

Toowoomba SARA  
Department of State Development, Manufacturing, Infrastructure and Planning  
PO Box 825  
TOOWOOMBA QLD 4350

11 September 2020

Our Reference: 0532612  
Your Reference: 2007-17946 SDA

Dear Danielle Harris

**Subject: Response to SARA advice notice – Wambo Wind Farm, Diamondy**

Environmental Resources Management Australia Pty Ltd writes on behalf of White Wind No.1 Pty Ltd (the Proponent) in relation to the receipt of a request for further advice from SARA for the Wambo Wind Farm project (SARA Reference 2007-17946 SDA).

On 26 August 2020 we received a SARA advice notice for the Wambo Wind Farm which requested additional information be provided to assist with the assessment process. A subsequent request was also provided on 2 September 2020 in relation Western Downs Regional Council feedback. A copy of both requests is provided as **Attachment A**.

This letter and its attachments provides a response to the items requested, with the below **Table 1** providing a summary of the information requested and further advice provided.

**Table 1 SARA Response Items**

<b>Performance Outcome (PO1) Aviation safety, integrity and efficiency</b>	
<b>Airspace Procedures</b>	
<p>1. <b>Issue:</b> PO1 of State code 23: Wind farm development (State code 23) requires that the safety, operational integrity and efficiency of air services and aircraft operations are not adversely affected by the location, siting, design and operation of the development.</p> <p><b>Action:</b> Provide written endorsement by Airservices Australia and the district aerodrome supervisor stating they have no objection to the proposed development</p>	<p><b>Response:</b> Aviation Projects, as technical experts for the project, have re-engaged in discussions with Airservices Australia.</p> <p>Advice has been provided by Airservices Australia that the operator of the Kingaroy aerodrome (South Burnett Regional Council) be consulted on the impact to MSA before any change can be supported. A copy of the correspondence between Airservices Australia and Aviation Project is provided as <b>Attachment B</b>.</p> <p>In providing this response Airservices Australia accepted that South Burnett Regional Council was consulted on the project prior to lodgement of the Development Application, with a copy of the correspondence with Council also include in <b>Attachment B</b>.</p>



**Performance Outcome (PO1) Aviation safety, integrity and efficiency**

It is understood that the response provided by Airservices Australia is consistent with other similar wind farm projects and there is an acknowledgement from the proponent that further consultation is required to change the MSA prior to construction, should the contributing turbines be erected.

**PO5 Flora and Fauna****Before and After Control Impact Study**

2	<p><b>Issue:</b></p> <p>State code 23: Wind farm development – Planning guideline July 2017 (Planning Guideline) requires a Before and After Control Impact (BACI) design for Bird Utilisation Surveys where the Study Area is determined to support significant bird species.</p> <p><b>Action:</b></p> <p>Provide updated Bird Utilisation Surveys that include a BACI design. A BACI design includes reference sites placed at a sufficient distance from the proposed turbine locations to obtain data outside the zone of influence of the turbines.</p>	<p><b>Response:</b></p> <p>A BACI designed survey for birds has been described in <i>Section 3.3.3</i> of the Ecological Assessment Report.</p> <p>A copy of the updated Ecological Impact Assessment is provided as <b>Attachment C</b>.</p>
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**Ecological Desktop Assessment**

3	<p><b>Issue:</b></p> <p>A search area containing the Study Area and a minimum 10 km buffer was used for the database searches. The Study Area is an irregular shape and, as such, a bounding rectangle was used (and buffered) for database searches requiring coordinate inputs. As a result, records may be further than 10 km from the Study Area boundary at some locations.</p> <p><b>Response:</b></p> <p>Provide justification for the desktop search generally being limited to a 10 km buffer. For example, Red Goshawk has home ranges of 120 km<sup>2</sup> and 200 km<sup>2</sup> for females and males, respectively.</p>	<p><b>Response:</b></p> <p>The 10 km buffer was chosen as this is the standard buffer distance utilised and adopted for the EPBC Act referral process.</p> <p>The 10 km search buffer used for the desktop analyses will be limiting for some species that travel great distances. This is particularly the case for the red goshawk, which can have a home range of up approximately 120 km<sup>2</sup> for females and 200 km<sup>2</sup> for males (Marchant &amp; Higgins, 1993), as well as many migratory species. In this instance, desktop reviews of the field results from windfarms outside of the 10 km buffer (e.g. Dulacca and Cooper's Gap Windfarms) were used to support conclusions made in the likelihood of occurrence assessment for such species.</p> <p>This is outlined in <i>Section 3.6</i> of the attached updated Ecological Assessment Report and attachments (<b>Attachment C</b>).</p>
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**Performance Outcome (PO1) Aviation safety, integrity and efficiency**


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**Survey Effort and Collision Risk Modelling and Population Viability Analysis**


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4	<p><b>Issue:</b></p> <p>Field studies were undertaken over a four-day field period with an assessment of accessible sections of the Study Area.</p> <p>The Planning Guideline requires Collision Risk Modelling and Population Viability Analysis to be undertaken when determining collision risk to birds.</p> <p>Due to the lack of data obtained from the surveys, due to low abundance and diversity of bird species observed in the field studies, no modelling and analyses was subsequently undertaken to assess collision risk and other potential impacts to birds.</p> <p><b>Action:</b></p> <p>Provide justification for the survey effort being limited to four days when insufficient data was collected during the field survey.</p>	<p><b>Response:</b></p> <p>Survey effort was undertaken across 4 days, and analysis of data conservatively accounts defines ecological values (overestimates). More detailed surveys have been committed to as part of the two stage process for informing micro-siting of infrastructure and ongoing avoidance of environmental values, that will accurately account for disturbance as not to exceed what is outlined in the impact assessment for MSES.</p> <p>The additional survey effort for the layout design process is outlined in <i>Section 3.3.1.1</i> of the updated Ecological Assessment Report (<b>Attachment C</b>).</p>
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**Greater Glider Survey**


