. This wetland and its immediate surroundings were the only wetland system within the study area that consistently retained surface water and supported abundant emergent vegetation (<1 m) during seasonal surveys, highlighting its potential to provide breeding habitat consistently across multiple years. In addition to Brolga observations, Black Swan nesting was recorded, along with other waterbirds and frogs. The area is also subject to cattle grazing. A small portion of the modelled wetland corresponds to VWI 25668 to the east, but it was not included based on the hydrological assessment (Water Technology 2026; see ALSO details in Appendix 8). The broader wetland complex does not extend into this area, as it does not meet the inundation criteria defined by the hydrological modelling and the presence of active drainage. No Brolga breeding has been recorded in this specific portion of the wetland system.	Yes	Yes	VBA + Nature Advisory	2024, 2025	On 12 September 2024, a Brolga pair was observed at a nest, with one adult sitting on the nest and the other foraging nearby. No chicks were seen. In October, the same pair was recorded again within the Cockatoo Swamp complex, but no breeding behaviour was observed. The wetland featured patchy, dense clumped grasses, a grassy base, and shallow water (<10 cm) with low emergent vegetation. A fox was observed approximately 200 m from the site. On 23 September 2025, a pair was observed utilising a wetland within the Cockatoo Swamp complex (W12e). Two adult Brolga were foraging at the edge of the wetland. No nests observed. Male exhibiting active, lively behaviour in the wetland. In previous years (2019 and 2020), Brolgas were also observed foraging in this area early in the breeding season before relocating to their primary breeding site at Wetland W4, where they spent most of the season.
Wetland 6832 BBHSM 6832 VWI 25956	The wetland was considered unsuitable during initial assessments based on hydrological assessments. It also did not contain much emergent vegetation, largely being tussock swamp. During 2025 breeding surveys, it was noted as retaining water in the eastern portion, likely draining from wetland 25974 to the east. A breeding pair were observed at this time. Subsequent hydrological analysis showed this easternmost section can retain water over 120 days (Water Technology 2026). While this wetland meets the criteria as a Breeding Wetland, it would not be considered a high-quality habitat owing to the sparse emergent vegetation (10% cover).	Yes	Yes	Nature Advisory	2025	A pair was incidentally observed in 2025 breeding in wetland 6832. The pair were identified as actively nesting in the easternmost part of the wetland; one was sitting on a nest containing a single egg. The wetland was revisited the following day (24/09/25), and an additional egg had been laid (2 in total).
W4 BBHSM 6829 VWI 25721	This large wetland retained surface water for at least 120 days during some breeding seasons, consistent with the hydrological assessment. A drain runs into the wetland. This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright	Yes	Yes	EHP VBA + Nature Advisory VBA + Nature Advisory Nature Advisory Nature Advisory	2010 2018 2019 2020 2021	An active nest was confirmed in 2010 via aerial survey and ground-truthing. In 2018, Brolga observed sitting on a nest, but no young were successfully hatched. In 2019, a pair nested in September and October, with a chick observed in November; not seen in December In 2020, an adult pair with a chick was present from September to November; the nest was located in the wetland. In 2021, a pair observed incubating a nest in early August.
Wild Dog Swamp BBHSM 6903 VWI 25816	This large wetland retains substantial water during the breeding season (consistent with the hydrological assessment) and supports high numbers of waterbirds, including breeding Black Swans. Although Brolga breeding has not been confirmed here during the past four years of monitoring, the wetland is considered of high quality and likely continues to provide suitable breeding habitat.	Yes	Yes	Local landholder (statutory declaration)	Not stated	A statutory declaration was completed by a local landholder on 6 August 2019 at the Warrnambool Police Station, stating that Brolga nesting had been observed at Wetland 25816, a large wetland on the property that appears to provide suitable breeding habitat. A Brolga pair was observed foraging at the site during 2020 surveys; however, breeding has not been confirmed there during the monitoring period.
Wetland 25729 VWI 25729	This small, well-vegetated wetland is fenced off from stock and is relatively isolated, with no adjacent wetlands present in the immediate vicinity. No hydrological assessment has been conducted for this site.	Yes	Unknown	Local landholder (statutory declaration)	2013 (approximately)	Nature Advisory spoke with the landholder (Simon Cozens) on 18 September 2019, who reported observing a Brolga pair with a juvenile approximately 5–6 years earlier.

Wetland ID(s)	Description	Emergent vegetation <1m	Meets 120d Inundation Criterion (10yr span)	Breeding record source	Breeding record year	Breeding records details
Wetland 25741 VWI 25741	This small wetland is partially drained but still holds surface water and supports abundant emergent vegetation. It is relatively isolated, with no adjacent wetlands present in the immediate vicinity, and is likely to provide suitable Brolga breeding habitat during wet years. No hydrological assessment has been conducted for this site.	Yes	Yes	VBA + Local landholder (statutory declaration)	2017	A statutory declaration by the landholder was completed on 31 July 2019, stating Brolgas have nested there most years over the past 25. This event is recorded in the VBA and consultation surveys, but no breeding was confirmed during the monitoring period.
Mt Misery Road VWI 25867	This medium-sized wetland is dominated by cumbungi (Typha), alongside water ribbon and other aquatic plants. It lies within a Blue Gum plantation block that was recently harvested and replanted with tube stock in 2018. No hydrological assessment has been conducted for this site.	Yes	Unknown	VBA + Nature Advisory	2018	A Brolga pair bred here in 2018. By 2019, the trees were around 2 metres high, and no Brolgas were observed during that breeding season or in any subsequent surveys.

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5.6. Breeding and Potential Breeding Wetland buffers

As outlined in the DEECA *Handbook*, buffers were applied to all wetlands that met the breeding and potential breeding criteria (see criteria in Tables 10 and 11 in DEECA 2025b).

The analysis resulted in five Brolga Breeding Wetland Buffers, which included the 600 m foraging and 300 m disturbance buffers, with additional home range areas where Breeding Wetlands were within 2 km of Potential Breeding Wetlands (Figure 8, see also buffer criteria in DEECA 2025b):

- **Cockatoo Swamp-W4-6832 Cluster (~2,566 ha):** This is a large zone that captures three Breeding Wetland areas (W4. Wetland 6832 and Cockatoo Swamp). This cluster broadly overlaps with the central part of the wind farm. It includes the confirmed Breeding Wetlands of Cockatoo Swamp (W12c/e, BBHSM 6727, VWI 26028), W4 (BBHSM 6829, VWI 25721), Wetland 6832 (BBHSM 6832, VWI 25956), and seven Potential Breeding Wetlands. This cluster represents the most extensive area of predicted Brolga breeding activity and is considered a critical, highly sensitive area with the greatest likelihood of future breeding attempts. Notably, at least one pair of Brolga regularly uses this cluster and is likely to breed within wetlands W4, W12c or W12e.

This cluster includes several wetlands whose boundaries were adjusted according to the guidance of the *Handbook* using hydrological data (Water Technology 2022, 2024, 2026): W1 (BBHSM 6681, VWI 25944), W4 (BBHSM 6829, VWI 25721), W12c/W12e (BBHSM 6727, VWI 26028) and W12w (BBHSM 6757, VWI 25957).

- **Wild Dog Swamp Cluster (~890 ha):** This cluster overlaps with the easternmost edge of the Project Site and includes one Breeding Wetland (BBHSM 6903, VWI 25816) and one Potential Breeding Wetland (BBHSM 8201). The Potential Breeding Wetland was not assessed during field surveys and lacks a hydrological assessment. However, it has been conservatively included in this buffer due to its proximity to the known breeding site and the absence of other nearby wetlands, suggesting it could form part of a future breeding home range.

This cluster includes one wetland whose boundary was adjusted according to the guidance of the *Handbook* using hydrological data (Water Technology 2022, 2024): Wild Dog Swamp (BBHSM 6903, VWI 25816).

- **Mt Misery Road Cluster (~1,014 ha):** Located on the western edge of the assessment area, this cluster comprises one Breeding Wetland (VWI 25867) and three Potential Breeding Wetlands (VWI 25868, BBHSM 6971, and VWI 25859). This cluster does not overlap with the proposed wind farm. It is the least likely area to support future breeding, as the wetlands are within Blue Gum plantations, where, since replanting, no breeding activity has been recorded. There is potential that the Brolga may be avoiding the area due to the now high tree cover. The tree cover also makes any longer-distance movements between this cluster and the Cockatoo Swamp less likely, further reducing the risk of interaction with the proposed wind farm.

No wetland boundaries required adjusting from those already modelled in the BBHSM and VWI.

- **Wetland VWI 25741 (~341 ha):** This Breeding Wetland Buffer includes a single isolated wetland in the northeast, within the assessment area but outside the proposed site boundary.

The wetland boundary did not require adjusting from that already modelled in the VWI.

- **Wetland VWI 25729 (~328 ha):** This Breeding Wetland Buffer includes a single isolated wetland in the northeast, within the assessment area but outside the proposed site boundary.

The wetland boundary did not require adjusting from that already modelled in the VWI.

Thirty-one Potential Breeding Wetlands were buffered using the process outlined in the *Handbook*. This involves a 300 m disturbance buffer to all Potential Breeding Wetlands further than 2 km from Breeding Wetlands (Figure 8).

5.7. Areas of buffer overlap

The layout has been revised multiple times to avoid Brolga habitat, accommodate wetland buffers, and protect other natural values (e.g., microbats). The project has revised the layout in line with the Handbook's mitigation hierarchy, with a primary focus on avoidance wherever possible (see Section 7.1). Despite major revisions and micrositing adjustments, it was not possible to completely avoid overlaps of surface tracks and above-ground infrastructure with some buffered wetlands, as further micrositing is constrained by other environmental and operational considerations. Accordingly, targeted mitigation measures have been developed to reduce impacts (see Section 7.2), and compensation measures have been outlined to manage any possible residual impacts (see Section 7.3).

5.7.1. Overlaps with Breeding buffers

Overlaps with turbines

None, no turbines overlap with the Breeding Wetland Buffers.

Overlaps with tracks, cables, and other infrastructure

The project has applied the mitigation hierarchy in accordance with the Handbook, with a clear emphasis on the avoidance of impacts to Brolga habitat. Through iterative site selection and design refinement, all practicable opportunities to avoid infrastructure within Brolga buffers have been exhausted, with associated infrastructure (tracks, cables, etc.) located outside of higher-risk areas wherever feasible.

Underground electrical cabling has been designed and will be constructed in a manner that avoids and minimises impacts to Brolga and associated habitat, consistent with the mitigation hierarchy and requirements of the Victorian Brolga guidance.

The following areas of infrastructure overlap with a Breeding buffer (Figure 9):

- **Cockatoo Swamp-W4-6832 – underground cabling and access track.** One section of proposed underground cabling (~1600 m) and a section of access track (~800 m) that terminates at an existing formed road, intersect with the cluster of Cockatoo Swamp-W4-6832 Brolga breeding buffers. The underground cabling connects the eastern turbines to the substation in the centre of the development. The access track connects the eastern turbines with the existing McGrath's Road, which is also within the Breeding Wetland buffer. Both the cables and track cross both the 300 m disturbance buffer and the 600 m foraging buffer. The proposed overlap is over 2 km to the nearest Breeding Wetland in the cluster, and over 500 m from the nearest Potential Breeding Wetland (VWI 26046).

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Mitigation of these overlaps is provided in Section 7.2, including minimising the potential for disturbance and hydrological alterations.

5.7.2. Overlaps with Potential Breeding buffers

Overlaps with turbines

In addition to Brolga buffer considerations, the proponents have undertaken detailed constraint mapping, iterative layout refinement and turbine micro-siting, consistent with the Handbook's requirement to avoid impacts wherever reasonably possible. One turbine, however, overlaps with a Potential Breeding Wetlands as follows (Figure 9).

This overlapped wetland meets the requirements of Potential Breeding Wetlands, but has no recorded history of breeding events, and no Brolgas were observed during field surveys, found in database searches, or notified by landholders

- **Turbine T31 – Wetland 12a.** This wetland was identified through a hydrological assessment (not mapped in the VWI or BBHSM). It is largely covered in *Poa* grasses and sedges, but with some emergent vegetation when inundated during flood events, and meets minimum size criteria and inundation criteria (Plate 1 and Plate 2). Around Wetland 12a, turbine siting is tightly constrained by turbine spacing requirements and infrastructure limitations. Based on the proponent's design parameters, they advise that the intersecting constraints leave few locations to relocate the turbine outside the 300 m disturbance buffer without affecting the layout integrity. While minor micro-siting may be possible within this envelope, avoidance is not achievable. Mitigation of the T31 overlap is provided in Section 7.2, including minimising the potential for disturbance and hydrological alterations from construction. Following the Handbook, the requirements of compensation measures are addressed in Section 7.4.

Overlaps with tracks, cables, and other infrastructure

- **Wetland 12a – underground cabling and construction area.** This potential breeding buffer is transected by new tracks, construction footprint and T31 to the east. Mitigation of this overlap is provided in Section 7.2, including minimising the potential for disturbance and hydrological alterations.

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Plate 1: Wetland 12a, looking northeast (Sept 2020).



Plate 2: Wetland 12a, minor pooling of water occurs with inundation suitable for Brolga only during flood events (Sept. 2020).

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**Figure 8: Brolga buffer
formulation**

Project No: 16087.28

Project location: Willatook Wind
Farm, VIC

Date: 31/07/2026

- Willatook WF boundary
- Willatook WF 5km buffer
- Turbines
- Breeding wetland buffer
- Foraging and movement corridors
- Potential breeding wetland disturbance buffer - 300m
- Foraging buffer - 600m
- 2 km area around Breeding wetlands

Wetland assessment

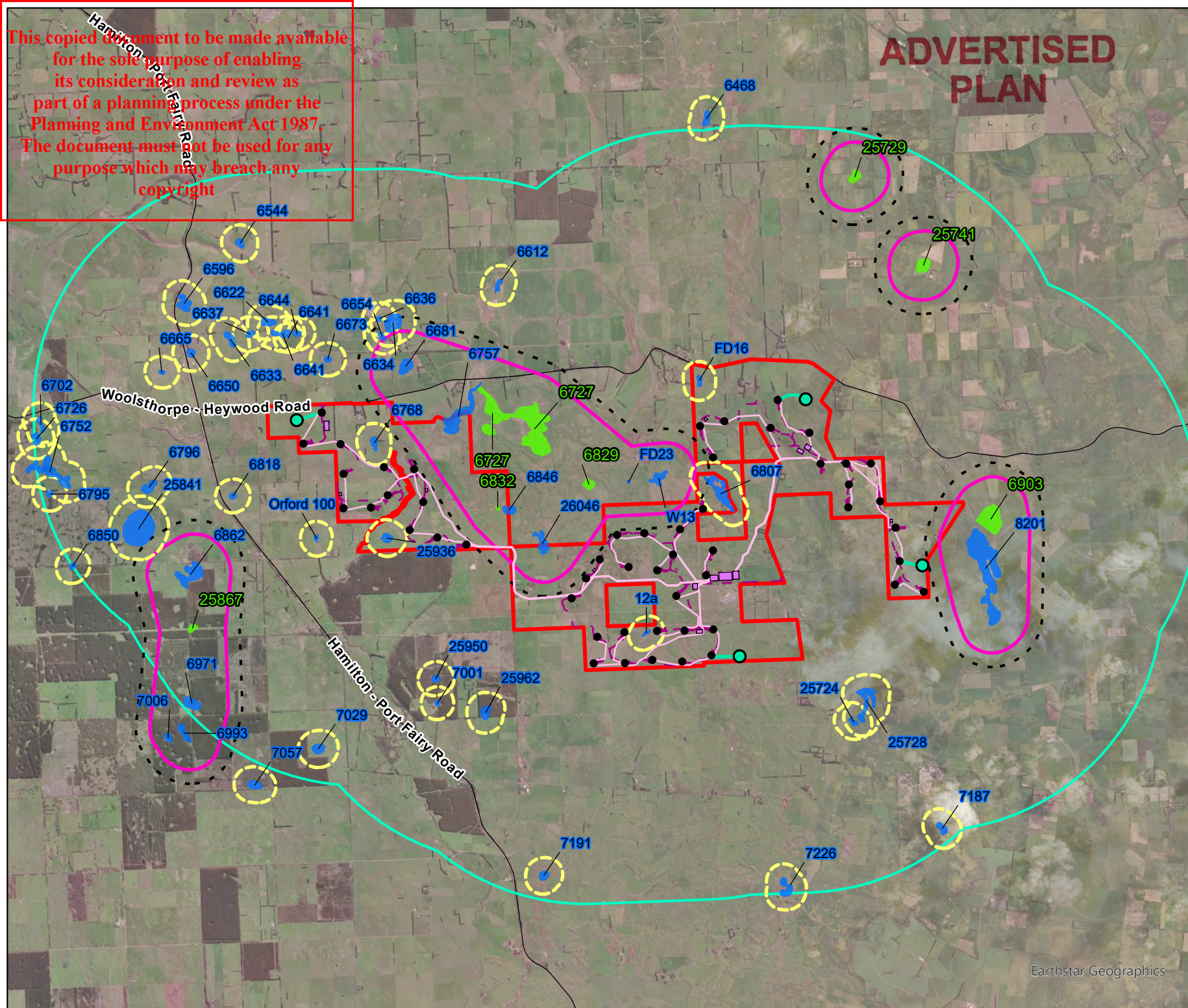
- Breeding
- Potential breeding

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Figure 9: Brolga buffers

Project No: 16087.28
Project location: Willatook Wind Farm, VIC
Date: 31/07/2026

- Willatook WF boundary
- Willatook WF 5km buffer
- Associated Infrastructure
- Power line
- Civil infrastructure inc. tracks
- Metmast tracks
- Metmasts
- Turbines
- Turbine blade envelope
- Breeding wetland buffer
- Foraging and movement corridors
- Potential breeding wetland buffer - 300m

Wetland assessment

- Breeding
- Potential breeding

N

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Kilometers

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Earthstar Geographics

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Figure 10: Wetlands not requiring buffering

Project No: 16087.28

Project location: Willatook Wind Farm, VIC

Date: 31/07/2026

- Willatook WF boundary
- Willatook WF 5km buffer

Wetland assessment

- Unsuitable

Note: Areas mapped as unsuitable wetlands may contain localised sections of suitable habitat. Only the unsuitable portions are intended to be shown on this map. Please see other figures for areas of suitable Breeding and Potential Breeding habitat.

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Earthstar Geographics

6. Potential impact pathways

Impact pathways for Brolga include both direct and indirect effects (DSE 2012):

- **Direct impacts:**
 - Mortality resulting from collision with turbines or powerlines.
- **Indirect impacts:**
 - Habitat avoidance;
 - Disturbance from construction activities; and
 - Barrier effects.
- **Cumulative impacts:**
 - Consideration of the above impacts in the context of similar nearby renewable energy facilities.

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6.1. Direct impacts

Wind energy facilities are recognised as having the potential to impact Brolga (DEECA 2025b). While little information is available on their risk of collision with turbines, they are known to collide with powerlines (Goldstraw & Du Guesclin 1991, Herring 2005). Prior studies suggest some level of avoidance, with Brolga observed flying directly under operating turbines (Woods 2014, 2017). However, and importantly, even a small number of mortalities can pose a significant risk to the Brolga due to their slow generational time and small, declining population (DEECA 2025b). Therefore, mitigation measures are recommended to reduce the risk of impacts to this listed species (DEECA 2025b). Details on mitigation measures are provided in Section 7.2.

6.2. Indirect impacts

There is evidence that Brolga are susceptible to disturbance, often selecting habitat away from areas of human activity (Veltheim et al. 2019). Rows of turbines may also create a movement barrier. Brolga avoiding turbines travel greater distances and expend more energy (Drewitt and Langston 2006). Layout, orientation and spacing of wind turbines are important factors to reduce barrier effects. Occasional gaps between turbine clusters may be appropriate to facilitate movement of Brolga from high-density breeding areas to flocking sites (DSE 2012).

The Brolga can be susceptible to disturbance from frequent human activities, such as during construction (Veltheim et al. 2019). Construction activities, including forming/upgrading tracks, erecting turbines, increased traffic and activities at the quarry, have the potential to impact nearby Brolga.

However, there is some evidence from the nearby Macarthur Wind Farm that Brolga bred within 400 m during both turbine construction and operation (Wood 2014, 2017, *Nature Advisory unpublished data*). With more recent evidence from 2024 of Brolga breeding within 500 m of turbines. Brolgas were also observed foraging within 100 m or less of the base of operating turbines (Wood 2014, 2017, *Nature Advisory unpublished data*). See additional details in Appendix 7.

Importantly, the wetland buffering protocol within the *DEECA Handbook's Appendix 2* (DEECA 2025b) includes a 300 m disturbance buffer around both Brolga Breeding Wetland home ranges and potential wetlands. Considering the latest evidence from the nearby Macarthur Wind Farm, this would be considered a conservative measure to reduce disturbance. Notwithstanding, where

the 300 m disturbance buffer is not adhered to, the *Handbook* requires compensation measures. Further details on mitigation and compensation measures are outlined in Section 7 and Appendix 9.

The construction of roads and hardstand areas has the potential to alter existing drainage patterns if not addressed during their design phase. Such hydrological alterations have the potential to occur over a larger area, due to the shallow topographical relief of floodplain systems, which may impact the ability of Breeding Wetlands to collect and retain water. Hydrological flood modelling should be used to inform the design of these facilities. Mitigation and compensation measures are outlined in Section 7 and Appendix 9.

6.3. Cumulative impacts

The cumulative effects of wind farms may impact Brolga through a combination of the above-mentioned direct and indirect pathways. These include, but are not limited to:

- Collision with turbines and powerlines across their range
- Displacement or disturbance across their range
- Barrier effects, where wind farms may create landscape-scale barriers to seasonal or local flight pathways.

Wind farms within southwest Victoria that are within approximately 100 km of the proposed Willatook Wind Farm, and that are operating, under construction or approved, are shown in Table 8. It is possible that, cumulatively, these wind farms could lead to an increased risk of collision, as individual Brolgas moving across the landscape could potentially encounter several of these projects. This may be particularly pertinent to the Brolga during the non-breeding season, where they undertake flights up to 100 km as they move between seasonal habitats (I. Veltheim, *pers. comm.*). To date, there has been one reported collision of a Brolga associated with wind turbines (Aurecon 2025), which was lower than the modelled one Brolga fatality every two years (Dundonnell Wind Farm 2016).

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Table 8: Wind farms within approximately 100 km of the Willatook Wind Farm.

Wind Farm Project	Status	Size (WTG #)
Darlington Wind Farm	EES referral submitted	150
Macarthur Wind Farm	Operational	140
Mount Fyans Wind Farm	EES referral submitted	80 to 85
Dundonnell Wind Farm	Operational	80
Mount Mercer Wind Farm	Operational	64
Ryan Corner Wind Farm	Approved	52
Mortlake South Wind Farm	Under construction	35
Oaklands Hill Wind Farm	Operational	32
Cape Bridgewater Wind Farm	Operational	29
Cape Nelson North / Cape Sir William Grant Wind Farm	Operational	23
Hawkesdale Wind Farm	Approved	23
Cape Nelson South Wind Farm	Operational	22
Woolsthorpe Wind Farm	Approved	20
Yambuk Wind Farm	Operational	20
Salt Creek Wind Farm	Operational	15
Codrington Wind Farm	Operational	14
Morton's Lane Wind Farm	Operational	13
Ferguson Wind Farm	Under construction	3
Maroona Wind Farm	Operational	2
Timboon West Wind Farm	Operational	2

Each of these wind farms has been individually assessed for its impacts on the Brolga using various methods. Currently, it is not possible to combine all the wind farms in Table 8, arrive at a definitive number of Brolgas at risk. This is primarily due to the disparate information available on the impacts, where impacts were assessed before the advent of the consistent method of assessment outlined in the *DEECA Handbook*, with some gaining approvals even prior to the older *Interim Brolga Guidelines* (DSE 2012).

Through the adoption of the mitigation hierarchy as outlined in the *DEECA Handbook*, it is expected that the overall risk to the species will be reduced. Mitigation measures are outlined in Section 7.2 and compensation measures in Section 7.4.

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7. Application of the mitigation hierarchy

Under the *Handbook* (DEECA 2025), projects are required to meet several criteria to avoid, minimise, and mitigate impacts to Brolga. The *Handbook* (DEECA 2025, Appendix 2) defines the need to apply the mitigation hierarchy to manage impacts on Brolga. When residual impacts are expected, compensatory measures must also be applied (DEECA 2025). These are outlined below.

7.1. Avoidance measures

The *Handbook* (DEECA 2025a, 2025b) defines the need to apply the mitigation hierarchy to manage impacts on Brolga. The following avoidance measures are the first step in the mitigation hierarchy, and have been developed based on comprehensive information derived from field assessments and desktop studies, and in compliance with the *Handbook* (DEECA 2025a, 2025b) guidance requirements. These measures have been designed to avoid expected impacts during the design phase of the project (Table 9).

Evolution of avoidance in the design layout

The Willatook Wind Farm layout has undergone multiple design iterations with a primary objective of avoiding impacts on Brolga, alongside other environmental and operational constraints. These iterations were informed by targeted onsite investigations and the application of contemporary Brolga guidance.

Avoidance has been embedded as a key design principle from the outset. This is demonstrated by a substantial reduction in project scale, with turbine numbers decreasing from 190 (2010 concept design) to 59 in the approved 2022 EES layout, and further reduced to 52 in the current layout (v120).

In addition, iterative micrositing of turbines and associated infrastructure has been undertaken to further avoid potential impacts. Key avoidance measures include increasing separation distances between turbines and wetlands, rerouting access tracks away from wetland habitats, and refining turbine and blade specifications. These refinements were informed by over a decade of detailed, site-specific studies of Brolga habitat use and wetland and hydrological characteristics, and align with best-practice guidance.

Overall, the current layout reflects a design process in which avoidance has been prioritised and systematically applied to reduce potential impacts on Brolga and associated habitats. Where impacts were not able to be avoided due to other environmental and operational constraints, further minimisation measures are implemented (see Section 7.2) and compensation measures when residual impacts were expected (see Section 7.4).

Table 9: Measures to avoid impacts to Brolga at Willatook Wind Farm

Avoidance ID	Impact	Description
AV01 Siting of wind farm	Flocking areas	The Willatook Wind Farm has been located outside of both mapped and unmapped flocking areas.
AV02 Reduction in the size of the wind farm	All pathways	The Willatook Wind Farm's design has been progressively refined from 190 proposed turbines in 2010 to 59 that were presented to the Minister in the 2022 EES layout. These refinements were informed by technical studies that assessed impacts to Brolga and other listed species. A further reduction occurred following the Minister's Assessment, as a result of further buffer refinements under the <i>Handbook's</i> guidance (2025b). The current layout proposes 52 turbines. Collectively, these reductions in the proposed size of the wind

Avoidance ID	Impact	Description
		farm have the effect of minimising impacts to Brolga and other listed species.
AV03 Breeding and Potential Wetland Buffers	Breeding habitat	Breeding and Potential Breeding Wetland habitat buffers have been produced as per guidance (DEECA 2025b), based on assessment of historical records, survey results, wetland assessments, and hydrological modelling. These buffered areas have largely been avoided in the layout of the wind farm. There are, however, two sections of overlap: - Underground cabling and a section of access track are proposed to transect the Cockatoo Swamp-W4-6832 Breeding Wetland buffer. This is likely to qualify as acceptable under 4.2.3 in the <i>Handbook</i> (DEECA 2025b). Further, mitigation measures will be applied (see Section 7.2), including construction activities to fall outside of the breeding season and the use of the track only for light vehicle usage. - One turbines (T31) and associated infrastructure to transect one Potential Breeding Wetland buffers (Wetlands 12a). Further mitigation and compensation measures are discussed below in Sections 7.2 and 7.4.
AV04 Siting of quarry	Disturbance	The quarry has been located outside of all Breeding and Potential Breeding Wetland buffers, to reduce the likelihood of disturbance.
AV05 Reduction in above-ground transmission line	All pathways	The overhead transmission line was reduced from 4.5 km to ~ 300 m, which is located away from Breeding and Potential Breeding Wetlands. This has reduced the risk of collision with powerlines by reduction of above-ground length by 93 %.

7.2. Mitigation measures

The *Handbook* (DEECA 2025, Appendix 2) defines the need to apply the mitigation hierarchy to manage impacts on Brolga. All mitigation measures for the project have been developed based on comprehensive information derived from field assessments and desktop studies, and in compliance with the *Handbook* (DEECA 2025) guidance requirements. These measures have been designed to minimise expected impacts before the commencement of the construction and operation phase (Table 10).

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Table 10: Mitigation measures to reduce impacts on Brolga at Willatook Wind Farm.

Mitigation ID	Impact	Description
MM01 Reducing hydrological alterations	Breeding and foraging habitat	Hydrological assessments were used to inform the placement of turbine locations outside of water flow paths (Water Technology 2022, 2024, 2026). In areas where inundation is predicted, hardstands will be designed to ensure drainage flows away from wind turbine locations. Hardstands will be slightly raised above the surrounding ground level, and, in several instances, foundations will be raised further to ensure floodwaters do not reach the base of the wind turbine in a 1 % AEP (Annual Exceedance Probability) flooding event. Permanent surface structures, including the substation and the Battery Energy Storage System (BESS), will be designed to maintain existing overland flow paths and not result in increased flood levels upstream of the infrastructure sites. There will be the development of a detailed drainage design in consultation with Glenelg Hopkins Catchment Management Authority, considering best practice design guidelines. Design measures would include, but not be limited to: - Permanent surface structures designed to maintain existing overland flow paths and not cause increased upstream flood levels; - Culverts installed parallel to the alignment of the banks of the waterway; - The use of a reduced-width construction right of way at watercourse crossings aims to avoid any standing water; and - Micro-siting crossings of creeks to avoid deeper pools where practicable to reduce potential effects.
		Underground cabling that intersects with Breeding Wetland Buffers (Cockatoo Swamp-W4-6832) has been designed and will be constructed in a manner that minimises impacts to Brolga and associated habitat. In these areas, the following measures will be implemented: - Hydrological integrity - cable trenches will be designed and constructed to maintain existing surface water flow paths and wetland connectivity. Hydrological modelling has informed the siting of infrastructure to avoid flood-prone areas and minimise disturbance to drainage lines and wetland systems. Where required, trenching will incorporate localised design measures (e.g. trench breaks, backfill permeability matching, and reinstatement of surface contours) to ensure that natural flow regimes and inundation patterns are not altered. - Minimise disturbance footprint - cabling will be co-located with existing or proposed access tracks, where practicable, to limit additional disturbance. Construction will be undertaken using standard trenching techniques within a defined corridor, with temporary disturbance areas minimised and clearly delineated. - Timing of works – construction will be scheduled outside of Brolga breeding season, to avoid disturbance to breeding behaviour and reduce risk of indirect impacts.

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Mitigation ID	Impact	Description
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		Where essential wind farm infrastructure (e.g., access tracks and electrical cables) crosses a creek, measures for avoiding and minimising impacts would be documented in the Construction Environmental Management Plan (CEMP), including: - Preferentially schedule work during the drier months of the year and the lowest flow of the waterway (December - March); - Avoiding undertaking works when high rainfall events are expected; - Maintaining adequate flow rates and water levels in waterways to be crossed (as determined in consultation with the relevant authorities) to minimise impacts on the aquatic ecosystem and environmental values; - Restoration of temporarily disturbed waterways and vegetation (removing any obstructions to waterway flow) as soon as practicable following the open-cut trenching works to at least its pre-construction condition; - Design measures to minimise future erosion in areas where trenching occurred (e.g., use of riprap made of stones to stabilise the waterway, geofabric to prevent erosion and scour until establishment of vegetation; and - Avoiding the creation of continuous rows of stockpiled materials and providing gaps to allow flow.
	MM02 Construction Environmental Management Plan (CEMP) Breeding and foraging habitat	
MM03 Sediment, Erosion and Water Quality Management Plan	Breeding and foraging habitat	Development and implementation of a Sediment, Erosion and Water Quality Management Plan, in consultation with Glenelg Hopkins Catchment Management Authority and EPA Victoria. Erosion and sediment control measures within the construction site would adopt a treatment train approach and would include: - Phasing of ground-disturbing works to periods of lower rainfall, where possible; - Maintaining watercourse and wetland buffers (with the exception of watercourse crossings) and adopting other measures consistent with EPA Victoria Publication 1896: <i>Working within or adjacent to waterways</i>; - Minimising clearance of vegetation, particularly along drainage lines, waterways and steep slopes. Vegetation, including within the watercourse and riparian zones, would be reinstated as quickly as practicable as open-cut trenching works are completed;

Mitigation ID	Impact	Description
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MM04 Management of contaminated soils on waterways		Implement a risk-based approach to management of potential acid sulphate soil and potentially contaminated soils, in accordance with EPA Victoria Publication 655.1: <i>Acid sulphate soil and rock</i>, which may include: - Identification of high-risk locations through mapping and soil testing - Implementing targeted measures at high-risk locations, such as the handling and stockpiling of material, protocols to neutralise soil acidity, monitoring and contingencies; and - Development of an acid sulphate soil management plan. If acid sulphate soil or contaminated soil is encountered, it would be managed as a priority waste in accordance with EPA Victoria Publication 1968: <i>Guide to classifying industrial waste</i>.
MM05 Management of potential waterway pollutants		Measures to manage potential pollutants from entering waterways include: Spills risk assessment and response plan, incorporating measures for the use, storage, transfer and disposal of hydrocarbons and chemicals (in accordance with EPA Victoria Publication 1698: <i>Liquid storage and handling guidelines</i>);

Mitigation ID	Impact	Description
		- Storage of liquid fuels and chemicals within containment facilities (e.g., bunded areas) more than 100 metres from waterways in designated areas within the project site; - Spill response kit, to be located at waterway crossings, at locations where machinery/plant are operating, and refuelling and fuel/chemical storage areas during construction; and - Incorporation of spill containment measures into the drainage design.
MM06 Marking transmission lines and meteorological masts	Collision risk (powerlines)	The overhead transmission line was reduced from 4.5 km to ~300 m and has been positioned away from all Brolga breeding sites to substantially minimise collision risk. As per mitigation measures outlined in the <i>Handbook</i> (DEECA 2025, Appendix 2), transmission lines should be marked to reduce collision mortality. Similarly, following the Minister's recommendations (Minister for Planning, 2023) the lines associated with meteorological masts will be marked to increase visibility.
MM07 Scheduling construction	Disturbance of breeding habitat	Several segments of track and cables traverse within the Potential Breeding and Breeding Wetland Buffers. Construction of this infrastructure should occur outside of the breeding season (July to November). Where this is not possible, a monitoring program should be employed to monitor breeding Brolga, with adaptive mitigation measures employed if construction activities approach within 300 m of the birds.
MM08 Reduce Quarry Disturbance	Disturbance of breeding and foraging	Quarry blasting has the potential to disturb breeding Brolga through noise, vibration, air blasts, and/or fly-rock events. Though little research has been undertaken to understand the distance and level of disturbance. A Blast Management Plan should be developed, which should include: - Measures to reduce fly-rock (e.g. reduced charge mass, front row burden, stemming height, etc.); - Measures to reduce ground vibration (e.g. reduce bench height, blast hole depths/diameter, etc.); - Measures to reduce noise (e.g. reducing charge mass, etc.); and - Measures to reduce air blasts (e.g. reduce charge mass, configure blasts to face away from Brolga buffer, etc.).
MM09 Monitoring during construction and quarry blasting	Disturbance of breeding and foraging	Construction activities within 300 m of Brolga are likely to cause disturbance, and the effects of quarry blasting are largely unknown on Brolga. Regardless, mitigation of potential effects should be implemented as per MM08. Monitoring should also be enacted to determine the efficacy of these mitigation measures and gain an understanding of the impacts of construction and quarry blasts. This monitoring program should include: - Monthly monitoring by a qualified Ecologist if/when construction and quarry blasting operations occur within the breeding season; - Ongoing monitoring outside of the monthly efforts, focused on wetlands within 300 m of quarry and construction activities by WWF Staff/Contractors, with engagement of a qualified Ecologist to confirm and investigate disturbance behaviour and site utilisation if/when any Brolga are observed; and

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Mitigation ID	Impact	Description
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		Development of a Bat and Avifauna Management Plan (BAM Plan), that would aim to: ▪ Minimise the impacts from the WWF on threatened fauna listed under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> (EPBC Act) and/or the Victorian <i>Flora and Fauna Guarantee Act 1988</i> (FFG Act); ▪ An informed understanding of the turbine collision risk to Brolga (and other listed fauna) that occurs on-site; ▪ An informed understanding of how Brolga (and other listed fauna) use the site changes in response to wind farm construction and operation; ▪ Monitoring for the timely identification of turbine collisions and the timely collection and analysis of data; ▪ Responsive updates to, and regular validation of, the impact assessment framework for Brolga (and other listed fauna regularly recorded on site), using monitoring data to support a robust adaptive management approach to reducing impacts, where possible; and ▪ Where applicable, the development and implementation of tangible, on-ground management actions to promote a long-term collision risk reduction on Brolga and other listed threatened and migratory bird and bat species. This measure should include investigation of emerging technology. The BAM Plan will require finalisation by agreement with DEECA during the approval process.
	MM10 Bat and Avifauna Management Plan (BAM Plan) Collision risk	
MM11 Turbine height	Collision risk (turbines)	This mitigation measure is not specifically stated as such within the Handbook. However, it is likely to reduce impacts, as determined from knowledge of Brolga flight behaviour. The previous EES included a minimum tip height of 40 m (i.e., the lower RSA, with all wind turbine blades will be at least 40 m from ground level). Following the Minister's Assessment, this has been increased to 60 m. This limit was selected to minimise potential collision risk with Brolga (and other birds and bats). The height was informed by flight behaviour data gathered by Nature Advisory (over 15 years) in southwestern Victoria. These monitoring observations of breeding Brolga showed that approximately 3% of flights (2 of the 67 recorded flights) were estimated to be below 60 m (see Section 5.4 and Figure 7). While this is not a specified mitigation measure in the Handbook, it is considered a consequential design mitigation, as evidence-based information suggests it may reduce Brolga collisions with wind turbines during local flights.

7.2.1. Bat and Avifauna Management Plan (BAM Plan)

The Bat and Avifauna Management Plan (BAM Plan) should aim for long-term mitigation and minimisation of potential impacts to birds and bats, including Brolga. Specific outcomes to meet this aim include (those targeted toward Brolga are highlighted in **bold** and detailed below):

- **Minimise the number of collisions by implementing monitoring and mitigation measures. This may be achieved by implementing the following:**
 - **Design and implementation of a long-term carcass monitoring program;**
 - **Identifying impact triggers and applying mitigation measures;**
 - Carrion removal to make the area less attractive for raptors;
 - **Limit grain feeding of stock under turbines to make the area less attractive to grain-feeding birds, including Brolga, parrots and cockatoos; and**
 - Low wind-speed curtailment of selected turbines to reduce the amount of bat fatalities.
- **Measure if there are changes in bird utilisation across the site by implementing a long-term bird monitoring program. This will be achieved by implementing the following:**
 - Bird utilisation surveys;
 - Bat studies; and
 - **Brolga breeding monitoring.**

The BAM Plan provides for adaptive management, allowing monitoring and mitigation measures for Brolga, as well as for other birds and bats of concern, to be refined over time based on the latest scientific knowledge and technological advances.

Carcass monitoring program

Carcass monitoring should aim to determine the actual impact on Brolga mortality, in addition to other bat and bird species. This program should include year-round monthly carcass searches, scavenger rate estimation, and detectability trials. This program should be implemented over the course of at least three years to ensure robust results and statistically usable data for estimating the mortality rate.

Impact triggers and adaptive mitigation measures

Impact triggers, the circumstances that result in notification, further investigation, and additional mitigation measures, should be clearly detailed. Responses to triggering events should be outlined in a decision-making framework, such as that displayed in Figure 11. If triggering events recur, mitigation measures should be applied simultaneously to reduce the likelihood or consequence of additional triggers.

Impact triggers and adaptive mitigation measures for Brolga may follow, but are not limited to:

- The occurrence of an impact trigger will be reported immediately to the Project's Responsible Officer, who will report it to the relevant statutory planner at DEECA within five business days of the impact trigger being detected;
- Carcass searching will be immediately expanded (in terms of turbine coverage and frequency) in the subsequent six weeks to determine if the Brolga collided more than once;

- Immediate investigation will occur (to be completed within ten business days) by an ecologist to determine, if possible, the circumstances that led to the impact trigger, including confirming if the death is due to turbine blade collision and, if so, what risk behaviours and environmental conditions led to the collision and whether they are continuing;
- This rapid investigation will aim to provide a clear understanding of the cause of the impact, informed by on-site investigations of the occurrence of the species on the WWF site, leading to a recommendation, where possible, of effective mitigation actions;
- This will identify the most effective available mitigation measures to be implemented, with those measures to be implemented as soon as practicable, based on the information collected during the investigation (e.g. increased mortality searches);
- Following this investigation, further action is not considered necessary if Brolga are no longer in the area or displaying species-specific risk behaviour (as agreed in consultation with DEECA);
- If the cause of the impact trigger is not clear and the definition of effective mitigation measures is not feasible, further investigation of Brolga behaviour will be required over the following six weeks (in parallel with the stepped-up carcass searches). This investigation will also consider the following.
 - Any recent data/information on the species (e.g. academic literature, policy statements),
 - Available information from the implementation and monitoring of other wind farms, and
 - A review of the effectiveness of management measures.
- If these investigations suggest that the impact was not continuing (e.g. the Brolga had left the site), then no further action would be necessary. This decision will be determined in consultation with DEECA, based on the collected evidence and adopting the most effective of the mitigation measures indicated in Table 11.
- If the onsite investigation suggests that the impact trigger indicates the potential for an unacceptable impact, Brolga monitoring and mitigation will be required. During Brolga monitoring and mitigation, periodic reports will be provided to DEECA, and, additionally, fully evaluated for their ongoing effectiveness in annual reports
- Examples of mitigation measures that will be evaluated include, but are not limited to, those outlined in Table 11. As wind turbine collision mitigation studies are ongoing worldwide, new knowledge on the nature and effectiveness of mitigation will be incorporated into this evaluation as it is generated.

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Table 11: Adaptive mitigation measures in the event of repeated collisions or risky behaviour by Brolga.

Hypothetical cause of impact	Possible Adaptive Mitigation Measure
Foraging source identified that attracts Brolga to impact areas	The use of acoustics (i.e. loud music/irregular noise) to discourage birds from foraging in this location, where such noise would not impact landowners or neighbours. Encourage species into alternative areas outside of the WWF boundary, where available, through the use of social attraction techniques off-site (decoys and audio playback systems), as well as supplementary feeding (e.g. grain) where practicable.
Farming practice attracts threatened species to risky areas (e.g. grain feeding of stock)	Investigate whether farming practice is a contributing factor, and if so, subject to landowner agreement, relocate farming further from turbines to reduce risk.
Wind/rain/fog causing low visibility	Carcass searches will be repeated during periods of low visibility to measure mortality rates. Temporary shutdown of those turbines found to generate repeated impact triggers will be necessary during periods of extreme low visibility.
Nest site close to a turbine	Conduct an assessment by a qualified ecologist and, depending upon the clear risk identified, develop options for mitigation measures for consultation with DEECA. Agree on Brolga-appropriate actions to discourage nesting close to turbines. Specific action to be agreed between DEECA and WWF, with advice from a qualified ecologist.
Ongoing Brolga turbine collisions are assessed as having a significant impact on the population	Investigate new and emerging technology in reducing collision risk at high-risk turbines. This may include various deterrents and/or automated bird detection systems.

Stock forage control

Land-use and stock management around turbines can influence the presence and behaviour of Brolga. For example, feeding stock with grain around turbines can attract Brolga to the turbine location, elevating collision risk. The BAM Plan should address this risk through measures, including, but not limited to:

- Educating project staff and landowners about stock management, and
- Recording instances when grain-feeding occurs within the swept area of turbines.

Operational monitoring of Brolga breeding

The results of operational monitoring will determine the effectiveness of mitigation measures and inform whether additional measures should be implemented. Comparisons between pre-construction and operational surveys will elucidate whether Brolga continue to utilise the area. To this end, the aims of the operational Brolga monitoring should be to:

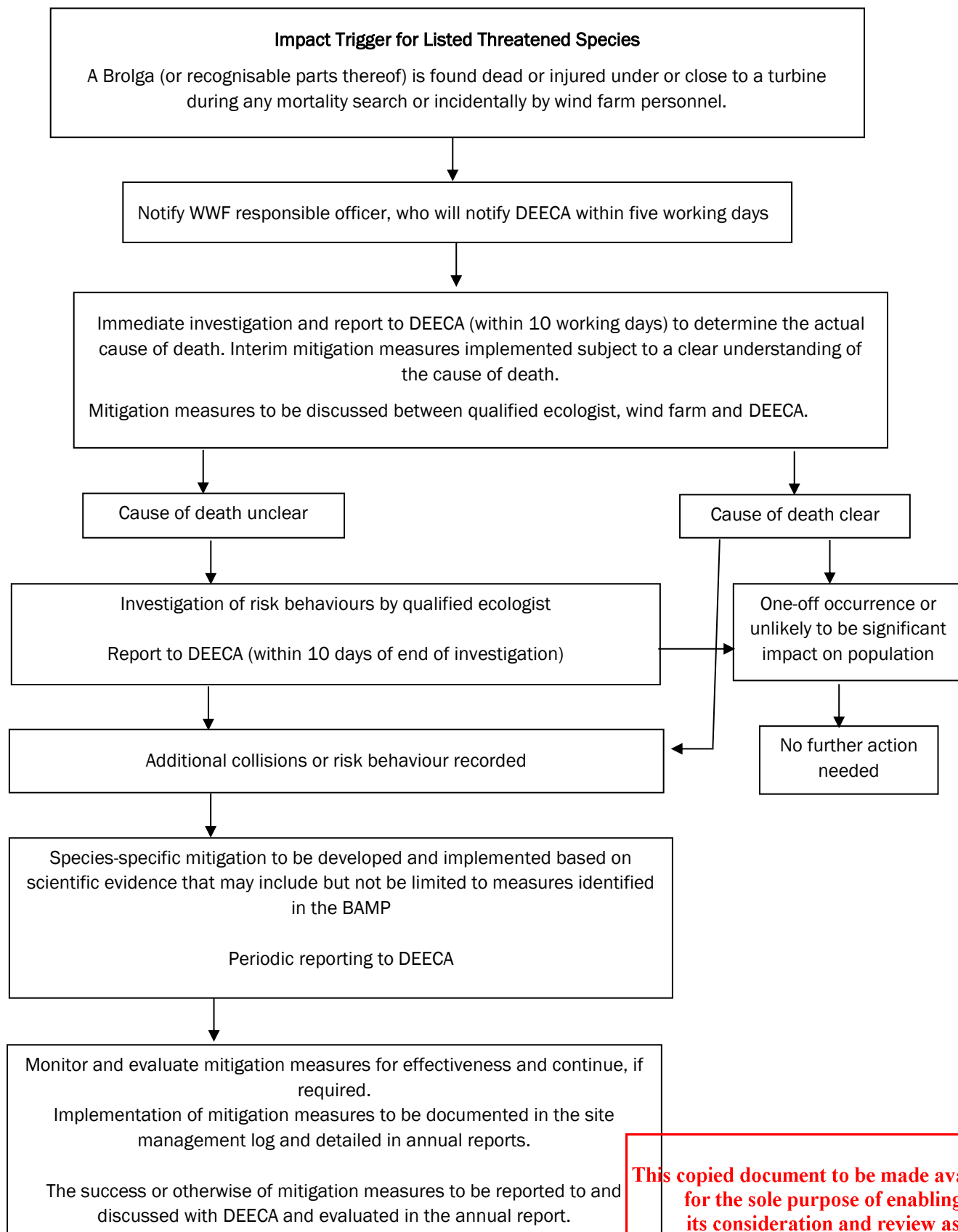
- Confirm that Brolga continues to occur within the identified Breeding Wetlands and foraging corridors;
- Confirm that Brolga continue to breed within the identified Breeding Wetlands; and
- To determine whether Brolga are observed demonstrating “risk behaviour”, such as flying at rotor swept heights.

The following survey methodology should be utilised for operational monitoring of Brolga:

- Monthly monitoring to be undertaken during the Brolga breeding season (July to December) for the first five years of operation;
- Wetlands monitored each month are those that have been reported as Breeding and Potential Breeding Wetlands;
- Each wetland will be searched for the presence of Brolga and any breeding activities recorded, including courting, nest building, incubation and rearing young; and
- All Brolga observations to be recorded, including breeding success, behaviour (inc. potential disturbance), observed flights (time, path, altitude, and interaction with any WWF infrastructure).

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Figure 11: Example decision-making framework for identifying and mitigating impacts of WWF.

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7.3. Residual impacts

The project will undertake several avoidance and minimisation actions to reduce impacts. However, aspects of the layout do overlap with the Breeding and Potential Breeding Wetland Buffers. As outlined in the *Handbook* (DEECA 2025, Appendix 2), it is thus interpreted as having residual impacts. These residual impacts on Brolga are most likely to present as either/both direct and indirect impacts (see Section 6 for a discussion of these impact pathways).

With inherent uncertainties and limitations in existing scientific knowledge, and the dynamic spatiotemporal nature of wildlife and the influence of environmental effects, some residual impacts cannot be ruled out or ignored. Accordingly, these residual impacts must be anticipated, addressed, and managed through appropriate planning, compensation, and adaptive measures.

7.4. Compensation requirements

Appendix 2 of the *Handbook* states that, under the mitigation hierarchy, if residual impacts remain after mitigation, compensation measures will be required. As detailed above, several avoidance and minimisation measures have been put in place, including several major redesigns of the wind farm layout. However, it was not possible to completely avoid overlaps of some turbines and infrastructure with all buffered wetlands, as further micro-siting is constrained by other environmental and operational considerations. As one turbine, access tracks, and underground cabling are located within the Breeding and Potential Breeding Wetland Buffers (see Section 5.7), compensation will be required under the guidance of the *Handbook* (DEECA 2025, p. 43). The nature and extent of compensatory measures are determined by the criteria outlined in Table 12.

The nature of overlap with Breeding Wetland Buffers is likely to qualify as acceptable as per 4.2.3 of the *Handbook* (DEECA 2025b). Impacts consist of the development of an underground cable and the construction of a new internal access track. Further, these will be mitigated by construction outside of the breeding season and a design that does not change existing surface water flows. Other measures will be captured within the CEMP, such as sediment control. The proponent commits to seeking agreement with DEECA on the suitability of these measures and actions. Provided this is agreed to with DEECA, compensation for these overlaps will not be required.

There is one Potential Breeding Buffer intersection that requires compensation, Wetland 12a. The wetland meets the minimum criteria for inclusion as a Potential Breeding Wetland based on hydrological evidence and on-ground observations. However, it is not expected to be of the highest value as it is relatively small (~0.6 ha), isolated from other suitable wetlands (>1.5 km), largely covered in Poa tussock grasses and sedges, and will only provide habitat during a one-in-ten-year flooding event (see Plate 1 and Plate 2, with further details in appendices 4 and 5). The nature of the intersection is the installation of one turbine (T31) and its associated footprint, construction area, and underground cabling (see Figure 9). While all of these components are within the 300 m disturbance buffer, there is no direct removal of the wetland habitat. Indirect impacts will be minimised through the construction and design to avoid alterations to the hydrological function of the wetland and measures in the CEMP, such as sediment control. While impacts to Wetland 12a are expected to be largely disturbance-based, residual impacts are expected to some level, as full buffering was not possible, and will therefore require compensation as per the *Handbook's* guidance.

A Brolga Compensation Plan was prepared by Odonata (2026b, Appendix 9), and its implementation will require consultation with DEECA, and can complement a BAM Plan to adaptively address impacts. Details of matters to be addressed in the plan are outlined below. This

does not exempt the requirement to mitigate residual impacts, as the BAM Plan must prioritise impact-triggered, effective responses in line with the mitigation hierarchy.

Table 12: Nature and extent of wetlands requiring compensation under the Handbook (DEECA 2025, Appendix 2)

Nature/extent of impact	Application to the project
The number of Potential Breeding Wetlands not buffered by a 300 m disturbance buffer	One Potential Breeding Wetland is not provided with a 300 m disturbance buffer: ▪ Wetland 12a (unmapped in BBHSM and VWI, with detection via hydrological modelling)
The size of the wetlands not buffered	▪ Wetland 12a – 0.617 ha
The proximity and connectivity of wetlands to other shallow vegetated wetlands	The Potential Breeding Wetland is isolated from Breeding Wetlands by over 2 km. Distance to the nearest other wetlands suitable for Brolga foraging and movement is approximately 1.5 km.

7.4.1. Compensation Plan

Options considered for compensation

The nature and extent of compensatory measures were determined as per the Handbook. These are outlined in Table 12, and address the:

- Number of Potential Breeding Wetlands not buffered by a 300 m disturbance buffer,
- Size of the Wetland(s) not buffered, and
- Proximity and connectivity of the wetlands to other shallow vegetated wetlands.

The purpose of a Brolga compensation is to protect and enhance habitat to enhance breeding success at breeding sites. This can be achieved in two ways:

- **Direct compensation** – overarching and management objectives aimed at restoration and protection of wetlands to directly benefit Brolga and their breeding habitat. These objectives could be achieved through on-ground actions carried out either directly by the proponents or by engaging a third party.
- **Indirect compensation** – delivering, either directly or by funding a third party, research or education outcomes and/or programs that are designed to indirectly benefit Brolga. For example, helping to address key knowledge gaps in behaviour, fecundity, habitat and other matters that are essential to ensuring its long-term survival.

The *Handbook* (DEECA 2025, Appendix 2) identifies a range of measures that may be implemented to offset potential impacts, including:

- Restoration of the natural flooding regime of wetlands by closing drains;
- Increasing the inundation frequency of Brolga Breeding Wetlands through artificial flooding;
- Creating new potential breeding habitat by damming or modifying existing wetlands or dams;
- Management of wetland vegetation condition through controlled grazing (or stock removal) to improve suitability as a breeding site;

- e) Addition of nesting material to Potential Breeding Wetlands to facilitate nest building; or
- f) Fox control at breeding sites.

All of the above measures are noted in the *Handbook* as (DEECA 2025, p. 43):

“must be accompanied by active management to reduce predation during breeding, such as fox control measures.”

Direct compensation measures will be prioritised and commensurate with the scale and ecological significance of impacts to Brolga habitat. Actions will be oriented towards the provision or protection of habitats of similar or higher quality than the Potential Breeding Wetlands that have not been buffered. Where restoration is proposed, it must be supported by evidence demonstrating a high likelihood of achieving habitats of comparable or superior quality. This includes consideration of key habitat attributes such as foraging resources, breeding suitability, hydrological regime, spatial extent, and long-term viability.

Further compensation actions may be required if post-construction monitoring determines mortalities and/or significant disturbance to Brolga (DEECA 2025, Appendix 2).

Compensation Options were detailed by Odonata (2026a, Table 13), that addressed all compensation options from the *Handbook*. Subsequently, a Draft Compensation Plan for Willatook Wind Farm was developed in April 2026 that chose a specific selection of these options (Odonata 2026a, 2026b; both provided as Appendix 9).

Table 13: Options to compensate for residual impacts on Brolga, as determined by Odonata (2026a).

Compensation Option	Offset category (DEECA 2025b)	Description
Protect and enhance existing Breeding Wetlands	b, d, e and f	This compensation option aims to improve the condition and resilience of key existing Breeding Wetlands. It involves excluding livestock to reduce grazing pressure, implementing fox and other predator control to protect nesting Brolga, and adjusting artificial flooding events to enhance the duration and extent of existing wetland inundation. Together, these actions will support more stable breeding conditions and improve long-term habitat quality.
Restoration of drained wetlands	a, c, and d	This option focuses on restoring natural wetland hydrology by filling artificial drains and improving sill levels to retain water for longer periods. Works will be prioritised in areas near existing or historically used wetlands to strengthen habitat connectivity and landscape-scale ecological function. Additional restoration actions may complement this measure, consistent with those outlined in C01, to enhance wetland quality and support breeding and foraging habitat.
Farm dam modifications	c and d	This option involves modifying selected farm dams to provide suitable nesting and foraging habitat for Brolga. Actions may include fencing to manage stock access, revegetating dam margins, and controlling or excluding livestock to improve water quality and vegetation structure. Dams will be prioritised in proximity to existing wetlands to enhance habitat connectivity and support broader landscape-scale conservation outcomes.
Research and development of conservation fencing protocols for Brolga	f	This option addresses targeted research into fencing solutions that balance predator access with Brolga movement needs. It will investigate the ecological impacts of fencing on Brolga, evaluate alternative physical fence designs, and explore the potential future use of AI-enabled systems for dynamic fence management. The outcomes may inform best-practice

Compensation Option	Offset category (DEECA 2025b)	Description
		approaches to the protection of nesting areas, while maintaining habitat connectivity and natural behaviours.
Marking of powerlines and meteorological masts to prevent Brolga collision	-	This option aims to reduce bird collision risk by increasing the visibility of powerlines. Line marking will be undertaken either onsite or in nearby areas identified as collision hotspots. These actions will improve flight safety for birds, particularly during low light or poor weather conditions, contributing to reduced mortality and safer movement across the landscape. Met masts guy wires will also be marked as those wires constitute a collision hazard for Brolgas and other birds,

NOTE: Options highlighted in grey refer to those being taken by WWF as outlined in the Compensation Plan (Odonata 2026b). Also note that the last option, marking of powerlines, has been adopted as a mitigation measure to ensure alignment with the mitigation hierarchy outlined in the Handbook.

Proposed compensation

The proponent has adopted from the options a flexible package of actions that are intended to restore and enhance Brolga breeding habitat. The 2026 plan (Appendix 9) aims to achieve an increase in the availability and quality of breeding habitat within the broader Brolga landscape, aligning with the DEECA compensation categories of A, B, D, E and F (DEECA 2025). The 2026 plan provides a flexible package of compensatory actions designed to meet this aim, rather than relying on a single prescribed outcome. To this end, five actions are proposed, as summarised here and detailed in Odonata (2026b):

- **C01 Identification of suitable Brolga breeding wetland** – selected potential breeding wetlands suitable for enhancement in the local area (>5 km from wind turbines) with collaboration with landholders and Landcare groups.
- **C02 Hydrological restoration and enhancement** – undertake hydrological works to improve inundation frequency and duration to suit Brolga breeding requirements.
- **C03 Habitat management and revegetation** – improve habitat conditions through grazing control, encouragement of native wetland vegetation regrowth, and supplementary planting of suitable native plants.
- **C04 Provision of nesting materials** – supplement of nesting materials where such materials are limited.
- **C05 Predator (fox and cat) control** – implementation of a control program in collaboration with landholders and Landcare groups, with a focus on breeding season to reduce predation risk to chicks and eggs.

As part of this compensation plan, we recommend that actions be accompanied by ongoing monitoring. This will allow for adaptive improvement of the measures over time and enable demonstration of the effectiveness of the plan. Finalisation and implementation of such compensatory plans should be undertaken in consultation with and to the satisfaction of DEECA, ensuring that potential and residual impacts are addressed in a manner commensurate with the ecological risk posed by the project.

Wetland 12a is expected to have indirect disturbance impacts only, with no direct loss of the wetland (see Section 5.7.2). The proposed Compensation Plan (Appendix 9) aims to address these

predicted residual impacts by providing measures that enhance the ecological values of other wetlands in the broader region. The proposed actions focus on protecting and improving habitat quality, supporting the long-term persistence of Brolga, their breeding resources, and offsetting the residual indirect impact of habitat through targeted management and restoration activities. These measures are considered proportionate to the nature and extent of the anticipated impacts and will complement the impact avoidance and minimisation measures already incorporated into the Project (see Section 7). As such, the Compensation Plan is expected to deliver ecological benefits that exceed the predicted residual impacts by improving the long-term condition, extent, and resilience of suitable Brolga wetlands within the surrounding landscape.

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8. Alignment with the Minister's recommendations and DEECA Handbook

The proposed Willatook Wind Farm was assessed in an *Environment Effects Statement* (EES) in 2023. The outcome of this assessment included a range of recommendations from the Minister (Minister of Planning, 2023), several of which were specific to Brolga. These recommendations were largely based upon the *Draft Standards* (DELWP, 2020) and *Interim Guidelines* (DSE, 2012). Both of these pieces of guidance have since been replaced by the *Handbook for the Development of Renewable Energy in Victoria: Guidance to Avoid, Minimise, Mitigate and Compensate for Impacts on Threatened Bird and Bat Species* (DEECA 2025) and its associated *Appendix 2: Species Specific Guidance for Onshore Wind Energy Facilities – Victorian Brolga* (DEECA 2025, Appendix 2).

The *Handbook* incorporates the guidance of previous guidance documents along with more recent research to provide a more robust assessment process and a clear mitigation hierarchy. The *Handbook* represents the current best-practice approach to assessment of Brolga at wind farm facilities. Consequently, the proponents of WWF have undertaken further assessments of Brolga to align with the *Handbook*.

8.1. Minister's recommendations

The Minister made several recommendations related to Brolga in their assessment (Minister for Planning, 2023). The Brolga-specific IAP/Minister's recommendations have been addressed by the proponent in the *Willatook Wind Farm Project: Application of the Victorian Renewable Energy Handbook and Response to the Minister's Assessment* (Wind Prospect 2026).

Below provides a summary of key recommendations, with the relevant application of the mitigation hierarchy in Table 14.

Key wetlands recommended as 'suitable habitat'

The IAP and Minister identified 18 key wetlands within their recommendations to be classified as 'suitable Brolga breeding habitat' (Primary IAP recommendation 2 and Biodiversity and habitat recommendation 2; Minister for Planning, 2023). These wetlands are displayed in Figure 12.

All of these wetlands have been reviewed under the current framework of the *Handbook* (DEECA 2025). Where this reassessment has resulted in the designation as a Breeding Wetland or Potential Breeding Wetland, it aligns with the Minister's recommendations to be 'suitable wetlands'. In these cases, they were provided with buffers as per guidance in the *Handbook*; a 300 m disturbance buffer (isolated Potential Breeding Wetland) or a 900 m foraging and disturbance buffer (Breeding Wetlands and associated Potential Breeding Wetlands). Where wetlands were found not to meet the criteria outlined in the *Handbook*, they were considered 'unsuitable wetlands' and not provided with a buffer. As noted by the Minister, some wetlands identified in the list were synonyms or erroneously included (e.g. wetland 25241 is 83 km away from WWF) – these are excluded from reassessment.

After undertaking the assessment process outlined in the *Handbook* (DEECA 2025), 14 wetlands were identified as 'suitable habitat' and four as 'unsuitable habitat'.

The following 14 wetlands were assessed as breeding/potential breeding habitat under the *Handbook* (see also Figure 12). **These wetlands meet both the Minister's recommendation and the Handbook's guidance to be considered 'suitable breeding habitat':**

- **Wetland W1** – this wetland is captured within DEECA's BBHSM and VWI layers (BBHSM 6681; VWI 25944). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Potential Breeding Wetland* (Appendix 4) and forms part of the Cockatoo Swamp-W4-6832 breeding cluster (Section 5.6). It does not meet the requirements for a Breeding Wetland, as the last recorded breeding event is from 1984, more than 20 years ago (Table 6). **Provided with a 900 m foraging and disturbance buffer.**
- **Wetland W3** – this wetland is captured within DEECA's BBHSM and VWI layers (BBHSM 6807; VWI 25677). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Potential Breeding Wetland* (Appendix 4), and it is isolated from other suitable wetlands. It does not meet the requirements for a Breeding Wetland, as there are no recorded breeding events associated with the wetland. **Provided with a 300 m disturbance buffer.**
- **Wetland W4** – this wetland is captured within DEECA's BBHSM and VWI layers (BBHSM 6829; VWI 25721). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Breeding Wetland* (Appendix 4) and forms part of the Cockatoo Swamp-W4-6832 breeding cluster (Section 5.6). **Provided with a 900 m foraging and disturbance buffer.**
- **Wetland W7** – this wetland is captured within DEECA's VWI layer (VWI 25936). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Potential Breeding Wetland* (Appendix 4), and it is isolated from other suitable wetlands. It does not meet the requirements for a Breeding Wetland, as there are no recorded breeding events associated with the wetland. **Provided with a 300 m disturbance buffer.**
- **Wetland W10** – this wetland is captured within DEECA's VWI layer (VWI 26046). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Potential Breeding Wetland* (Appendix 4), and forms part of the Cockatoo Swamp-W4-6832 breeding cluster (Section 5.6). It does not meet the requirements for a Breeding Wetland, as there are no recorded breeding events associated with the wetland. **Provided with a 900 m foraging and disturbance buffer.**
- **Wetland W12** – this wetland is part of the larger Cockatoo Swamp complex, with the specific section addressed by the Minister (26028), also known as W12c and W12e, being captured within DEECA's BBHSM and VWI layers (BBHSM 6727; VWI 26028). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Breeding Wetland* (Appendix 4) and forms part of the Cockatoo Swamp-W4-6832 breeding cluster (Section 5.6). **Provided with a 900 m foraging and disturbance buffer.**
- **Wetland 25729** – this wetland is captured within DEECA's VWI layer (VWI 25729). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Breeding Wetland* (Appendix 4) and forms an isolated breeding habitat outside of the Project Area (Section 5.6). **Provided with a 900 m foraging and disturbance buffer.**
- **Wetland 25741** – this wetland is captured within DEECA's VWI layer (VWI 25741). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Breeding Wetland* (Appendix 4) and forms an isolated breeding habitat outside of the Project Area (Section 5.6). **Provided with a 900 m foraging and disturbance buffer.**

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- **Wetland 25816** – this wetland is captured within DEECA's BBHSM and VWI layers (BBHSM 6903; VWI 25816). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Breeding Wetland* (Appendix 4) and forms part of the Wild Dog Swamp breeding cluster (Section 5.6). **Provided with a 900 m foraging and disturbance buffer.**
- **Wetland 25941** – this wetland is captured within DEECA's BBHSM and VWI layers (BBHSM 6634; VWI 25941). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Potential Breeding Wetland* (Appendix 4). It is adjacent to other suitable wetlands, but does not qualify for inclusion in the Cockatoo Swamp-W4-6832 breeding cluster (i.e. >2 km from breeding wetland). It does not meet the requirements for a Breeding Wetland, as there are no recorded breeding events associated with the wetland. **Provided with a 300 m disturbance buffer.**
- **Wetland FD2** – this wetland is captured within DEECA's BBHSM and VWI layers (BBHSM 6768; VWI 25933). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Potential Breeding Wetland* (Appendix 4), and it is isolated from other suitable wetlands. It does not meet the requirements for a Breeding Wetland, as there are no recorded breeding events associated with the wetland. **Provided with a 300 m disturbance buffer.**
- **Wetland FD16** – this wetland was not captured in existing DEECA wetland maps, rather it was identified through hydrological assessments for the WWF (Appendix 8). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Potential Breeding Wetland* (Appendix 4), and it is isolated from other suitable wetlands. It does not meet the requirements for a Breeding Wetland, as there are no recorded breeding events associated with the wetland. **Provided with a 300 m disturbance buffer.**
- **Wetland 12a** – this wetland was not captured in existing DEECA wetland maps, rather it was identified through hydrological assessments for the WWF (Appendix 8). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Potential Breeding Wetland* (Appendix 4), and it is isolated from other suitable wetlands. It does not meet the requirements for a Breeding Wetland, as there are no recorded breeding events associated with the wetland. Despite iterative turbine and layout adjustments, and due to other constraints, this wetland could not be avoided and so does not have a disturbance buffer (see detailed discussion in Section 5.7). Compensation measures to address residual impacts are discussed in Section 7.4.
- **Wetland W13** – this wetland was not captured in existing DEECA wetland maps, rather it was identified through hydrological assessments for the WWF (Appendix 8). Assessment of this wetland under the criteria outlined in the Handbook results in a classification as a *Potential Breeding Wetland* (Appendix 4), and forms part of the Cockatoo Swamp-W4-6832 breeding cluster (Section 5.6). It does not meet the requirements for a Breeding Wetland, as there are no recorded breeding events associated with the wetland. **Provided with a 300 m disturbance buffer.**

Four wetlands, when assessed under the criteria outlined in the Handbook, result in a classification as unsuitable habitat (see also Figure 12). **These do not meet the Minister's recommendations or the Handbook's criteria as 'suitable breeding habitat':**

- **Wetland 25710** – this wetland is captured in DEECA's VWI layer (VWI 25710). Assessments found that this wetland did not meet the 120-day inundation criteria due to the presence

of drains that direct water into the Cockatoo Swamp complex (Water Technology 2026). Under the criteria of the Handbook, this wetland does not qualify as a Potential Breeding Wetland, and as there are also no recorded breeding events associated with the wetland, it does not qualify as a Breeding Wetland (Appendix 4). This wetland is outside of the Project Area, encapsulated within the turbine-free buffer of the Cockatoo Swamp-W4-6832 breeding cluster, and approximately 2 km from the nearest turbine and infrastructure (Figure 12). **While not a suitable habitat, it is captured within buffers for other wetlands – no impacts are expected.**

- **Wetland 25731** – this wetland is captured in DEECA's VWI layer (VWI 25731). Assessments found that this wetland is a series of disconnected areas, which could only maintain water in small, disaggregated pools (Water Technology 2026). Modelled evaporation rates show that the pools would not retain water for 120 days during the Brolga breeding season (Water Technology 2026). Further, none of the series of small wetlands covers an area of 0.1 ha. Consequently, this wetland does not meet the criteria as a Breeding or Potential Breeding Wetland under the Handbook and is considered unsuitable for breeding Brolga. **Not provided with a buffer as it is unsuitable habitat. The nearest turbine is within approximately 210 m (Figure 12).**
- **Wetland 25932** – this wetland is captured in DEECA's VWI layer (VWI 25932). A statutory declaration stated that Brolga nesting at this wetland (Section 5.1). Photographic evidence did not support the presence of a nest, as images were of an immature Brolga without parents or a nest and did not show signs of typical habitat features (i.e. emergent vegetation used for nest construction). Field assessments did not locate any Brolga near this wetland in any year. Hydrological modelling found the wetland did not retain inundations for 120 days during the breeding season, with several significant drains preventing pooling (Water Technology 2026). The pools that may form are likely to be shallow and not retain water for a sufficient period due to evaporation and seepage (Water Technology 2026). There was insufficient evidence to corroborate the statutory declaration, with the wetland being assessed as unsuitable for breeding Brolga. **No provided with a buffer as it is unsuitable habitat. However, no impacts are expected as it is outside of the Project Area and approximately 1.9 km from the nearest turbine and 1.7 km from the nearest access track (Figure 12).**

Wetland FD21 – this area consisted of a farm dam and a surrounding wetland, which was not captured in existing DEECA wetland maps, rather it was identified through hydrological assessments for the WWF (Appendix 8). Hydrological Assessments found the wetland outside of the dam did not meet the 120-day inundation criteria, with drains preventing the pooling of water to a sufficient depth to retain surface water coverage for 120 days over the breeding season (Water Technology 2026). Under the criteria of the Handbook, this wetland does not qualify as a Potential Breeding Wetland, and as there are also no recorded breeding events associated with the wetland, it does not qualify as a Breeding Wetland (Appendix 4). **While not a suitable habitat, it is captured within buffers for other wetlands – no impacts are expected.**

Key wetlands identified for further assessment

The following wetlands were specified for further assessments (Primary IAP recommendation 2 and Biodiversity and habitat recommendation 3; Minister for Planning). Both of these wetlands were assessed by Water Technology (2024; Appendix 8), with outcomes summarised as:

- **Wetland 25698** – based on-site inspection, aerial photograph, and topographic information, this wetland is permanently drained (Water Technology, 2024). Two drains run from the centre of the wetland to the north and southeast. There are numerous other smaller drains that connect to these larger drains. All drains are actively functioning, well-maintained, and prevent the pooling of water. **This wetland is permanently drained and not a suitable Brolga wetland.**
- **Wetland 25668** – based on-site inspection, aerial photograph, and topographic information, this wetland is permanently drained with several drains preventing water from pooling (Water Technology, 2024). The boundary of this wetland was altered as the 2024 hydrological assessment found it to be an extension of VWI 26028, being a part of the upstream outer extent of the larger 26028. **This wetland is permanently drained and not a suitable Brolga wetland**

Buffering recommendations

The IAP and Minister recommended several processes to determine turbine-free buffer for all Brolga wetlands and functional wetlands (Biodiversity and habitat recommendation 1; Minister for Planning, 2023). This was intended to strengthen the protection of Brolga breeding habitat by adopting a consistent, habitat-based buffer framework that recognises the functional wetlands the same as breeding wetlands and incorporates an additional disturbance allowance within the overall turbine-free buffer.

In response to the Minister's recommendation, breeding home range delineation and turbine-free buffers have been revised in line with the Minister's Assessment and Appendix 2 of the Handbook (DEECA 2025):

- Buffers are measured from the wetland edge;
- A 900 m turbine-free buffer with an additional 86.5 m blade length setback, created from a 600 m foraging corridor and a 300 m disturbance buffer, was applied to all Breeding Wetlands; and
- The same framework is applied to both Breeding Wetland complexes and isolated Breeding Wetlands, ensuring consistency.

In accordance with Appendix 2, Breeding Wetlands and Potential Breeding Wetlands were identified using a structured methodology (Sections 4.5 and 5.6). Breeding home range buffers are based on confirmed breeding status and spatial connectivity, rather than applying buffers to all modelled or functional wetlands. This approach is both precautionary and aligned with the current government framework.

The revised buffers have informed turbine layout refinements, including removal and relocation of turbines to maintain required separation distances, as reflected in the amended permit application.

Works schedule and monitoring recommendations

The IAP and Minister recommended several processes to reduce disturbance during breeding season (Table 3, Biodiversity and habitat recommendation 5; Minister for Planning, 2023). This recommendation intends to manage the potential indirect impacts from construction-related disturbance, such as noise and human activities, during periods when Brolga are most sensitive.

This recommendation is adopted by WWF, with specific mitigation measures including scheduling of construction near suitable wetlands outside of the breeding season. Where this is not possible,

a monitoring program will be employed to monitor the presence of Brolga, with adaptive mitigation measures if they are within 300 m of activities. Quarry operations will also undergo measures to reduce disturbance, including that from fly-rock, vibration, noise, and air blasts. Monitoring at all nearby wetlands will occur when quarry blasting occurs during the breeding season.

Compensation plan recommendations

The IAP and Minister recommended that a compensation plan be formulated in consultation with DEECA (Table 3, Biodiversity and habitat recommendation 5b; Table B1, recommendation 6; Minister for Planning, 2023). This was intended to address any residual impacts on Brolga. This recommendation is aligned with the guidance within the Handbook (DEECA 2025).

The Handbook provides a structured pathway to determine the extent of compensation required and provides a list of approved measures. The Project has developed a Compensation Plan following the Handbook's process (see Section 7.4, with the Compensation Plan provided in Appendix 9). This plan will include monitoring to gauge the success of the Plan. As per the Handbook, this Plan is to be agreed to in consultation with DEECA. This meets the Minister's recommendation for a compensation plan.

Bat and Avifauna Management Plan recommendations

The IAP and Minister recommended that post-construction mortality monitoring be undertaken for at least five years from the commissioning of the first turbine (Table B1, recommendation 7; Minister for Planning, 2023). This recommendation was a precautionary measure to ensure that post-construction mortality monitoring is sufficiently robust to detect impacts and allow adaptive management in consultation with regulatory agencies.

This measure has been adopted by the Project, with a five-year initial carcass monitoring programme, with continued 12-month monitoring at five-year intervals (e.g. year 10, year 15, etc.) for the life of the project. This aligns with the guidance of the Handbook (DEECA 2025) and exceeds the Minister's recommendation of five years

Table 14: Summary of the Minister's Recommendations to the Willatook Wind Farm.

Minister's Recommendations (Minister for Planning, 2023)	Application to the proposed Willatook Wind Farm	Relevant step(s) in the mitigation hierarchy
All wetlands for which historical Brolga breeding records exist or which meet the criteria for suitable Breeding Wetlands in the <i>Draft Standards</i> , and which have not been shown to have been permanently drained, are to be considered Brolga Breeding Wetlands for the purposes of mapping breeding home ranges.	The current assessment adopts the <i>Handbook's</i> guidance for the classification of Breeding and Potential Breeding Wetlands (DEECA 2025b, p. 35): <i>"...the definition of a Brolga Breeding Wetland is: The nest of a Brolga breeding pair and the perimeter of the surrounding wetland. A Breeding Wetland also includes wetlands with the previous verified records of Brolga breeding nests from the Victorian Biodiversity Atlas (VBA) and Birdlife in the last 20 years."</i> The <i>Handbook's</i> guidance aligns largely with that of the Minister's Recommendations, with the exception that breeding records >20 years old are not captured. The <i>Handbook's</i> guidance is considered the most current best practice.	AV03

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Minister's Recommendations (Minister for Planning, 2023)	Application to the proposed Willatook Wind Farm	Relevant step(s) in the mitigation hierarchy
	In addition, the current assessment differentiates Breeding and Potential Breeding Wetlands, as per guidance in the Handbook. This does not follow the, now superseded, Interim guidelines used by the Minister. However, it aligns with current best practice and allows for the creation of appropriate buffering for each wetland use, as detailed in the Handbook.	
In consultation with DEECA BSW, Wind Prospect should map turbine-free buffers for Brolga Breeding Wetlands within the proposed wind farm, adopting home range dimensions of 600 m from the margins of all Breeding Wetlands and extending up to 2 km in the direction of other wetlands, and applying a further 300 m disturbance buffer to aggregated home ranges thus mapped.	Adopted by WWF and contained within the <i>Handbook</i> . No turbines, or their swept areas, are within the Breeding Wetland Buffers. Monitoring is proposed during construction to determine potential impacts, with adaptive management of any impacts contained within a BAM Plan that will be finalised with agreement from DEECA.	AV03, MM09-10
Isolated Breeding Wetlands with no other wetland within 2 km should also be mapped on the basis of a 600 m home range from the margins of the Breeding Wetland and a further 300 m disturbance allowance.	Adopted by WWF and contained within the <i>Handbook</i> . No turbines or other infrastructure are within isolated Breeding Wetlands. Monitoring is proposed during construction to determine potential impacts, with adaptive management of any impacts contained within a BAM Plan that will be finalised with agreement from DEECA.	AV03, MM09-10
All parts of a wind turbine including the sweep of turbine blades should be excluded from turbine free buffers.	All wind turbines, including the sweep of blades, are excluded from Breeding Wetland Buffers. One turbine (T31) and its swept area is within a Potential Breeding Wetland Buffer (wetland 12a). The full mitigation hierarchy was applied to this overlap, with a priority on avoidance. However, due to other constraints, it is not possible to completely avoid the wetland (see details in Section 5.7). Construction of these items will be undertaken outside of the breeding season to reduce the likelihood of disturbance. A Draft Compensation Plan (Odonata 2026b; Appendix 9) addresses the compensation requirements around these overlaps as per the <i>Handbook</i> . Monitoring is proposed during construction to determine potential impacts, with adaptive management of any impacts contained within a BAM Plan that will be finalised with agreement from DEECA.	AV03, MM02-05, MM07, MM09-10, C01-05

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Minister's Recommendations (Minister for Planning, 2023)	Application to the proposed Willatook Wind Farm	Relevant step(s) in the mitigation hierarchy
Construction works are to be avoided during the Brolga breeding period of July-November to avoid disturbance effects.	Construction works will be avoided between July and November where they intersect with any of the 300 m disturbance buffers of Breeding and Potential Breeding Wetlands. Further monitoring will be undertaken during construction to determine potential impacts, with adaptive management of any impacts contained within a BAM Plan that will be finalised with agreement from DEECA.	MM02, MM07, MM09-10
The collision casualty monitoring program proposed for the BAM Plan and the proposed Brolga Compensation Plan should respond to the specific findings in this assessment.	A BAM Plan and Compensation Plan have been drafted. These currently respond to the specific findings of the current assessment.	MM10, C01-05
This assessment should be provided to the Minister for Environment to consider the findings with respect to defining "permanently drained" wetlands, finalising the Draft Standards and considering reviewing the FFG Act Brolga Action Statement.	This assessment follows the <i>Handbook</i>, which clearly defines the criteria under which a wetland can be considered unsuitable (p. 41 in DEECA 2025b): ▪ A wetland that does not meet the required inundation requirements (>120-d) to allow Brolga fledging ▪ Wetlands less than 0.1 ha in size ▪ Permanent saline swamps, temporary saline swamps, saline marches and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record ▪ Wetlands that are now covered by a hardened, man-made surface (e.g. a road) and are no longer capable of holding water or functioning as a wetland or have been permanently drained. ▪ A mapped wetland that has been incorrectly identified as a wetland, and the mapped area is not capable of functioning as a wetland. Assessments of all wetlands within the investigation area are shown in Section 5.5 and Appendices 4 to 6.	Provided within this document as Appendices 4 to 6, and the <i>Handbook</i> (DEECA 2025b).

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8.1. Handbook guidance

The table below demonstrates how the mitigation measures within the Handbook are applied to the proposed Willatook Wind Farm (**Table 15**).

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Figure 12: Wetlands identified in the Minister's assessment

Project No: 16087.28

Project location: Willatook Wind Farm, VIC

Date: 31/07/2026

- Willatook WF boundary
- Turbine buffer - 86.5m
- Breeding wetland buffer
- Metmasts
- Turbines

Wetland assessment

- Breeding
- Potential breeding
- Unsuitable

Note: This map includes only wetlands specifically addressed in the Minister's recommendations and is not intended to represent all wetlands within the broader study area

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Source: Esri, Vantor, Earthstar Geographics, and the GIS User Community

Table 15: Application of the Handbook (DEECA 2025) to the Willatook Wind Farm.

Handbook's mitigation measures (DEECA, 2025b)	Application to the proposed Willatook Wind Farm	Relevant step(s) in the mitigation hierarchy
Avoidance of flocking areas Any turbine, building or other structure or thing used in or in connection with the generation of electricity by wind force and anemometers is prohibited within a Brolga flocking area. This includes any electricity transmission lines connecting the wind energy facility to the electricity network.	The Willatook Wind Farm has been located outside of both mapped and unmapped flocking areas. Assessment of flocking areas was undertaken as per guidance within the Handbook (see survey methods in Section 4).	AV01
Application of Breeding Wetland Buffers The Breeding Wetland Buffer must be applied to all wetlands that are Brolga Breeding Wetlands.	Breeding wetlands were buffered as outlined in the methods section and detailed in the <i>Handbook</i> (DEECA 2025b). Assessments informing these buffers include community consultation, use of existing records, and several years of detailed surveys, including aerial and on-ground observations (see survey methods in Section 4). Only underground cabling and new tracks overlap with the Breeding Wetland Buffers, which will be constructed outside the breeding season to prevent disturbance to breeding individuals. The use of the track will continue as it has been used historically, exclusively by light vehicles, with no increases in traffic volume being proposed. The track through the Breeding Wetland will not be used as a throughfare during construction of the rest of the wind farm. All other elements of the development footprint lie wholly outside the buffer.	AV03-05, MM02, MM07
Application of Potential Breeding Wetland Buffers The Potential Breeding Wetland Buffer must be applied to all Potential Breeding Wetlands, unless an alternative mitigation and compensation arrangement is agreed to the satisfaction of DEECA	Potential Breeding Wetlands were buffered as outlined in the methods section and detailed in the Handbook (DEECA 2025b). One Potential Breeding Wetland is not provided with a full turbine-free buffer (Wetland 12a, see Section 5.7). These impacts are addressed in the Draft Compensation Plan (Appendix 9), which will be finalised and implemented in agreement with DEECA. Construction activities within these wetlands will be scheduled outside of the breeding season to further reduce the likelihood of disturbance. Monitoring is proposed to be undertaken during construction to ascertain impacts on Brolga. Compensation measures are outlined in a Draft plan that will need finalisation with agreement from DEECA.	AV03 -05, MM02, MM07, MM09, C01-05

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<i>Handbook's mitigation measures (DEECA, 2025b)</i>	<i>Application to the proposed Willatook Wind Farm</i>	<i>Relevant step(s) in the mitigation hierarchy</i>
Location of transmission lines The use and development of land for a wind energy facility or an electricity transmission line (directly associated with a wind energy facility or to connect it to the national electricity network) is prohibited within a Breeding Wetland Buffer or a Potential Breeding Wetland Buffer unless the following conditions are met: ▪ The use or development is for underground cabling or an underground electricity transmission line (directly associated with a wind energy facility or to connect a wind energy facility to the national electricity network) and measures to minimise disturbance and habitat loss impacts for Brolga from construction activity are agreed to the satisfaction of DEECA and included within an approved Environmental Management Plan or Construction Environmental Management Plan for the wind energy facility ▪ The use or development of land is to maintain or upgrade an existing all-conditions internal access track or to construct a new all-conditions internal access track, provided the track: a) meets any engineering standards or requirements imposed as part of planning approval; and b) measures to minimise disturbance and habitat loss impacts for Brolga from construction activity, especially for Brolga Breeding Wetlands, are agreed to the satisfaction of DEECA and included within an approved Environmental Management Plan or Construction Environmental Management Plan for the wind energy facility.	The overhead transmission line was reduced from 4.5 km to ~ 300 m, which is located away from Breeding and Potential Breeding Wetlands, where the project connects to the Tarrone Terminal Station. The development proposed within the Breeding Wetland buffer is for underground cabling. Measures are in place to minimise disturbance and habitat loss impacts, including construction outside of the breeding season and siting of infrastructure to reduce hydrological alterations. Further measures will be implemented such as sediment, erosion and water quality management, and management of contaminated soils and pollutants. These measures will be detailed within a Construction Environmental Management Plan (CEMP) and agreed to with DEECA. The use of a section of track overlapping with the Breeding Wetland buffers (McGraths Road) is proposed to keep with existing use and will not involve upgrading or use during construction. Further, monitoring of Brolga during construction is proposed to ensure these measures are adequate to reduce impacts on Brolga. This copied document to be made available for the sole purpose of enabling its consideration and review as part of a planning process under the Planning and Environment Act 1987. The document must not be used for any purpose which may breach any copyright	AV05, MM01-07, MM09-10

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<i>Handbook's mitigation measures (DEECA, 2025b)</i>	<i>Application to the proposed Willatook Wind Farm</i>	<i>Relevant step(s) in the mitigation hierarchy</i>
Marking electricity transmission lines Collision with electricity transmission lines is an important source of anthropogenic mortality for many crane species and is a recognised cause of Brolga mortality. Marking electricity transmission lines to reduce collision mortality has been demonstrated to markedly reduce collision risk for other species of cranes. A range of bird flight diverter products are commercially available.	The overhead transmission line was reduced from 4.5 km to ~ 300 m, which is located away from Breeding and Potential Breeding Wetlands. The 300 m of overhead powerlines will be marked to increase visibility to Brolga and other fauna, in line with guidance in the Handbook. Marking of additional powerlines is proposed within the Draft Compensation Plan (Odonata 2026b; Appendix 9). The location and extent of such compensation measures will be finalised with agreement with DEECA.	MM06
Water regime management Implementing water regime management to maintain the health and accessibility of Brolga Breeding Wetlands and Potential Breeding Wetlands. This ensures that critical wetland habitats are preserved and available for Brolga, promoting breeding success.	The development has been sited to reduce hydrological alterations to the area, preserving current inundation patterns. The proponent also proposes measures to avoid erosion, sedimentation, and movement of contaminated soils and pollutants. The Draft Compensation Plan (Odonata 2026b; Appendix 9) proposes further measures to protect/enhance existing wetlands, restoration of drained wetlands, and modification of farm dams to increase habitat. These measures will be finalised with agreement with DEECA.	MM01-05, C02
Stock control and fencing Managing livestock and preventing overgrazing around Brolga Breeding Wetlands and Potential Breeding Wetlands through effective stock control can protect these sensitive areas from degradation, which is crucial for Brolga habitat preservation	The Draft Compensation Plan (Odonata 2026b; Appendix 9) proposes to research the ecological impacts of fencing on Brolga, evaluate alternative physical fence designs, and explore the potential future use of AI-enabled systems for dynamic fence management. These measures will be finalised with agreement with DEECA.	C03
Weed management Implementing a weed management plan to control invasive plant species around Brolga Breeding Wetlands and Potential Breeding Wetlands will help maintain the integrity of the wetlands and the natural vegetation Brolga rely on for food and shelter	The Draft Compensation Plan (Odonata 2026b; Appendix 9) proposes further measures to protect/enhance existing wetlands, restoration of drained wetlands, and modification of farm dams to increase habitat. These measures include weed management. Compensation measures will be finalised with agreement with DEECA.	C03

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Appendix 1: Community questionnaire

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Community Survey Questionnaire

Date:_____

Landholder's Name:_____

Property Address:_____

The aim of the following survey is to establish a broad-scale understanding of the environment on and around local landholder properties in the region through acquiring information such as; land use, historical land use, management practices, habitats and what flora and fauna are present. This information will inform the design and operation of Willatook Wind Farm.

LAND USE

What is the primary use for your land? E.g. cropping, grazing, mixed, alternating (indicate areas on map) – use attached spreadsheet

What broad land types exist on your land? E.g. arable, stony, aquatic, mixed, cleared (indicate on map) – use attached spreadsheet

How long have you owned or farmed the land? (Previous landowner if owned <5yrs)

History / previous land use? – use attached spreadsheet

(If sheep grazing) When and where does lambing typically occur?

Do you remove the carcasses of dead stock? If so, what is the process?

Do you artificially feed stock on your property? - use attached spreadsheet

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FLORA

Are there native plant communities / habitats on your property you are aware of?

Yes / No

What type? E.g. wetlands, woodlands, grasslands, rocky outcrops (indicate on map)

How do you manage these areas? (i.e. fencing stock, weed control)

Has there been changes to wetlands in and around your land? When, what caused this?
(i.e. drainage for cropping purposes)

Are you aware of any of the following threatened flora species on your property?

Matted Flax Lily Yes / No

Spiny Rice Flower Yes / No

Others?

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FAUNA

Are you aware of feral animals on your land? E.g. Rabbits and warrens, foxes, deer etc...

Do you manage feral animals on your land?

Yes / No

Are you aware of any of the following species on your land?

Wedge-tailed Eagle	Yes / No	Nests present?	Yes / No
Fat-tailed Dunnart	Yes / No		
Striped Legless Lizard	Yes / No		
Swamp Skink	Yes / No		
Growling Grass Frog	Yes / No		
Golden Sun Moth	Yes / No		
Brolga	Yes / No	Nests present?	Yes / No
Owl Species	Yes / No		
Snipe	Yes / No		
Roosting Owls	Yes / No		

Bats (followed-up with all participants):

Supplementary question: Are you aware of bat caves or bat daytime roosting areas in and around your property?

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BROLGA SPECIFIC

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Have Brolgas occurred on your land? Yes /no

Explain _____

For each sub-area (paddock) of your land subject to different land use histories, how often and in what numbers have you seen Brolgas?

Area No (see map)	1	2	3	4	5	6	7
>10 birds*							
5-10 birds							
3-5 birds							
1-2 birds							
None							
Never							
>20 yrs ago							
10-20 yrs ago							
<10 yrs ago							

* If more than 10, estimate actual observed numbers or range of numbers.

If yes to the above - locate areas on maps

Have there been changes in the wetlands in and around your land?

When ? What was the cause ?

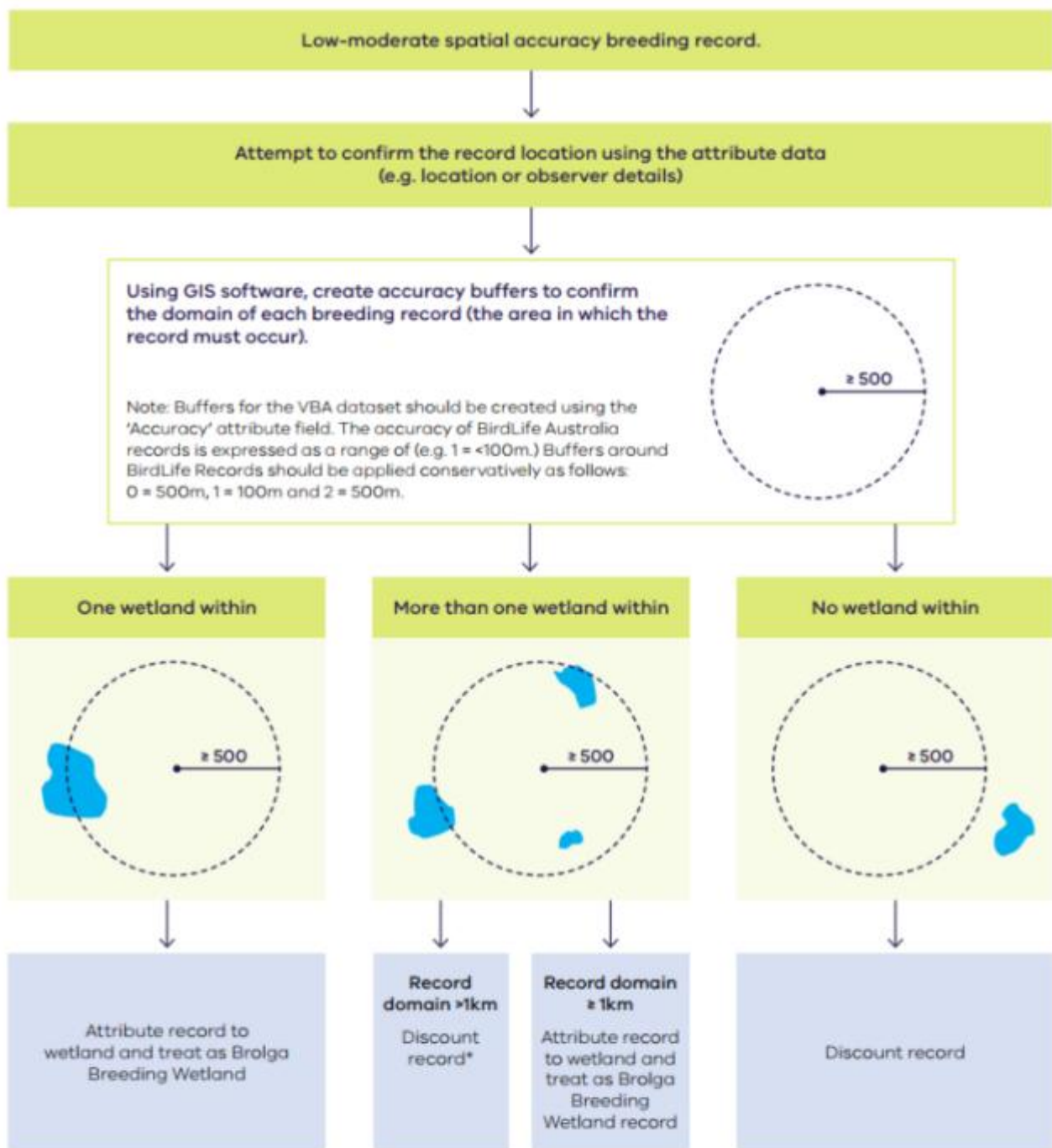
Confirmed Brolga Breeding on property? Yes / No

Confirmed Brolga Flocking on property? Yes / No

Additional Comments on Brolgas

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Appendix 2: Protocol for managing low-moderate accuracy breeding records (DEECA 2025)



* Records may be discounted if adequate evidence is provided to indicate the accuracy attribute is incorrect (e.g. confirmation of inaccuracy from observer or source literature report). Discounted records must be retained in Assessment Reports as unvalidated database records.

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Appendix 3: Summary of on-ground surveys by Nature Advisory 2018 to 2025

Year	Brolga Breeding Observations	Other Brolga Observations
2018	Breeding attempt at Wetland W4. The nest was flooded, and the breeding attempt failed to hatch any chicks. Breeding attempt at Wetland 25867 near Mt Misery Road. The pair successfully reared a chick to fledging. Breeding attempt at Wetland 25650 at Macarthur Wind Farm. The pair successfully reared a chick.	Nil
2019	Brolga returned to Wetland W4, where they successfully reared a young chick. They were observed foraging at W12c in July before breeding. A pair of Brolga at Macarthur Wind Farm in July observed foraging at Wetland 25699, noted as no breeding activity observed. A pair of Brolga with a chick observed at Wetland 25650, a nesting wetland was not confirmed, but suitable ones were nearby. Local land manager reported a pair of Brolga breeding in the St. Helens area. An adult pair reported with a young chick. Likely nesting site at Wetland 25894.	A pair of Brolga were observed by a local landholder foraging on seed along hay trails in the floodplain of the Moyne River early in the breeding season. No breeding activity was reported. A single Brolga was reported by a local landholder at Wetland 25906 in July. No Brolga were observed here for the rest of the year. Likely an immature bird roaming the landscape. A pair of Brolga observed foraging in October at Wetlands 25784 and 25788 along Muddy Dam Road, noted that no breeding activities were observed. A pair of Brolga were seen with last year's young bird foraging together at Wetland 25841 near Mt Misery Road. Seen on two occasions, August and November. Their breeding attempt this year was missed. This pair nested at Wetland 25867 the previous year.
2020	Brolga returned to Wetland W4, where they successfully reared a young chick. Observed foraging at W12w and W12e before nesting commenced. A pair heard duetting at Wetland 25829 at Pallisters Reserve. Likely breeding attempt. A pair of Brolga with a young chick was observed in December in the St Helens area near Wetland 25913. The breeding site was not confirmed. The Brolga pair at Macarthur Wind Farm were not monitored this year.	In June, a pair of Brolga were reported by a local landholder foraging in paddocks in the Moyne River floodplain. No breeding activity reported. Later in July, the pair were observed foraging at 25816 (Wild Dog Swamp), no breeding activity was observed. In June a pair observed foraging at Wetland 25797 along Muddy Dam Road. No breeding activity observed. In June, a pair observed foraging in a wetland south of Mt Misery Rd. Seen again in November, observed foraging near wetland 25868 near Mt Misery Road. No breeding activity observed.

Year	Brolga Breeding Observations	Other Brolga Observations
		In July, a pair observed foraging at wetland 25698 along the Tarrone North Road. No breeding activity observed.
2021	Brolga returned to Wetland W4, where they were observed sitting on a nest in August. The Brolga pair in the St Helens area was observed sitting on a nest in August at Wetland 25894. This wetland is likely to be the wetland the pair have been using to breed in previous years. Brolga returned to Wetland 25650 at Macarthur Wind Farm, where they were observed sitting on a nest in August.	A local landholder reported seeing a pair of Brolga foraging in a wetland on private property south of Riordans Road in June. This pair was likely to be the same pair breeding at Wetland W4 before they started breeding and were still roaming the landscape.
2022	Breeding attempts were not observed.	A pair of Brolga was found at a historically known nesting site near the north-west corner of Abrahams and Barkers Roads, Orford, in September (Wetland 25894).
2024	Brolgas were observed attempting to breed at wetland W12e during the September survey. The Brolgas were observed at a nest with one adult on the nest and the other foraging nearby. No chicks were observed.	The pair of Brolga was recorded at the same wetland (W12e) in October, but no breeding behaviour was observed. In September, a single adult Brolga was also observed foraging in shallow water at W12c. Given the proximity of the record to the nesting pair seen 500 m east earlier that day, it was likely that this individual is one of the breeding pair.
2025	Two adult Brolga (breeding pair) observed at Wetland 6832 (BBHSM 6832, VWI 25956). One sitting on a nest containing a single egg. The wetland was revisited the following day (24/09/25), and an additional egg had been laid (2 in total).	Two adult Brolga, foraging at the edge of the Cockatoo Swamp wetland (W12e). No nests observed. Male exhibiting active, lively behaviour in the wetland.

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Appendix 4: Wetland Analysis

Mapping Information			Assessment information			Assessment criteria										Assessment outcome									
BBHSM ID	VWI ID	Hydro ID	Hydrological assessment	Desktop assessment	Field assessment	Intersects flocking area?	Size >0.1 ha	Associated breeding records (y/n)			Has 120d inundation in 1 or more breeding seasons in 10 years? (only for natural wetlands, including those associated with farm dams)	If field assessed (y/n)			If desktop only (y/n)		Breeding Wetland	Potential Breeding Wetland	Do not require buffer	Remarks					
								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m height	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed									
6768	25933	FD2	n	y	y	n	y	n	n	n	unk	y	y	n/a				X		Insufficient evidence to exclude as Potential Breeding Wetland.					
6812			y	y	n	n	y	n	n	n	n				y	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.					
6814			y	y	n	n	y	n	n	n	n				y	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.					
6831	25952		y	y	y	n	y	n	n	n	n	y	y	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.					
6757	25957	W12 (W12w)	y	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.					
6794			y	y	n	n	y	n	n	n	n				n	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.					
6832	25956		y	y	y	n	y	y	n	y	y	y	y	n/a			X			Meets criteria as Breeding Wetland. Wetland extent updated with hydrological data.					
6846	25974		y	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.					

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Mapping Information			Assessment information			Assessment criteria											Assessment outcome						
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								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m height	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed							
6727	26028	W12 (W12e, W12c)	y	y	y	n	y	y	y	y	y	y	y	n/a			X			Meets criteria as Breeding Wetland. Wetland extent updated with hydrological data.			
	25989		y	y	y	n	y	n	n	n	n	n/a	n/a	n/a	n/a	n/a			X	Not a wetland (incorrect topographic representation)			
6829	25721	W4	y	y	y	n	y	y	y	y	y	y	y	n/a			X			Meets criteria as Breeding Wetland.			
6890			y	y	n	n	y	n	n	n	n				y	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.			
6916			y	y	n	n	y	n	n	n	n				y	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.			
6952			y	y	n	n	y	n	n	n	n				y	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.			
6974			y	y	n	n	y	n	n	n	n				y	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.			
6965			y	y	n	n	y	n	n	n	n				n/a	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.			

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Mapping Information			Assessm ent informati on	Assessment criteria										Assessment outcome									
BBHS M ID	VWI ID	Hydr o ID	Hydrological assessment	Desktop assessment	Field assessment	Intersects flocking area?	Size >0.1 ha	Associated breeding records (y/n)			Has 120d inundation in 1 or more breeding seasons in 10 years? (only for natural wetlands, including those associated with farm dams)	If field assessed (y/n)			If deskto p only (y/n)		Breeding Wetland	Potential Breeding Wetland	Do not require buffer	Remarks			
								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m heigh	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed							
6807	25677	W3	y	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.			
	25936	W7	y	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.			
	26046	W10	y	y	y	n	y	n	n	n	y	y	y	n/a				X		Sections of this wetland meet the criteria as a Potential Breeding Wetland.			
		12a	y	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland. This wetland was specifically assessed in Water Technology (2026), as meeting inundation requirements.			
		FD33	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.			
		FD21	y	y	y	n	y	n	n	n	n	y	y	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.			
		FD16	n	y	y	n	y	n	n	n	unk	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.			
6881			y	y	n	n	y	n	n	n	n				y	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.			
6903	25816	Wild Dog Swamp	y	y	y	n	y	y	unk	unk	y	y	y	n/a			X			Meets criteria as Breeding Wetland.			
8201			n	y	n	n	y	n	n	n	unk				y	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.			
6468			n	y	n	n	y	n	n	n	unk				y	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.			

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Mapping Information			Assessment information			Assessment criteria										Assessment outcome				
BBHS M ID	VWI ID	Hydro ID	Hydrological assessment	Desktop assessment	Field assessment	Intersects flocking area?	Size >0.1 ha	Associated breeding records (y/n)			Has 120d inundation in 1 or more breeding seasons in 10 years? (only for natural wetlands, including those associated with farm dams)	If field assessed (y/n)			If desktop only (y/n)		Breeding Wetland	Potential Breeding Wetland	Do not require buffer	Remarks
								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m height	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed				
6709			y	y	n	n	y	n	n	n	n				y	n			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.
6612			n	y	n	n	y	n	n	n	unk				y	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.
6710			y	y	n	n	y	n	n	n	n				n	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.
6681	25944	W1	y	y	y	n	y	y	y	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.
6634	25941		y	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.
6636			n	y	n	n	y	n	n	n	unk				n	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.
6654			n	y	n	n	y	n	n	n	unk				y	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.
6673			n	y	n	n	y	n	n	n	unk				y	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.
6641 and 6647			n	y	n	n	y	n	n	n	unk				unk	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland. Wetlands combined as one considering hydrological boundaries.
6622	25908		y	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.
6637	25906		y	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.

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								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m height	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed									
6633	25891		y	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.					
6650	25872		n	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.					
6596	25873		n	n	y	n	y	n	n	n	unk	y	y	n/a				X		Insufficient evidence to exclude as Potential Breeding Wetland.					
6665			n	y	n	n	y	n	n	n	unk				n	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.					
6818	25887		n	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.					
6796	25846		n	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.					
6544	25900		n	y	y	n	y	n	n	n	unk	y	y	n/a				X		Insufficient evidence to exclude as Potential Breeding Wetland.					
6532	25892		n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.					
6519	25903		n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.					
6862	25868		n	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.					
6851			n	y	n	n	n	n	n	n	unk				n	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.					
6702	25788		n	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.					
6726	25784		n	y	y	n	y	n	n	n	unk	y	y	n/a				X		Insufficient evidence to exclude as Potential Breeding Wetland.					

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								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m height	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed									
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6752	25797		n	y	y	n	y	n	n	n	unk	y	y	n/a				X		Insufficient evidence to exclude as Potential Breeding Wetland.					
6795	25792		n	y	y	n	y	n	n	n	unk	y	y	n/a				X		Insufficient evidence to exclude as Potential Breeding Wetland.					
6850	25806		n	y	y	n	y	n	n	n	unk				y	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.					
6971			n	y	n	n	y	n	n	n	unk				y	y		X		Insufficient evidence to exclude as Potential Breeding Wetland.					
6993	25859		n	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.					
7057	25895		n	y	y	n	y	n	n	n	unk				y	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.					
7029	25918		n	y	y	n	y	n	n	n	unk	unk	unk		y	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.					
7001			n	y	n	n	y	n	n	n	unk				y	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.					
7191			n	y	n	n	y	n	n	n	unk				unk	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.					
7226			n	y	n	n	y	n	n	n	unk				y	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.					
7187			n	y	n	n	y	n	n	n	unk				unk	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.					
6644			n	y	n	n	y	n	n	n	unk				unk	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.					
7005			n	y	n	n	n	n	n	n	nr				y	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland. See further discussion in Appendix 6.					

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								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m height	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed									
7006			n	y	n	n	n	n	n	n	unk				y	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.					
		W13	y	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.					
	25729		n	y	y	n	y	y	n	y	unk	y	y	n/a			X			Meets criteria as Breeding Wetland.					
	25741		n	y	y	n	y	y	n	y	y	y	y	n/a			X			Meets criteria as Breeding Wetland.					
	25841	Bartlett Swamp	n	y	y	n	y	y	y	n	unk	y	y	n/a				X		Insufficient evidence to exclude as Potential Breeding Wetland.					
	25867		n	y	y	n	y	y	n	y	unk	y	y	n/a			X			Meets criteria as Breeding Wetland.					
	25932		y	y	y	n	y	y	unk	unk	n	y	y	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria. This wetland was specifically assessed in Water Technology (2026), as not meeting inundation criteria.					
		1	y	y	y	n	y	y	n	y	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.					
	25947		y	y	y	n	y	n	n	n	n	unk	unk	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.					

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								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m height	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed									
	25949		y	y	y	n	y	n	n	n	n	unk	unk	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.					
	25969		y	y	y	n	y	n	n	n	n	y	y	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.					
	25964		y	y	y	n	y	n	n	n	n	n/a	n/a	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.					
	25710		y	y	y	n	y	n	n	n	n	unk	unk	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria. This wetland was specifically assessed in Water Technology (2026), as not meeting inundation criteria.					
	25731		y	y	y	n	y	n	n	n	y	y	y	n/a					X	Series of small, disaggregated areas, which retain some water but due to the discontinuous nature of the patches have a high evaporation and would not remain inundated for extended periods. Further, areas that retain water at shallow depth are all less than 0.1 ha, not fulling the size requirements.					
	25686		y	y	y	n	y	n	n	n	n	n/a	n/a	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.					
	25698		y	y	y	n	y	n	n	n	n	y	y	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.					
	25700		n	y	y	n	y	n	n	n	n	unk	unk	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, permanently drained.					

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								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m height	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed								
	26035	5a	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, permanently drained.				
	26036		y	y	y	n	y	n	n	n	n	unk	unk	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.				
	26037		y	y	y	n	y	n	n	n	n	unk	unk	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.				
	25639		y	y	y	n	y	n	n	n	n	y	y	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.				
	26034		y	y	y	n	y	n	n	n	n	unk	unk	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.				
	26038		y	y	y	n	y	n	n	n	n	unk	unk	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.				
	25672		y	y	y	n	y	n	n	n	n	unk	unk	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.				
	25696		y	y	y	n	y	n	n	n	n	unk	unk	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.				

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								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m heigh	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed						
	25879		n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, permanently drained.		
	26047		n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, permanently drained.		
	25920		y	y	y	n	y	n	n	n	n	unk	unk	n/a	y	n/a			X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.		
	25922		y	y	y	n	y	n	n	n	n	y	y	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.		
	26026	FD5	n	y	y	n	y	n	n	n	n	y	y	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
	25955	FD3	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
	25950		n	y	y	n	y	n	n	n	unk	unk	unk	n/a	y	n/a		X		Insufficient evidence to exclude as Potential Breeding Wetland.		
	25972		n	y	y	n	n/a	n	n	n	n	n/a	n/a	y					X	Does not meet criteria of Breeding or Potential Breeding Wetland, not a wetland (plantation).		
	25962		n	y	y	n	y	n	n	n	unk	unk	unk	n/a				X		Insufficient evidence to exclude as Potential Breeding Wetland.		
	25724		n	y	y	n	y	n	n	n	unk	unk	unk	n/a				X		Insufficient evidence to exclude as Potential Breeding Wetland.		
	25728		n	y	y	n	y	n	n	n	unk	unk	unk	n/a				X		Insufficient evidence to exclude as Potential Breeding Wetland.		

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Mapping Information			Assessment information		Assessment criteria										Assessment outcome					
BBHS M ID	VWI ID	Hydro ID	Hydrological assessment	Desktop assessment	Field assessment	Intersects flocking area?	Size >0.1 ha	Associated breeding records (y/n)			Has 120d inundation in 1 or more breeding seasons in 10 years? (only for natural wetlands, including those associated with farm dams)	If field assessed (y/n)			If desktop only (y/n)		Breeding Wetland	Potential Breeding Wetland	Do not require buffer	Remarks
								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m height	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed				
		FD37	n	y	y	n	y	n	n	n	n	y	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.
		FD36	n	y	y	n	y	n	n	n	n	y	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.
		FD34	n	y	y	n	y	n	n	n	n	y	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.
		FD35	n	y	y	n	y	n	n	n	n	y	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.
		FD32	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.
		FD28	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.
		FD29	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.
		23a	y	y	y	n	y	n	n	n	n	unk	unk	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, particularly inundation criteria.
		FD31	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.
		FD30	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.
		FD27	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.
		FD26	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.

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Mapping Information			Assessm ent informati on			Assessment criteria										Assessment outcome						
BBHS M ID	VWI ID	Hydr o ID	Hydrological assessment	Desktop assessment	Field assessment	Intersects flocking area?	Size >0.1 ha	Associated breeding records (y/n)			Has 120d inundati on in 1 or more breedin g seasons in 10 years? (only for natural wetland s, includin g those associa ted with farm dams)	If field assessed (y/n)			If deskto p only (y/n)		Breeding Wetland	Potential Breeding Wetland	Do not require buffer	Remarks		
								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m heigh	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed						
		W5	y	y	y	n	n	n	n	n	y	y	y	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
		FD38	n	y	y	n	y	n	n	n	n	y	y	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
		FD22	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
		FD19	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
		FD24	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
		FD13	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
		FD25	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
		FD23	n	y	y	n	y	n	n	n	unk	y	y	n/a				X		Insufficient evidence to exclude as Potential Breeding Wetland.		
		FD10	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
		FD6	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
		FD8	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
		FD7	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		
		FD9	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.		

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Mapping Information			Assessment information			Assessment criteria										Assessment outcome				
BBHS M ID	VWI ID	Hydro ID	Hydrological assessment	Desktop assessment	Field assessment	Intersects flocking area?	Size >0.1 ha	Associated breeding records (y/n)			Has 120d inundation in 1 or more breeding seasons in 10 years? (only for natural wetlands, including those associated with farm dams)	If field assessed (y/n)			If desktop only (y/n)		Breeding Wetland	Potential Breeding Wetland	Do not require buffer	Remarks
								Any record?	Older than 20 yrs	Equal or less than 20 yrs		Emergent Veg <1m height	Emergent plants	Trees (if present) are interspersed	Some vegetation within/ surrounding	Trees (if present) are interspersed				
		FD11	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.
		FD1	n	y	y	n	y	n	n	n	n	n	n	n/a					X	Does not meet criteria of Breeding or Potential Breeding Wetland, farm dam without breeding records or observations.
		Orford 100	y	y	y	n	y	n	n	n	y	y	y	n/a				X		Meets criteria as Potential Breeding Wetland.

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ADVERTISED PLAN

Appendix 5: Descriptions for wetlands within 5 km of the Willatook Wind Farm site

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New DEECA ID	VWI ID	Map ID	Breeding records	Habitat Description
6768	25933	FD2	None	A farm dam is present but no historical Brolga breeding records. Medium sized wetland has been drained and dammed though still holds good cover of water and emergent vegetation. Grazed by sheep, Black Swan nested here.
6812			None	Desktop assessment only. Drainage lines cross the wetland. Patchy vegetation within and around the wetland. No trees. No visible water.
6814			None	Desktop assessment only. Drainage line crosses the wetland. Patchy vegetation within the wetland. No trees. No visible water.
6831	25952		None	Large wetland partially drained, surface water present in parts, started to dry in October and little surface water remaining by November due to drainage. Black Swan nesting though was not enough water to sustain them. Sparse emergent vegetation, grazed by sheep.
6757	25957	W12 (W12w)	None	The majority of this mapped wetland is part of the Shaw River and is choked by Cumbungi and is not suitable for Brolga. At the eastern section of the mapped wetland there is a floodplain that is plausible for Brolga breeding. This section had a good cover of water and emergent vegetation throughout the breeding season.
6794			None	Desktop assessment only. Drainage line crosses the wetland. No visible vegetation within or around the wetland border. Some vegetation in the surroundings. No trees. No visible water.
6846	25974		None	Medium sized wetland with good cover of surface water and emergent vegetation. It was inundated throughout the breeding season. Black Swan nesting on the wetland, grazed by cattle and sheep, many waterbirds congregating.
6727	26028	W12 (W12e, W12c)	1984 (VBA), Nature Advisory 2024	Very large and expansive wetland known as Cockatoo Swamp where the Shaw River flows through this swamp and had good cover of surface water and emergent vegetation. Was inundated up until November started drying out in December, Black Swan nesting here, many waterbirds and frogs present. Grazed by cattle. The hydrology assessment modified the wetland boundary from the VWI wetland layer, receding in the southern section due to drainage, receding in the central section due to elevation and extending to the west to include a flood plain of the Shaw River. All Brolga observations from 2024 were at this wetland only. Most likely only a pair. The Cockatoo Swamp comprising all sections of the W12 wetland complex was the only area within the study area that reliably retained water in 2024, so even during particularly dry years.
6727	25989		None	Not a wetland, mapped wetland is in a rocky rise area.
6829	25721	W4	2010 (EHP) 2018 & 2019 (VBA & Nature Advisory), 2020 & 2021 (Nature Advisory)	Large wetland has a drain running into it. Had surface water throughout the breeding season.
6832	25956		2025 (Nature Advisory)	Large wetland that is mostly permanently drained. Surface water in the east and west of wetland mapped, emergent vegetation in wet areas, grazed by sheep and cattle. A Brolga pair were found on a nest containing 2 eggs during the 2025 surveys.
6890			None	Desktop assessment only. Few patches of vegetation. Looks heavily trampled by cattle. No trees. No visible water.
6916			None	Desktop assessment only. Drainage lines cross the wetland. Fringing vegetation and scattered patches within the wetland. No trees.
6952			None	Desktop assessment only. Dammed wetland. Some potential vegetation within and around the wetland. No trees. Only the dam holds water.
6974			None	Desktop assessment only. Drainage line crosses the wetland. Patchy and scattered vegetation within the wetland. No trees. No visible water.
6965			None	Desktop assessment only. Drainage lines cross the wetland. Dense vegetation within the wetland. No trees. No visible water.
6807	25677	W3	None	Large swamp had water throughout the breeding season, many waterbirds and frogs congregate here throughout the wet season. Partly fenced, some parts grazed by sheep and cattle.
	25936	W7	None	Suitable Brolga habitat. Small wetland with good cover of surface water, aquatic vegetation emerged in September, water levels started to recede in October. Grazed by sheep.
	26046	W10	None	Large wetland on the VWI wetland layer, has a series of drains running through it, surface water patchy, only really in 1m wide drainage lines. The hydrology assessment outlined a small section of 5.95ha of this wetland that would hold water long enough to support Brolga breeding indicated as W10. This wetland crosses a property boundary and is quite different habitat on each side. The north side is dominated by Poa Tussock Grass with scattered sedges while the southern side is dominated by pasture grasses. Northern section is wetter. Potential to provide Brolga breeding habitat in a one in ten-year flood on the northern property only of W10. Only a very small section of wetland 26046 is considered likely to provide suitable breeding habitat.
		12a	None	Wetland identified through the hydrology assessment, not a mapped VWI wetland. Wetland covered in poa tussock grass and sedges, meets minimum criteria in size. May provide habitat during a one in ten-year flooding event only.
		FD33	None	Farm dam
		FD21	None	Farm dam is too small, unlikely to support breeding Brolga most years, during a one in ten-year flooding event the wetland would extend into the pasture dominated by Poa Tussock Grass and sedges. May provide Brolga breeding habitat in a one in ten-year flood.
		FD16	None	The dam does overflow in spring and has emergent vegetation. A pair of Brolga were observed foraging here in July 2020, believed to be the pair that nest at wetland W4. Overflow is dominated by Poa Tussock and sedges, grazed by sheep.
6881			None	Desktop assessment only. Drainage lines cross the wetland. Potential dense patchy vegetation within the wetland and/or trampled soil. Scattered fringing vegetation. No trees. No visible water.

New DEECA ID	VWI ID	Map ID	Breeding records	Habitat Description
6903	25816	Wild Dog Swamp	Date not stated (landholder)	This site (Wild Dog Swamp) is a large wetland that holds a lot of water during the breeding season. Many waterbirds congregate here and many Black Swan breed here. While Brolga were not confirmed to breed here during the past four years during monitoring, the wetland is of high quality and considered to provide suitable breeding habitat and Brolga are considered likely to breed here in the future.
8201		Wild Dog Swamp (south)	None	Desktop assessment only. Drainage lines cross the wetland. Vegetation is notably sparser and limited compared to the northern section (BBHSM: 6903). No trees. No visible water.
6468			None	Desktop assessment only. Dammed wetland. Drainage lines cross the wetland. Scattered vegetation. No trees. Only the dam holds water.
6709			None	Desktop assessment only. Dammed wetland. Drainage line crosses the wetland. Dam densely surrounded by trees. Only the dam holds water.
6612			None	Desktop assessment only. Dammed wetland. Some fringing vegetation around the dam, which matches the boundaries of the modelled BBHSM wetland. Only the dam holds water.
6710			None	Desktop assessment only. Drainage lines cross the wetland. Patchy vegetation within the wetland. No trees within the wetland but a few next to the southern border (part of roadside vegetation). No visible water.
6681	25944	W1	1984 (VBA)	This is an old breeding record, the wetland has been well drained since, with deep channels running through the wetland. No surface water present through the breeding season surveys. Grazed by cattle. This wetland was once large though has very deep channels draining it. No waterbirds observed here throughout the surveys. Drainage line to the south is deep with high walls. Inundation period, the size of the wetland and presence of aquatic vegetation suggest a functional wetland. Hydrology analysis indicates that it may become inundated in a one in ten-year flood to support Brolga.
6634	25941		None	Medium sized wetland with good cover of surface water and emergent vegetation throughout the breeding season. Cattle excluded for majority of the breeding season only seen grazing in September.
6636			None	Desktop assessment only. Drainage lines cross the wetland. No visible vegetation within or around the wetland border. No trees. No visible water.
6654			None	Desktop assessment only. Dammed wetland. One large dam and one small one. Some fringing vegetation around the small dam. No trees apart from roadside trees nearby. Only the dam holds water.
6673			None	Desktop assessment only. Drainage lines cross the wetland. Potential vegetation within the wetland. No trees. No visible water.
6641			None	Desktop assessment only. Drainage lines cross the wetland. No identifiable vegetation. No trees. No visible water.
6622	25908		None	Medium sized wetland held water throughout the breeding season, good cover of emergent vegetation. Black Swan nesting.
6637	25906		None	Small wetland held water throughout the breeding season, good cover of emergent vegetation from September, grazed by sheep. Landholder reported a single Brolga the week prior in July 2019. Not here during any visits during field work.
6633	25891		None	Medium sized wetland has a drain running through it though still held water throughout the breeding season, emergent vegetation present from September, grazed by sheep
6650	25872		None	A farm dam has been dug in the middle of the wetland; dam has flooded creating a wetland. Emergent vegetation present in shallow areas. Many waterbirds present throughout the assessment (but can hold water for an entire breeding season besides the farm dam?)
6596	25873		None	Wetland has been partially drained, surface water only present in 1/6 of mapped wetland. The smaller wetland did have good cover of emergent vegetation and held water for the breeding season. Some waterbirds throughout the survey.
6665			None	Desktop assessment only. Well/pit with several drainage lines crossing the wetland. Transformed into pasture. No trees. No visible water.
6818	25887		None	There are a series of three wetlands, they held water throughout the breeding season and had a good cover of emergent vegetation, grazed by sheep.
6796	25846		None	Medium sized wetland that held water throughout the breeding season in 2019, had emergent vegetation, was ungrazed during breeding season though was on a dairy farm. Black Swan nesting here. An immature Brolga was observed foraging here on one day in 2018.
6544	25900		None	Small wetland, patchy emergent vegetation.
6532	25892		None	Permanently drained, no native vegetation.
6519	25903		None	Permanently drained, pasture, grazed by cattle.
6862	25868		None	Wetland has been drained on west side of road, surface water only on east side of road. The wetland has a good cover of surface water and emergent vegetation. Held water throughout the breeding season, Black Swan nesting here and many waterbirds congregating. Grazed by sheep at times.
6851			None	Desktop assessment only. Dammed wetland (two dams). The boundaries of the modelled BBHSM wetland are all within the larger dam (no vegetation). Only the dams holds water.
6702	25788		None	Medium sized wetland held water throughout the breeding season. Vegetation started emerging in August and had a good cover of vegetation from September to December. Grazed by sheep for most of the season.
6726	25784		None	Medium sized wetland, it is drained and does not hold water for as long as the other three wetlands nearby. Was grazed by sheep early in the season. Good cover of emergent vegetation throughout the breeding season.
6752	25797		None	Large wetland with drainage lines running through it. Is made up of three main pools of water connected by the drainage lines. Good cover of emergent vegetation, rushes, sedges and tussock grass. Sheep grazing and Black Swan nesting.

New DEECA ID	VWI ID	Map ID	Breeding records	Habitat Description
6795	25792		None	A small dam surrounded by Blue Gum plantation and a row of cypress pine trees. Some emergent sedges in dam, ungrazed
6850	25806		None	Small wetland with a road dissecting it. Drained on north side of road, surface water only on south side of road. Fenced and ungrazed. Too small to support a breeding pair of Brolga.
6971			None	Desktop assessment only. Within tree plantation. Some vegetation, but also seems to include some interspersed trees. Planting lines over the wetland area. No visible water.
6993	25859		None	Wetland is surrounded by Blue Gum plantation, held water throughout the breeding season and had emergent vegetation
7057	25895		None	Wetland is surrounded by Blue Gum plantation, was dry during aerial survey, unlikely to hold water long enough to support breeding Brolga.
7029	25918		None	Wetland has been drained though still holds some water approximately 50% surface water. Grazed.
7001			None	Desktop assessment only. Within tree plantation. Dense vegetation within and around the wetland. Trees surrounding most of the wetland footprint. No visible water.
7191			None	Desktop assessment only. Drainage lines cross the wetland. No identifiable vegetation. No trees. No visible water.
7226			None	Desktop assessment only. Two wetland sections with some dense patches of vegetation within the wetland footprint and scattered fringing vegetation. No trees. No visible water.
7187			None	Desktop assessment only. No identifiable vegetation. No trees. No visible water.
6644			None	Desktop assessment only. Drainage line crosses the wetland. No identifiable vegetation. No trees. No visible water.
6647			None	Desktop assessment only. No identifiable vegetation. No trees. No visible water.
7005			None	Desktop assessment only. Within tree plantation. Dense vegetation within and around the wetland. Trees surrounding most of the wetland footprint. This is only a small section next to wetland BBHSM 7001. No visible water.
7006			None	Desktop assessment only. Within tree plantation. Few scattered vegetation within the wetland. Trees surrounding the entire wetland footprint. Planting lines. No visible water.
		W13	None	Wetland has many drains in it, mostly drained though some drains silted up. Dominated by Poa Tussock Grass and sedges, soils were saturated with wetland herbs present. Surface water covers 1% in drains.
	25729		Approximately 2013 (landholder)	Small wetland fenced off from stock and well vegetated.
	25741		2017 (landholder)	Small isolated wetland, partially drained though still holds water for long periods during the breeding season and has emergent vegetation. This wetland is a small wetland that had some surface water at the time and a lot of emergent vegetation.
	25841	Bartlett Swamp	1984 (VBA)	This is a large wetland locally known as Bartlett Swamp. It has been drained and only held water and significant water in August 2019, was dry by October. Has many drainage lines running through it now, does hold water certain times of year though did not hold water for long enough during the Brolga breeding season in 2018 and 2019. Brolga have been seen foraging in this wetland. Grazed by cattle and sheep some emergent vegetation.
	25867		2018 (Nature Advisory)	This wetland was located within a Blue Gum plantation. Was harvested with last few years, replanted in 2018. Medium sized wetland with cumbungi covering a lot of it and also water ribbon and other aquatic plants. Located in a harvested Blue Gum plantation block that had been recently planted with Blue Gum tube stock.
	25932		Date not stated (landholder)	Isolated wetland with many drains running through it. Wetland had limited emergent vegetation and was grazed by sheep.
		1	2005 (landholder, VBA)	The hydrology assessment did not identify this wetland, and the land contains several drainage lines that make flooding unlikely, even in years when the creek overtops its banks. This area is unlikely to provide resources to successfully rear young.
	25947		None	Permanently drained, holds very little water. Several drainage lines.
	25949		None	Large wetland though has been drained, does not hold water long enough to support breeding pair of Brolga. Wetland mapping is incorrect wetland more to the north.
	25969		None	Medium sized wetland that has been partially drained. Emergent vegetation was present and was grazed by cattle and sheep. Does not hold water long enough to support breeding Brolga.
	25964		None	No wetland in area mapped.
	25710		None	Small tussock swamp, partially filled in July, holding water in August and September, only had water in drainage lines from October, dry by December. Grazed by cattle or sheep at times.
	25731		None	Ephemeral tussock swamp, shallow water from July to September, dry by December. Some patches of sedges, grazed by cattle. Hydrological assessment indicates highly fragmented inundation, likely insufficient to support a continuous wetland system.
	25686		None	Permanently drained, pastureland. Drainage lines look old but classified as drained based on the hydrological assessment.
	25698		None	Permanently drained, surface water patchy in July, no surface water in August. Reeds and sedges present, grazed by cattle. Several drainage lines.
	25700		None	Wetland is permanently drained, surface water patchy (field assessment). Tussock grass present and grazed by cattle.
	26035	5a	None	Permanently drained (field assessment), some surface water at eastern side, no emergent vegetation, grazed by cattle.
	26036		None	Permanently drained, surface water only present in drainage lines, pasture, grazed by cattle. Drainage line crossing the entire wetland.
	26037		None	Not identified in the hydrological assessment. Permanently drained based on field assessment, pasture, grazed by cattle.
	25639		None	Permanently drained, surface water only present in drainage line for a short time, usually no surface water. Sedges in northern section and heavily grazed by cattle.
	26034		None	Permanently drained, grazed by cattle. Drainage lines and road crossing.

New DEECA ID	VWI ID	Map ID	Breeding records	Habitat Description
	26038		None	Permanently drained, surface water only in drainage lines, pasture, grazed by cattle.
	25672		None	Permanently drained. Drainage lines.
	25696		None	Medium sized tussock swamp, surface water only in northern section, grazed by cattle. LiDAR results indicated it does not hold water long enough to support Brolga.
	25879		None	Permanently drained, no emergent vegetation. Drainage lines and pastures.
	26047		None	Permanently drained, no emergent vegetation. Drainage lines and pastures.
	25920		None	Wetland surrounded by Blue Gum plantation. Brolgas typically avoid areas with dense tree cover and gum plantations. The hydrological assessment did not identify this wetland, and the AEP (Annual Exceedance Probability) mapping did not indicate this area as subject to flooding.
	25922		None	Small wetland has been drained, limited emergent vegetation, too small and isolated to support a breeding pair of Brolga.
	26026	FD5	None	Wetland has been dammed, no emergent vegetation, grazed by cattle, some aquatic vegetation to the north of dam.
	25955	FD3	None	Wetland has been drained and dammed. Dam very small and has no aquatic vegetation. Area too small to support a breeding pair of Brolga.
	25950		None	Wetland surrounded by Blue Gum plantation. Brolgas typically avoid areas with dense tree cover and gum plantations. No hydrological assessment available, so a precautionary classification was applied due to limited information. Buffering is not relevant, as the area is outside the Project boundary and surrounded by trees.
	25972		None	No wetland present, Blue Gum plantation.
	25962		None	This wetland is partially drained and is 20% smaller than what is mapped. Surrounded by Blue Gum plantation on the northern edge. No hydrological assessment available, so a precautionary classification was applied due to limited information.
	25724		None	Wetland has been drained, no surface water during surveys, poa tussock grassland, grazed by sheep and cattle (field assessment). No waterbirds. No hydrological assessment available, so a precautionary classification was applied due to limited information.
	25728		None	Tussock swamp did not hold any water from September 2018. Unlikely that it will hold water long enough to support a breeding pair of Brolga. No hydrological assessment available, so a precautionary classification was applied due to limited information.
		FD37	None	Farm dam
		FD36	None	Farm dam
		FD34	None	Farm dam
		FD35	None	Farm dam
		FD32	None	Farm dam
		FD28	None	Farm dam
		FD29	None	Farm dam
		23a	None	Farm dam
		FD31	None	Farm dam
		FD30	None	Farm dam
		FD27	None	Farm dam
		FD26	None	Farm dam
		W5	None	Patchy with lots of drainage, most has been permanently drained. 1% surface water cover at time of field assessment and all restricted to drainage line. Dominated by pasture grasses, Poa Tussock Grass and sedges. No waterbirds. .
		FD38	None	Farm dam
		FD22	None	Farm dam
		FD19	None	Farm dam
		FD24	None	Farm dam
		FD13	None	Farm dam
		FD25	None	Farm dam
		FD23	None	Farm dam
		FD10	None	Farm dam
		FD6	None	Farm dam
		FD8	None	Farm dam
		FD7	None	Farm dam
		FD9	None	Farm dam

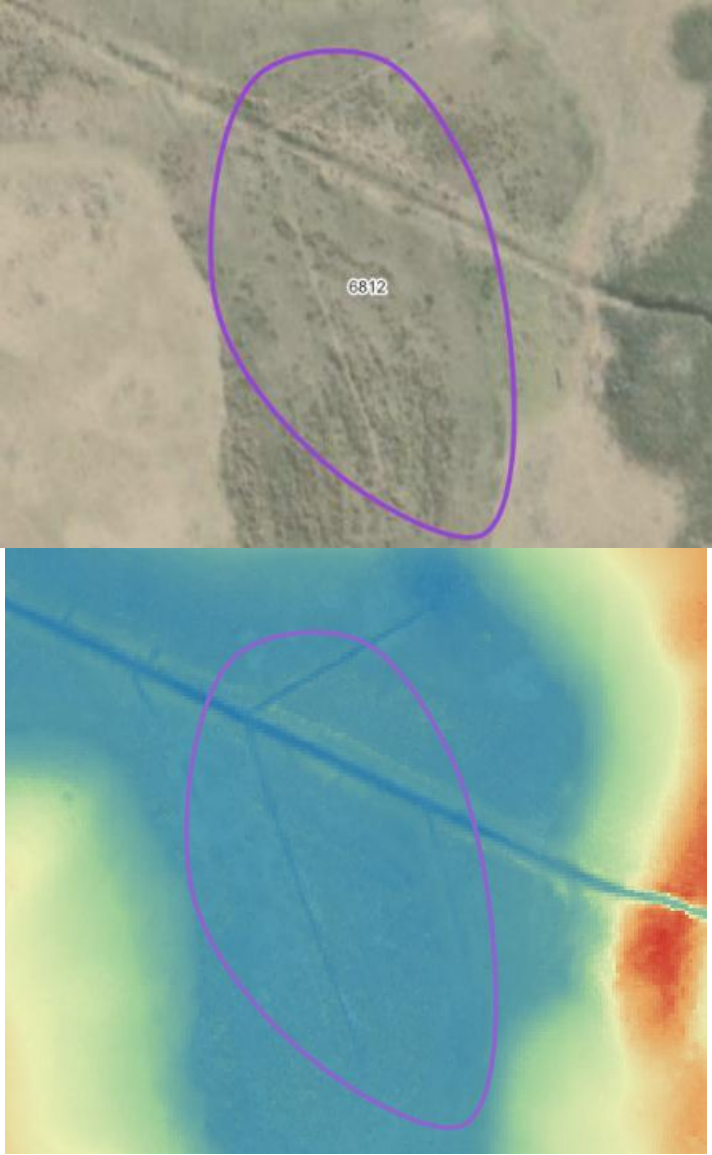
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New DEECA ID	VWI ID	Map ID	Breeding records	Habitat Description
		FD11	None	Farm dam
		FD1	None	Farm dam
		Orford 100	None	Farm dam

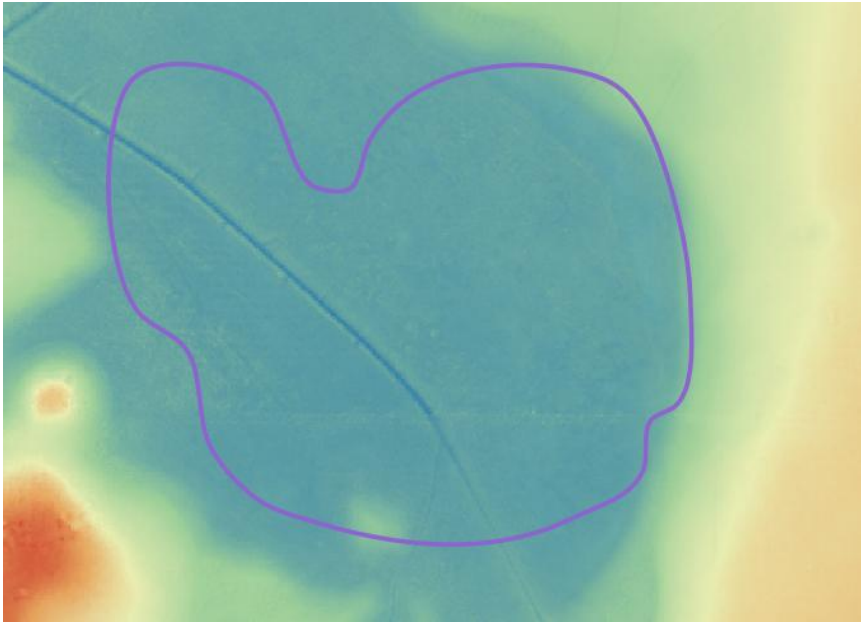
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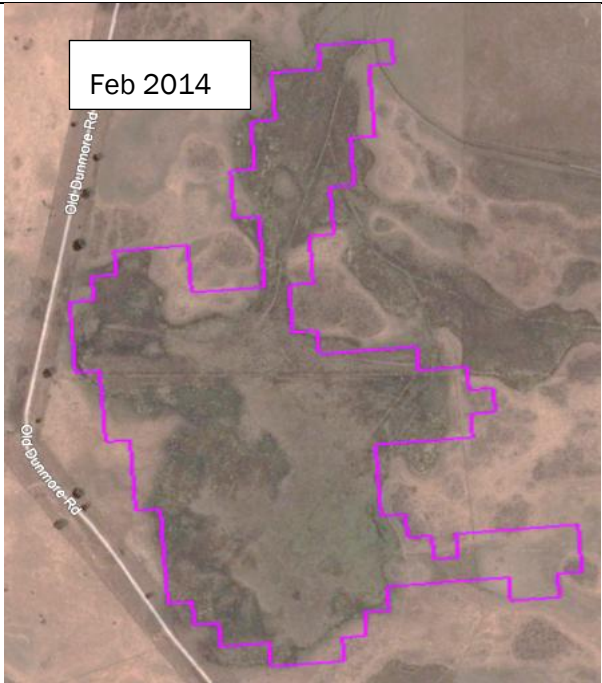
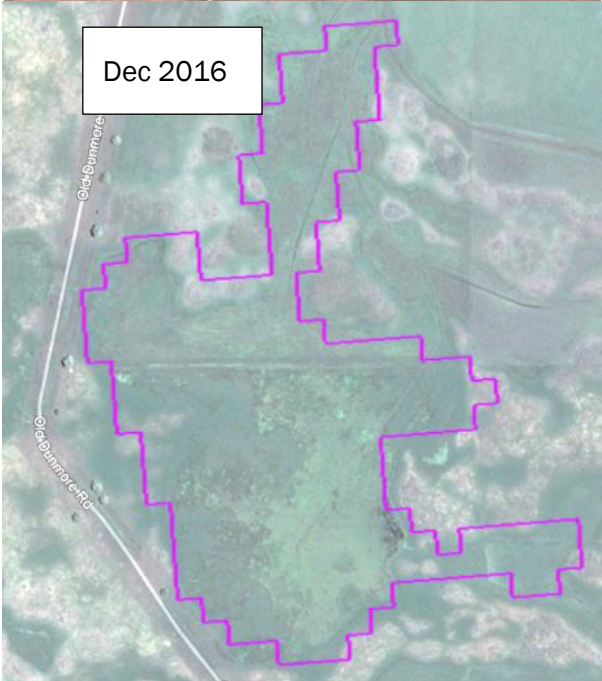
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Appendix 6: Exclusion of Brolga Breeding Habitat Suitability Model Wetlands

Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6812 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: YES	Hydrological modelling shows that this wetland is not able to hold water for more than 120 days during the breeding season. There are constructed channels that show clearly on both satellite and LiDAR imagery. The desktop assessment shows there are several man-made channels, which are likely to drain the wetland.	Yes.	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	Not applicable.	May temporarily hold water at times, such as during wet periods, but does not function as a wetland suitable for Brolga breeding largely due to man-made drainage lines.	Some vegetation is visible on remote imagery within and surrounding the wetland's boundary. No trees are visible within the boundary.	

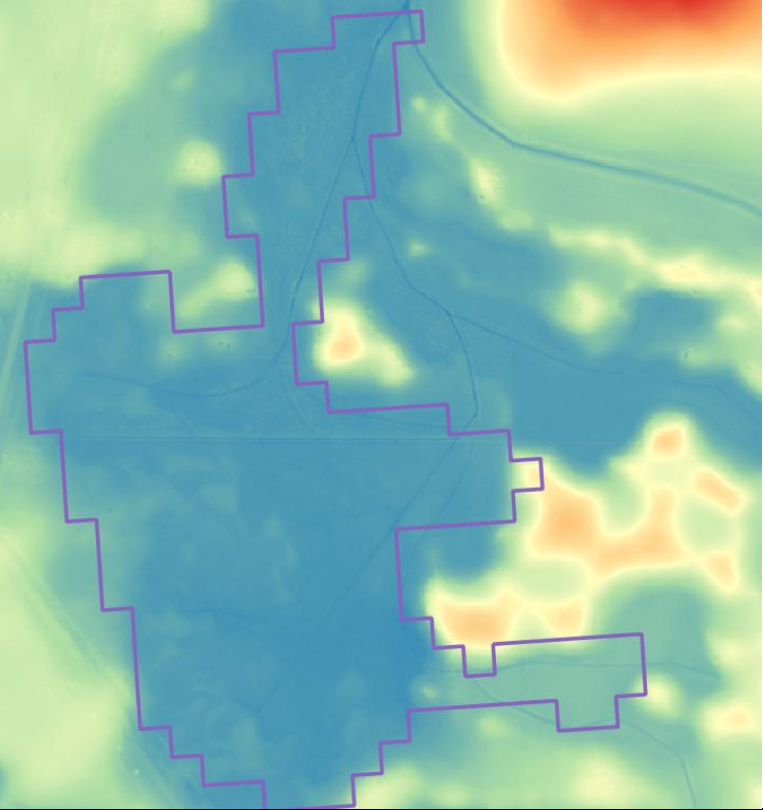
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Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6814 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: YES	Hydrological modelling shows that this wetland is not able to hold water for more than 120 days during the breeding season. There are constructed channels that show clearly on both satellite and LiDAR imagery. The desktop assessment shows there are several man-made channels, which are likely to drain the wetland.	Yes.	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	Not applicable.	May temporarily hold water at times, such as during wet periods, but does not function as a wetland suitable for Brolga breeding largely due to man-made drainage lines.	Some vegetation is visible on remote imagery within and surrounding the wetland's boundary. No trees are visible within the boundary.	 

BBHSM: 6831 VWI: 25952	Desktop assessment: YES Field assessment: YES Hydrological modelling: YES	Hydrological modelling shows that this wetland is not able to hold water for more than 120 days during the breeding season. There are constructed channels that show on both satellite and LiDAR imagery. These channels are in the low points of the wetland. The desktop and field assessments show there are several man-made channels, which are likely to drain the wetland. Remote imagery from 2016 and 2019 (both above-average rainfall during breeding season; BOM 2016, 2019) shows that some water was retained in a small section of the wetland. Field assessments in 2019 confirmed partial inundation from mid-July to mid-October. There was sufficient water in September for a Black Swan to nest, but the nest failed by October due to receding water levels.	Yes.	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	Not applicable.	May temporarily hold water at times, such as during wet periods, but does not function as a wetland suitable for Brolga breeding largely due to man-made drainage lines.	Some vegetation present, largely as tussock-forming Poa species.	Feb 2014  Dec 2016 
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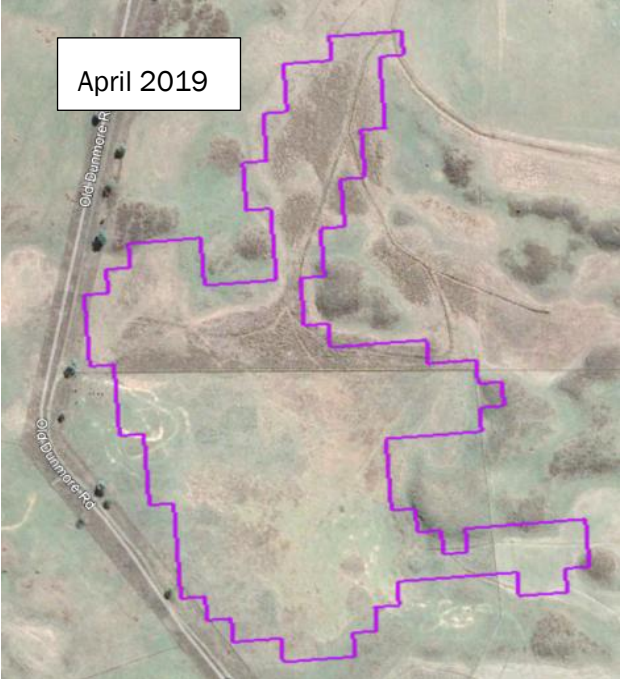
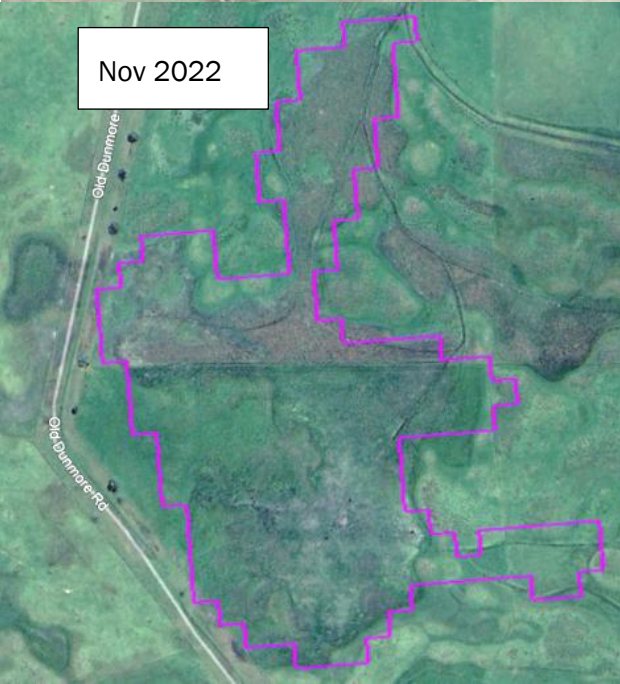
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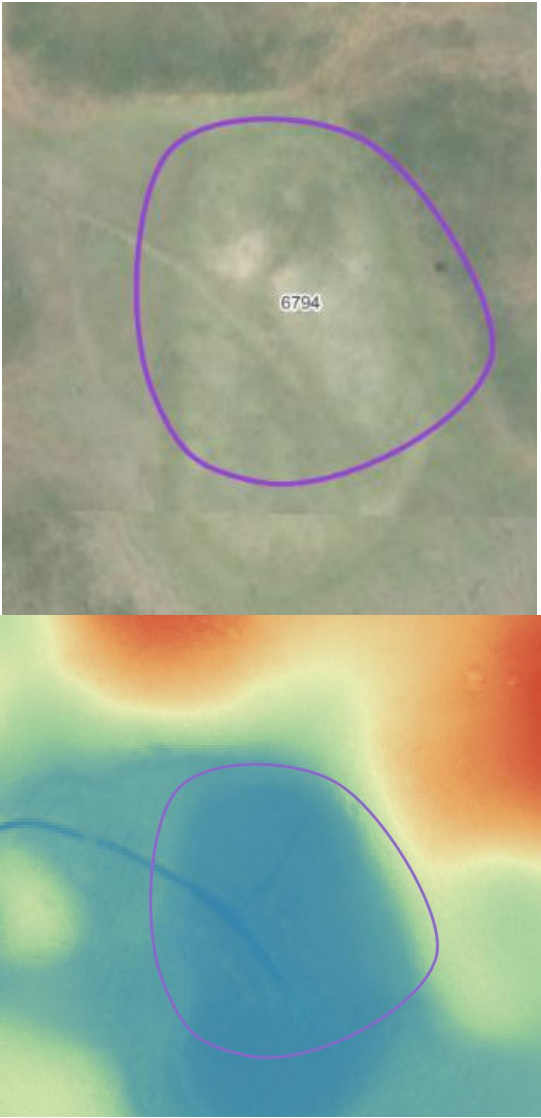
Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
								

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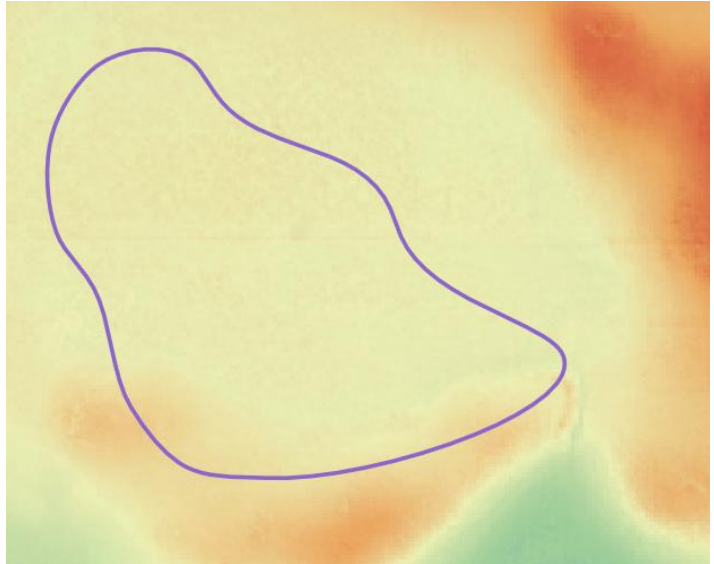
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Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
								April 2019  Nov 2022 

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Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6794 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: YES	Hydrological modelling shows that this wetland is not able to hold water for more than 120 days during the breeding season. There are constructed channels that show on both satellite and LiDAR imagery. The desktop and field assessments show there are several man-made channels, which are likely to drain the wetland.	Yes.	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	Not applicable.	May hold water at times, such as during wet years, but does not function as a wetland suitable for Brolga breeding largely due to man-made drainage lines.	Some vegetation is visible on remote imagery within and surrounding the wetland's boundary. No trees are visible within the boundary.	

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Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6890 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: YES	Hydrological modelling shows that this wetland is not able to hold water for more than 120 days during the breeding season. The wetland is drained at its outlet, which is constructed and clearly shows in the LiDAR in the southeast corner. The desktop and field assessments show there are no periods during which remote imagery showed inundation of the wetland.	Yes.	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	Not applicable.	May hold some water in a small waterhole in the centre, but the area does not function as a wetland suitable for Brolga breeding.	Some vegetation is visible on remote imagery within and surrounding the wetland's boundary. No trees are visible within the boundary.	 

Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6916 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: YES	Hydrological modelling shows that this wetland is not able to hold water for more than 120 days during the breeding season. There are constructed channels that show on both satellite and LiDAR imagery. The desktop and field assessments show there are several man-made channels, which are likely to drain the wetland.	Yes.	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	Not applicable.	May hold water at times, such as during wet years, but does not function as a wetland suitable for Brolga breeding largely due to man-made drainage lines.	Some vegetation is visible on remote imagery within and surrounding the wetland's boundary. No trees are visible within the boundary.	

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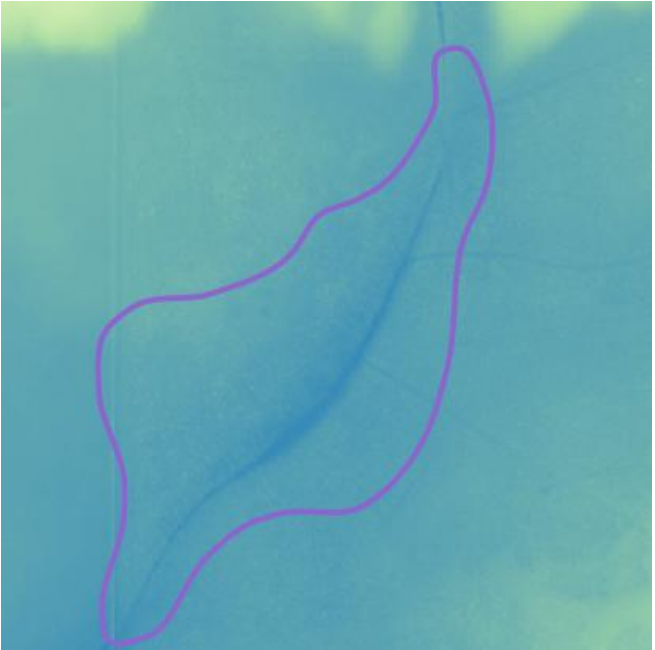
Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6952 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: YES	Hydrological modelling shows that the farm dam holds water, but the surrounding wetland is not able to hold water for more than 120 days during the breeding season. This wetland is dammed at its invert and has a limited catchment, limited to its immediate surrounds. The desktop and field assessments show there are no periods during which remote imagery showed inundation of the wetland.	Yes.	This is a farm dam with no surrounding wetland. No existing records or observed incidences of breeding Brolga.	Not applicable.	Holds water as a man-made dam, with the surrounding area not functioning as a wetland.	Some vegetation is visible on remote imagery within and surrounding the wetland's boundary. No trees are visible within the boundary.	 

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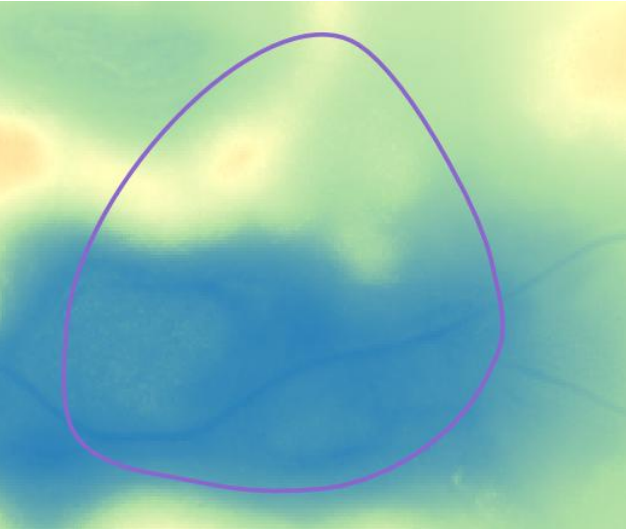
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Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6974 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: YES	Hydrological modelling shows that this wetland is not able to hold water for more than 120 days during the breeding season. There are constructed channels that show on both satellite and LiDAR imagery. This channel runs from the wetland invert. The desktop and field assessments show there are several man-made channels, which are likely to drain the wetland.	Yes.	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	Not applicable.	May hold water at times, such as during wet years, but does not function as a wetland suitable for Brolga breeding largely due to man-made drainage lines.	Some vegetation is visible on remote imagery within and surrounding the wetland's boundary. No trees are visible within the boundary.	

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Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6965 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: YES	Hydrological modelling shows that this wetland is an incorrect topographic representation and is not able to hold water for more than 120 days during the breeding season. There are constructed channels that show on both satellite and LiDAR imagery. This channel runs from the wetland invert The desktop and field assessments show there are several man-made channels, which are likely to drain the wetland.	Yes	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	Not applicable.	May temporarily hold some water at times, such as during wet periods, but does not function as a wetland suitable for Brolga breeding largely due to man-made drainage lines.	Some vegetation is visible on remote imagery within and surrounding the wetland's boundary. No trees are visible within the boundary.	 

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Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6881 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: YES	Hydrological modelling shows that this wetland is not able to hold water for more than 120 days during the breeding season. There are constructed channels visible in the satellite and LiDAR imagery. These channels run from the wetland invert and drain the wetland. The desktop and field assessments show there are several man-made channels, which are likely to drain the wetland.	Yes.	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	Not applicable.	May temporarily hold some water at times, such as during wet periods, but does not function as a wetland suitable for Brolga breeding largely due to man-made drainage lines	Some vegetation is visible on remote imagery within and surrounding the wetland's boundary. No trees are visible within the boundary.	 

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Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6709 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: YES	Hydrological modelling shows that the farm dam holds water, but the surrounding wetland is not able to hold water for more than 120 days during the breeding season. There are constructed drainage lines visible within the satellite and LiDAR imagery. Only the dam holds water. The desktop and field assessments show there are no periods during which remote imagery showed inundation of the wetland.	Yes.	This is a farm dam with no surrounding wetland. No existing records or observed incidences of breeding Brolga.	Not applicable.	Holds water as a man-made dam, with the surrounding area not functioning as a wetland due to alterations, including a drainage line.	Minimal emergent vegetation, with that present largely being larger trees and shrubs.	

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Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6710 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: YES	Hydrological modelling shows that this wetland is not able to hold water for more than 120 days during the breeding season. The LiDAR shows that the topography does not appear to be a wetland, with a constructed drain also present to the west. The desktop and field assessments show there are several man-made channels, which are likely to drain the wetland.	Yes	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	Not applicable.	May temporarily hold some water at times, such as during wet periods, but does not function as a wetland suitable for Brolga breeding largely due to man-made drainage lines	Appears largely cropped.	

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Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6532 VWI: 25892	Desktop assessment: YES Field assessment: YES Hydrological modelling: NO	Field and desktop assessments show drainage lines and the lack of standing water. No hydrological modelling was undertaken at this wetland, but due to prominent constructed drainage lines, it is unlikely to meet the inundation requirements of 120 days through any of the last 10 years of breeding seasons.	Yes	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	Not applicable.	May temporarily hold some water at times, such as during wet periods, but does not function as a wetland suitable for Brolga breeding largely due to man-made drainage lines	Appears to be largely cropped.	

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Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6519 VWI: 25903	Desktop assessment: YES Field assessment: YES Hydrological modelling: NO	Field and desktop assessments show drainage lines and the lack of standing water. No hydrological modelling was undertaken at this wetland, but due to prominent constructed drainage lines, it is unlikely to meet the inundation requirements of 120 days through any of the last 10 years of breeding seasons.	Yes	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	Not applicable.	May temporarily hold some water at times, such as during wet periods, but does not function as a wetland suitable for Brolga breeding, largely due to man-made drainage lines	Little to no emergent vegetation. Appears to be cropped.	

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Wetland ID	Assessment details	Criteria to define wetlands that do not require the Potential Breeding Wetland Buffer					Comments	Imagery
		Criterion 1: Wetlands that do not meet the 120-d inundation period during any of the last 10 breeding seasons.	Criterion 2: Wetlands ≥ 0.1 ha	Criterion 3: Permanent saline swamps, temporary saline swamps, saline marshes and meadows, estuaries, high country peatlands and intertidal flats and farm dams that do not have a known breeding record.	Criterion 4: Wetlands that are now covered by a hardened, man-made surface and are no longer capable of holding water or functioning as a wetland or have been permanently drained.	Criterion 5: A Mapped wetland that has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.		
BBHSM: 6851 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: NO	This likely meets the inundation criteria as it is a man-made farm dam. Dams appear to have been present since at least 2007, with the number and size increasing with subsequent development.	The BBHSM boundary shows a <0.1 ha wetland. However, this is incorrect, with the dam being much larger and consisting of 4 separate man-made dams (totally to ~ 0.9 ha).	This is a farm dam with no surrounding wetland and no existing records or observed incidences of breeding Brolga.	Not applicable.	Holds water as a man-made dam, with the surrounding area not functioning as a wetland due to alterations, including a drainage line.	This area appears to have contained some potential habitat in 2007. Subsequent developments have largely removed suitable habitats.	
BBHSM: 7005 VWI: n/a	Desktop assessment: YES Field assessment: NO Hydrological modelling: NO	This wetland is unlikely to meet the inundation criteria, as it is incorrectly identified as a wetland. Note that the nearby wetland (7001) may retain water and so has been included conservatively as a potential wetland.	The BBHSM boundary shows a <0.1 ha wetland. However, this wetland is likely an error in the geometry of the BBHSM layer, likely being an extension of wetland 7001. Combined, they are >0.1 ha.	Not applicable. Noting that there are also no existing records or observed incidences of breeding Brolga.	This wetland is mapped across a hardened track. It is no longer capable of holding water or functioning as a wetland.	Unlikely to hold water or be capable of functioning as a wetland.	Some vegetation is visible on remote imagery within and surrounding the wetland's boundary. No trees are visible within the boundary.	

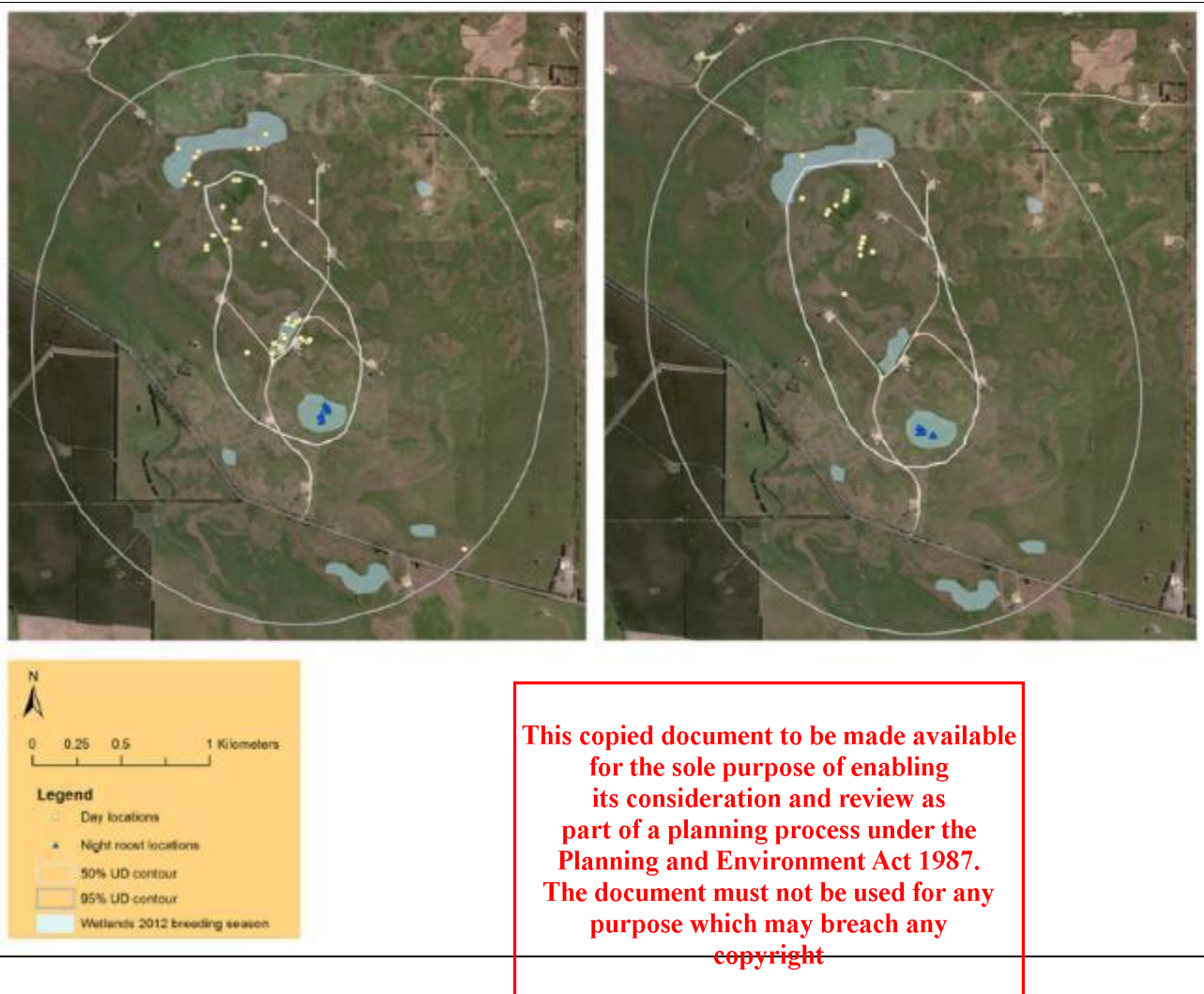
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Appendix 7: Observations of the Brolga pair that regularly nest and forage at Macarthur Wind Farm

A pair of Brolga regularly breed at the Macarthur Wind Farm site in two different wetlands surrounded by turbines. Monitoring activities have been undertaken in the past decade since the wind farm has become operational. Below are the results of the monitoring activities that have been undertaken.

Wetland 25650

This wetland is surrounded by three turbines all within 290 metres from the edge of the Breeding Wetland.



Appendix figure 1: Monitoring undertaken during the 2012 breeding season (Source: Figure 3 in Veltheim *et al.* 2019)

Appendix figure 1: above shows the results of the satellite tracking of pre-fledged Brolga chicks at the Macarthur wind farm. Brolga were recorded foraging within 80 metres of the base of one of the turbines.

Appendix figure 2 below shows the results of a monitoring exercise undertaken by Nature Advisory during the 2018 breeding season. Points were recorded of adult birds every two hours while monitoring over 13 days from 5 September to 21 October 2021. Birds were observed foraging within 150 m from the base of a turbine. Similarly, Veltheim found that at the start of the breeding season the Brolga pair were confined to areas around the Breeding Wetland. Later in the breeding season the birds moved further from the Breeding Wetland to the northwest.



Appendix figure 2: Monitoring undertaken by Nature Advisory at the nearby Macarthur Wind Farm.

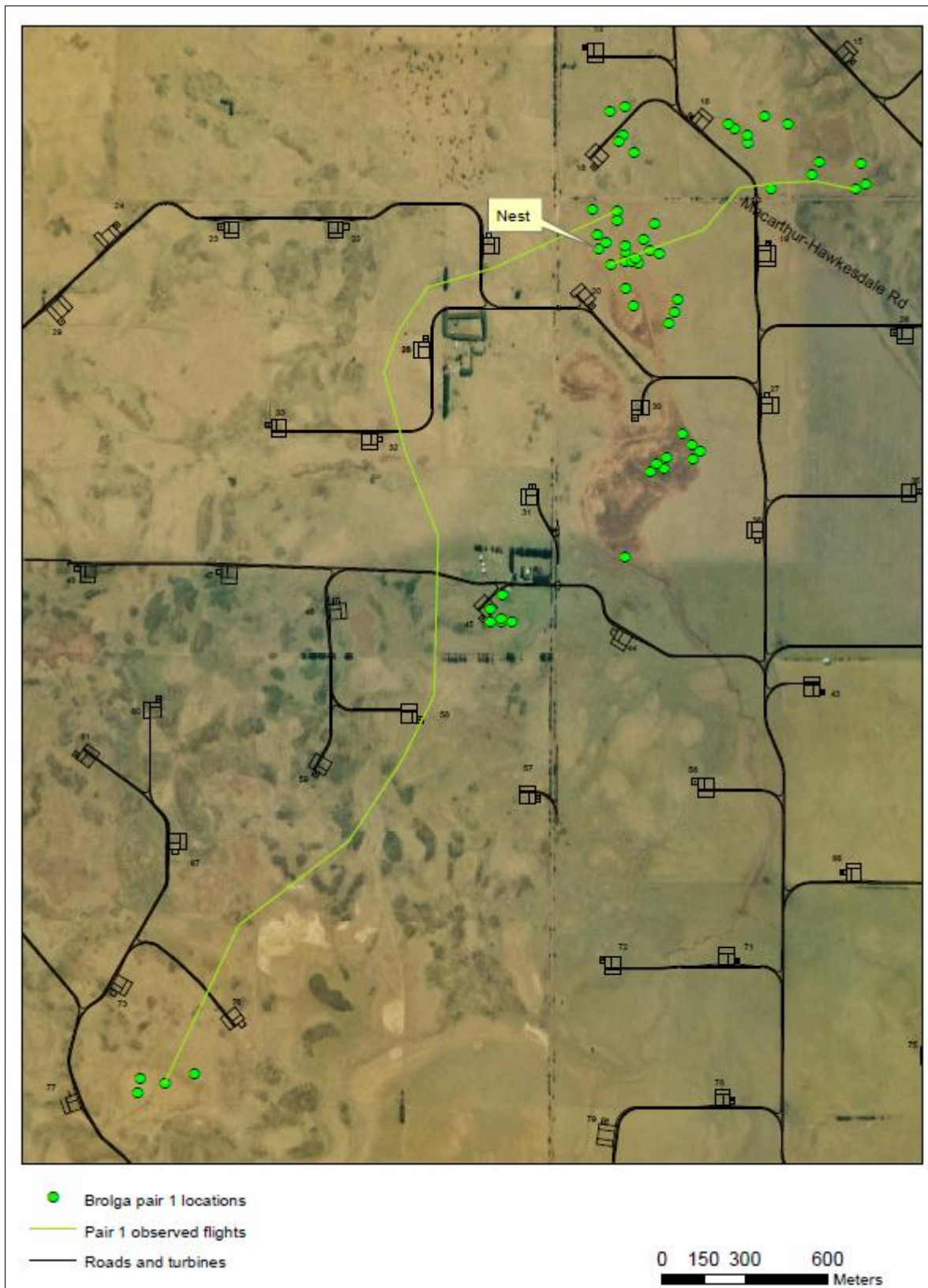
Wetland 25699

This wetland is surrounded by six turbines all within 420 metres from the edge of the Breeding Wetland.

Appendix figure 3 below shows the results of the Brolga monitoring during the 2014 breeding season. It shows that Brolga were foraging on the hard stand under turbine 45 within 50 metres of the base of the operating tower.

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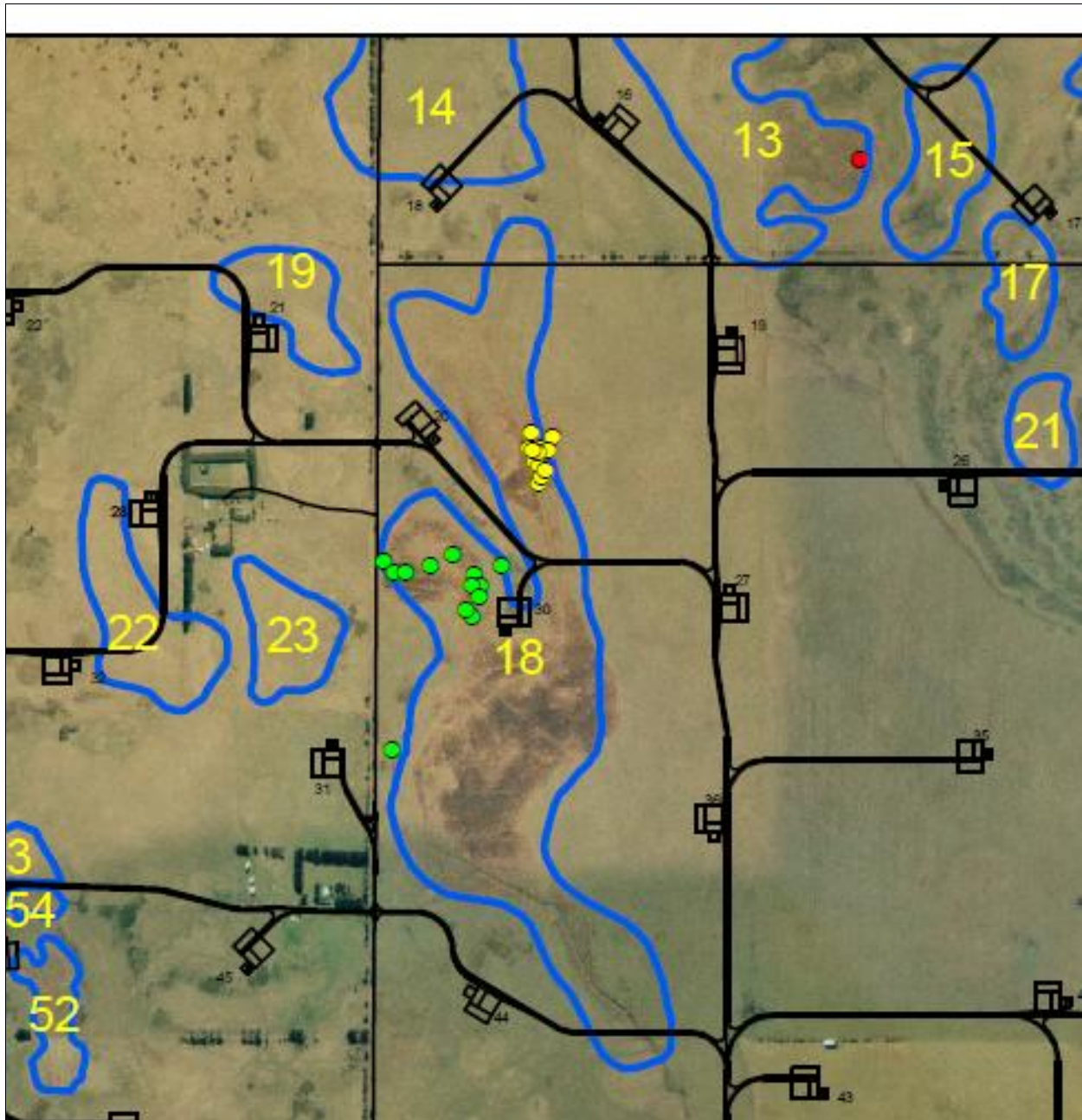


Appendix figure 3: Monitoring undertaken during the 2014 breeding season (Source: Figure 4 in Wood 2014)

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- 11 Nov 2016
- 25 Nov 2016

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Appendix figure 4: Monitoring undertaken during the 2016 breeding season (Source: Figure 10 in Wood 2017)

Wetland 18 in the above Appendix figure 4 is wetland 25699 and is one of the wetlands where Brolga have nested in the past. Monitoring of the Brolga movements during the 2016 breeding season showed that Brolga were recorded foraging within approximately 90 m of an operating turbine.

Appendix 8: Hydrological assessments by Water Technology (2022, 2024, 2026)

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MEMORANDUM

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To Michael Sale | Willatook Wind Farm
From Ben Hughes | Water Technology
Date 24 March 2026
Subject Willatook Wind Farm – Wetland Analysis Addendum

1 OVERVIEW AND PURPOSE

The Willatook Wind Farm is proposed between Orford and Hawkesdale in south-west Victoria (Figure 1-1). The Willatook Wind Farm Environment Effects Statement (EES) reviewed the design and potential impacts of the proposed wind. The EES publicly exhibited in July and August 2022, with the Minister for Planning completing her assessment of the EES on 21 July 2023. Since this assessment findings Willatook Wind Farm Pty Ltd has completed an updated design. The time since the EES and revised design has required additional analysis.

As part of the original EES investigations hydrological modelling was completed to inform the assessment of potential impacts on Brolga and their potential breeding and night roosting habitat¹. This modelling was then used as a basis for more detailed review and site assessment by specialist ecologists Nature Advisory.

Since the initial assessment there have been three major changes to the hydrological modelling of potential breeding and night roosting habitat:

- The Brolga Guidelines² that support the Handbook for Renewable Energy Development in Victoria (DEECA, 2025) have been released.
- During site investigations Nature Advisory highlighted four additional areas as having the potential for brolga breeding and night roosting. Two were dams with larger connected wetland areas and two were wetlands which had drains present but were holding water.
- There was a significant rainfall event in October 2022, post the 2022 analysis.

There have also been several queries about specific wetlands from the Department of Energy, Environment and Climate Action (DEECA) post the Minister's assessment.

This report is an addendum to the previous assessment detailed in the Willatook Wind Farm EES¹ any changes in the assessment as a result of the Brolga Guidelines release, details assessment of the additional four wetland areas and the potential for including the October 2022 event in the broader wetland assessment. It also answers specific queries from DEECA post the Minister's assessment.

This memo does not replicate the content of the previous assessment but does provide an overview of the methodology and results. A detailed methodology and results are outlined in the original assessment in the final Willatook Windfarm – Wetland Analysis report, Water Technology March 2022.

¹ Water Technology, March 2022 - Willatook Windfarm – Wetland Analysis

² DEECA, 2025 - Handbook for Renewable Energy Development in Victoria, Appendix 2: Species Specific Guidance for Onshore Wind Energy Facilities – Victorian Brolga

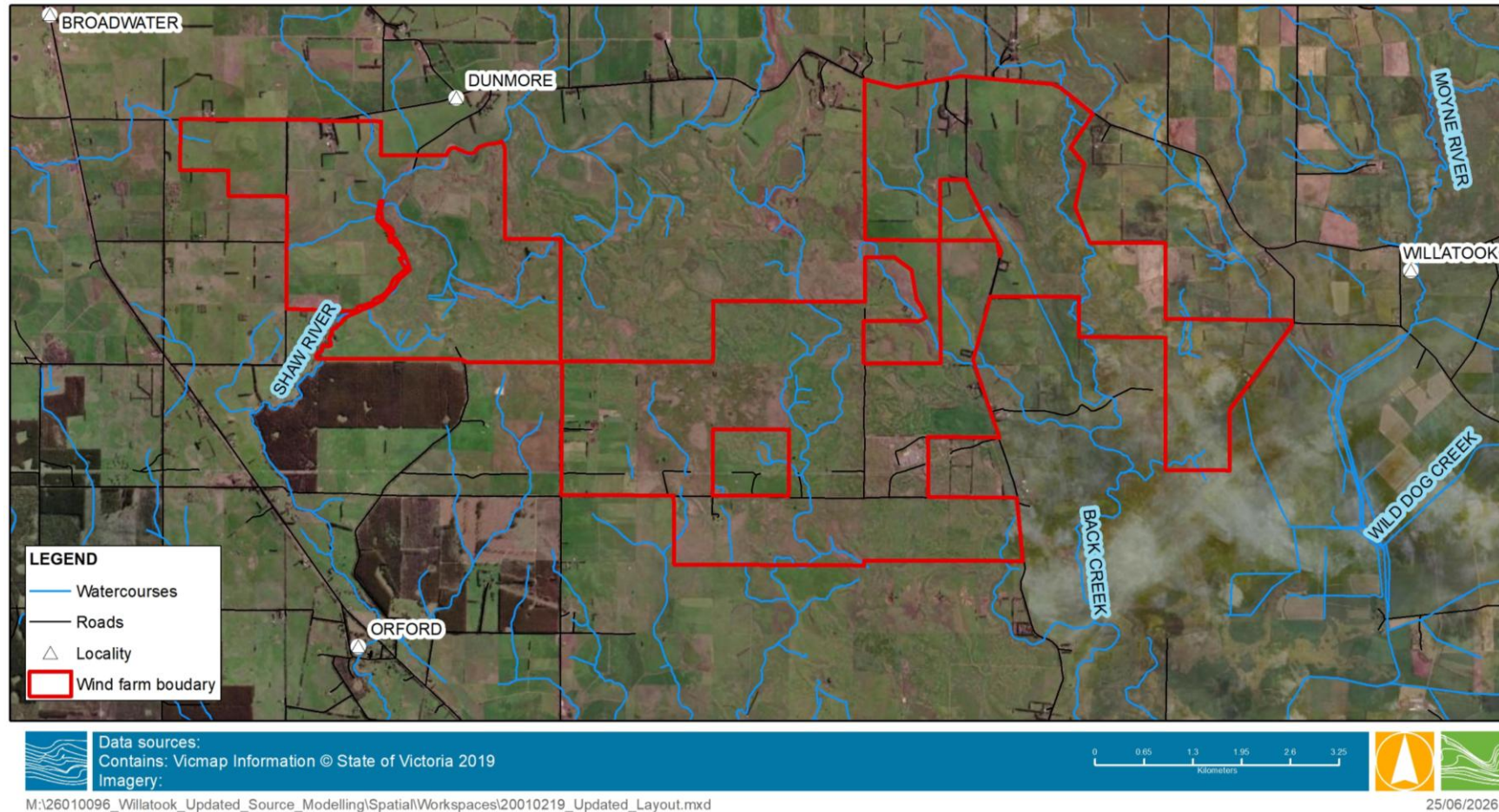


Figure 1-1 Site Locality

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2 OVERVIEW OF PREVIOUS MODELLING

2.1 Methodology

The original assessment methodology aimed to identify areas which held water for more than 120 consecutive days between July and December from the beginning of 2009 to the end of 2019 within and surrounding the proposed Willatook Wind Farm.

The inundation period of 120 days and the 10 year time period was advised by the Department of Environment, Land, Water and Planning (now the Department of Energy, Environment and Climate Action (DEECA)). Brolga nest in wetlands with emergent vegetation that holds water for at least 120 days, permitting nest building, egg laying and incubation, hatching and the growth of chicks to an age where they can walk to nearby wetlands should the original breeding wetland dry out (Nature Advisory, 2021).

Given the large and hydrologically complex nature of the windfarm area several steps and modelling tools were used to complete this assessment, an overview of these tasks is provided below with detail included in the sections that follow.

- A 'Rain on Grid' hydraulic model of the proposed windfarm and upstream catchment area was developed and modelling of the 1% Annual Exceedance Probability (AEP³), 72-hour event was undertaken to gain an understanding of overland flow paths, wetland interrelationships and wetland extents. The hydraulic model was run for seven days post rainfall ceasing allowing all water to flow to its terminal wetland/waterway
- All current DEECA mapped wetlands were modelled (hydraulic model results provided more accurate representation of the DEECA mapped wetland extents rather than relying on those digitised by DEECA relying on aerial imagery).
- All areas with a depth of greater than 2cm were filtered from the hydraulic model results and polygons of areas with depths greater than 2cm were created. It is standard practice in 'Rain on Grid' models to remove shallow depths which may be inaccurate due to minor inaccuracies in the model topography.
- All inundated areas less than 0.1 Ha (1,000 m²) were removed. Nature Advisory advised that wetlands less than 0.1 Ha (1,000m²) are not suitable for breeding habitat based on a review of Brolga nesting habitat sites.
- Manual assessment of the remaining wetlands was completed, screening those from detailed analysis if they met the following criteria:
 - The wetland was permanently drained – a wetland was considered permanently drained if an excavated earthen channel had been constructed from the wetland invert to a connecting drain, downstream waterway or downstream wetland.
 - The wetland had a relatively small size (only slightly above 0.1 Ha), was shallow (less than 300mm - the Source model results showed wetlands generally need to have a maximum depth of at least 300mm to maintain water for more than 120 days) and had a small catchment area.
 - Incorrect topographic representation resulted in the water pooling – e.g. a road culvert was not represented.

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³ Annual Exceedance Probability (AEP) refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which may be calculated to have a 1% chance of occurring in any one year, would be described as 1% AEP flood event.



- A Source hydrologic model was developed of the remaining wetlands to determine a daily water level series for each from 2010-2019 inclusive.
- All areas modelled in Source that held water for at least 120 days during the July to December period were mapped.

2.2 Results

From the modelling undertaken the following was identified:

- The hydraulic modelled identified 804 areas which required further assessment. Of these:
 - 12 had an incorrect topographic representation within the model.
 - 145 had constructed drainage from the invert of the depression.
 - 41 were excluded because of their limited size, depth and catchment area. This combination of low depth, the size being close to 0.1 Ha and the small catchment mean these areas would dry quickly.
 - 38 were farm dams – automatically meeting the inundation criteria.
 - 26 were deemed suitable and required further assessment.
- The detailed hydrologic assessment determined 17 of the 26 wetlands assessed in detail met the inundation criteria required for the areas to be hydrologically suitable for brolga breeding and night roosting.

3 BROLGA GUIDELINES

As part of the development of the Brolga Guidelines, DEECA have developed a Brolga Breeding Habitat Suitability Model. The suitability model *“extrapolates the remotely sensed environmental characteristics of wetlands where Brolgas are known to breed to the wider landscape to predict the locations suitable, high quality Brolga breeding habitat in Victoria and includes known breeding wetlands.”* The intent is for the model to be used as a starting point for further site-specific survey and assessment to determine if wetlands identified in the model are Brolga Breeding Wetlands or Potential Broga Breeding Wetlands.

This assessment specifically deals with Potential Broga Breeding Wetlands which are identified in the Brolga Guidelines as meeting the requirements outlined in Table 1. This assessment specially deals with Criteria 2, assessing the potential for wetlands to hold 120 days of consecutive inundation for through breeding season.

The process for identifying, assessing and buffering Brolga Breeding Wetlands and Potential Brolga Breeding wetlands as outlined in Figure 4 of the Brolga Guidelines is shown in Figure 3-1. The parts of this process relevant to this report and the previous EES report are highlighted in red.

The Brolga Guidelines also outline the criteria for wetlands which do not need buffered in Table 11. Of relevance to this assessment are the criteria and evidence requirements outlined in Table 2.

The modelling undertaken in this assessment and that undertaken for the Willatook EES aligns with the Brolga Guidelines and aligns with the recommended approach for identifying and characterising potential breeding habitat. The only separation from the Brolga Guidelines is all DEECA mapped wetlands were assessed rather than the subset identified in the Brolga Breeding Habitat Suitability Model. This is in excess of the requirements of the Brolga Guidelines. The DEECA mapped wetlands and those identified in the Brolga Breeding Habitat Suitability Model are shown in

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Table 1 Potential Broga Breeding Wetland Requirements

Criteria	Rational
1 - Does not have an associated Broga breeding record in the last 20 years	A wetland mapped in the Broga Breeding Habitat Suitability Model with a known breeding record in the past 20 years is considered a Broga Breeding Wetland.
2- Meets the inundation requirements of 120 days through breeding season in any year in the ten-year period preceding the commencement of the assessment.	120 days of inundation during the breeding season allows for nest building and incubation of Broga chicks becoming mobile where the breeding pair may walk to them to other wetlands.
3 - Wetland with sufficient emergent vegetation, within and surrounding the wetland to allow for nest building.	Important for both nest building and protecting Broga chicks from predators. Sufficient emergent vegetation includes: ■ Vegetation not over one metre in height ■ Presence of low wetland plants that respond to shallow flooding that allow for food, nest construction and cover ■ Trees and taller vegetation may be present but are generally interspersed with vegetation of lower height and areas of open water.

Table 2 Potential Broga Breeding Wetland Requirements relating to this assessment

Criteria	Evidence requirements
A wetland that does not meet the required inundation requirements to allow for Broga Fledging	Evidence that the wetland does not meet the inundation requirements of 120 days through the breeding season in any year in the ten-year period preceding the commencement of assessment.
Wetlands are less than 0.1ha	Disregard wetland/s clearly shown and labelled on the map
A modelled wetland has been incorrectly identified as a wetland and the mapped area is not capable of functioning as a wetland.	The evidence must show that it is obvious that the mapped area has been incorrectly identified as a mapped wetland or the wetland has been permanently drained. Evidence requirements include, but are not limited to: ■ Satellite imagery clearly shows a drainage channel impacting the wetland. ■ Detailed hydrological modelling clearly shows that the wetland has been permanently drained and cannot hold water.
The wetland has been permanently drained.	

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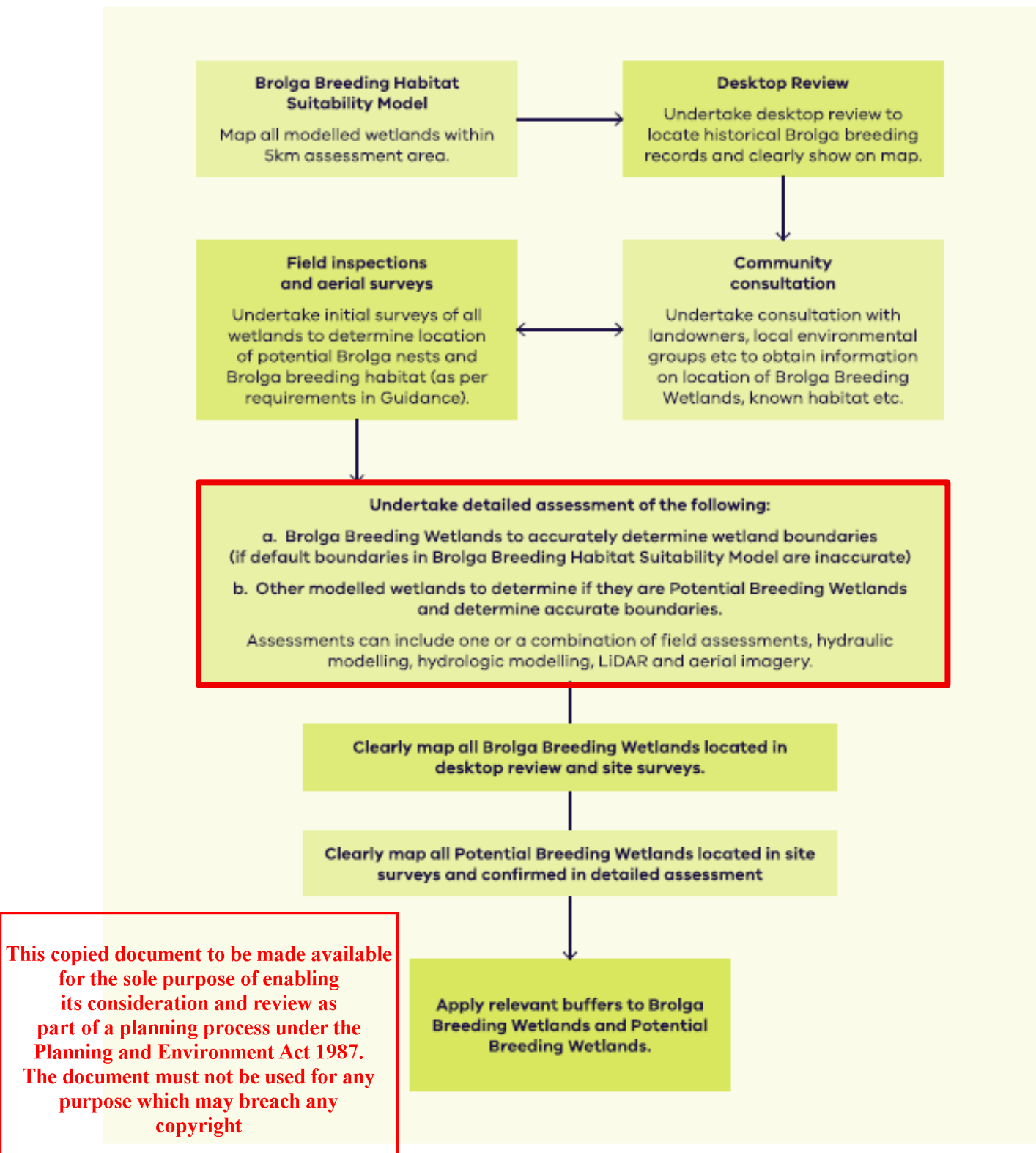


Figure 3-1 Process to identify, assess and buffer Brolga Breeding Wetlands and Potential Brolga Breeding wetlands outlined in the Brolga Guidelines

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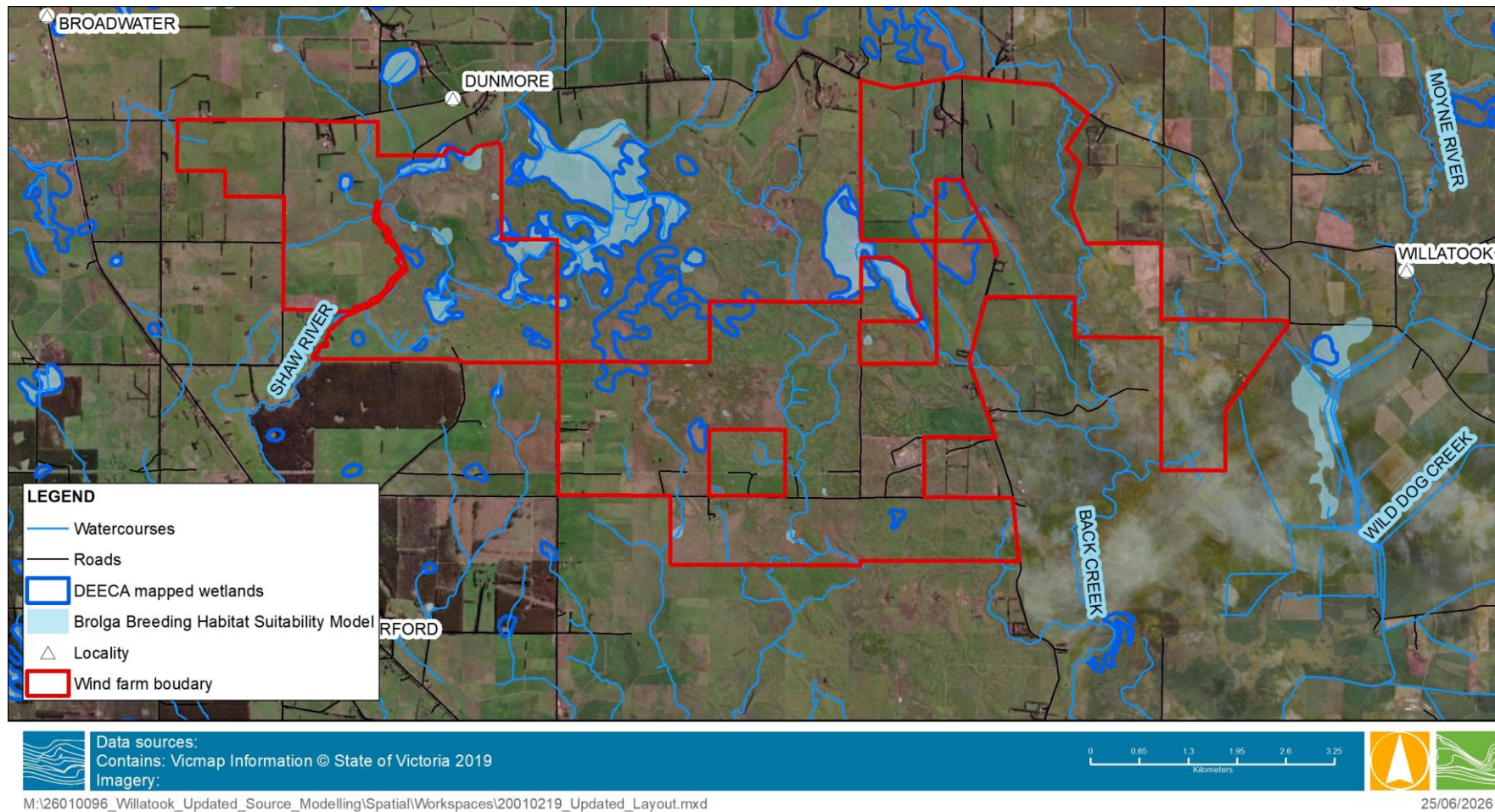


Figure 3-2 DEECA mapped wetlands and those identified in the Brolga Breeding Habitat Suitability Model

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4 WETLAND ANALYSIS

4.1 Additional Analysis

4.1.1 Overview

As mentioned in Section 1, four additional wetlands were required hydrologic analysis to determine their potential to hold water for more than 120 consecutive days between July and December. Two were drained but were observed holding water and two were farm dams within a wetland basin. The two wetlands with drains in them have not been effective at removing all water from the wetland areas due to lack of maintenance and/or construction issues. The farm dams within a broader wetland were previously automatically considered to hold water for 120 days, but further modelling was undertaken to determine whether the surrounding wetland could support Brolga breeding.

Three of the four wetlands were individual, while one was a portion of a larger wetland which has largely been drained. These wetlands were modelled using the same methodology as adopted for all other areas flagged as potentially holding water for an extended period during the EES assessment. Modelling was undertaken from 2009 to 2019, matching the modelled period. The wetlands are identified in this report according to their wetland number in the DEECA wetland database, or a number assigned as part of the analysis undertaken.

These wetland locations which were assessed in more detail are shown in Figure 4-1.

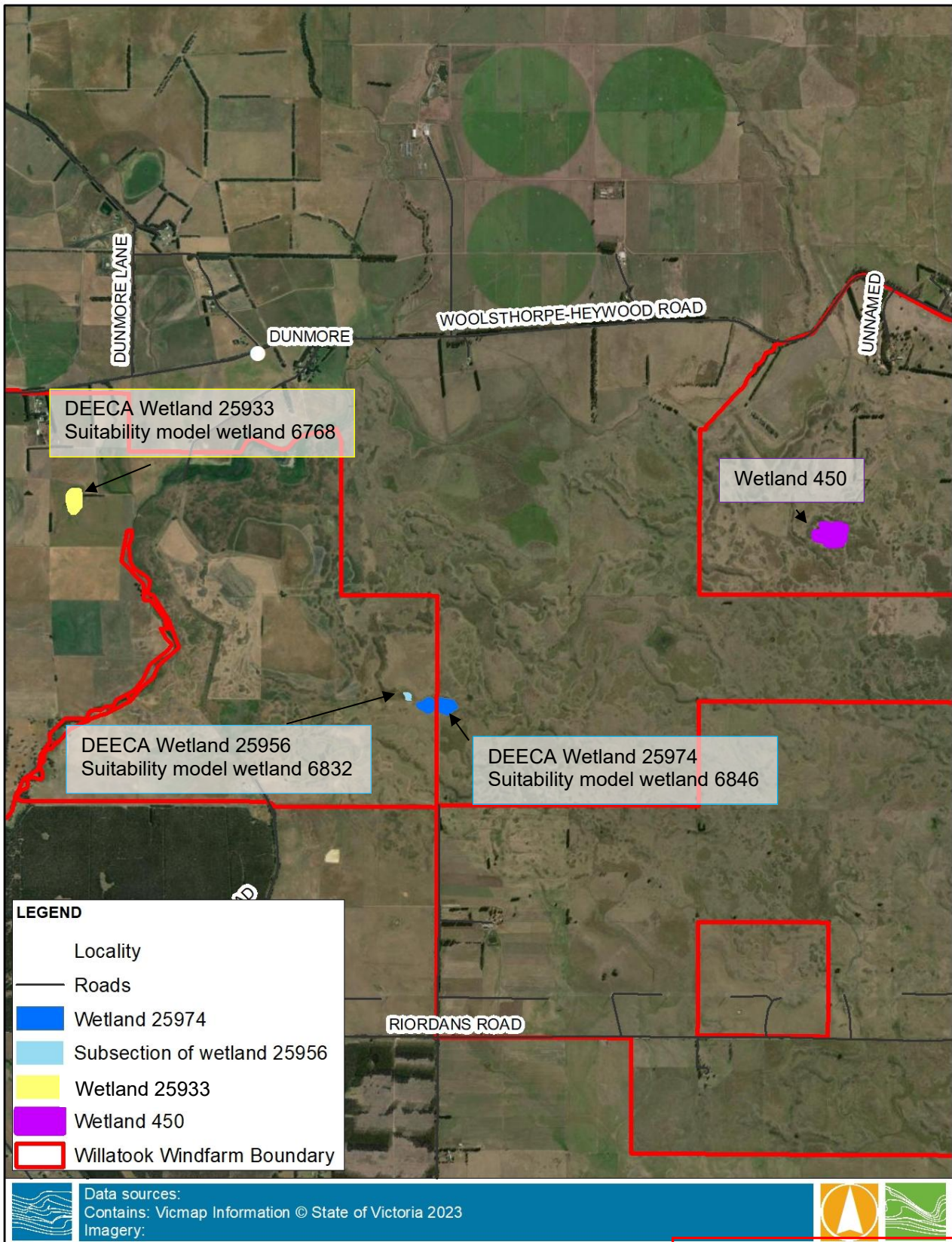
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Figure 4-1 Additional Wetland Locations

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4.1.2 Wetland 25933

During the original EES assessment, wetland 25933 (also listed as wetland 6768 in the Brolga Breeding Habitat Suitability Model) was automatically assigned as suitable due to the presence of the farm dam, but the broader wetland was not modelled. The farm dam is on the western side which will hold water for extended periods and a drain through the wetland. However, the topography indicates the drain runs the broader wetland area both north to the dam and south to the Shaw River, as shown in Figure 4-2.

The topography indicates the wetland invert is around 85.5 mAHD, and spills to the Shaw River occur at 85.79 mAHD. The modelled wetland depths are shown in Figure 4-3.

From 2009 to 2019 the maximum modelled depth was 0.28m. Through the modelled period there is a defined pattern of inundation following the seasons. The seasonal pattern demonstrates this wetland would hold water at around the maximum depth during winter, part of spring before decreasing significantly during summer. There are extended periods where the wetland holds water at a depth greater than 0.1m. The longest period of consistent inundation in the modelled 10 year period was from February 2010 to January 2013. Figure 4-4 shows the potential maximum inundation extent in the wetland as well as the area that exceeds 0.1m deep.

Outside of the dam, the wetland area of wetland 25933 is capable of being inundated for more than 120 consecutive days through the July to November period.

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Figure 4-2 Wetland 25933 Location and Extent

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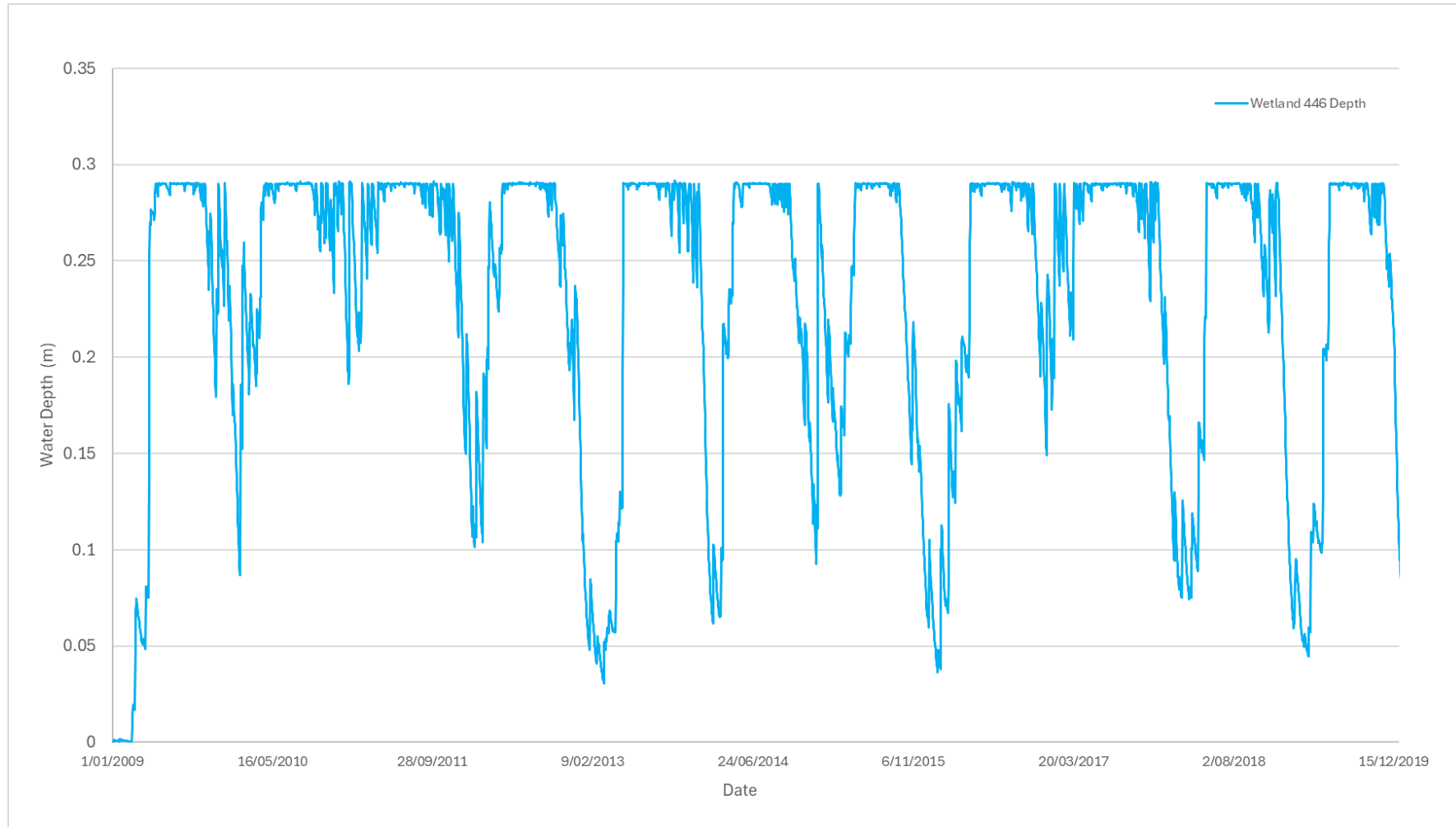


Figure 4-3 Water depth of Wetland 25933

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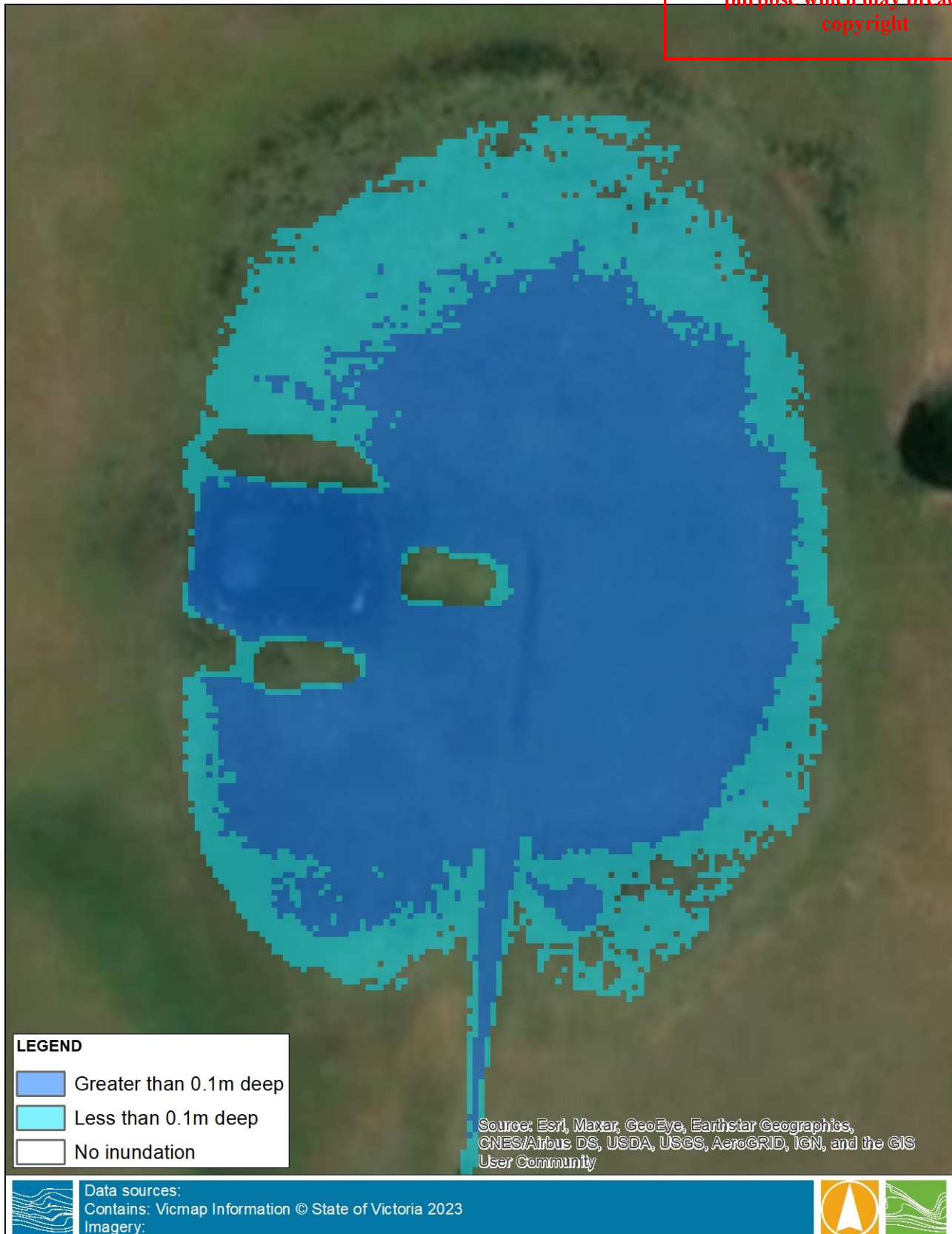
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Figure 4-4 Wetland 25933 - maximum Extent and extent of depths exceeding 0.1m



4.1.3 Wetland 25974 & Wetland 25956

Wetlands 25974 (also listed as wetland 6846 in the Brolga Breeding Habitat Suitability Model) and 25956 (also listed as wetland 6832 in the Brolga Breeding Habitat Suitability Model) and are located immediately up and downstream of each other respectively, connected by constructed drainage. This analysis focuses on a small western portion of wetland 25956 and the entirety of wetland 25974. Most of wetland 25956 is directly connected to constructed drainage with no potential to hold water on an ongoing basis aside from a small subsection on the eastern most side. This small subsection is connected to the drains but is marginally lower than a high point in the drain, allowing water to pool within it. The location of the wetlands and the sub section of wetland 25956 is shown in Figure 4-5. The topography of wetland 25956 is shown in Figure 4-6, with the topography of wetland 25974 shown in Figure 4-7. Wetland 25974 is much larger than wetland 25956 and while there is an excavated channel connecting two wetlands, the drain of the invert is higher than the invert of wetland 25974 and it cannot fully drain. Along this drain the LiDAR also data also shows some maintenance has been undertaken, with piles of excavated spoil on the edge of the channel.

The topography indicates the invert levels of wetland 25974 and wetland 25956 are 91.44 mAHD and 91.5 mAHD respectively. For water to spill from wetland 25974 into wetland 25956, it must reach 92.15 m AHD (a depth of around 0.7m). For it to spill from wetland 25956 and downstream it must reach 91.8 mAHD (a depth of 0.3m). The modelled depths within each wetland from 2009 to 2019 is shown in Figure 4-8.

Both wetlands are capable of holding water for extended periods; however much greater depths are shown in the upstream wetland 25974. The modelled section of wetland 2595 holds water for extended periods but it is mostly only around 0.2m deep, at its deepest.

Figure 4-9 and Figure 4-10 show the potential maximum inundation extent in the wetland as well as the area that exceeds 0.1m deep for wetland 25974 and 25956 respectively.

Both the small eastern area of wetland 25956 and wetland 25974 is capable of holding water for more than 120 consecutive days over the July to November period.

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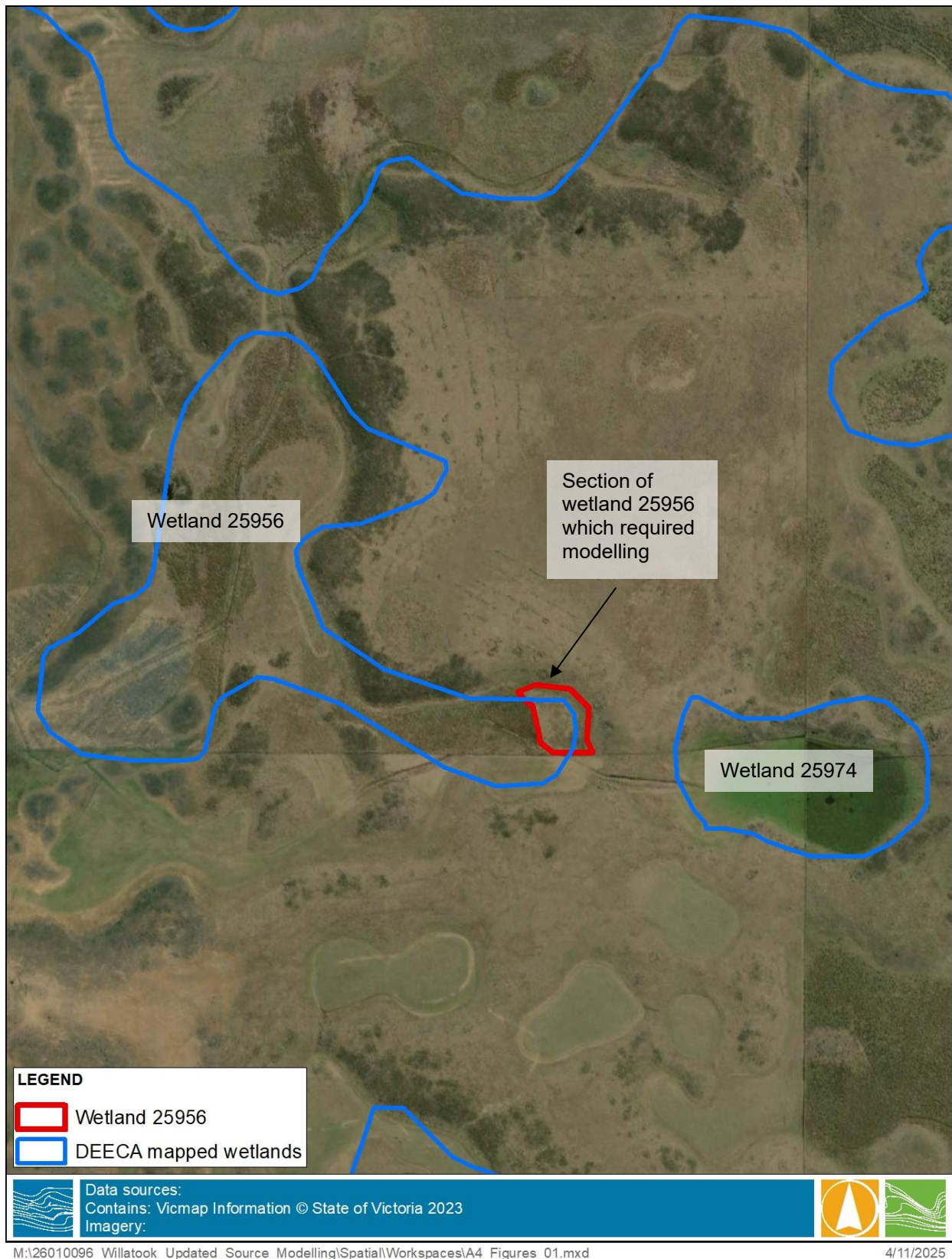


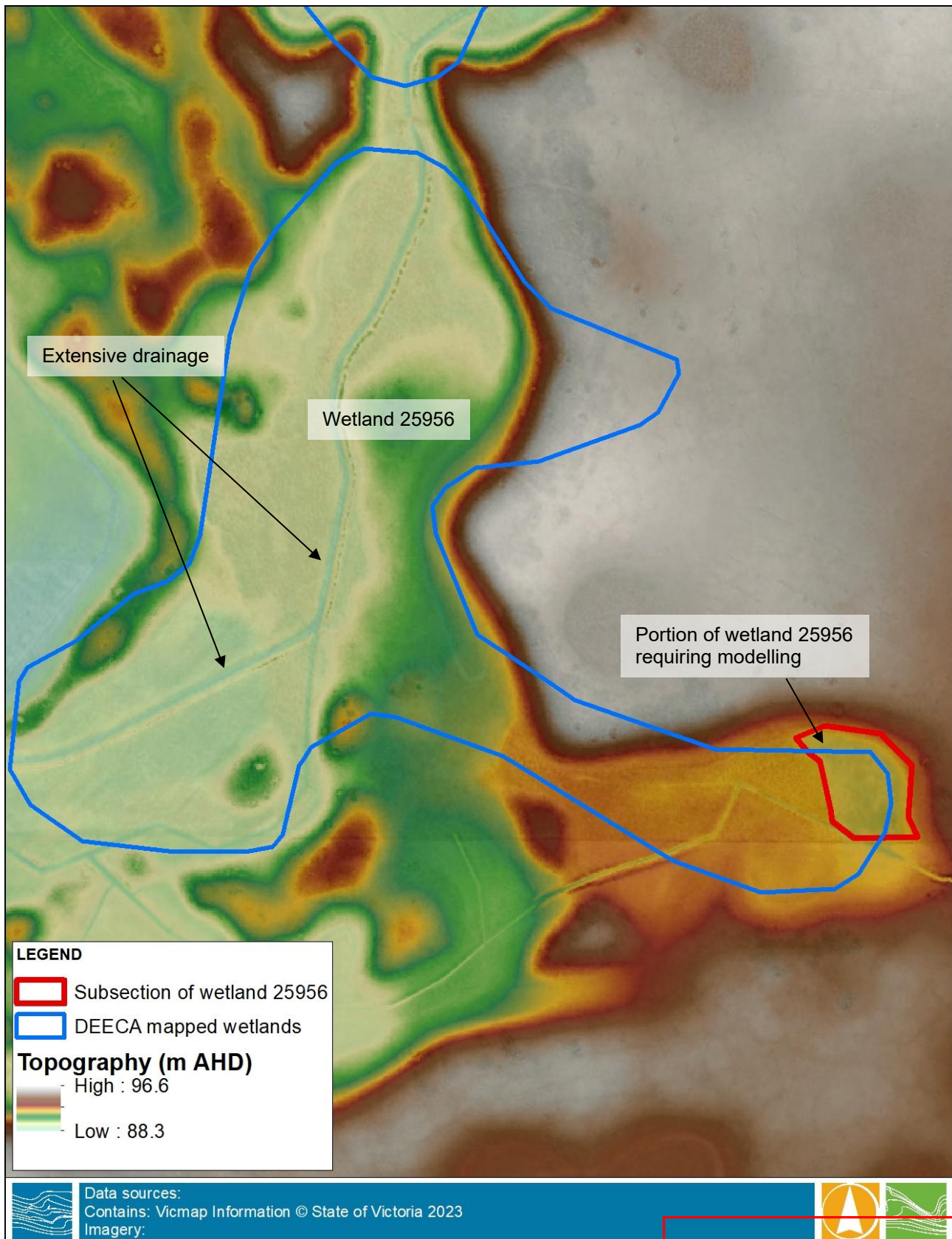
Figure 4-5 Wetland 25956 and Wetland 25974 locations and extents with the subsection of Wetland 25956 highlighted

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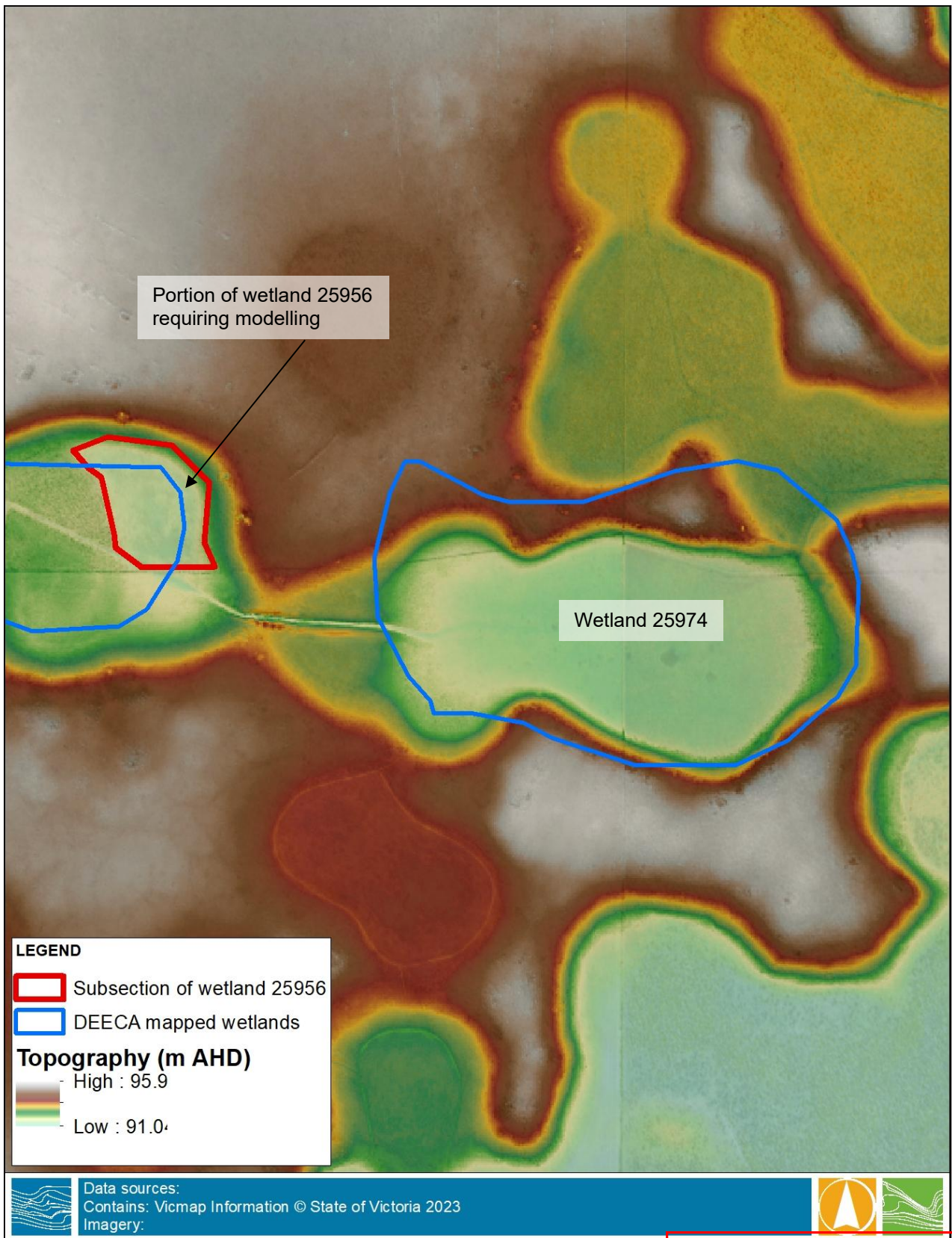
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Figure 4-6 Topography and drains within wetland 25956



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Figure 4-7 Topography within Wetland 25974

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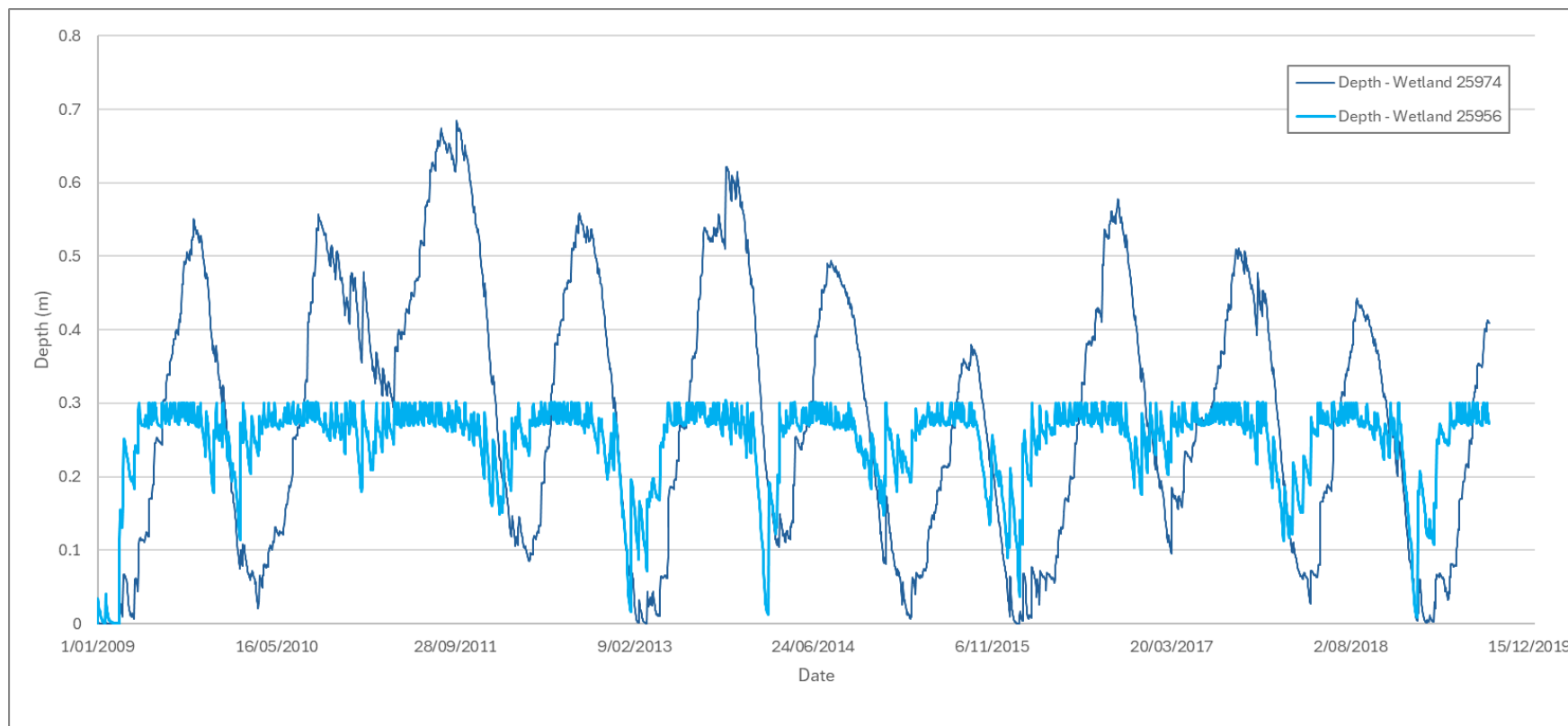


Figure 4-8 Water depth of Wetland 25974 & 25956

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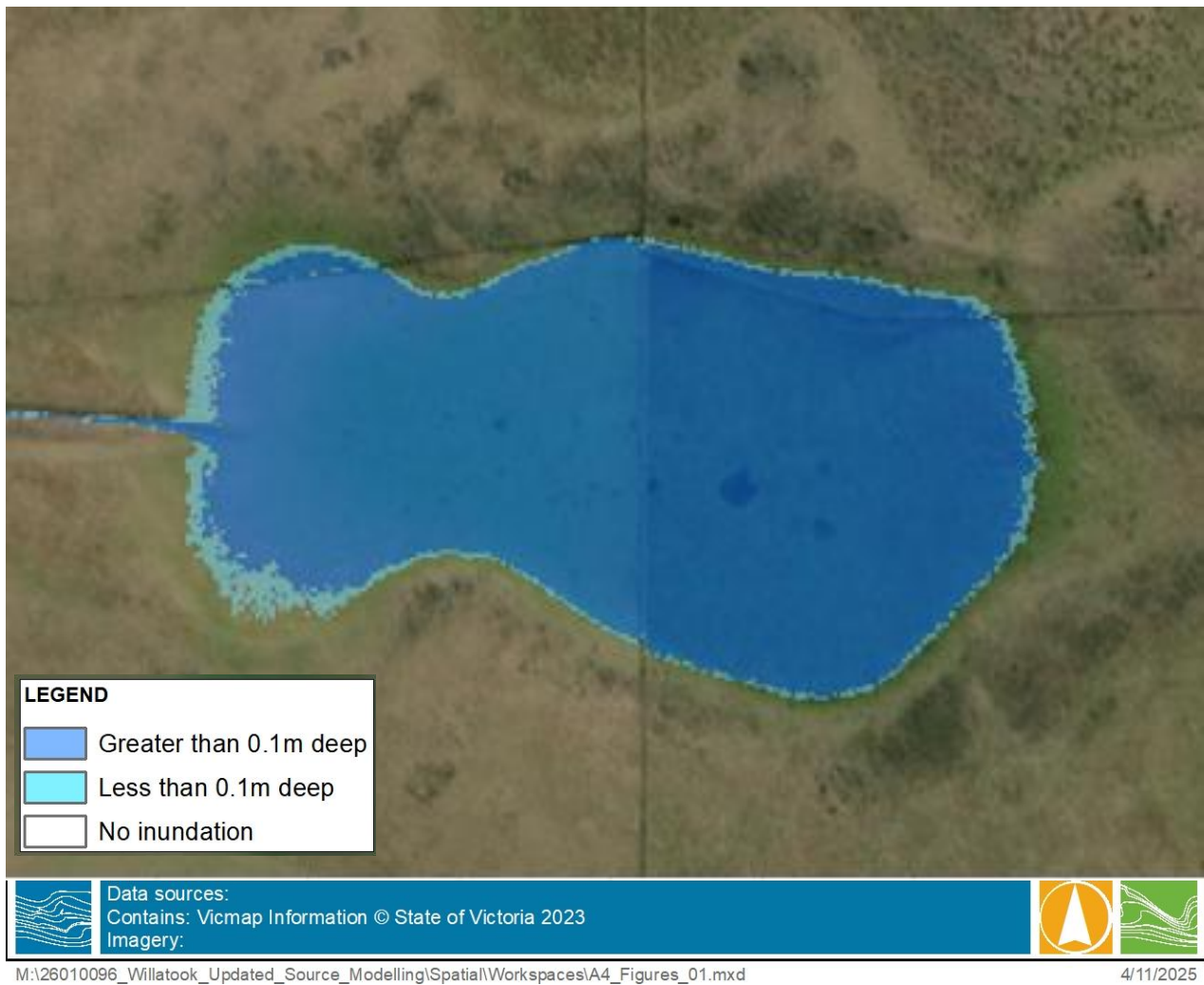


Figure 4-9 Wetland 25674 Potential water extents at maximum water depth and area deeper than 0.1m

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Figure 4-10 Wetland 25626 subsection Potential water extents at maximum water depth and area deeper than 0.1m

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4.1.4 Wetland 450

Wetland 450 is in a small defined catchment with a dam on the eastern side, all flow from the catchment and can either enter the dam or flow freely to the east and south. The topography of wetland 450 is shown in Figure 4-11, showing the direction of drainage within the wetland and through the dam.

The invert of wetland 450 (within the wetland not the dam) is around 86.6 mAHD, the spill level of the wetland is also approximately 86.6 mAHD, which is the level the farm dam spills and the level which water can spill around the dam to the south. This means the wetland will not hold water for any significant period of time as it is able to drain freely to the east.

Outside of the dam, wetland 450 is not capable of holding water for more than 120 days within the July to November period.

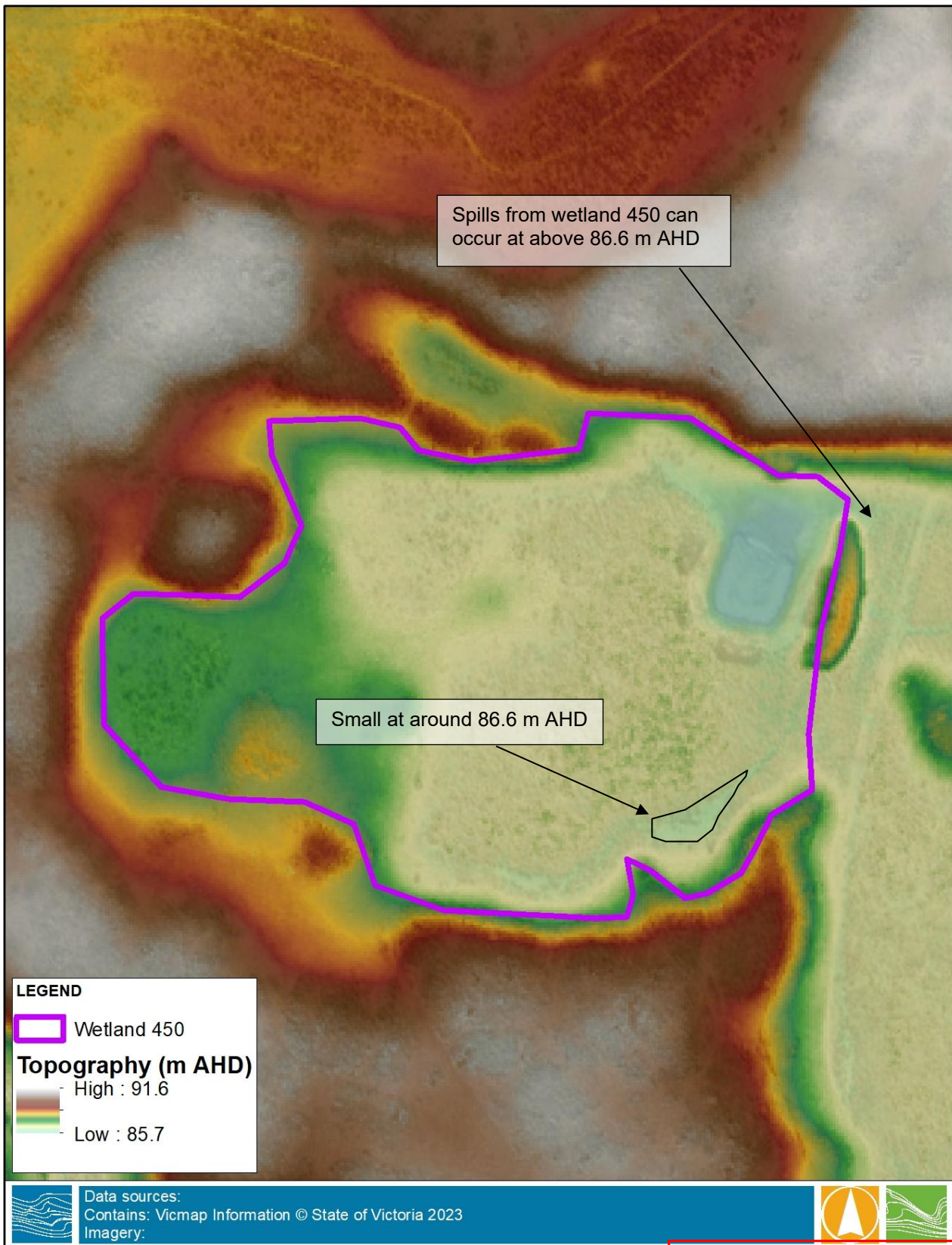
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Figure 4-11 Wetland 450 topography

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4.2 Wetland queries

4.2.1 Overview

Post the Minister's assessment DEECA had several queries specifically relating to specific wetlands. These included the following wetland numbers as per their numbering in the modelling undertaken as part of the EES:

- 25932.
- 12a.
- 25710.
- 25731.
- 25668.

The following sections specifically address these queries.

4.2.2 25932

Wetland 25932 was modelled immediately prior to the WWF Independent Panel Hearing/Inquiry. The extent and topography of the wetland is shown in Figure 4-14. Review of the wetland topography showed some drainage; however, the drainage was not from the wetland invert and there was potential for the wetland to hold water on an ongoing basis. Modelling of the wetland was undertaken using Source, adopting the same methodology as presented in the Willatook Windfarm – Wetland Analysis.

Modelling of the wetland showed it could maintain depths above 0.02 m for 107 days within the July to November period, this included a modelled period of 1900 to June 2019. This exceeded the 10 year modelled period adopted for other wetlands assessed as part of the WWF. It should be noted modelling of the wetland is considered conservative, as parts of the catchment to the wetland may not contribute when the wetland is full due to the nature of the constructed drainage. The primary reason for the relatively short period of inundation was the constructed drainage, enabling only relatively shallow peak depths (reaching a maximum of 0.6m but quickly draining), followed by evaporation and seepage.

Aerial imagery of wetland 25932 captured by Google Earth also shows limited water within the wetland on all dates aside from November 2022 (October 2022 recorded significant rainfall across Victoria with flooding across large portions of the state). The dates available and their description are detailed below, with the imagery shown in Figure 4-12.

- November 2022 – Post 2022 floods, water is shown in the wetland and its drainage network. This is expected to be close to the maximum inundation the wetland can achieve post large rainfall.
- April 2019 – Wetland is dry.
- January 2019 – Wetland is dry.
- December 2016 - Wetland is dry. It should be noted 2016 was a very wet year, with south west Victoria receiving high rainfall through September and October. The Hawksdale (Post Office) gauge recorded 241.6 mm of rainfall across September and October. This is more than 100mm greater than the average monthly total across the months.
- February 2014 – Wetland is dry.
- November 2011 - Water is shown in the wetland and its drainage network. October 2011 was partially wet with the Hawksdale (Post Office) gauge recording 96.8mm of rainfall. Well above the average 66.4mm.

Wetland 25932 was not shown to be able to reach 120 days of consecutive inundation through any part of the year.

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Figure 4-12 Wetland 25932 in November 2022

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4.2.3 12a

The extent and topography of Wetland 12a is shown in Figure 4-15. The wetland was modelled and was shown to maintain inundation for more than 120 days within the July to November period. The wetland is not drained and can maintain water for extended periods.

4.2.4 25710

The extent and topography of Wetland 25710 is shown in Figure 4-16. The wetland drains to the broader Cockatoo Swamp Complex, with the downstream areas maintaining inundation for extended periods. The area shown as Wetland 25710 is on the edge of the broader wetland complex and has drains which prevent extended periods of inundation. Modelling of the wetland was undertaken using Source as part of the broader complex adopting the same methodology as presented in the Willatook Windfarm – Wetland Analysis, but the area highlighted as the wetland did not maintain water for extended periods.

Wetland 25710 was not shown to be able to reach 120 days of consecutive inundation through any part of the year.

4.2.5 25731

The extent and topography of Wetland 25710 is shown in Figure 4-17. The wetland is not drained and has a small defined catchment, mostly limited to its extent and immediate surrounds. Modelling of the wetland was undertaken using Source, adopting the same methodology as presented in the Willatook Windfarm – Wetland Analysis. However, modelling of the wetland showed it could only maintain water in small, disaggregated areas. The discontinuous nature of these patches would facilitate faster evaporation and would not remain inundated for extended periods. This is highlighted in Figure 4-17. These areas may maintain water as individual portions at shallow depth, rather than as one large waterbody and the individual areas are less than 0.1 Ha. The limit for exclusion on the basis of area, as detailed in the Willatook Windfarm – Wetland Analysis. The outcome of this assessment is consistent with its assessment in the EES. 25668

The extent and topography of Wetland 25668 is shown in Figure 4-18. The wetland is part of the larger and downstream Wetland 26028. There are constructed drains in Wetland 25668, draining to Wetland 26028. Modelling of both wetlands was undertaken using Source as part of the broader complex adopting the same methodology as presented in the Willatook Windfarm – Wetland Analysis, but the area highlighted as Wetland 25668 did not maintain water for extended periods draining downstream.

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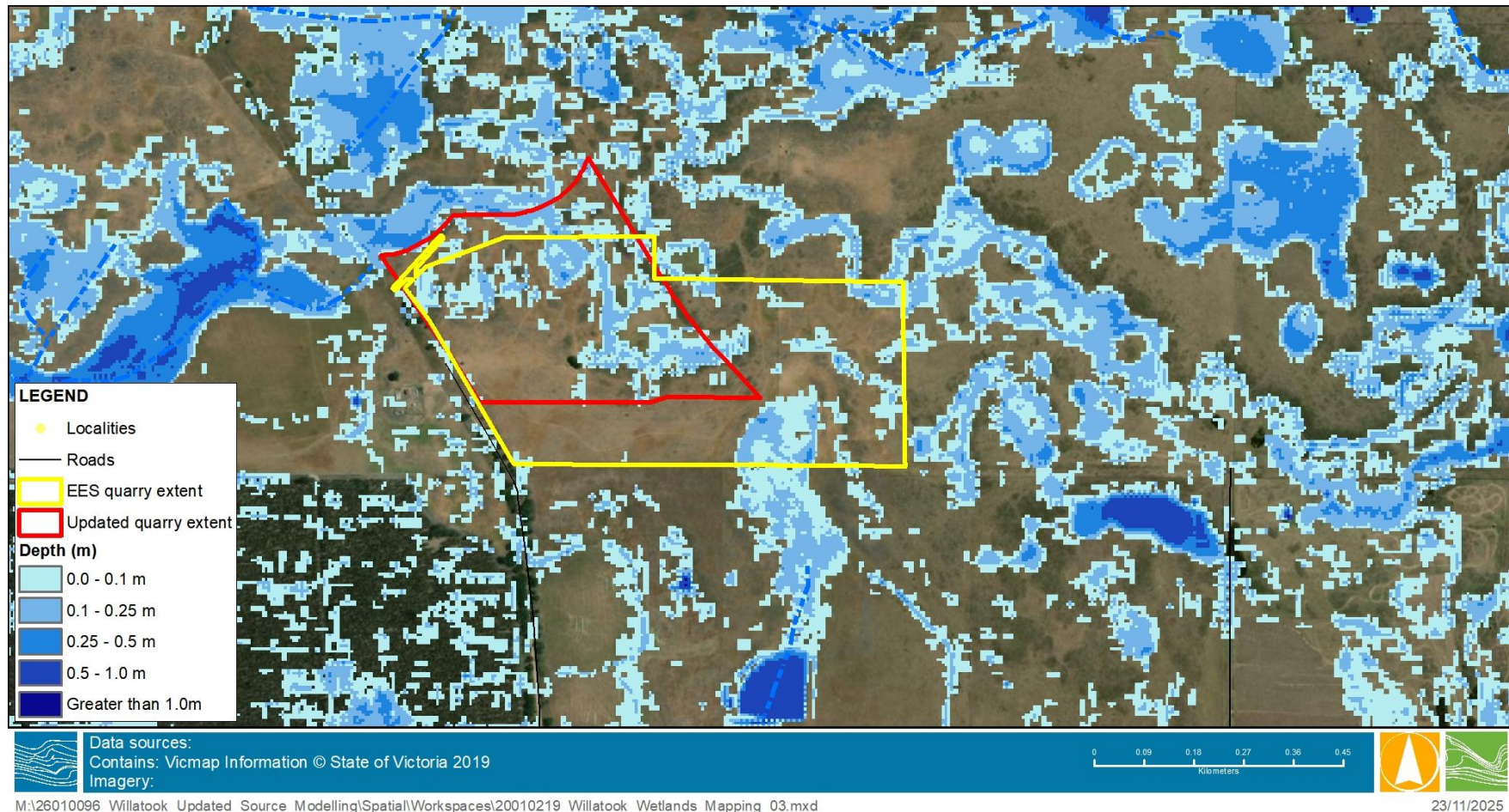


Figure 4-13 1% AEP depths within and surrounding the EES and updated quarry footprints.

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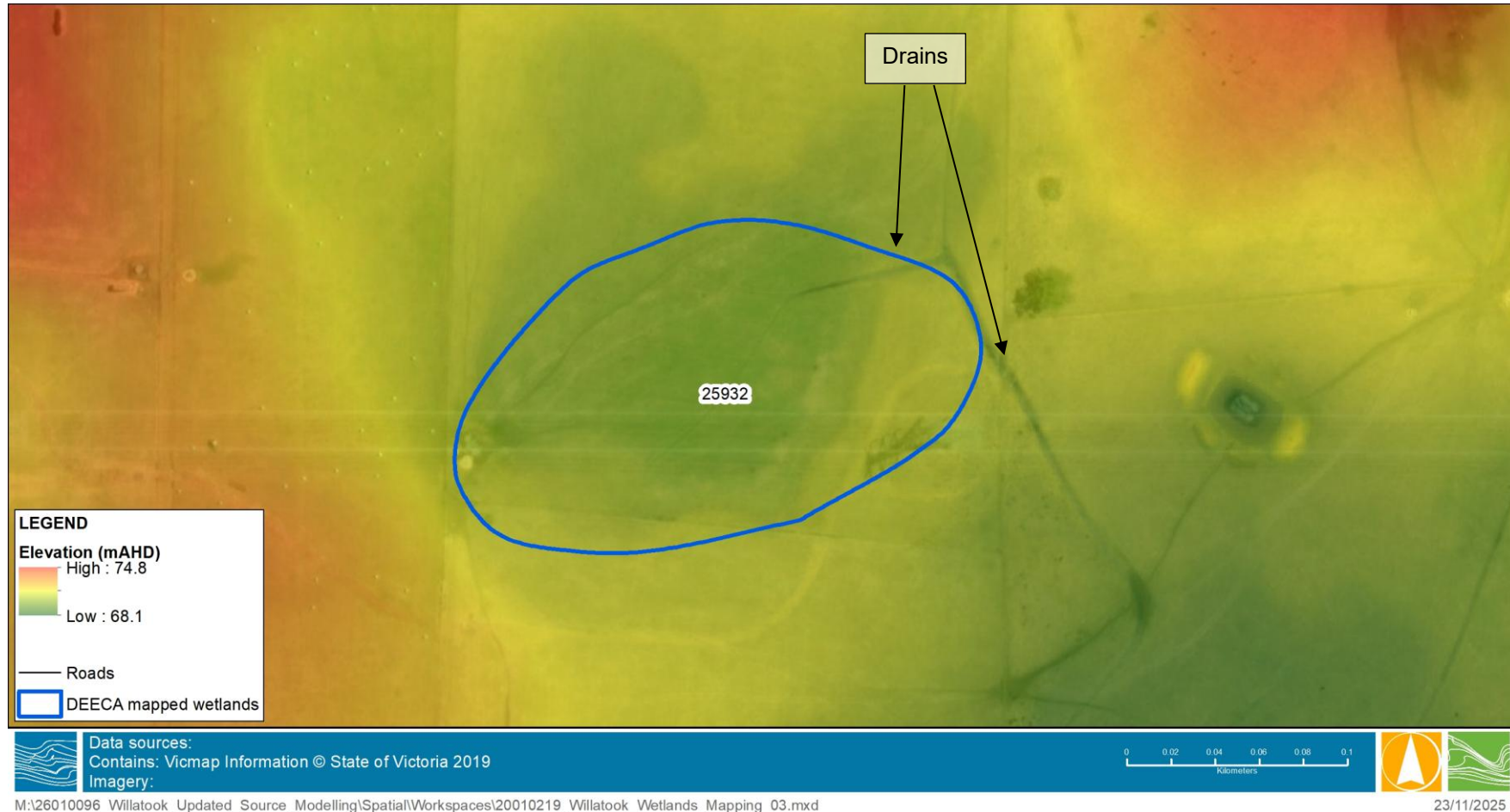


Figure 4-14 Wetland 25932 extent and topography.

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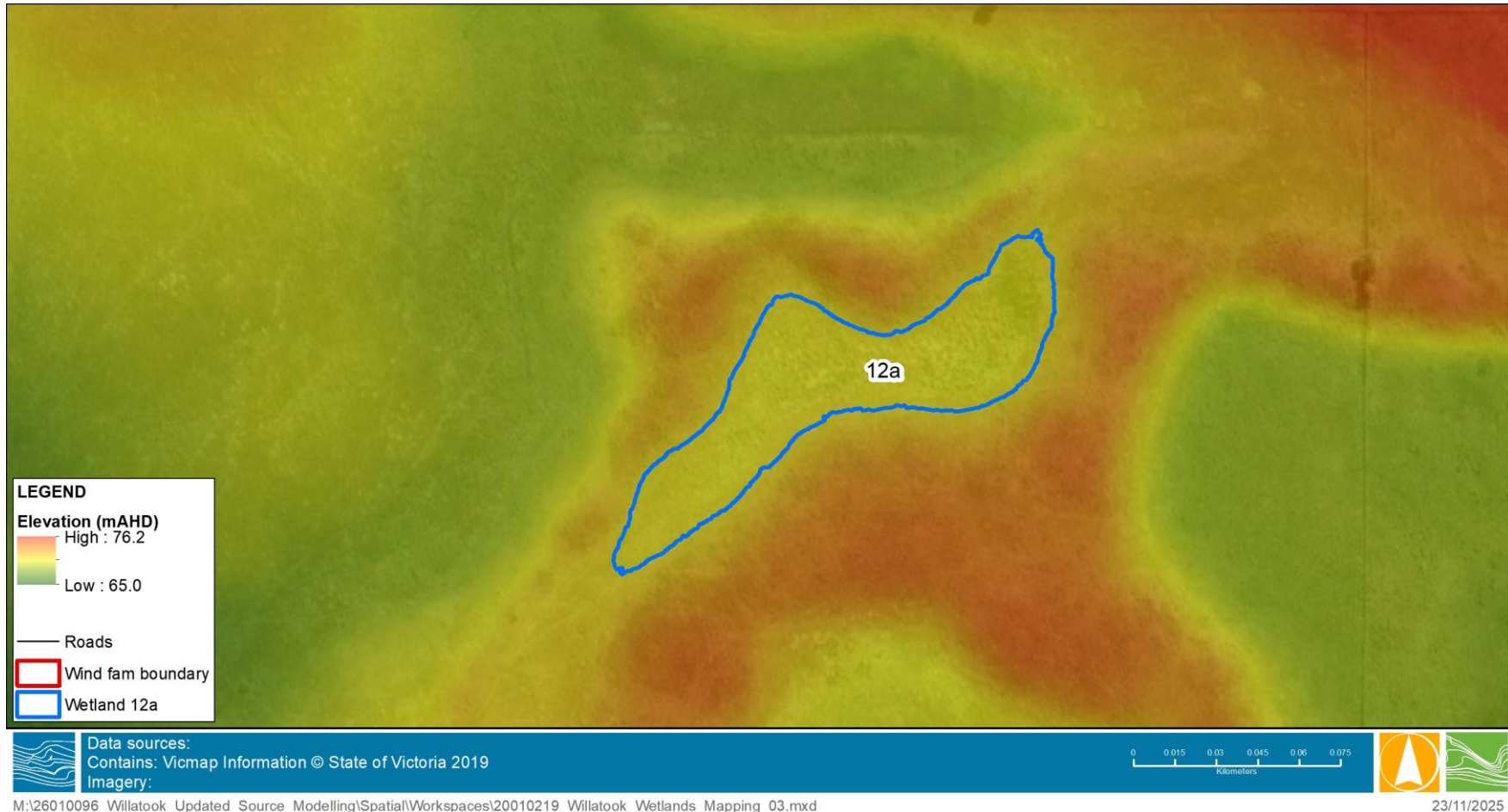


Figure 4-15 Wetland 12a extent and topography.

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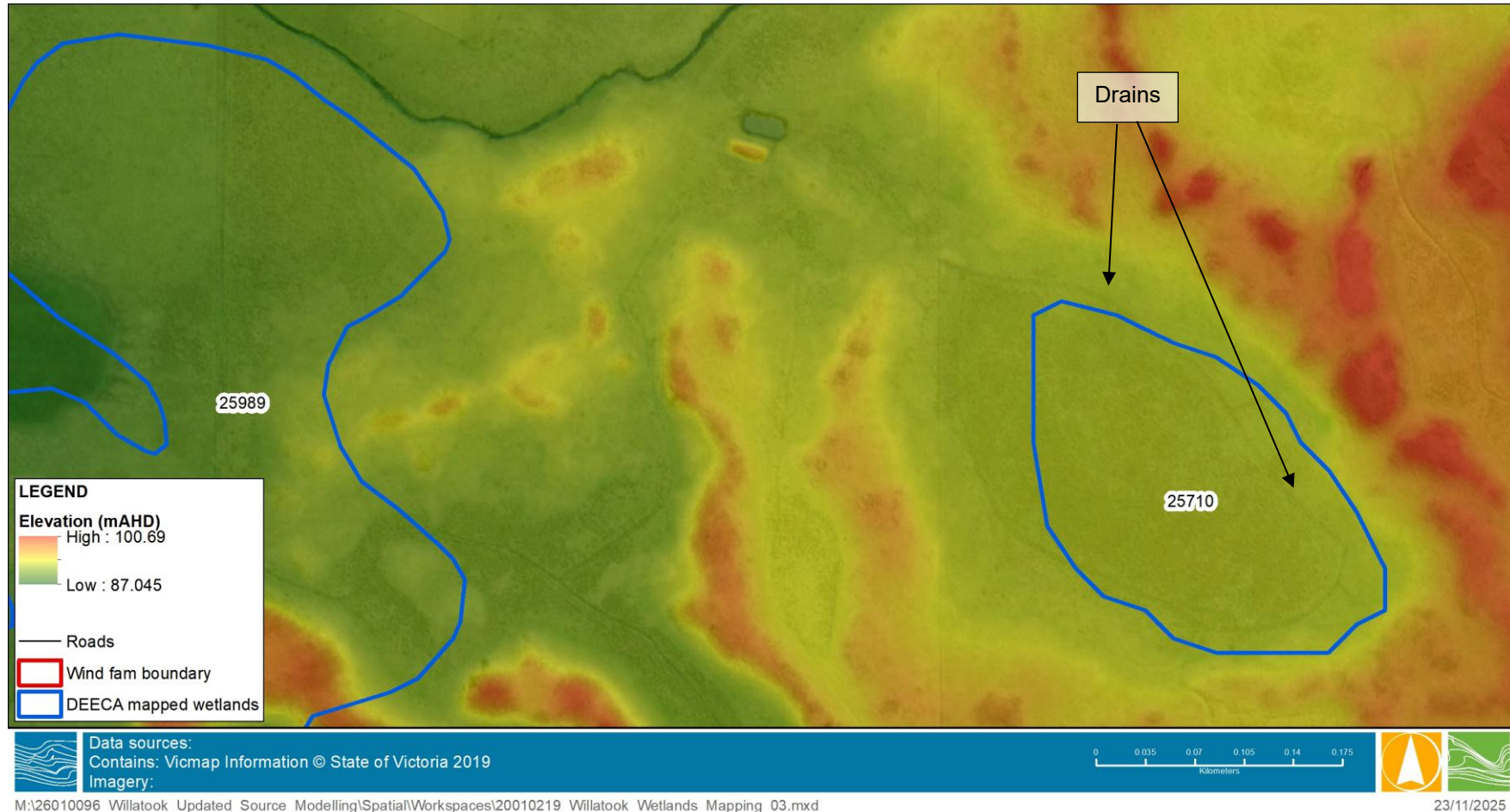


Figure 4-16 Wetland 25710 extent and topography.

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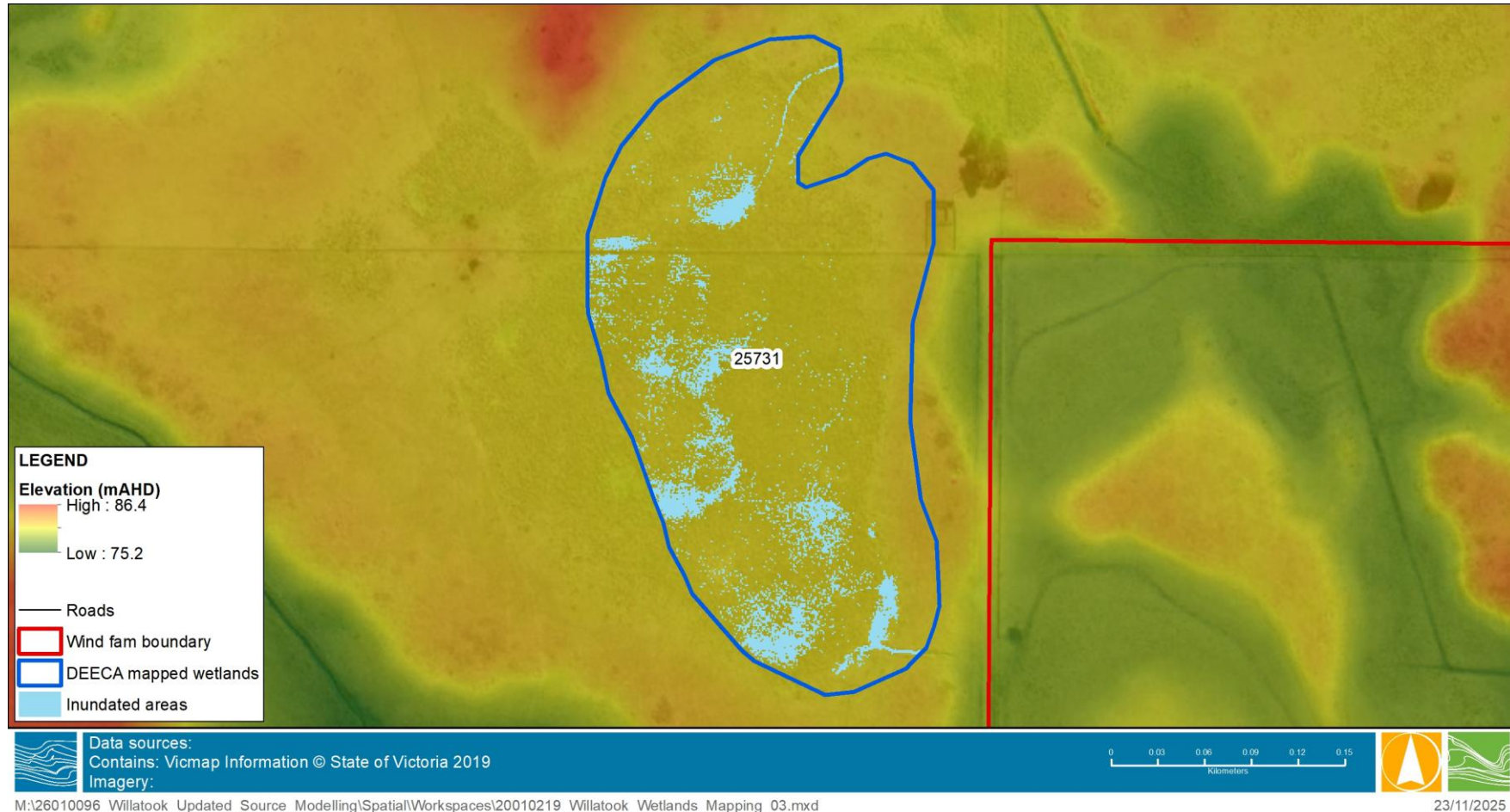


Figure 4-17 Wetland 25731 extent and topography.

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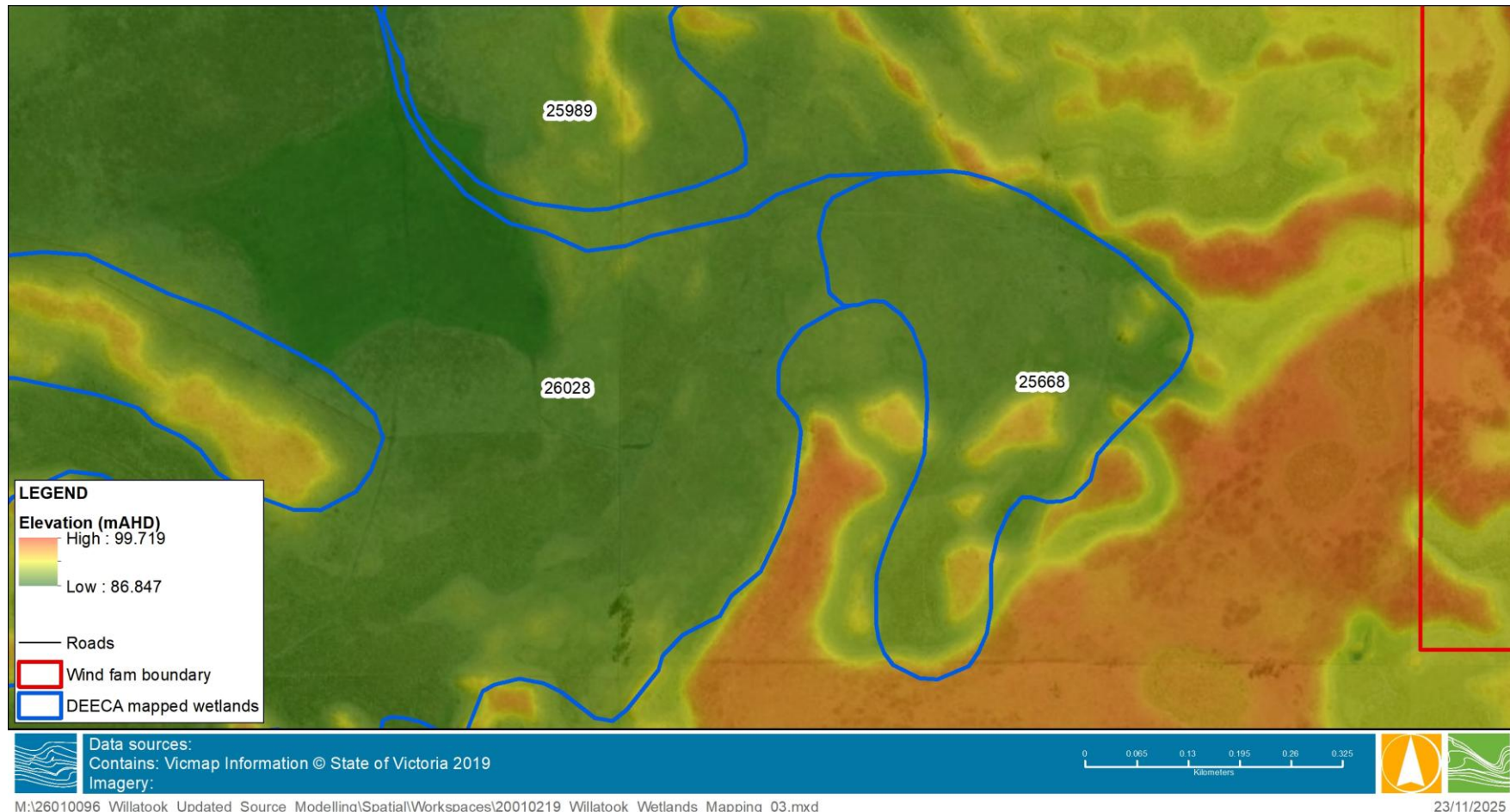


Figure 4-18 Wetland 25668 extent and topography.

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5 2022 SENSITIVITY TESTING

The period modelled in the previous EES reporting and this report included 2009-2019, covering the period during and prior to the preparation of the original Environment Effects Statement (EES). Given the time taken between the EES, the finalisation of this report (2025) and the 2022 rainfall event occurring since the EES preparation a sensitivity test was undertaken comparing modelled water levels between the 2022 and 2016 events, which was also significant.

Maximum monthly wetland depths in wetland 446, 25974 and 25956 were compared for the 2022 and 2016 events, as shown in Figure 5-1, Figure 5-2 and Figure 5-3 respectively. The comparison showed events had similar water levels. The 2022 started with higher water levels in each of the wetlands but with the 2016 event producing higher water levels but the 2016 event reached higher water levels in wetland 25974, with more runoff during the 2016 event.

Using the 2009-2029 period to assess wetland inundation characteristics is considered sufficient to represent both wet and dry times. Adding to the modelled period or moving the 10 year window assessed is unlikely to change the modelling outcomes.

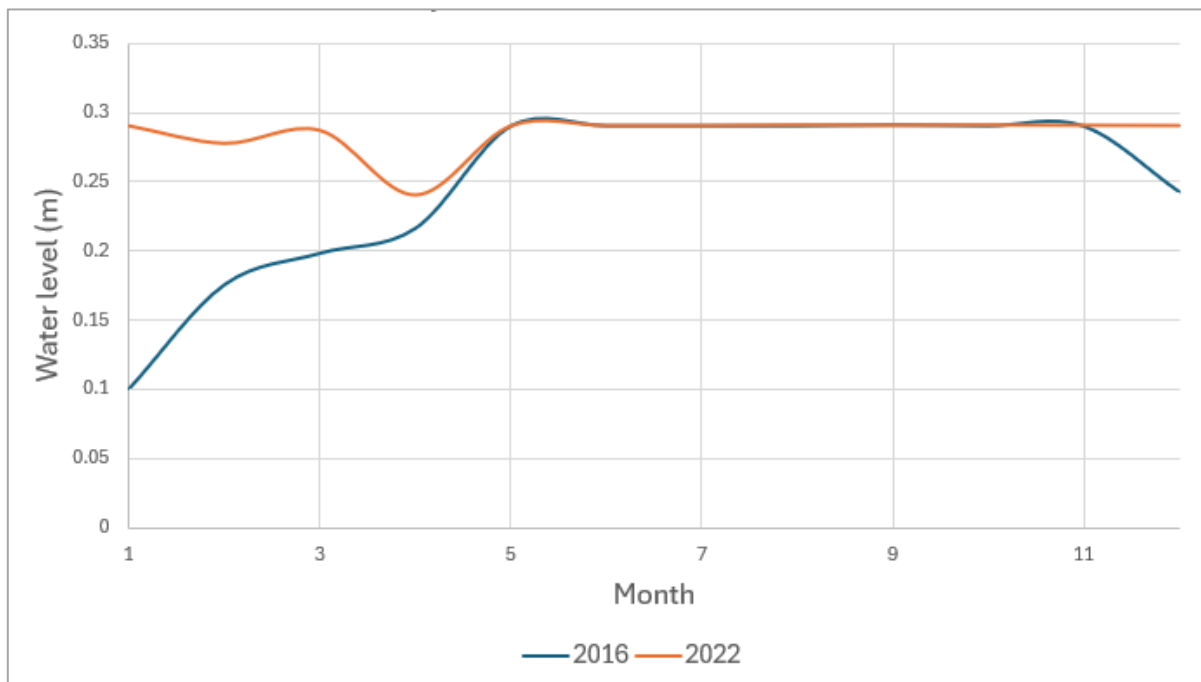


Figure 5-1 Maximum monthly wetland depths in wetland 446 - 2016 and 2022

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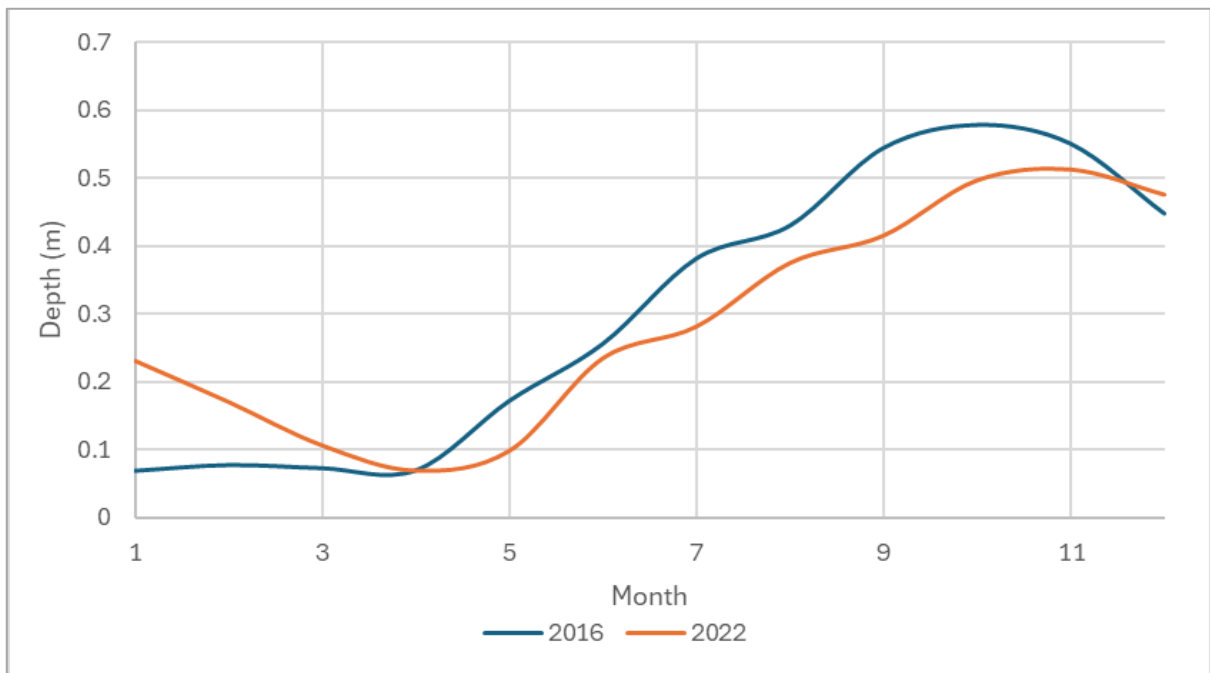


Figure 5-2 Maximum monthly wetland depths in wetland 25974 - 2016 and 2022

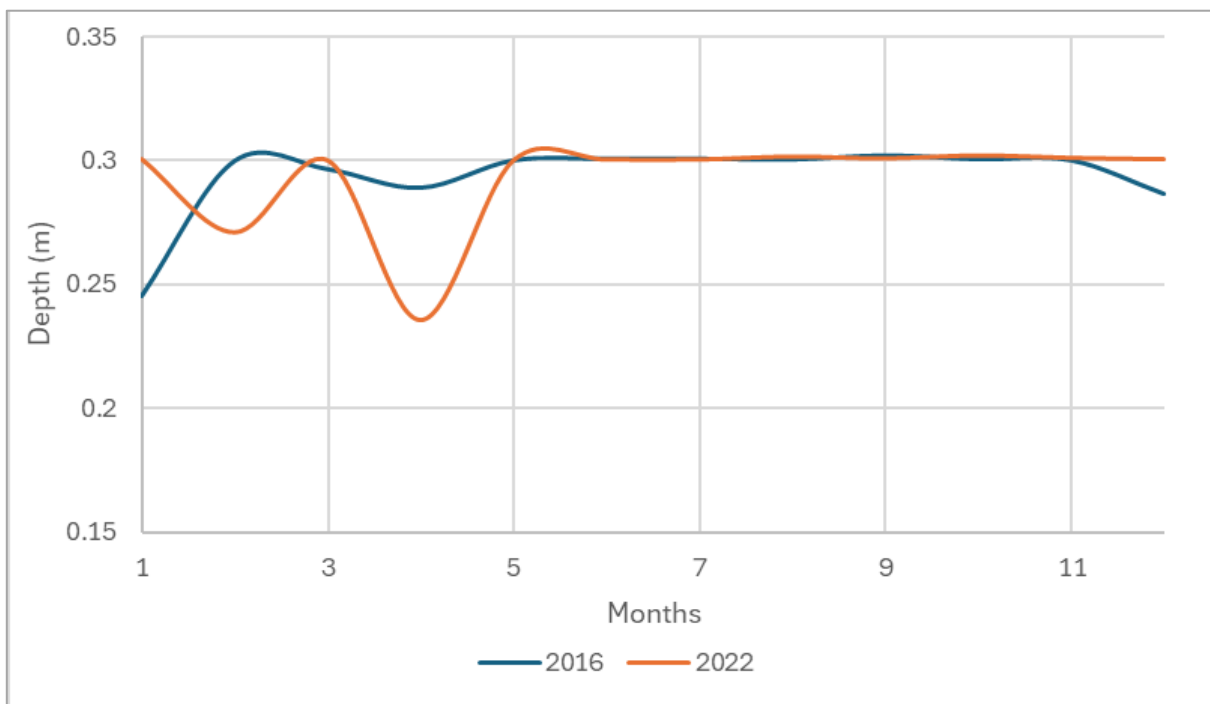


Figure 5-3 Maximum monthly wetland depths in wetland 25956

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6 SUMMARY

This updated assessment aligns with the Brolga Guidelines that support the Handbook for Renewable Energy Development in Victoria (DEECA, 2025) and aligns with the recommended approach for identifying and characterising potential breeding habitat. The updated mapping ensures that habitat assessments are consistent with the current methodology endorsed by the Victorian Government and that potential impacts are appropriately considered in project design and mitigation planning.

Sensitivity analysis of the October 2022 event has shown its inclusion in the broader assessment will not change its outcomes due to the previous assessment already including the significant 2016 period.

An updated map of the areas within and surrounding the Willatook Wind Farm project area where 120 consecutive days of inundation through the July to November period has been met is shown in Figure 6-1.

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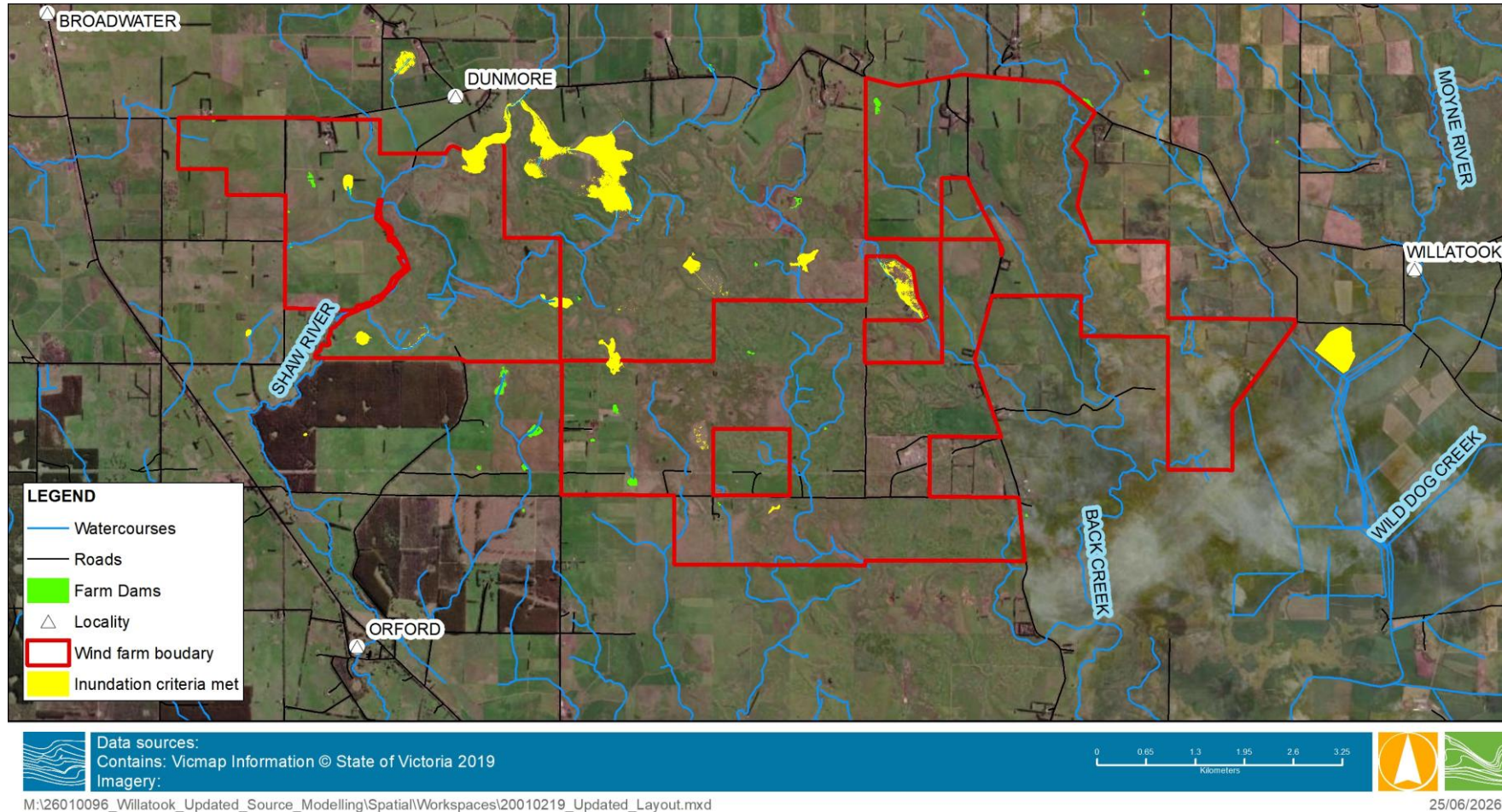


Figure 6-1 Updated areas highlighted as meeting the 120 days of consecutive inundation in the July to November period.

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MEMORANDUM

Date 22 January 2024
To Michael Sale | Willatook Wind Farm Pty Ltd
From Ben Hughes | Water Technology
Subject Wetland assessment – Wetland 25668 and 25698
WT ref 24010167_M01V01_Wetlands_Assessment.docx

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1 OVERVIEW AND PURPOSE

The proposed Willatook Wind Farm development area is located in south west Victoria, approximately 22 kilometres north of Port Fairy and 32 kilometres northwest of Warrnambool. The development area is located immediately south of Woolsthorpe-Heywood Road. The development area is spread across the Eumeralla-Shaw River and Moyne River catchments, within the Glenelg Hopkins Catchment Management Authority (GHCMA) management area. Much of the site is low lying and has a poorly defined natural drainage system with some constructed drainage. The Moyne River and Shaw River are the two major waterways flowing through and near to the site, with Back Creek a tributary of the Moyne River also flowing through the east of the site. Land use within development area and upstream catchments is a mixture of private and public land that is largely used for agriculture, predominantly sheep and cattle grazing with some cereal and fodder crops.

An Environment Effects Statement (EES) and Planning Permit application were submitted in early 2022 for the project. Post submission and EES Inquiry, the Willatook Wind Energy Facility EES Inquiry and Planning Permit Application Panel report was issued in January 2023, followed by the Willatook Wind Farm Ministers Assessment under the Environment Effects Act 1978 in July 2023.

The Ministers Assessment made specific comments in relation to wetlands 25698 and 25668 (state wetland mapping numbers), these were:

- *Wetland 25698, to confirm if it is hydrologically unsuitable for Brolgas or permanently drained.*
- *Wetland 25668, to determine the reasons for the LiDAR assessment reducing its extent.*

This memo addresses those recommendations.

2 ASSESSMENT DATA

This assessment has been based on aerial photography, topographic Light Detection and Ranging (LiDAR) data sourced for the Willatook Wind Farm EES and a site visit undertaken by Ben Hughes of Water Technology on October 24, 2023.

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3 WETLAND 25698

Wetland 25698 is located within the Back Creek catchment and adjacent to Tarrone North Road, as shown in Figure 3-1. The wetland drains to the north east, via constructed drainage channels, before flowing through a larger drain to Back Creek. Photos of these drains were captured during the site inspection. The mapped extent of Wetland 25698, drains and photo locations are shown in Figure 3-1 with the wetland topography shown in Figure 3-2. Photos captured during the site inspection are shown in Figure 3-3 to Figure 3-6, there had been recent rainfall immediately prior and during the site inspection.

The following points describe Wetland 25698's hydrologic characteristics based on the site inspection, aerial photography and topography:

- It is permanently drained.
- There are two main drains running from the north and south east to the centre, which then drains under Tarrone North Road.
- Connecting to the main drains are numerous smaller minor drains.
- Both the main and minor drains are actively working and are generally well maintained.

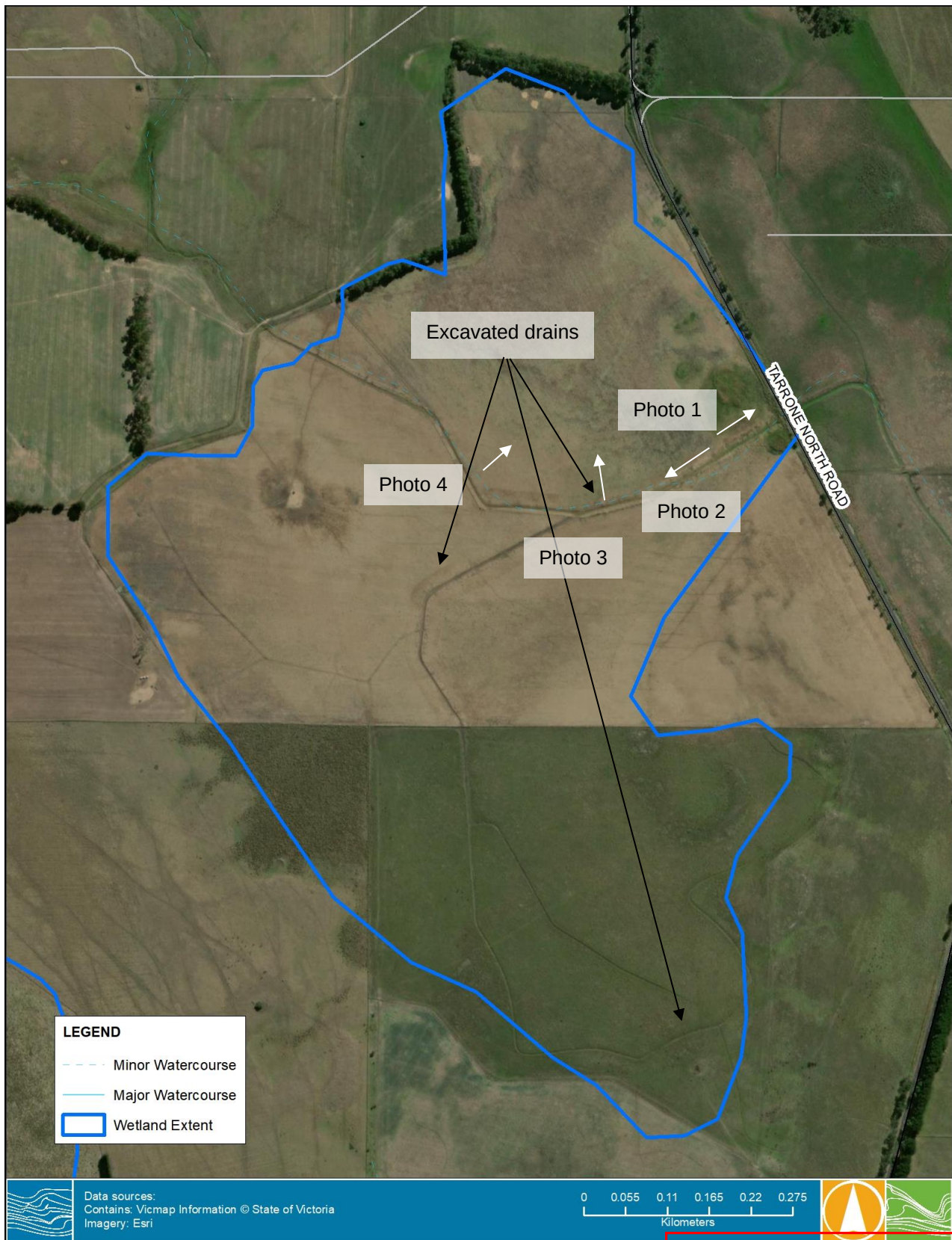
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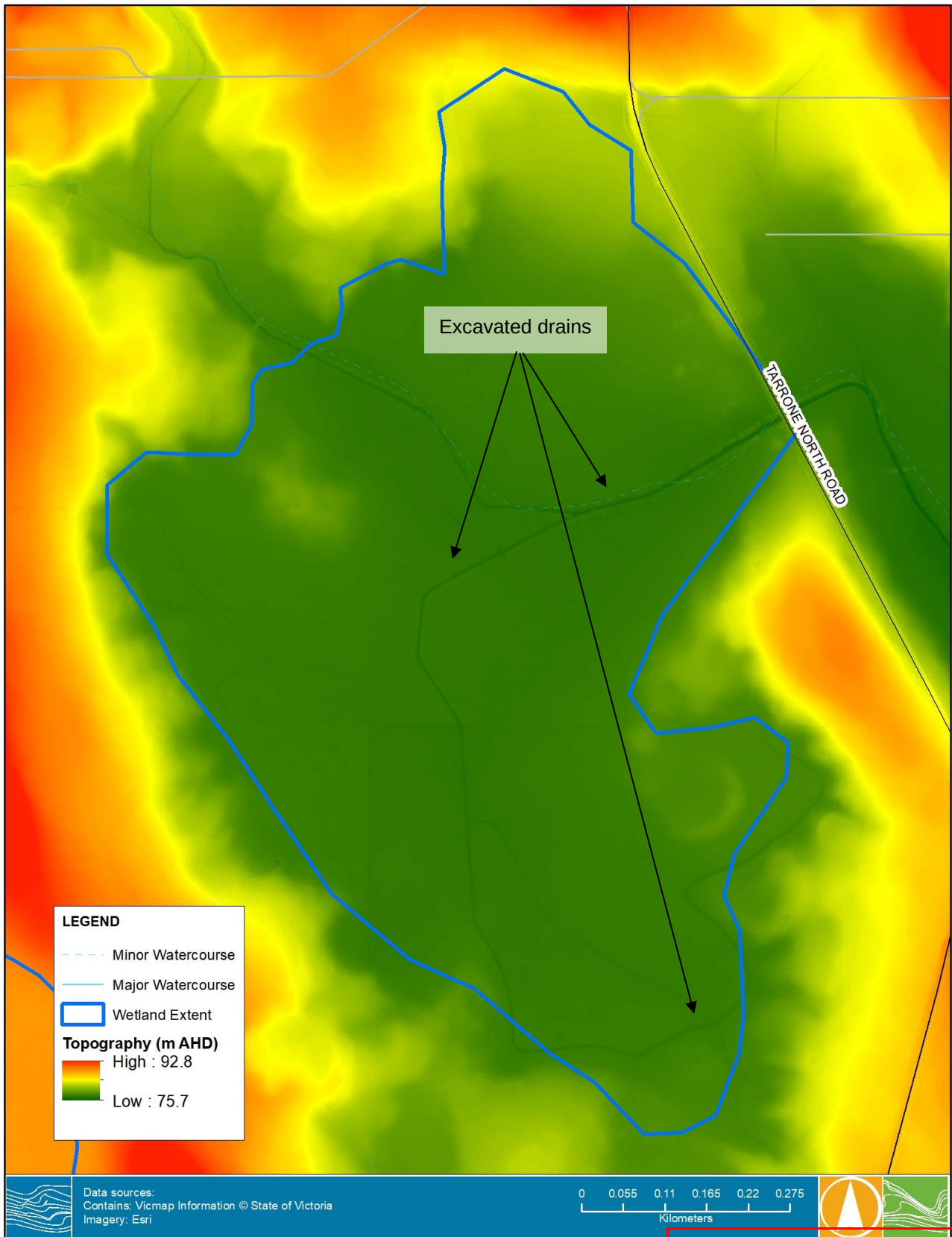
Figure 3-1 Wetland 25698 extent and photography references

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Figure 3-2 Wetland 25698 topography

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Figure 3-3 Main drain from Wetland 25698 (Photo 1)



Figure 3-4 Main drain from Wetland 25698 (Photo 2)

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Figure 3-5 Minor drain from Wetland 25698 (Photo 3)



Figure 3-6 Minor drain from Wetland 25698 (Photo 4)



4 WETLAND 25668

Wetland 25668 is south of Woolsthorpe-Heywood Road and is part of a larger wetland complex, connected via a series of excavated drains. It is not a standalone wetland, but an upstream section of Wetland 26028, as shown in Figure 4-1. The wetland drains to the north west, in constructed drainage channels. Photos of these drains were captured during the site inspection. The mapped extent of Wetland 25668, drains and photo locations are shown in Figure 4-2 with the wetland topography shown in Figure 4-3. Photos captured during the site inspection are shown in Figure 4-4 to Figure 4-6.

The following points describe Wetland 25668's hydrologic characteristics based on the site inspection, aerial photography and topography:

- It is permanently drained.
- Hydrologically, Wetland 256667 is considered part of the larger Wetland 26028. As shown in Figure 4-3 there is no topographic separation.
- Wetland 25668 was assessed in detail as part of the modelling undertaken for Wetland 26028. The drains in Wetland 25668 drain to Wetland 26028, making it part of the upstream outer extent of the larger wetland. The detailed assessment of Wetland 26028 undertaken as part of the Willatook Wind Farm EES demonstrated parts of Wetland 26028 meet the inundation criteria required to enable brolga breeding; however, the extent of this area did not extend to Wetland 25668. This is due to the presence of drains in Wetland 25668. The area determined as meeting the brolga breeding inundation criteria in Wetland 26028 is shown in Figure 4-7.
- Drains were part of a grazed paddock.

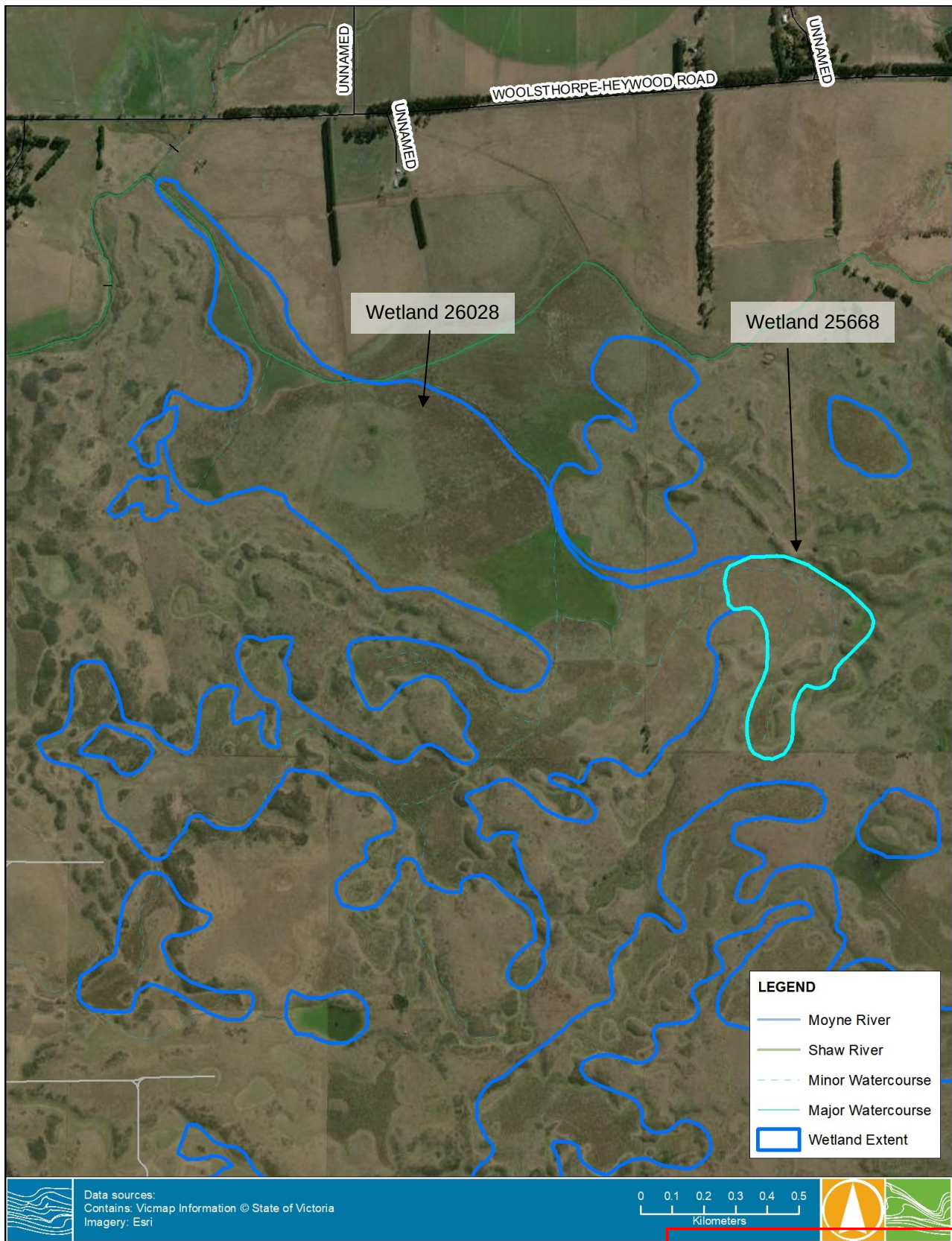
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Figure 4-1 Wetland 25668 in the context of other wetlands

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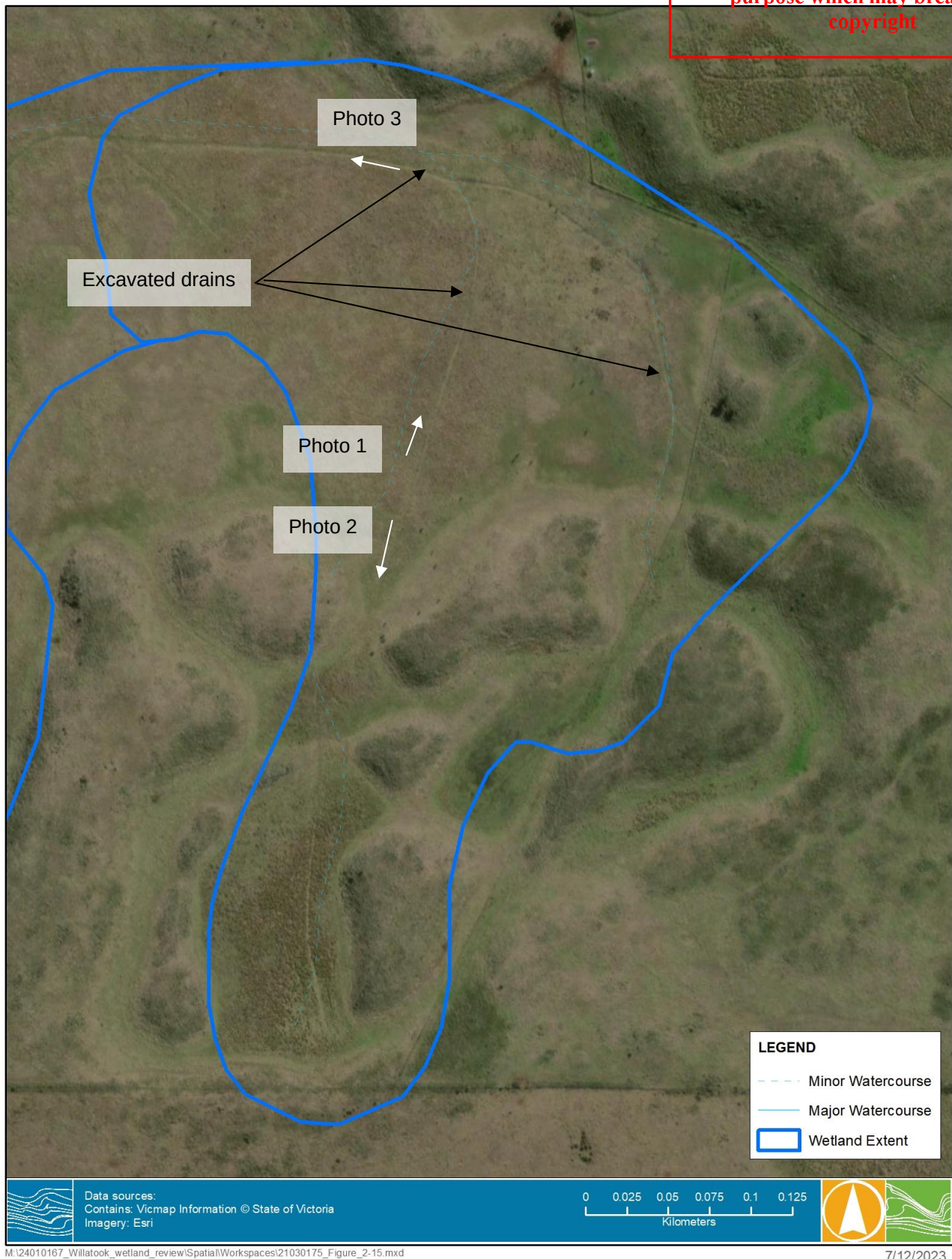


Figure 4-2 Wetland 25668 extent and photography references

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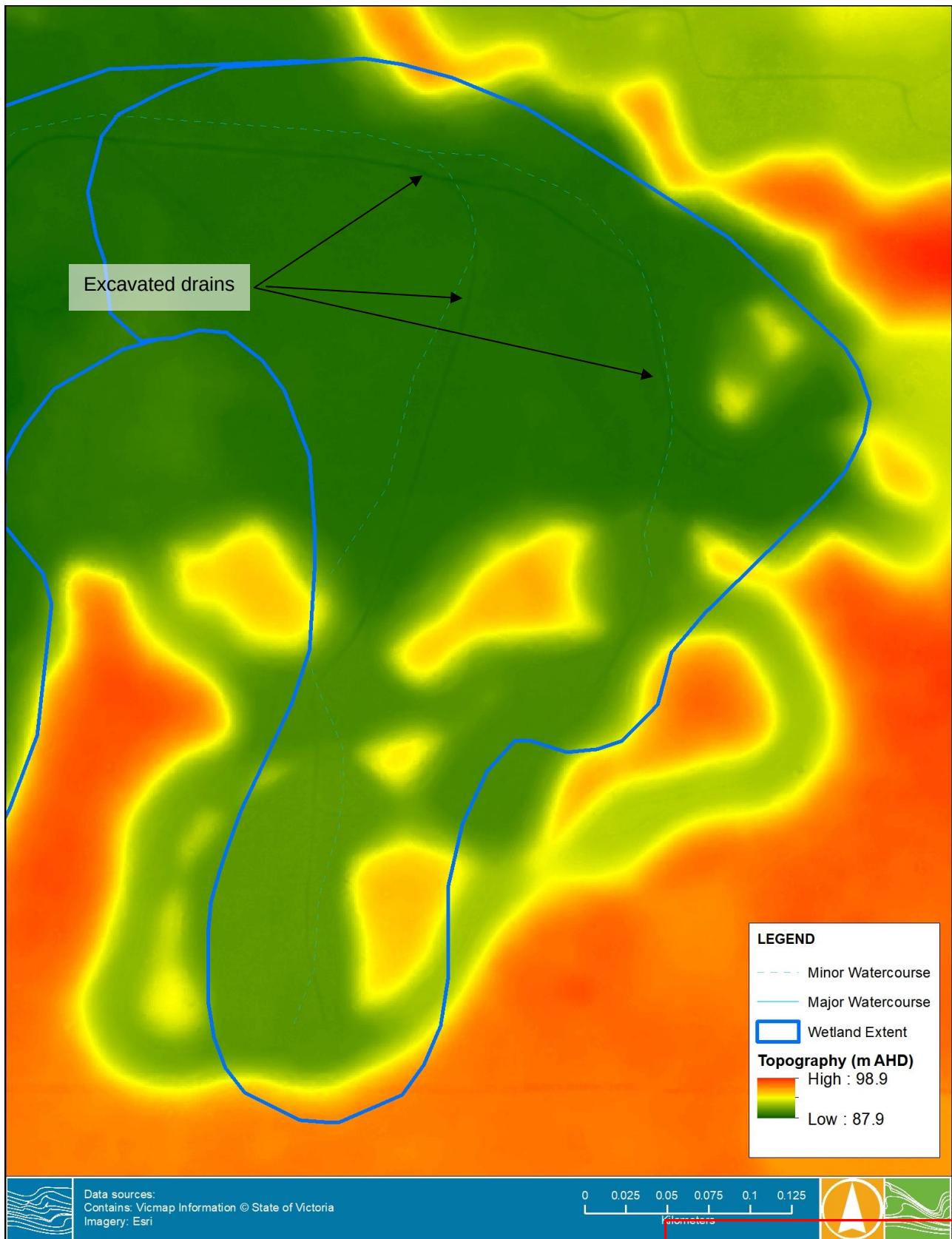


Figure 4-3 Wetland 25668 topography



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Figure 4-4 Main drain from Wetland 25668 (Photo 1)



Figure 4-5 Main drain from Wetland 25668 (Photo 2)



Figure 4-6 Main drain from Wetland 25668 (Photo 3)

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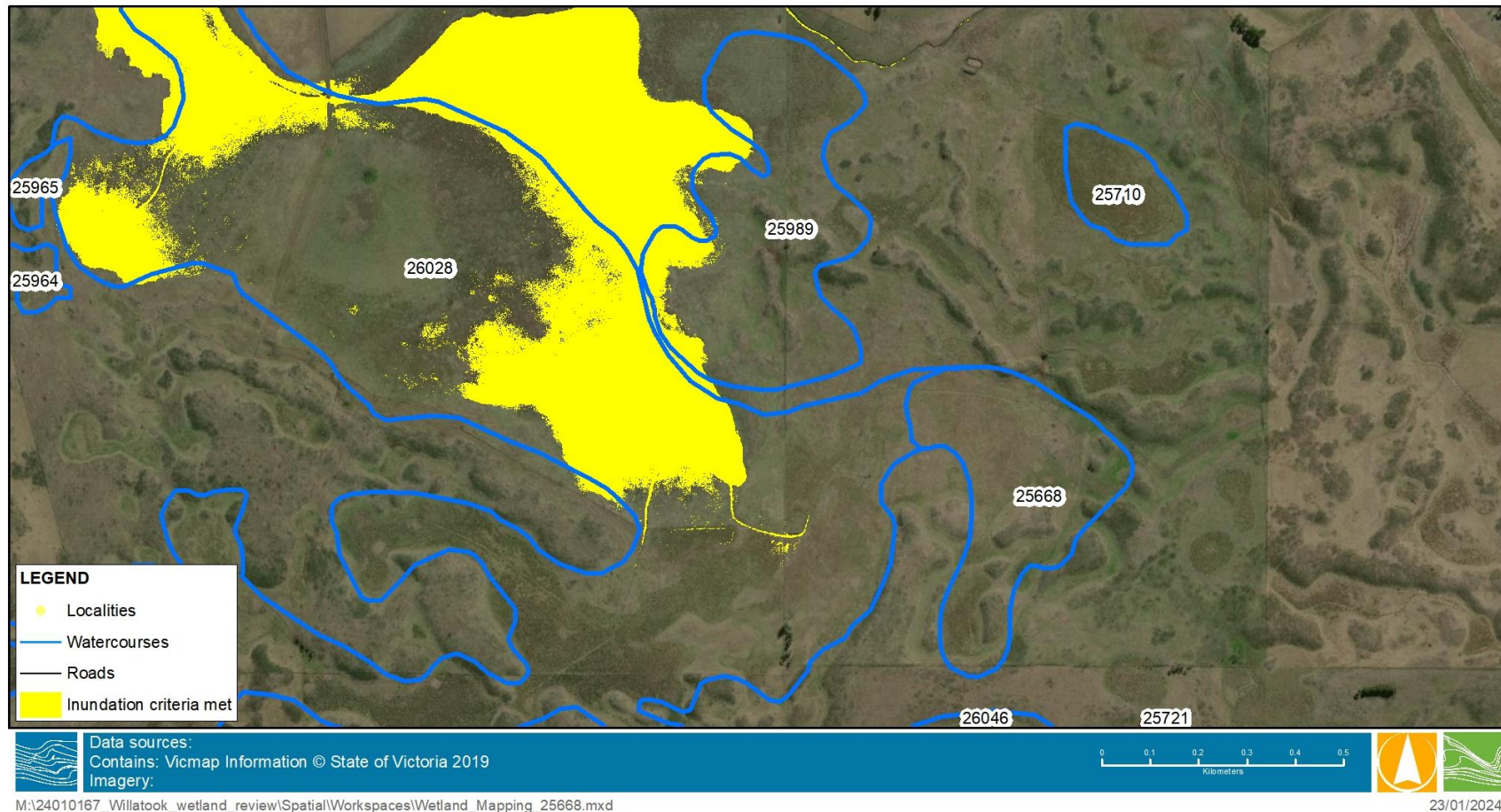


Figure 4-7 Wetland 26028 Wetland 25668 with respect to areas meeting the wetland inundation criteria outlined in the Willatook Wind Farm EES

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Willatook Windfarm – Wetland Analysis

Willatook Wind Farm Pty Ltd

24 March 2022

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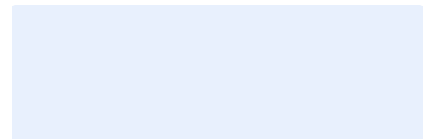
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04	Final	Ben Hughes	Ben Hughes	08/03/2022
05	Final	Ben Hughes	Ben Hughes	22/03/2022

Project Details

Project Name	Willatook Windfarm – Wetland Analysis
Client	Willatook Wind Farm Pty Ltd
Client Project Manager	Rory McManus
Water Technology Project Manager	Ben Hughes
Water Technology Project Director	Ben Tate
Authors	Ben Hughes
Document Number	20010218_R01V01_Wetland_Analysis.docx



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24 March 2022

Rory McManus
Development Manager
Willatook Wind Farm Pty Ltd
Suite 10 | 19-35 Gertrude St | Fitzroy | Victoria 3065
Via email rory.mcmanus@windprospect.com.au

Dear Rory

Willatook Windfarm – Wetland Analysis

This report documents an assessment of the long term inundation regime of depressions within and surrounding the Willatook Wind Farm. The inundation regime of these depressions has been used to identify potential brolga breeding habitat by specialist ecologists.

Yours sincerely

Ben Hughes
Principal Engineer

Ben.hughes@watertech.com.au

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1 INTRODUCTION

1.1 Overview

Willatook Wind Farm Pty Ltd (WWF) are completing investigations into their proposed wind farm located between Orford and Hawkesdale in south-west Victoria (Figure 1-1). Hydrological modelling was completed to inform the assessment of potential impacts on Brolga and their potential breeding and night roosting habitat. This modelling was then used as a basis for more detailed review and site assessment by specialist ecologists Nature Advisory.

1.2 Purpose of the report

This report details the assessment methodology and the surface water modelling results dictating which areas were highlighted as potential brolga breeding habitat. The objectives of this assessment are summarised below:

- Determine which areas within and surrounding the Willatook Wind Farm have the potential to have water pooling.
- Assess the likelihood water will remain in these pools for a time sufficient to support successful Brolga breeding and night roosting.

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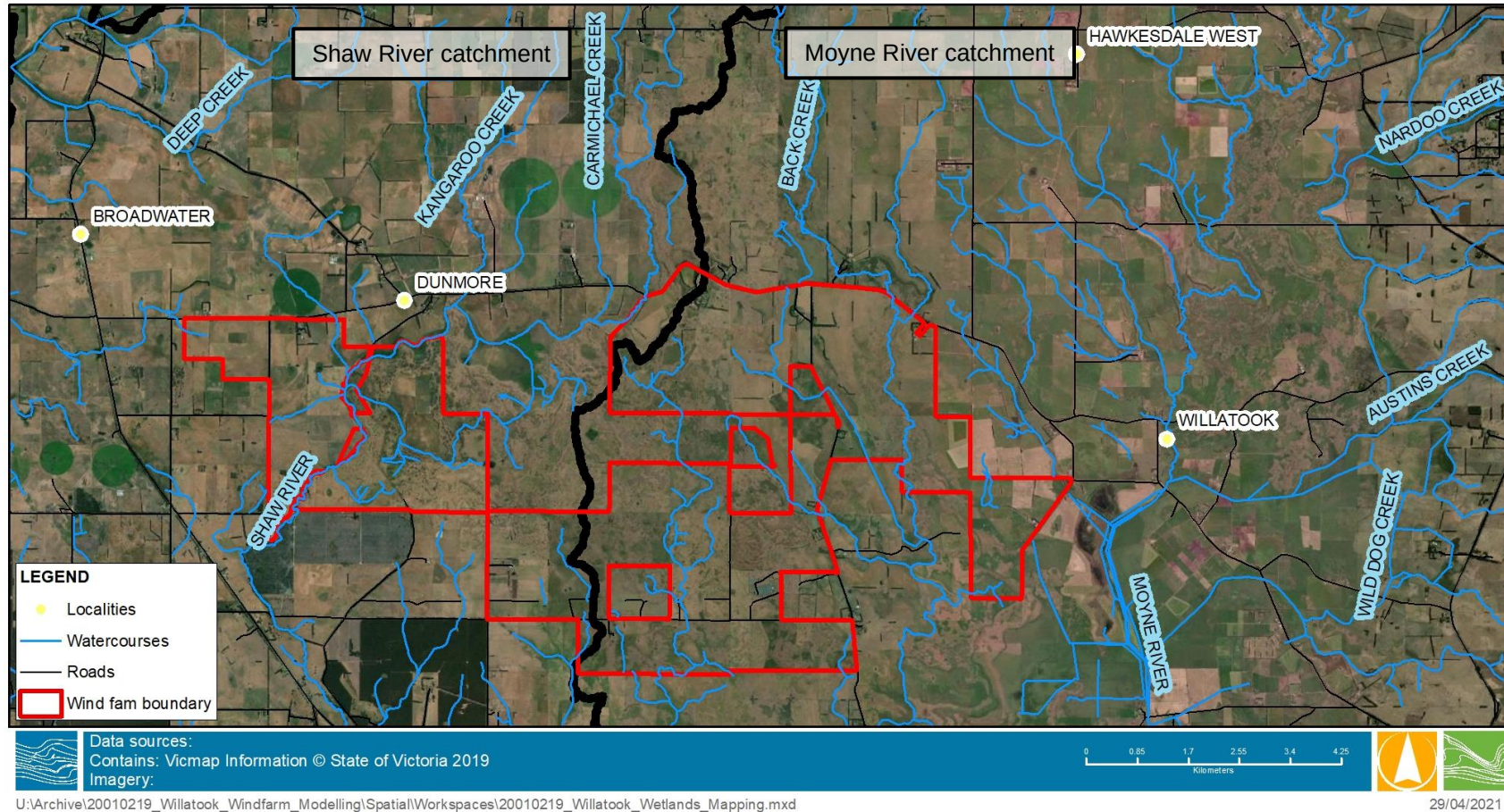


FIGURE 1-1 SITE LOCALITY

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2 METHODOLOGY

2.1 Overview

The assessment methodology aimed to identify areas which held water for more than 120 consecutive days between July and December from the beginning of 2009 to the end of 2019 within and surrounding the proposed Willatook Wind Farm.

The inundation period of 120 days and the 10 year time period was advised by the Department of Environment, Land, Water and Planning. Brolga nest in wetlands with emergent vegetation that holds water for at least 120 days, permitting nest building, egg laying and incubation, hatching and the growth of chicks to an age where they can walk to nearby wetlands should the original breeding wetland dry out (Nature Advisory, 2021).

Given the large and hydrologically complex nature of the windfarm area several steps and modelling tools were used to complete this assessment, an overview of these tasks is provided below with detail included in the sections that follow.

- A 'Rain on Grid' hydraulic model of the proposed windfarm and upstream catchment area was developed and modelling of the 1% Annual Exceedance Probability (AEP¹), 72-hour event was undertaken to gain an understanding of overland flow paths, wetland interrelationships and wetland extents. The hydraulic model was run for seven days post rainfall ceasing allowing all water to flow to its terminal wetland/waterway
- All current Department of Environment, Land, Water and Planning (DELWP) mapped wetlands were modelled (hydraulic model results provided more accurate representation of the DELWP mapped wetland extents rather than relying on those digitised by DELWP relying on aerial imagery).
- All areas with a depth of greater than 2cm were filtered from the hydraulic model results and polygons of areas with depths greater than 2cm were created. It is standard practice in 'Rain on Grid' models to remove shallow depths which may be inaccurate due to minor inconitences in the model topography.
- All inundated areas less than 0.1 Ha (1,000 m²) were removed. Nature Advisory advised that wetlands less than 0.1 Ha (1,000m²) are not suitable for breeding habitat based on a review of Brolga nesting habitat sites.
- Manual assessment of the remaining wetlands was completed, screening those from detailed analysis if they met the following criteria:
 - The wetland was permanently drained – a wetland was considered permanently drained if an excavated earthen channel had been constructed from the wetland invert to a connecting drain, downstream waterway or downstream wetland.
 - The wetland had a relatively small size (only slightly above 0.1 Ha), was shallow (less than 300mm - the Source model results showed wetlands generally need to have a maximum depth of at least 300mm to maintain water for more than 120 days) and had a small catchment area.
 - Incorrect topographic representation resulted in the water pooling – e.g. a road culvert was not represented.

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¹ Annual Exceedance Probability (AEP) refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which may be calculated to have a 1% chance of occurring in any one year, would be described as 1% AEP flood event.



- A Source hydrologic model was developed of the remaining wetlands to determine a daily water level series for each from 2010-2019 inclusive.
- All areas modelled in Source that held water for at least 120 days during the July to December period were mapped.

2.2 Hydraulic Modelling

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2.2.1 Overview

Hydraulic modelling of the Willatook Wind Farm project area and upstream catchment was completed using TUFLOW². TUFLOW is one of the most widely used hydraulic modelling software packages in Australia and is the preferable modelling package for Glenelg Hopkins CMA (which the Willatook Wind Farm is within). The software is considered an appropriate modelling tool for modelling of the site. A Rain on Grid approach was used, allowing the simulation of runoff generated from local rainfall on a two-dimensional (2D) grid representative of the site topography (i.e. a 2D grid of cells with assigned topographic values). The TUFLOW model was used to identify how wetlands and other depressions are filled, their maximum expected extent and interconnections. The TUFLOW model covered the Shaw River catchments as well as all local catchments to the Willatook Wind Farm. The hydraulic model extent is shown in Figure 2-1.

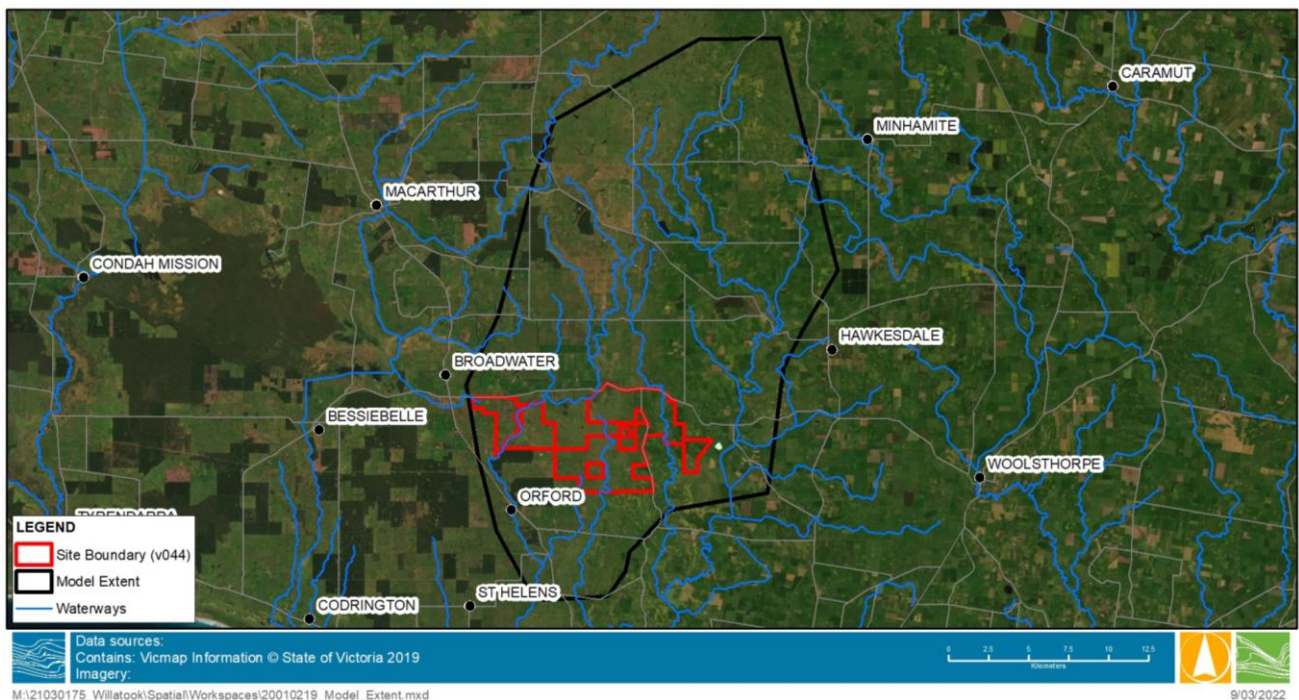


FIGURE 2-1 WILLATOOK WIND FARM – HYDRAULIC MODEL EXTENT

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² <https://www.tuflow.com/>



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2.2.2 Inputs

The TUFLOW model had four key inputs, these included:

- A Digital Elevation Model (DEM) – The DEM was constructed by combining LiDAR data specifically flown for the Willatook Wind Farm (and provided by Willatook Wind Farm Pty Ltd at a 1m grid resolution) within the proposed windfarm and the VicMap10m DEM outside the proposed windfarm area. The combined DEMs were resampled to a 5x5 m grid resolution and were adopted in the model development to enable reasonable model run times.
- Hydraulic roughness – Roughness was modelled using a Manning's 'n'³, determined using planning layers and verified using aerial imagery, the adopted values are highlighted in Table 2-1.
- Rainfall depths and temporal pattern - Bureau of Meteorology 2016⁴ recommended Intensity Frequency Duration (IFD) rainfall data was adopted for modelling of the 1% AEP, 72-hour event, extracted from the ARR2019 Datahub⁵. Temporal Pattern 08 was applied (based on modelling undertaken during the Willatook Wind Farm Hydrogeological and Hydrological Investigation⁶).
 - The 72hr event was chosen as the most appropriate event duration to maximise the volume of runoff to low areas within the model topography. Shorter duration events may generate larger peak flows from small catchments but the quantity of runoff to potential wetland areas was a larger contributing factor to requiring a more detailed assessment for potential brolga breeding habitat.
- Losses – The recommended Australian Rainfall and Runoff 2019 (ARR2019⁷) losses were adopted and extracted from the ARR2019 Datahub⁵, determined using planning layers and verified using aerial imagery, the adopted values are outlined in Table 2-1.
- Model outflow boundaries – flowrate height boundaries were used on the perimeter of the model to enable water to freely drain without any backwater in the model.

TABLE 2-1 MANNING ROUGHNESS COEFFICIENTS AND LOSSES

Land Use Type	Manning 'n'	Initial Loss (mm)	Continuing Loss (mm/hr)
Open Space - minimal vegetation	0.04	10	4.6
Open Space - moderate vegetation	0.06	10	4.6
Open Space or Waterway - heavy vegetation	0.09	0	0.1
Open water (with reedy vegetation)	0.06	0	0.1
Open water (with submerged vegetation)	0.02	0	0

2.2.3 Results

The hydraulic model was run for seven days post rainfall had ceased to allow water to drain to each depression. Results were also filtered to remove depths less than 2cm ensuring very shallow areas were not erroneously indicating inundation. The hydraulic model results at seven days post rainfall are shown in Figure 2-2.

³ Manning's roughness coefficient is used in the Manning's formula to calculate flow in open channels - Chow, V.T. (1959) Open Channel Hydraulics. McGraw-Hill, New York.

⁴ <http://www.bom.gov.au/waterdata/>

⁵ <https://data.arr-software.org/>

⁶ Water Technology, 2022, Willatook Wind Farm Hydrogeological and Hydrological Investigation.

⁷ Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), 2019, Australian Rainfall and Runoff: A Guide to Flood Estimation, Commonwealth of Australia

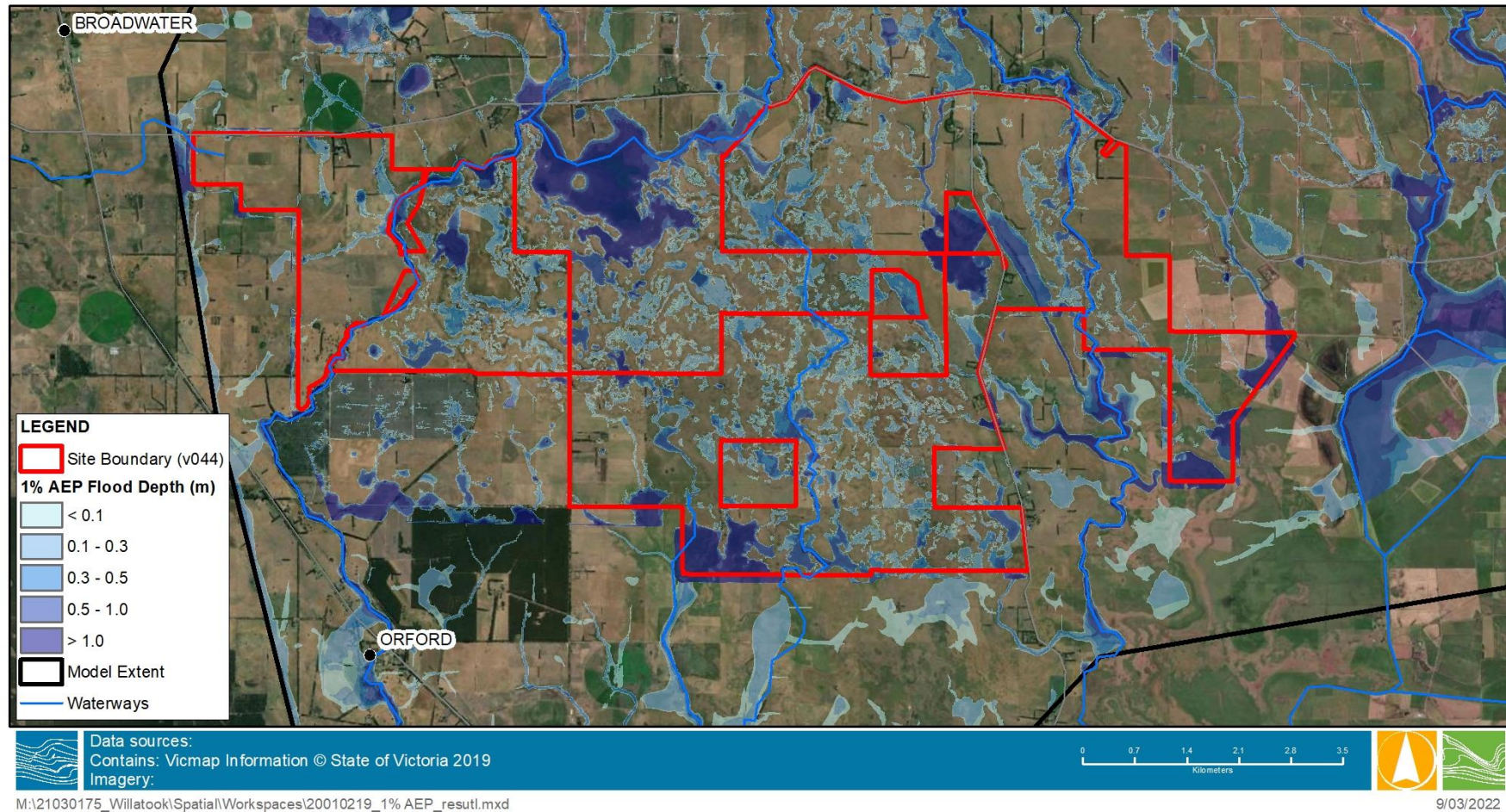


FIGURE 2-2 INUNDATION WITHIN THE PROPOSED WILLATOOK WINDFARM – 1% AEP, 72 HOUR EVENT, 7 DAYS POST RAINFALL OCCURRING.

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2.3 Wetland Selection

As discussed in Section 2.1, the hydraulic model results were used to delineate which wet areas would move to a more detailed hydrologic assessment. Inundated areas with an area of less than 0.1 Ha were removed, this left approximately 800 potential wetland sites across the windfarm area. These areas were assessed using a desktop assessment of LiDAR, hydraulic model results and aerial imagery to exclude those that did not require detailed modelling. There were three main reasons a wetland could be excluded from detailed modelling, these were as follows, with an example of each shown in Table 2-2.

- The wetland was permanently drained – a wetland was considered permanently drained if an excavated earthen channel had been constructed from the wetland invert to a connecting drain, downstream waterway or downstream wetland.
- The area had a relatively small size (only slightly above 0.1Ha), was shallow (less than 300mm – the Source model results showed wetlands generally need to have a maximum depth of at least 300mm to maintain water for more than 120 days) and had a small catchment area.
- Incorrect topographic representation resulted in the water pooling – e.g. a road culvert was not represented.

Farm dams were also excluded from the detailed assessment as they were guaranteed to meet the 120 day inundation criteria. These dams automatically progressed for further assessment by Nature Advisory. A map of the wetlands excluded from assessment and those that progressed to detailed modelling are shown in Figure 2-3.

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TABLE 2-2 EXAMPLE EXCLUSIONS

Reason for exclusion	Explanation	Figure
Drained area	Drainage lines are observed on satellite imagery and topography. The drains are smaller than the hydraulic model resolution but have been constructed to prevent water from accumulating for long periods.	
Relatively small size (only slightly above 0.1Ha), was shallow (less than 300mm) and had a small catchment area	The wetland has an area of 1500 m ² , maximum depth of 0.18 m and there is no obvious upstream catchment that could contribute water or connectivity to nearby wetland areas.	

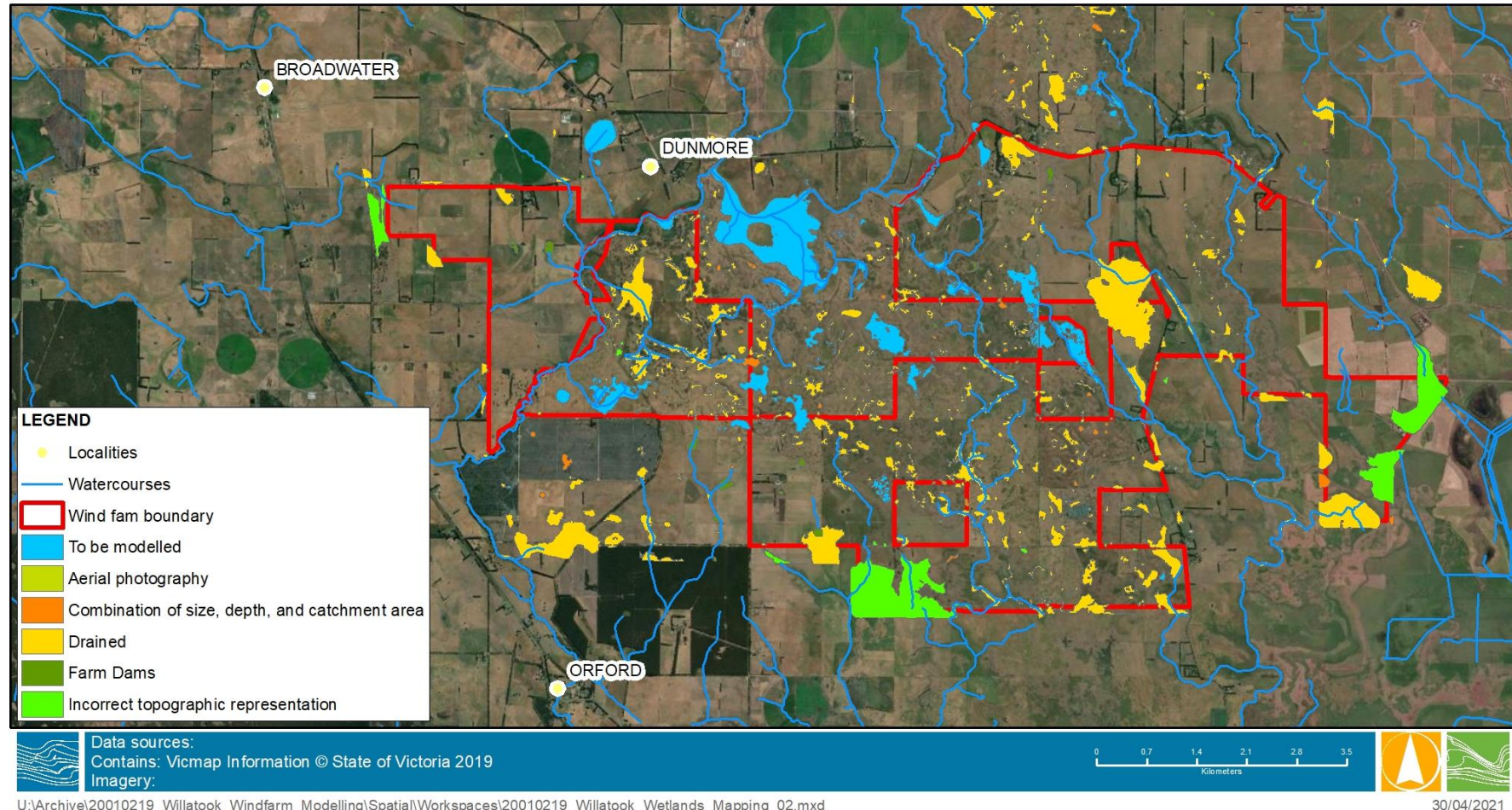
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Reason for exclusion	Explanation	Figure
Incorrect topographic representation	The roads representation in the DEM prevents the area from draining, however a culvert under the road not modelled would enable water to move from one side to the other.	

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FIGURE 2-3 WETLANDS EXCLUDED OR PROGRESSED TO DETAILED MODELLING

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2.4 Hydrologic Modelling

2.4.1 Overview

Wetlands which were selected for longer term hydrologic analysis were modelled in Source⁸. Source was used to conduct water balance modelling of each wetland individually or as a series of connected wetlands with a specific Source model of each wetland or series of wetlands built.

Source was used to estimate runoff volumes and wetland levels and included the following key components:

- Sources of inflow water to the water bodies (watercourses and wetlands) was rainfall and rainfall runoff.
- Outflows from the watercourses and wetlands modelled included evapotranspiration, evaporation (from the surface areas of wetlands and watercourses), interflow with soil layers and deep seepage to groundwater.

The interactions between these components over time produced a water level time series for each modelled wetland. An example of how one of the Source models was schematised is shown in Figure 2-4.

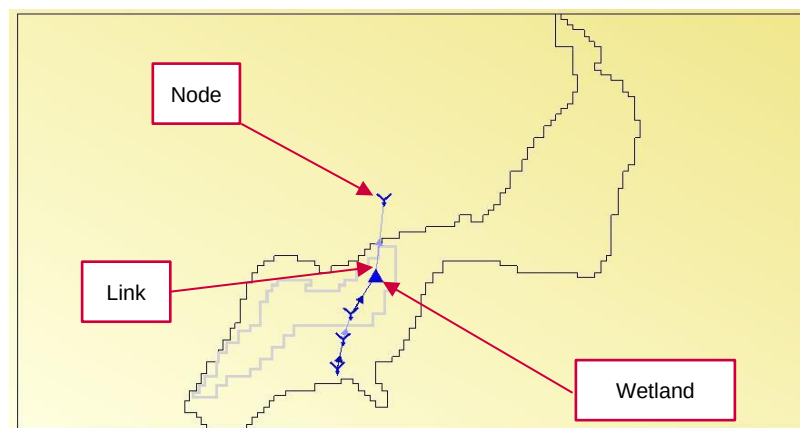


FIGURE 2-4 SOURCE MODEL FOR WETLAND NO.12

The rainfall runoff model adopted in Source was SIMHYD, estimating the flow generated from each sub-catchment based on the applied climatic data (rainfall and evapotranspiration). Climatic data was obtained from SILO Queensland Point Data and applied to the sub-catchments based on closest proximity. The SILO rainfall data was compared to the BoM rainfall data recorded at the closest daily rainfall gauge, Hawkesdale (Post Office), indicating a close match between the datasets. The model used the default parameter values outlined for the SIMHYD model in eWater Source documentation² as there was no gauge data available to calibrate the models. Catchments are represented by nodes, watercourses by links, and storage nodes for wetlands.

The model required daily rainfall and potential evapotranspiration data and had nine parameters as shown in Table 2-3, along with their recommended range.

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⁸ <https://ewater.org.au/products/ewater-source/>



TABLE 2-3 MODEL PARAMETERS

Parameter	Description	Units	Min	Max
Baseflow coeff.	Base flow Coefficient		0.0	1.0
Impervious Threshold	Impervious Threshold	mm	0.0	5.0
Infiltration Coeff.	Infiltration Coefficient		0.0	400
Infiltration shape	Infiltration Shape		0.0	10.0
Interflow Coeff.	Interflow Coefficient		0.0	1.0
Perv. Fraction	Pervious Fraction		0.0	1.0
Recharge coefficient	Recharge Coefficient		0.0	1.0
RISC	Rainfall Interception Store Capacity	mm	0.0	5.0
SMSC	Soil Moisture Store Capacity	mm	1.0	500

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2.4.2 Verification

Verification of small catchment water balance models is difficult given the lack of gauge data. To provide some form of model parameter verification, a single catchment was used as the basis for comparing model results to historic aerial photography. Wetland 4 was chosen as it is a known brolga breeding site, the location of Wetland 4 is shown in Figure 2-5

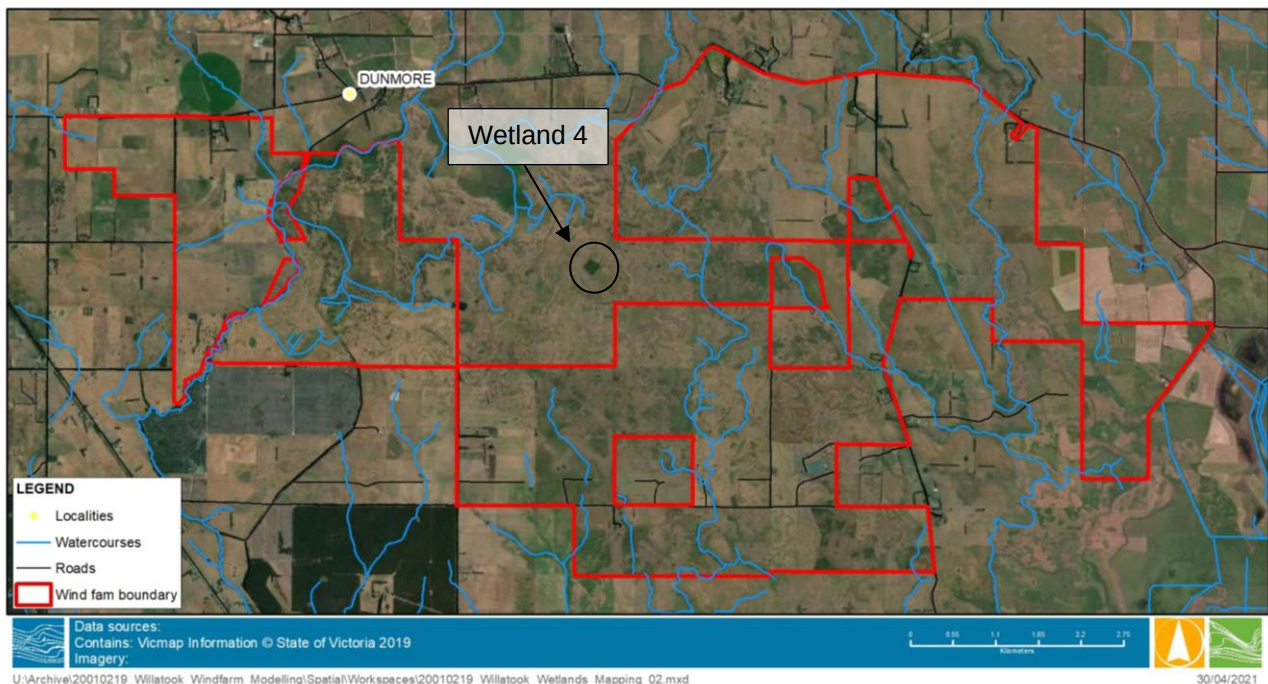


FIGURE 2-5 WETLAND 4 LOCATION

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Google Earth Pro has aerial photography at a high resolution was available for the following snapshots in time:

- April 2019.
- December 2016 (late 2016 is a known wet period in south west Victoria).
- February/March 2014.
- November 2013.
- November 2012.
- November 2011.

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Poor resolution imagery was also available for December 1985 and January 2011. High resolution aerial images for each of the dates available is shown in Appendix A, with a comparison of the model results and the aerial images described in Table 2-4.

TABLE 2-4 COMPARISON OF HISTORIC AERIAL IMAGERY AND MODEL RESULTS – WETLAND 4.

Date	Imagery and model results comparison
April 2019	Imagery shows the wetland to be largely dry with the potential for some water above the invert of the wetland in a small pool around 10m across. A review of the LiDAR data indicates the depth in the aerial photography to be around 0.1m. This compares to a steady depth in the model results through April 2019, varying from 0.05m to 0.07m.
December 2016	Wetland has several areas with appear to be holding water, the area is very green with a channel draining to the wetland also potentially holding water. A review of the LiDAR data indicates the depth in the aerial photography to be around 0.25m. This compares to a declining depth in the model results through December 2016 varying from 0.51 m to 0.3 m.
February/March 2014	The wetland looks to have water in it to a reasonable extent, but the surrounding terrain appears to be drier. A review of the LiDAR data indicates the depth in the aerial photography to be around 0.3-0.4m. This compares to a steady depth in the model results through April 2019, varying from 0.10 m to 0.22m.
November 2013	Water appears in the wetland to a reasonable depth with inundation in the upstream channel and spreading to broader areas of the wetland. A review of the LiDAR data indicates the depth in the aerial photography to be around 0.6-0.65m. This compares to a depth level in the model results through November 2013, varying from 0.58-0.61m.
November 2012	Inundation of the wetland is difficult to discern in the aerial photography due to the colouration of the vegetation. The change in vegetation colour indicates water may be or recently have been in the wetland, with a review of the LiDAR data indicating depths around 0.3-0.35m. This compares to a declining depth in the model results through November 2012, starting at 0.5m and ending November at 0.25 m.
November 2011	Very clear inundation of the wetland in the aerial photography with some small areas of open water. A review of the LiDAR data indicates depths of 0.35-0.5m. This compares to a declining depth in the model results through November 2011, starting at 0.5m and ending November at 0.3 m.

The model results were also compared to estimates made using the Australian Rainfall and Runoff (2019) Regional Flood Frequency Estimation (RFFE) model⁹. This comparison was made as an additional line of evidence for the small catchments contributing to the wetlands assessing less frequent events.

⁹ <https://rffe.arr-software.org/>



The comparison showed adopting the default Source parameters resulted in flow estimates higher than those recommended by the RFFE model, but within the estimated confidence limits. The default Source parameters were modified to achieve a closer match to the RFFE model estimates. A comparison of the RFFE model estimates and confidence limits was made against the modelled Source flows adopting both the default and modified model parameters, as highlighted in Table 2-5 and Figure 2-6.

TABLE 2-5 ADJUSTED PARAMETERS IN SOURCE

	SMSC	Infiltration Coefficient	Interflow Coefficient
Default parameters	320	200	0.1
Modified parameters	450	350	0.5

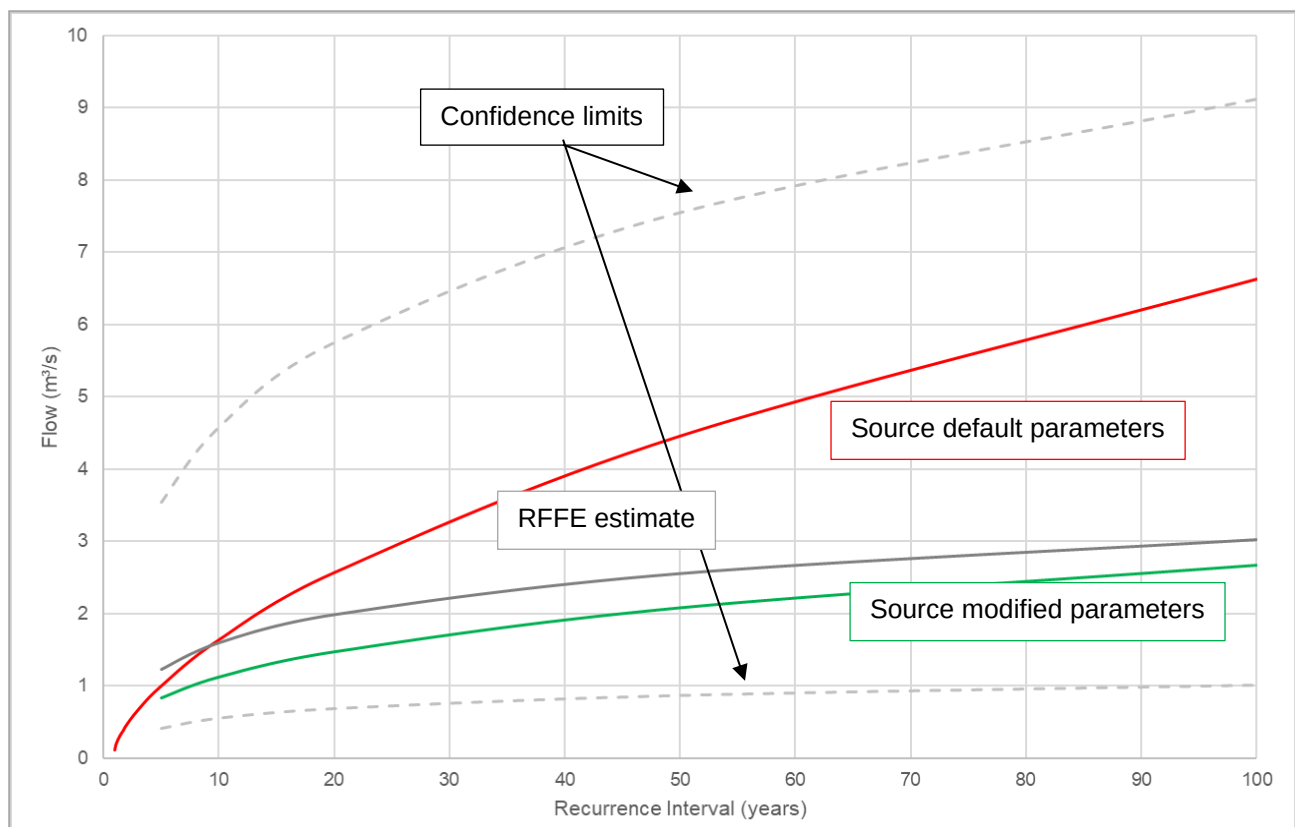


FIGURE 2-6 COMPARISON OF RFFE AND SOURCE DISCHARGES FOR DIFFERENT RECURRENCE INTERVALS

The wetlands were modelled as part of the catchment they were located within, with zero infiltration loss to rain applied to the wetland area. Each wetland was assigned rainfall and evapotranspiration data associated with its location (Morton Actual evaporation was used – alternatively Morton Lake Evaporation could have been used; however, it was slightly higher (around 0.6mm/day greater) and the lower evaporation value was adopted), zero infiltration occurred within each wetland. Each wetland was also set to start with zero initial volume. Using a lower estimate of evaporation and no infiltration allowed for a conservative estimate of wetland losses.

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The water level between 01 Jan 2009 to the 31 December 2019 was determined for each wetland and those which met the 120-day continuous inundation criteria in any instance from July to December were highlighted as prospective brolga breeding and night roosting habitat for further assessment.

2.4.3 Sensitivity testing

Sensitivity testing was undertaken varying the SIMHYD parameters within their expected range (as discussed in Section 2.4.1), while leaving all other inputs the same. The results for Wetland 4 and Wetland 6 were reviewed, as previously discussed Wetland 4 is a documented site for brolga breeding, while Wetland 6 only met the inundation criteria set once in the assessed 10 year period.

The sensitivity testing showed the input parameters could vary depths within Wetland 4 by up to 0.5m, with an average depth difference of 0.3m. The difference in modelled wetland depth was very consistent throughout the modelled period on a wetland which typically holds water and the potential for brolga breeding. In all modelled scenarios the wetland was continuously wet and there was no change to its determination as suitable for brolga breeding and night roosting.

The sensitivity testing showed the input parameters could vary depths within Wetland 6 by up to 0.3m, with an average depth difference of 0.025m. The larger variance in depth only typically occurred for a short period of time (days) with only a minor difference in consistent depth. This indicated the variance in depth due to the input parameters in a wetland which only just meets the inundation criteria for brolga breeding (once in the 10 year period) was relatively low. In all modelled scenarios the wetland generally dried out rapidly and there was no change to the number of instances where the brolga breeding criteria was met.

The sensitivity testing also showed the adopted parameters had consistently higher water levels than the default parameters in Wetland 4, with a mean difference of 0.05m. In Wetland 6 there was no mean difference in water level (less than 1mm) across the adopted and default parameters.

2.4.4 Discussion

Verification and sensitivity testing of the Source modelling has indicated an appropriate selection of input parameters, most clearly through the comparison to aerial photography. This indicated the Wetland 4 Source model was able to accurately reflect the presence and depth of water. Testing of the model input parameters indicated greater sensitivity in wetlands which consistently held water than those that are intermittently inundated.

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3 RESULTS

From the modelling undertaken the following was identified:

- The hydraulic modelled identified 804 areas which required further assessment. Of these:
 - 12 had an incorrect topographic representation within the model.
 - 145 had constructed drainage from the invert of the depression.
 - 41 were excluded because of their limited size, depth and catchment area. This combination of low depth, the size being close to 0.1 Ha and the small catchment mean these areas would dry quickly.
 - 38 were farm dams – automatically meeting the inundation criteria.
 - 26 were deemed suitable and required further assessment.
- The detailed hydrologic assessment determined 17 of the 26 wetlands assessed in detail met the inundation criteria required for the areas to be hydrologically suitable for brolga breeding and night roosting.

The areas modelled and those highlighted for further assessment are shown in Figure 3-1, those that met the inundation criteria, including farm dams are shown in Figure 3-2.

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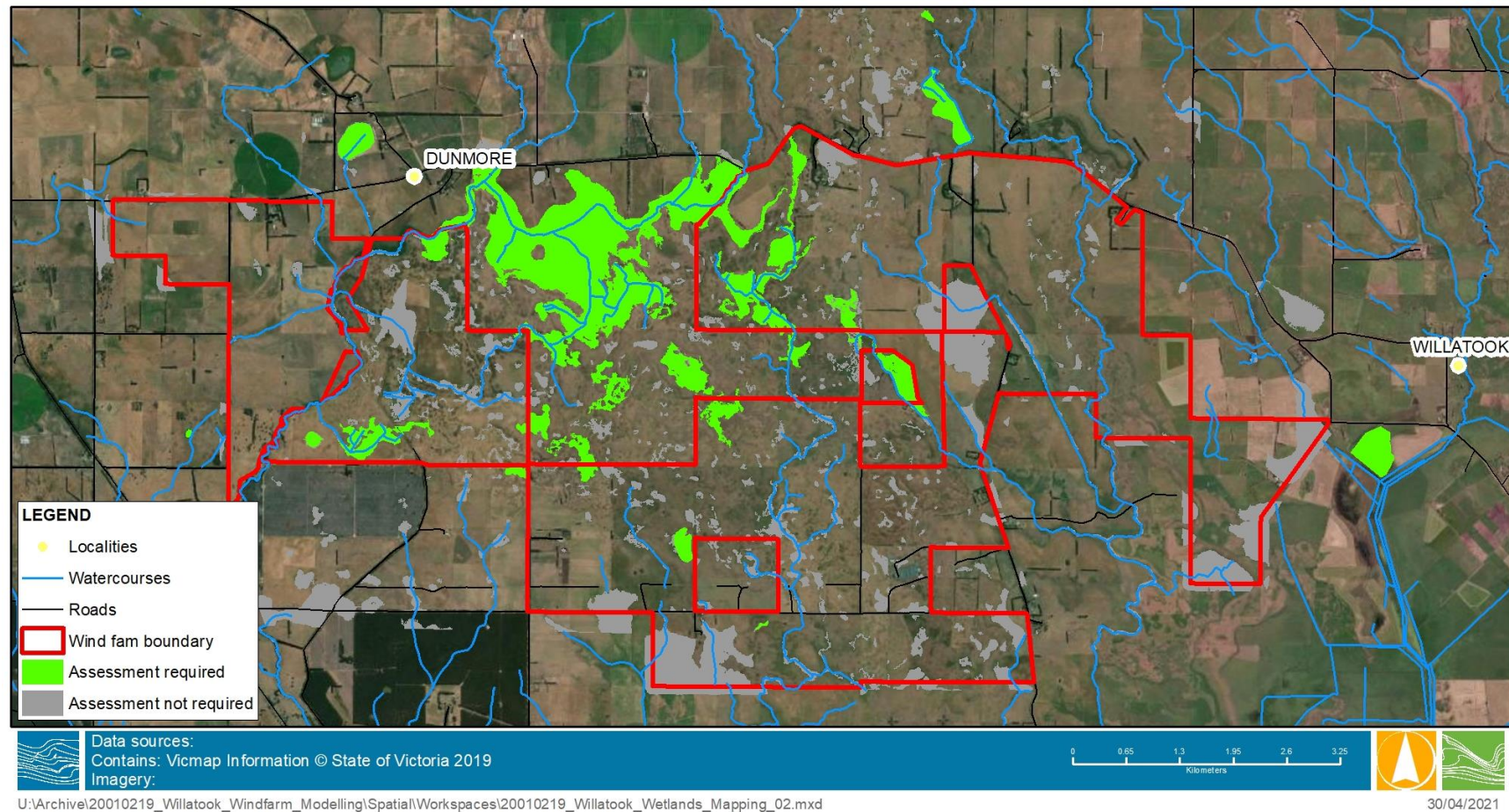


FIGURE 3-1 AREAS HIGHLIGHTED AS REQUIRING DETAILED HYDROLOGIC ASSESSMENT

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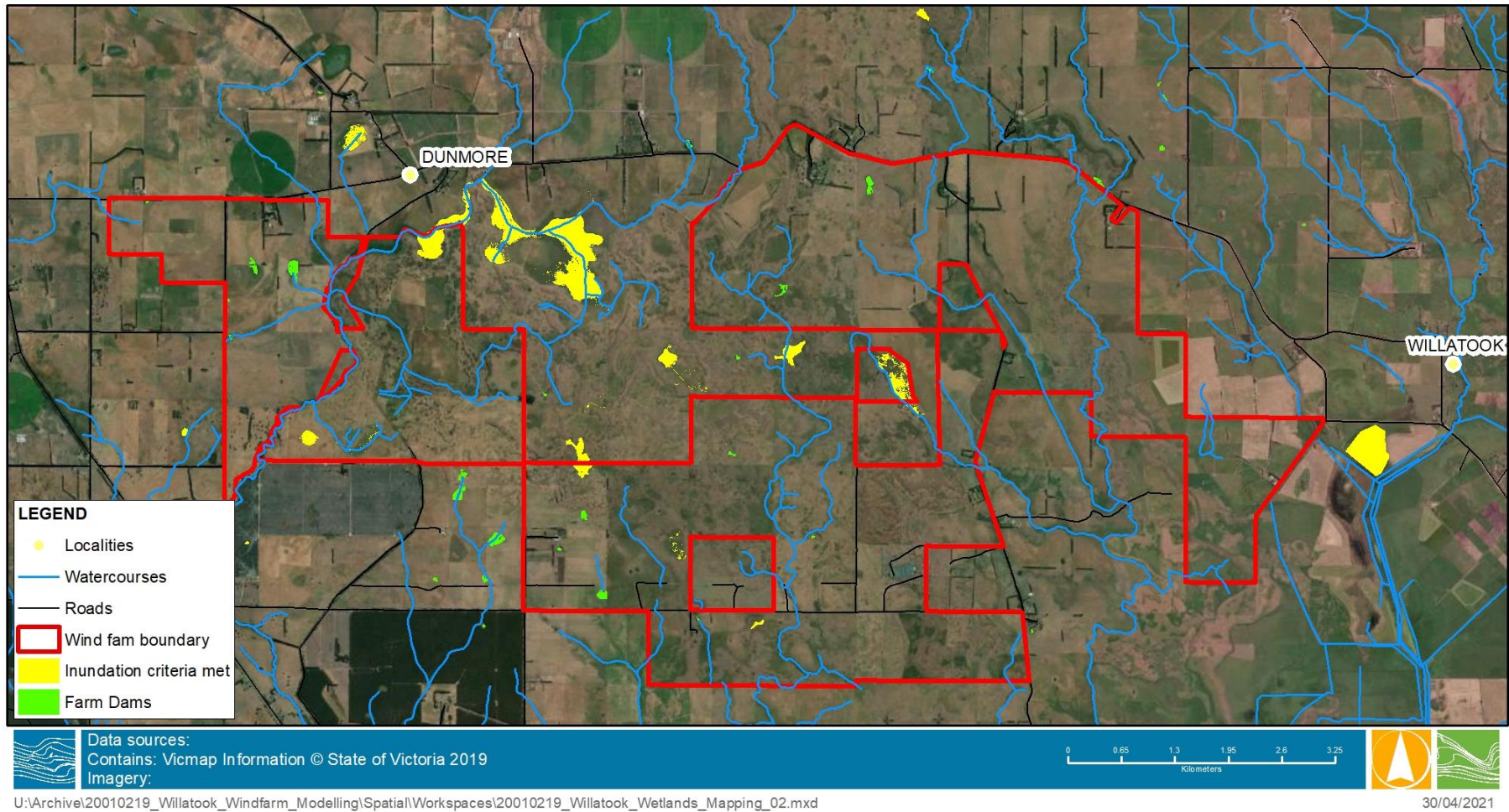


FIGURE 3-2 AREAS HIGHLIGHTED AS MEETING THE INUNDATION CRITERIA

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APPENDIX A – HISTORIC AERIAL IMAGERY OF WETLAND 4

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April 2019

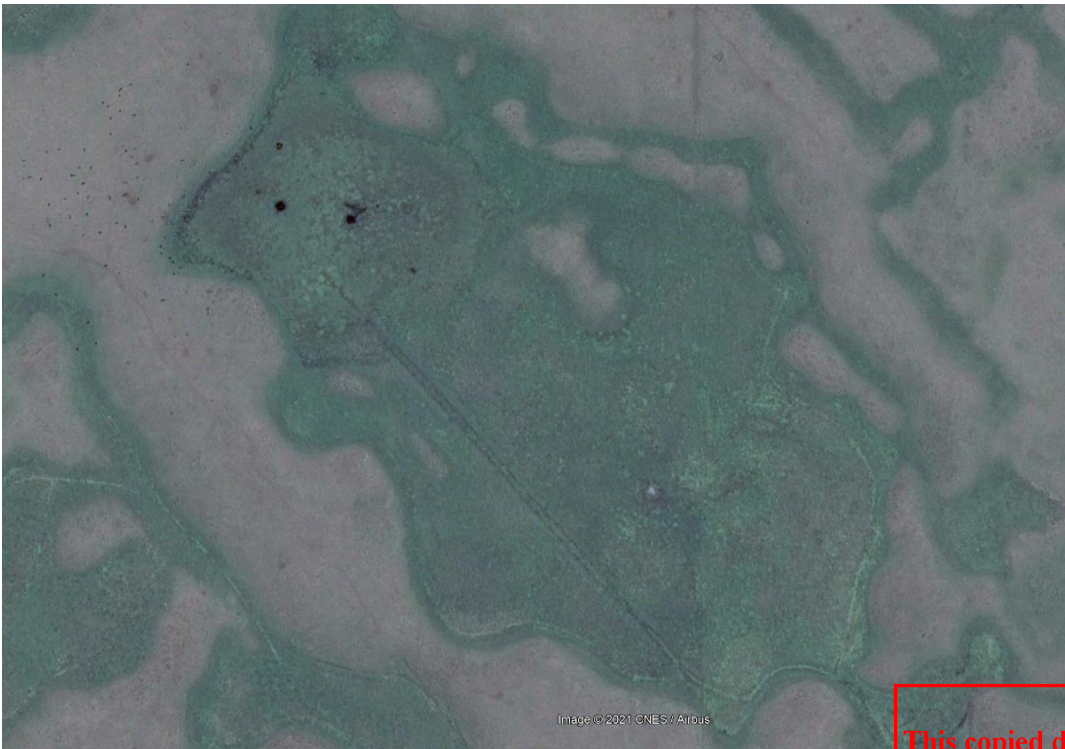


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December 2016

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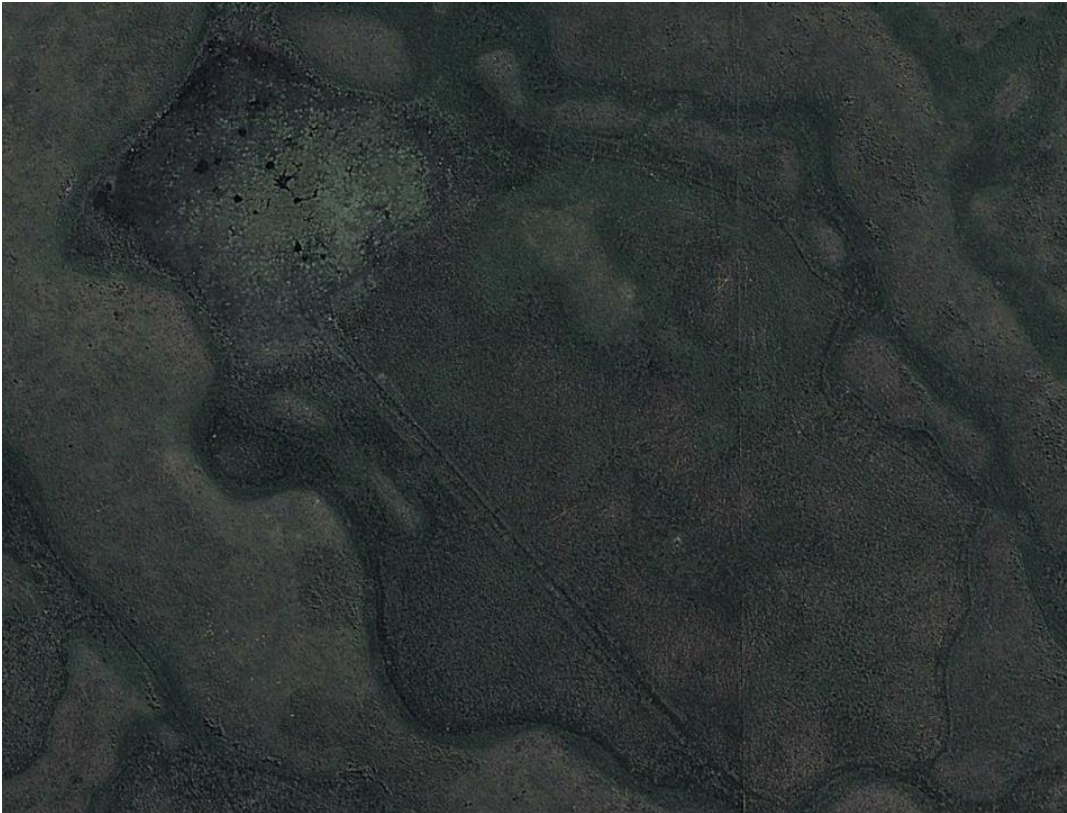
November 2013



November 2012

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Appendix 9: Draft Compensation plan for Willatook Wind Farm Brolga (Odonata 2026a, 2026b)

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Willatook Wind Farm – Options for Brolga Compensation



Client: Willatook Wind Farm Pty Ltd

Project: Willatook Wind Farm Planning

Document history

Version	Date	Author	Description of changes
1.0	6 October 2025	Amy Cockroft	Initial release, for feedback
2.0	20 November 2025	Amy Cockroft	Amended per feedback from client
3.0	5 July 2026	Amy Cockroft	Amended per feedback from client

Distribution list

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Executive summary

Willatook Wind Farm's requirement to compensate for potential impact to Brolga presents a significant opportunity to deliver conservation outcomes that extend well beyond minimum regulatory compliance. Odonata Foundation has developed five compensation options that not only meet the requirements under the "Handbook for the development of renewable energy in Victoria" (May 2025), (the Handbook) but strategically position the project to achieve measurable, nature-positive outcomes across the landscape.

Five options are presented for Willatook Wind Farm consideration:

1. Protecting and enhancing existing breeding wetlands,
2. Hydrological restoration of drained wetlands,
3. Modification of farm dams for improved habitat,
4. Research and development of Brolga fencing options, and
5. Marking powerlines to prevent Brolga and other bird collision.

Each option delivers benefits that cascade beyond Brolga conservation. Wetland protection and restoration creates habitat for multiple threatened waterbird species whilst improving water quality, carbon sequestration, and ecosystem resilience. Powerline marking has demonstrated potential to reduce collision mortality across all large bird species, not just Brolga, addressing a landscape-scale conservation challenge. Farm dam modifications create biodiversity corridors that benefit amphibians, invertebrates, and vegetation communities alongside targeted species. Each option explored in this report provides a base which can be expanded upon, or elements of each option can be blended to create a bespoke solution for Willatook Wind Farm.

Odonata's approach enables Willatook Wind Farm to maximise conservation return on investment. By selecting wetlands strategically, considering factors such as coastal proximity for climate resilience, landscape connectivity, and existing ecological condition. Options can be implemented individually or combined to create a compensation package calibrated to project capacity whilst achieving demonstrable population-level outcomes for Southern Brolga and broader biodiversity gains.

Each option has been assessed against the specific requirements in Appendix 2, Section 4.4 of the Handbook, realistic implementation timelines, cost implications, and the potential for genuine, measurable conservation impact. Consideration of pathways for meaningful engagement with Traditional Owners, has been documented.

As one of the first major wind farm projects to progress under the new Handbook, Willatook Wind Farm is well-positioned to demonstrate how renewable energy development can deliver substantive biodiversity stewardship beyond regulatory minimums. Odonata welcomes the opportunity to support this leadership through rigorous option selection, robust implementation planning, and evidence-based monitoring frameworks that demonstrate conservation outcomes throughout the operational life of the wind farm.

The next stage involves presenting these options in a workshop setting to enable informed decision-making on the approach that best aligns with project values whilst delivering maximum conservation benefit. Following option selection, Odonata will develop detailed implementation plans with specific site numbers, costings, success indicators, and monitoring protocols to ensure compensation outcomes are demonstrable and verifiable.

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1.0 Introduction

This report presents five options for Brolga Compensatory measures required for the development of Willatook Wind Farm, in accordance with Victorian government guidelines.

In developing the options presented in this report, a comprehensive long list of potential compensatory measures was generated, drawing on current research, established conservation practices, and innovative approaches to habitat protection and species management (Appendix 1, this report). This long list was subsequently refined following a meeting with Wind Prospects, during which key project priorities were established. These priorities emphasised creating genuine conservation benefit to Brolga beyond mere regulatory compliance and establishing meaningful opportunities for Traditional Owner involvement in project design and implementation. The shortlisting process evaluated each option against these values and assessed the realistic feasibility for implementation of options.

Each shortlisted option (this report, Section 3.0) is further evaluated for potential positive impact for Brolga population outcomes, alignment with the specific aims and requirements detailed in the Handbook, (specifically Appendix 2, section 4.4), and the financial and temporal resources required for effective implementation. Additional evaluation criteria include the ability to demonstrate and monitor compensation outcomes through evidence-based methodologies, and the potential for co-benefits to broader biodiversity conservation and ecosystem restoration objectives. A comparative summary of shortlisted options is provided below, which also shows potential for co-design and engagement with Eastern Maar Aboriginal Corporation (EMAC) and Gunditjmara Traditional Owners. At the time of writing, Odonata has initiated conversation with EMAC to learn more of the Cultural importance, conservation and restoration of wetlands.

The report ends with recommendations for next steps in selecting Options to proceed, and potential pathways for implementation of options to establish the Willatook Wind Farm as an exemplar project for biodiversity stewardship in the renewable energy sector.

2.0 Project Overview

In developing the Options outlined in this report, Odonata has considered the compensation needs of the project, the modelling carried in the Brolga Impact Assessment (Nature Advisory, 2025) and the mapping of wetlands in proximity to Willatook Wind Farm. Additionally, the opportunity for Willatook Wind Farm to show leadership in environmental responsibility and Cultural engagement informed the options development.

Willatook Wind Farm impact

The Willatook Wind Farm is a proposed renewable energy project located in southwest Victoria within the Brolga area of interest defined by the Victorian Department of Environment, Energy and Climate Action (DEECA) and on the traditional lands of the Eastern Maar and Gunditjmara people. The site characteristics of Willatook Wind Farm features wetlands that are known to be used by Southern Brolga as feeding, foraging and occasional breeding habitat. The project has secured strong community backing, with 70 per cent of the community expressing positive support for renewable energy development. This is complemented by robust landholder engagement, with 20 local families actively participating in the project development process.

Southern Brolga (*Antigone rubicunda*) is a threatened species in Victoria, with primary threats to its survival including change of hydrology and modification of vegetation in wetlands and impact from introduced predators (foxes and feral pigs) (Veltheim, 2019). Brolga may also be impacted by collision with built infrastructure, particularly power lines and wind turbines, although evidence of collisions with turbines is limited. The impact to Brolga population from potential mortalities caused by collision with turbine blades has been considered for Willatook Wind Farm, according to regulatory requirements. Wind Prospects, project developers, have implemented the standard hierarchy of avoid, minimise and mitigate measures (Appendix 2, section 4.1-4.3) outlined in the Handbook. The project design has been modified to include turbine-free buffer areas for Brolga movement around wetlands, however residual risk to Brolga cannot be avoided.

Application of regulatory requirements to Willatook Wind Farm

Willatook Wind Farm will require compensatory measures for Brolga where project infrastructure is located within relevant buffers to potential Brolga breeding habitat, following application of the avoidance, minimisation and mitigation measures adopted through the revised project design.

Options for compensation have been developed with reference to the residual risk to Brolga breeding habitat and breeding success, rather than by relying on collision risk modelling. This reflects the current Handbook approach, which emphasises compensatory measures that increase and/or enhance Brolga habitat, improve wetland condition and hydrology, support breeding opportunities, and reduce threats to eggs, chicks and adults.

Accordingly, the compensation package focuses on securing a measurable habitat and breeding-success outcome, including the protection, restoration or enhancement of at least one suitable potential breeding wetland within the relevant landscape. Willatook Wind Farm is committed to delivering a like-for-like or better outcome for potential Brolga breeding habitat, so that the compensatory measures achieve a net improvement in the extent and condition of breeding habitat within the landscape.

The regulatory framework under Section 4.4 of the Handbook recommends compensatory measures that result in increased and/or enhanced habitat for Brolga. Measures for an increase of habitat include restoration of hydrology at drained wetlands, enhancing flooding regimes of wetlands for prolonged inundation (prolonged inundation being a recognised factor to increased Brolga breeding), or creating new breeding environments from modifying farm dams or damming existing sites. Enhancement of wetlands can include restoration of aquatic vegetation through stock control mechanisms and revegetation or providing nesting materials to promote breeding attempts. Protecting of eggs and chicks from predation of foxes and cats is noted in the Handbook as an example of how avoiding mortality can have positive impact on Brolga population.

Project leadership and Cultural engagement

The Willatook Wind Farm presents a significant opportunity to establish meaningful partnerships with First Nations communities, particularly Eastern Maar citizens and Gunditjmara people, whose traditional Country encompasses the project area. Early engagement with these Traditional Owners in project design phases will enable the integration of biocultural land management practices that can enhance both environmental outcomes and cultural values. As one of the first major wind farm projects to progress under the new Handbook Willatook Wind Farm is positioned to become an exemplar project for Brolga conservation and habitat management in the renewable energy sector. This approach reinforces Wind Prospects' commitment to industry leadership in biodiversity protection and culturally responsive project development, setting new standards for collaborative environmental stewardship in Victorian renewable energy projects.

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3.0 Shortlisted Options

Option 1: Protect and enhance existing breeding wetlands

Option outline

According to the Brolga Impact Assessment (Nature Advisory, 2025), there are 26 wetlands within the Region of Interest, 17 of which have hydrology suitable for Brolga breeding and night roosting. Wetland selection criteria for protection and enhancement should include landscape context such as proximity to other wetlands to allow for foraging range, proximity to known breeding sites and previous Brolga visitation to site. Landholder willingness to maintain and protect wetlands should also be considered. Consideration may also be given to wetlands on private or public land, with public wetlands creating greater engagement opportunity for community.

Consideration can be given to wetlands within the known vicinity of Willatook Wind Farm, or other identified wetlands that would benefit from protection. Climate modelling suggests that wetlands close to the coast are likely to remain inundated for longer, and rainfall inland is expected to continue to decline, leading to dryer ground conditions. This will cause Brolga displacement and movement toward coastal environments. This modelling should be included in wetland selection.

Fencing wetlands for stock control (private land) can allow for the return of native aquatic vegetation and improve ground condition to encourage breeding and nesting behaviour. Controlled grazing allows for the management of biomass, reducing weed and exotic grass load and seedbank in the summer months when the ground is dry and hard. Excluding stock while the ground is wet prevents browsing and selective grazing of aquatic herbs during winter and spring, allowing these seeds to set into the ground. Preventing access of hard hooved animals while the ground is inundated restores and retains soil structure suitable for aquatic vegetation and invertebrates that are food sources for Brolga.

Fox and predator control in and around the wetland area is critical for successful fledging of chicks once hatched. Chicks are particularly vulnerable to ground predators for up to three months after hatching, until they are capable of flight. Mortality rates of chicks are as high as 70-90%, with fox predation attributed as a main cause of mortality (Herring, 2007). Landholders and managers with protected wetlands on their properties must agree to fox and predator control programs to minimise risk to chicks. Fox control programs should balance the potential for disturbance to chicks (i.e. shooting, pedestrian traffic) with the benefit of reduced predator populations, noting that landholders have reported shooting over 100 foxes on one property in a single year.

Brolga prefer wetlands that retain inundation for longer periods (Veltheim et al, 2019), therefore wetlands should be selected on their ability to retain water or respond to artificial flooding within their current sill level and make use of nearby water sources (for example close to a dammed waterway or farm dam that can be accessed). Artificial flooding can be used during long periods of rainfall deficit to recreate Brolga breeding environments. Hydrological assessments of wetlands suitability must include potential impact on waterways both up and down stream.

Adaptive management of the wetland, especially for water release into the wetland to increase inundation duration, will be critical to the success of this option.

Alignment with Handbook

This method is in direct alignment with Section 4.4 (Appendix 2) of the Handbook, however it can be designed in such a way that wetlands are selected for greater conservation and ecological benefits.

Cost implications

- Assessment and recommendation of wetlands for protection
- Compensation to landholders
- Establishment costs such as permits, fencing etc (per wetland TBC)
- Installation of monitoring equipment
- Ongoing monitoring and adaptive management (annual per wetland)

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Timeline

- Assessment and recommendation of wetlands for assessment – 1 year
- Hydrology modelling – 1 year
- Land Use Agreement and site establishment – 6 months
- Ongoing monitoring – life of wind farm

Implications for Brolga conservation

Habitat loss is a key contributor to decline of Brolga populations (Veltheim et al, 2019), making protecting and enhancing existing habitat critical to species survival.

Monitoring and evidence of impact

Selecting wetlands with existing monitoring from work done by Willatook Wind Farm provides a strong baseline for monitoring.

Ongoing monitoring and observations will show any improvement in breeding behaviour over the life of the project. Ecological response and Brolga use of wetlands can be directly credited to site enhancement.

Option 2: Restoration of drained wetlands

Option outline

In this option, additional wetlands are returned to the landscape through filling of drains and restoration or improvement of sill levels. Wetlands for restoration and hydrological improvement are selected based on their ability to be suitable for Brolga night roosting and breeding once restored. Consideration is also given to landscape context, proximity to existing known breeding and flocking sites, ability to provide feed and forage habitat with range, and geographic location to mitigate climate change impact to rainfall.

The Brolga Impact Assessment (Nature Advisory, 2025) identified 145 wetlands within the Region of Interest that have been hydrologically modified, typically meaning they have been drained for grazing or cropping use. These wetlands may benefit from restoration, or greater benefit may be gained from restoration of other known drained wetlands in southwest Victoria. Selected wetlands to restore in higher Brolga concentration areas than Willatook surrounds could lead to greater success of Brolga breeding and should be considered.

Mechanisms for protection and enhancement including vegetation management, stock control, predator control and artificial flooding, as outlined in Option 1, would also be implemented at restored wetlands. This option provides for addition of habitat through the restoration of currently drained, non-functional wetlands to the landscape. Ongoing adaptive management of wetlands, particularly in relation to sill levels, water inflows and stock control will be required to maximise chance of successful breeding activity.

Alignment with Handbook

This method encompasses all of the recommendations within Section 4.4 of Appendix 2 of the Handbook. Wetland selection and restoration method will be critical to the success of these wetlands.

Cost implications

- Assessment and recommendation of wetlands for protection
- Hydrology modelling of site potential and required works for closing drains
- Compensation to landholders may be higher than Option 1 to compensate for loss of productive land
- Establishment costs such as drain filling, permits, fencing etc (per wetland TBC)
- Installation of monitoring equipment
- Ongoing monitoring and adaptive management (annual per wetland)

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Timeline

- Assessment and recommendation of wetlands for assessment – 1 year
- Acquisition of LiDAR data and hydrology modelling – 1 year
- Land Use Agreement and site establishment – 6 months
- Ongoing monitoring – life of wind farm

Implications for Brolga conservation

Creating new protected habitat for Brolga will assist in species survival, especially in targeting areas with predicted higher rainfall in the longer term.

Monitoring and evidence of impact

Baseline observations of Brolga visitation should be recorded from local landholders.

Ongoing ecological response (vegetation and hydrology), visitation and breeding behaviour from Brolga and other species should be monitored for the life of the wind farm.

Option 3: Farm dam modifications

Option outline

In this proposal, suitable farm dams are selected for size and landscape context that complement existing Brolga range, within known Brolga visitation areas. These dams are modified to create suitable environments for Brolga foraging and nesting habitat. The option builds from research and field work undertaken by Australian National University as part of their Sustainable Farms initiative.

Artificial wetland environments are created by modifying the dam area to include shallow areas and islands within dams. Ephemeral wetlands may be replicated in the spillway from the dam through earthworks and revegetation. Stock access to the dam is restricted by fencing, thereby preventing disturbance to dam edges and soil. Stock water access is provided either by a hardened ramp to the dam, or via a stock trough outside of the protected area. Figure 1 (below) shows how a farm dam may be modified to create a habitat suitable for waterbirds and biodiversity.

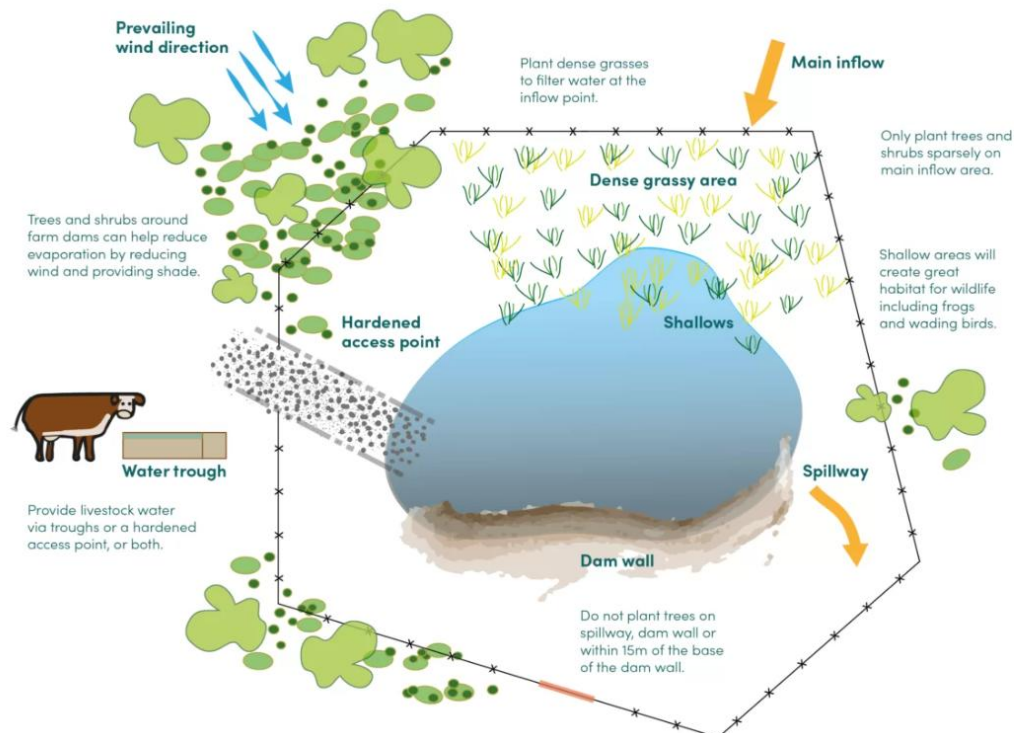


Figure 1 - Diagram of farm dam enhancement (credit Australian National University, 2025)

Pilot projects for Farm Dam restoration (Australian National University, 2025) show initial results of more water bug species in restored dams, higher water quality and other ecological indicators for Brolga habitat. It should be noted that current pilot programs are not within Brolga habitat regions.

Farm dams can be selected from within the existing properties of Willatook Wind Farm (excluding buffer zones) or from other areas in southwest Victoria. Management plans of modified dams should consider fencing

Alignment with Handbook

This compensation method addresses specific elements of the Handbook (Appendix 2, Section 4.4) in the creation of new breeding habitats through the modification of existing dams, addition of nesting material, management of wetland vegetation condition through stock control, and with fox control mechanisms.

Cost implications

- Assessment and recommendation of farm dams
- Plans for dam modification
- Compensation to landholders for productive land and access
- Establishment costs such as earthworks, installation of troughs
- Installation of monitoring equipment
- Ongoing monitoring (annual per dam)

Timeline

- Assessment and recommendation of dams for assessment – 1 year
- Construction plans – 6 months
- Land Use Agreement and site establishment – 6 months
- Ongoing monitoring and adaptive management – life of wind farm

Implications for Brolga conservation

This is a new area for consideration for Brolga conservation, and has potential to add many, small habitat areas for landscape connectivity. When applied at scale, for example on many dams on one farm, cumulative positive impact for Brolga could be high. Modifications are reasonably inexpensive, with many farm owners having suitable machinery to carry out modifications themselves. There is evidence of benefit to farm owners, which may help to increase uptake of the initiatives.

Monitoring and evidence of impact

Baseline observations for vegetation, invertebrates and water quality.

Observation for Brolga can be taken from local landholder interviews or monitoring undertaken in planning.

Ongoing monitoring for ecological response and Brolga use of sites should be informed by Sustainable Farms initiative from Australian National University.

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Option 4: Research and development of conservation fencing protocols for Brolga

Option outline

The compensatory measures will be achieved through the protection of wetlands and nests with fencing systems that allow for natural Brolga movements, while preventing predation from foxes, cats and feral pigs. Fencing is not currently used as a tool for Brolga conservation, with concern that fencing will impact range and create disconnection across landscape. In this option, we propose research and development for standard fencing and fence management protocols for the protection of wetlands and nests. Such fencing can have far reaching benefit to all Southern Brolga habitat areas and addresses a specific compensation measure in the Handbook (Appendix 2, section 4.4) relating to fox control.

The research and design will consist of three parts:

- investigating the impact of exclusion fencing on Brolga
- physical fence design and
- applicability of artificial intelligence systems to enable dynamic management of fence electrification.

The **impact of exclusion fencing** on existing Brolga movement, such as choice of wetland for breeding and night roosting as well as chick movement to foraging wetlands, will be investigated to determine any common factors or risks to Brolga from fence design or elements.

The **physical fence design** will consider design options that allow for chick movement and safe flight of adult Brolga into and out of wetland areas, while preventing breaches by foxes, cats and feral pigs. Such a design can be used for permanent protection of wetland areas or implemented on a temporary basis in response to nesting.

Application of **AI recognition software** to activate or deactivate electric fencing depending on presence of predators or Brolga chicks will be researched. Examples of applications of this AI recognition software can be seen in the IdentiFlight Systems which recognise target birds in flight, and shut off wind turbines accordingly (Identiflight, 2025). Other examples of applications are in road treatments in North America, where the presence of wildlife on road areas trigger safety messages for drivers, and the development of the Sentinel Bait Station by the CSIRO (Charlton et al, 2022)– a fox baiting system that dispenses bait only when a fox is identified.

The program combines field research with technology development to establish evidence-based predation control methodologies applicable across Victorian wind farm developments and broader Brolga conservation efforts. It is anticipated that this would be a three-year program, and require involvement from university researchers, AI software developers and Odonata Foundation's fence design experience.

Alignment with Handbook

The Handbook specifically refers to fox control at sites and recognises fox predation as a significant risk to Brolga chicks prior to fledging.

Cost implications

- Field researcher – 1 year
- Fence establishment, materials, monitoring equipment
- AI research and application – 3 years academic research.

Timeline

- Research of impact of existing fences – 1 year
- Physical fence design – 6 months
- Application of AI Cameras and field trials – 3 years

Implications for Brolga conservation

This initiative has broad reaching benefits for Brolga conservation, with the ability to be adapted for specific areas to protect Brolga chicks after hatching and prior to fledging.

Monitoring and evidence of impact

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A three-year monitoring program is built into this project.

Option 5: Marking of powerlines to prevent Brolga collision

Option outline

Research suggests a strong link between single strand powerlines and collision of Brolga causing mortality (Goldstraw & Du Guesclin, 1991). This may be due to the anatomy and flight patterns of such birds being incompatible to sighting such obstacles in flight (Martin & Shaw, 2010). Marking power lines with brightly coloured ribbons or flags may reduce bird mortalities by improving visibility and creating noise to alert birds in flight to the powerline thereby preventing collisions.

Willatook Wind Farm has mitigated some impact of potential collision with single strand power lines by ensuring underground powerlines in its design. There is a remaining 400m section of above ground line that can be improved with the addition of fladry devices, however potential further mitigation will be minimal as the powerline does not cross known Brolga areas.

Powerline marking should be undertaken on existing powerlines to reduce mortalities to Brolga population. Consultation with DEECA will determine known sites where powerlines impact bird movement and cause collisions. Additionally, sites where single powerlines cross known Brolga flocking sites can be selected for marking. Research will then be undertaken to determine suitable visual deterrents to mark powerlines at appropriate sections of these powerlines.

Alignment with Handbook

The Handbook refers to powerline marking as a mitigation measure for wind farm developments; however, it does not extrapolate on this option beyond the wind farm.

Cost implications

- Research of existing 'hot spots' for Brolga injury from powerline collision
- Length of powerlines required for marking
- Installation of markers on powerlines using specialist EWP and qualified installers
- Establishment of monitoring cameras
- Ongoing monitoring

Implications for Brolga conservation

The full extent of the impact of single power lines on Brolga are not fully known, however a strong area of interest for study, and concern for DEECA. Reducing these mortalities will improve population at flocking sites.

Monitoring and evidence of impact

Baselining of Brolga collision will need to be estimated, either from existing data or monitoring program during flocking season.

Once markers are installed, ongoing monitoring for evidence of collision should be carried out for the life of the wind farm. This may be done remotely through camera monitoring, or visual inspection under marked lines for carcasses.

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Summary of options

The options explored above have been summarised in the table below.

Option #	Option description	Alignment with Handbook	Cost implication	Timeline	Conservation and biodiversity co-benefits	Opportunity for First Nation involvement
1	Protect and enhance existing breeding wetlands	High	Ongoing for life of project	Life of project	High	High
2	Create new habitat with hydrological restoration of wetlands	High	Ongoing for life of project	Life of project	High	High
3	Create new habitat with farm dam modification	Medium/High	Ongoing for life of project	Life of project	Medium, potential to work with ANU	Medium/Low
4	Research and development of conservation fencing protocol for Brolga	Medium/Low	3-year research program	2-3 years	High	Low
5	Marking of power lines to prevent Brolga collision	Medium/Low	Short term project	1 – 2 years	Medium	Low

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4.0 Long list of options considered

The full list of options considered for Willatook Wind Farm is summarised in Appendix 1. This comprehensive long list was developed drawing on Odonata's six years of experience delivering Brolga compensation projects for wind farm developments across Victoria, through consideration of emerging conservation research, innovative habitat management approaches, specific ecological context of southwest Victoria's wetland landscapes, and our working relationship with Traditional Owner groups. The breadth of options presented in the long list reflects Odonata's practical knowledge of what delivers measurable conservation outcomes in the field.

Following the generation of this comprehensive long list, options were refined through a workshop with Willatook Wind Farm and ENGIE on 27 August 2025. This collaborative process enabled alignment between Odonata's technical conservation expertise and the project's priorities for genuine conservation benefit, practical feasibility, and stakeholder engagement. The shortlisted options presented in Section 3.0 represent those measures assessed as having the strongest potential for demonstrable Brolga population outcomes whilst creating broader biodiversity and Cultural co-benefits.

5.0 Next steps

The immediate next step, and included in this project scope, is to present these shortlisted options to Willatook Wind Farm in a workshop-style setting, providing an opportunity for detailed discussion of each option's feasibility, alignment with project values, and potential for meaningful conservation outcomes. This workshop will facilitate informed decision-making on the preferred compensatory approach or combination of approaches that best meet both regulatory requirements and the project's broader environmental stewardship objectives.

Odonata Foundation has established initial contact with Eastern Maar Aboriginal Corporation (EMAC) about this project, and we are looking forward to co-designing the next stages of this project with EMAC representatives. This partnership will ensure that Cultural values and Traditional Owner perspectives inform the selection and implementation of compensatory measures from the outset.

Following Willatook Wind Farm's selection of preferred options, Odonata will develop comprehensive implementation plans with detailed costings for each chosen measure. These plans will specify the number of sites required to meet the compensation objective (securing a measurable habitat and breeding-success outcome), establish clear success indicators, outline monitoring protocols, and provide realistic timelines for delivery. For options requiring collaboration with third parties, such as research organisations, universities, or specialist contractors, Odonata will lead the engagement and coordination of these partnerships, leveraging our established networks within the conservation and research sectors.

Implementation planning will include risk assessments, contingency measures, and adaptive management frameworks to ensure compensation outcomes can be demonstrated and verified throughout the operational life of the wind farm. Odonata is positioned to provide ongoing project management, monitoring coordination, and reporting services to ensure the successful delivery of the selected compensatory measures and their contribution to broader Brolga conservation efforts in Victoria.

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6.0 Conclusion

This options paper presents evaluated pathways for Willatook Wind Farm to meet regulatory compensatory requirements for Brolga by securing a measurable habitat and breeding-success outcome, including the protection, restoration or enhancement of at least one suitable potential breeding wetland, over the operational life of the project. The five shortlisted options; protecting and enhancing existing breeding wetlands, restoring drained wetlands, modifying farm dams to create new habitat, developing conservation fencing protocols, and marking powerlines to prevent collision, each offer distinct approaches with varying levels of conservation benefit, implementation complexity, and opportunity for Cultural engagement with Traditional Owners. These options can be implemented individually or in combination, providing flexibility to design a compensation package that delivers genuine conservation outcomes whilst aligning with Willatook Wind Farm's values and capacity.

The development of these options has been informed by current research, established conservation practices for Southern Brolga, and the regulatory framework outlined in the Handbook for the development of renewable energy in Victoria. Importantly, the options have been summarised with consideration for meaningful co-design opportunities with Eastern Maar Aboriginal Corporation. Odonata Foundation is committed to supporting Willatook Wind Farm through this process, ensuring that the selected options are implemented effectively and contribute meaningfully to the long-term survival and recovery of Southern Brolga populations in Victoria.

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Appendix 1 – Long list of options

Option	Detail	Conservation benefits	First Nation opportunity	Community engagement	Cost consideration
Protect and enhance existing wetlands	Identify existing wetlands that are currently visited by adult Brolga and/or hosting nesting Brolga	Encourages return of native aquatic vegetation	Early engagement in identifying bioculturally important sites	Landcare and other groups involved in planting days, come and see days.	Land Use agreements that compensate landholders
	Carry out works to enhance wetlands through revegetation, protection from stock, weed management.	Longer wetland duration provides water sources for other species – create ‘oasis’	Provide advice and support on appropriate enhancement methods		Ongoing monitoring costs
	Mechanisms to hold water for longer in wetlands – either by raising sill levels, releasing water to wetlands	Longer duration of inundation related to better breeding outcomes	Ongoing access to wetland sites		
	Carry out work to reduce or eliminate predation threats to eggs and chicks	Reduces predation pressure on surrounding areas	Guardian workforce opportunities		
	• fox and cat control • rat control Compatibility of use with grazing – at least some of year, and benefits of holding water for longer for graziers.	Habitat restoration and ecological system repair			

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Option	Detail	Conservation benefits	First Nation opportunity	Community engagement	Cost consideration
Exclusion fencing for existing wetlands	Investigate and trial fence types that prevent predation of nests but allow roaming of Brolga - fence does not impede Brolga flight and accessibility - use of AI to identify and open gates OR deactivate electric wires Investigate appropriate wetlands for fencing - fence around wetland complexes, rather than individual wetlands to allow chicks to roam Identify areas that are already protected / on Crown land etc to fence = less acquisition cost Compatibility of use with grazing – at least some of year, and benefits of holding water for longer for graziers.	Potential opportunities for reintroduction of other species. Opportunity for revegetation of other species within fenced area Possibility for reintroduction of other threatened species Create protected areas for other birds to safely nest	Early engagement in identifying bioculturally important sites Provide advice and support Ongoing access to wetland sites Guardian workforce opportunities	Landcare and other groups involved in planting days, come and see days.	Land Use agreements that compensate landholders Ongoing monitoring costs

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Option	Detail	Conservation benefits	First Nation opportunity	Community engagement	Cost consideration
Dam enhancement on farms in area	Increase suitable Brolga habitat with artificial wetlands in farm dams. https://www.sustainablefarms.org.au/on-the-farm/farm-dams/	Direct engagement with landholders who experience better stock water quality and water holding in the dams	Limited Advice on restoration, fauna species selection	Directly benefits landholders	One – off costs to carry out work on private land
	Dams would need to be near wetland areas – increase foraging habitat	Revegetation around dam area creates better habitat for birds and amphibians	Employment and training opportunities		Ongoing agreement with landholder to maintain
	Fence area around dam				
	Spillway provides shallow area that could be Brolga habitat				Monitoring
	Provide hardened ramp for stock access, or water trough	Less erosion and improved water quality on farm.			
	Revegetate area around dam				
	Create variable depths, islands within dam				

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Option	Detail	Conservation benefits	First Nation opportunity	Community engagement	Cost consideration
Power line marking	Mark single power lines for visibility, especially in Brolga flocking areas Research suggests high mortality of collision with power lines Develop program for monitoring and marking near sensitive areas. Determine best method / distance etc. Fund research into impact	Potential lessen impact on other large birds?	Limited Research, training, employment	Limited	Dependent on scale
Camera monitoring and turbine shut offs	https://www.identiflight.com/ Currently operate in Tas and US. AI software would need to be programmed specifically for Brolga – not currently a species supported by Identiflight. May require group approach from Wind Farms in southwest Vic to develop AI program	Ability to detect other bird species and shut off turbines accordingly Can it apply to bats?	Limited	Limited	Can only monitor for birds not killed, not birds added to population

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Option	Detail	Conservation benefits	First Nation opportunity	Community engagement	Cost consideration
Breed and release	Captive breeding of Southern Brolga, raised to adulthood in safe environment and released to secure areas Again, could be group program by wind farm developers. Each contributing to breeding	Guaranteed adult birds released	Limited	Limited PR on release Citizen science project to find release sites	\$2.5M for 4 birds. Could be combined with other wind farm projects
Community led solutions	Host a series of workshops and support ongoing community initiatives. 5 Stage community engagement and decision-making model based on Save the Bay	Local knowledge and insights can be generated Is this a problem being led by a Wind Farm company? Remote community – possibly difficult to communicate with and engage	Limited	High opportunity for community engagement	Unknown

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Option	Detail	Conservation benefits	First Nation opportunity	Community engagement	Cost consideration
Engagement through schools	School worksheets and programs that focus on needs of Brolga in area	Reach landholders through children. Possible engagement of school grounds for restoration	Limited	High – reach primary school aged children. Requires ‘champion’ teacher within schools Low population area	

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Willatook Wind Farm

Compensation proposal for residual impact to Brolga habitat

April 2026

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Background

Odonata Advisory has been engaged by Willatook Wind Farm Pty Ltd to prepare and document proposed compensatory measures in response to residual impacts identified in the Brolga Impact Assessment (Nature Advisory, 2025; Report No. 16087 v2.3).

That assessment identifies infrastructure overlap within Potential Breeding Wetland 12A. While there are no confirmed breeding records for this wetland, it meets the definition of a Potential Breeding Wetland under the *Handbook for the Development of Renewable Energy in Victoria* (DEECA, 2025). In accordance with Appendix 2, Section 4.4 of the Handbook, compensatory measures are therefore required.

This submission outlines the compensation framework and to address those requirements.

About Odonata

Odonata Advisory is an independent environmental advisory organisation specialising in the design, delivery and monitoring of offset and compensation programs for renewable energy projects. Odonata has acted as an independent delivery partner for two approved Brolga Compensation Plans associated with wind farm developments in western Victoria, with responsibilities including landholder engagement, wetland restoration design, predator control coordination, monitoring and reporting. This experience has informed the development of the compensation approach outlined in this submission.

Proposed compensation framework

The compensation measures proposed in this submission are intended to deliver a clear and measurable outcome that addresses the residual impact associated with Potential Breeding Wetland 12A, as identified in the Brolga Impact Assessment (Nature Advisory, 2025; Report No. 16087 v2.3).

The proposed approach is structured around the delivery of a flexible package of compensatory actions, rather than reliance on a single prescribed outcome. While identification and restoration or enhancement of a potential breeding wetland represents one possible pathway, effective compensation may also be achieved through an appropriate combination of hydrological improvement, vegetation management, provision of nesting materials and targeted predator control.

Implementation of the proposed actions will result in an increase in the availability and quality of breeding habitat within the broader Brolga landscape. Additional fox and cat control in the area will reduce predation pressure on nests, eggs and chicks, thereby increasing the likelihood of successful breeding attempts.

Collectively, these actions will result in a net improvement in potential breeding habitat condition and function, beyond what would occur in the absence of the project, and will address known limiting factors to Brolga breeding success.

On this basis, the proposed compensation package provides an appropriate and proportionate response to the residual impacts to Potential Breeding Wetland 12A and meets the compensation requirements of the Handbook.

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Compensation actions

The compensatory response to Potential Breeding Wetland 12A will comprise a tailored combination of actions informed by site-specific constraints and opportunities.

The actions outlined below represent the suite of measures available under Appendix 2, Section 4.4 of the Handbook. Not all actions will necessarily be applied at a single site, and not all actions are required to be implemented concurrently. Rather, the selected combination will be designed to collectively achieve the required compensatory outcome.

Identification of suitable Brolga breeding wetland

Suitable potential breeding wetland will be identified in the local area, using existing landholder relationships and engagement with local Landcare groups.

Wetland selection will be informed by site-specific assessment and will consider:

- hydrological capacity, or restoration potential, to support seasonal inundation suitable for Brolga breeding;
- existing or restorable wetland vegetation condition;
- proximity and functional relationship to other shallow, vegetated wetlands in the landscape;
- landholder willingness to enter into management arrangements; and
- a location outside a 5 km radius of wind turbines, ensuring the compensatory outcome is spatially independent of the project footprint.

This selection process is consistent with the approach documented in the Willatook Wind Farm – Brolga Options Paper and supports the delivery of a clearly defined addition to potential breeding habitat at a landscape scale.

Hydrological restoration and enhancement

Where required, hydrological works will be undertaken to improve inundation frequency and duration to better meet Brolga breeding requirements. Measures may include:

- modification or closure of artificial drains;
- adjustment of sill levels or low points within wetlands; and
- management of controlled inflows from adjacent water sources.

Hydrological works will be designed to avoid adverse impacts on upstream or downstream water processes.

Habitat management and revegetation

Habitat conditions will be enhanced through measures such as:

- controlled grazing and seasonal stock exclusion during periods of inundation to protect soil structure encourage native seed setting;
- encouragement of native wetland vegetation regeneration; and
- supplementary planting of suitable local native species where required.

These actions are intended to improve habitat structure, availability of nesting materials and shelter for chicks.

Provision of nesting materials

Where natural nesting resources are limited, additional nesting material may be introduced to support breeding attempts, particularly where Brolga are known to frequent or in a restored habitat area.

Predator (fox and cat) control

Targeted fox and cat control programs in collaboration with landholders and local Landcare groups will be supported, both in the identified habitat compensation area, and in other areas identified by Landcare. Predator control will be prioritised during the breeding season to reduce the risk of egg and chick predation, consistent with Handbook guidance identifying predator management as a key component of effective compensation.

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