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5	<p><b>Issue:</b></p> <p>No spotlighting was undertaken for the Greater Glider.</p> <p>The searches for scats and scratch marks have indicated koala and greater glider presence in the Study Area, and so impact assessments have been undertaken assuming presence of these species.</p> <p><b>Action:</b></p> <p>a) Provide a reference that states that searches for scats and scratches are relevant to Greater Glider. The species is not mentioned in the Commonwealth survey guidelines for mammals. The survey guidelines for the species for Victoria, recommended by the Commonwealth Government, do not mention scratches and only mention scats with regard to predator scats</p> <p>b) Confirm if spotlighting will be undertaken in future additional surveys</p>	<p><b>Response:</b></p> <p>While not a documented survey technique specifically for greater gliders, identification of scats can be used to indicate presence of terrestrial fauna. Based on the experience of the survey team in identification of mammalian scats and recent greater glider records in vegetation adjacent to the Study Area, the species has conservatively been considered to occur throughout suitable habitat within the Study Area.</p> <p>Spotlighting of the Greater Glider will be undertaken for future surveys, and is confirmed in the Fauna Management Plan.</p> <p>This has been outlined in <i>Section 3.3.2</i> and in <i>Table 4-6</i> in the updated Ecological Assessment Report (<b>Attachment C</b>).</p>
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**Performance Outcome (PO1) Aviation safety, integrity and efficiency**


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**Vulnerable Black-breasted Button-quail Survey**

6	<p><b>Issue:</b></p> <p>The Vulnerable Black-breasted Button-quail was not considered in the filed survey techniques and has been identified as having 'A Likelihood of Occurrence' on the site</p> <p><b>Action:</b></p> <p>Provide justification for not undertaking a targeted Black-breasted Button-quail survey.</p>	<p><b>Response:</b></p> <p>Surveys were performed for this species in suitable habitat, in accordance with the requirements of survey guidelines, but at a reduced effort to requirements. However, due to the lack of suitable habitat features, and lack of records in the area, it was concluded to be only potentially occurring. Due to its potential occurrence, this species will be targeted during the stage two micro-siting, pre-clearance surveys.</p> <p>This is outlined in <i>Section 3.3.3</i> of the updated Ecological Assessment Report (<b>Attachment C</b>).</p>
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**Bat Surveys**

7	<p><b>Issue:</b></p> <p>No harp trapping was undertaken during the field assessments for all bat species. Not all bat species can be identified to species level by ultrasonic calls, including the Vulnerable Corben's Long-eared Bat, which has been identified as having 'potential' to occur on site.</p> <p><b>Action:</b></p> <p>Confirm whether harp trapping will be undertaken in future additional surveys.</p>	<p>Harp trapping will be undertaken in accordance with survey guidelines.</p> <p>This has been addressed in <i>Section 3.3.4</i> and <i>Table 6.1</i> of the updated Ecological Impact Assessment (<b>Attachment C</b>).</p>
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**PO11 & 12 Acoustic Amenity**
**Sound power levels**

8	<p><b>Issue:</b></p> <p>The Planning Guideline requires predictions to be based on guaranteed sound power levels for the turbines. It is unclear if the predicted noise levels in the Noise Assessment, dated 30 July 2020, are based on guaranteed (or equivalent) noise levels.</p> <p>Generally, noise monitoring should be conducted at all sensitive land use receptors where the predicted noise level is greater than 35 dB(A).</p> <p>The two most critical locations for background noise are Non-Host Lots 8 and 12, as the predicted noise level is greater than 35 dB(A) and therefore these</p>	<p><b>Response:</b></p> <p>The sound power level (Lw) adopted in the assessment are equivalent to a guaranteed SWL for the turbine model being considered for the project which meets the projects noise objectives.</p> <p>Further justification for the noise monitoring locations and commitments to further monitoring are detailed in the Noise Assessment Technical Memo included as <b>Attachment D</b>.</p>
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**Performance Outcome (PO1) Aviation safety, integrity and efficiency**


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<p>locations rely on elevated background noise levels to achieve compliance. Background noise monitoring has not been conducted at either of these locations; rather Host Lot F has been used to represent both locations.</p> <p>Where an assessment for a sensitive receptor is reliant on elevated background noise levels, there needs to be a high level of confidence that the measured background noise levels are representative of the noise at the sensitive receptor. Only in exceptional circumstances should a representative location be used. For Non-Host Lots 8 and 12 there is not sufficient information provided to demonstrate that the background noise will be the same as at Host Lot F.</p> <p>For example, background noise monitoring was also conducted at Host Lot I, which is a similar distance from Non-Host Lot 8 as Host Lot F. The background noise measured at Host Lot I was lower than at Host Lot F and if used as being representative for Non-Host Lot 8, would result in the criteria being exceeded.</p> <p><b>Action:</b></p> <p>Provide additional information that demonstrates that the sound power levels are indicative of the highest levels that would be guaranteed for the range of turbines being considered.</p>	<p><b>Response:</b></p> <p>The noise assessment includes a preliminary assessment of noise impacts from the BESS and Substation locations under consideration, which demonstrates compliance with the Acoustic Quality Objectives of the Environment Protection (Noise) Policy 2019.</p> <p>Further detail is provided in the Noise Assessment Technical Memo included as <b>Attachment D</b>.</p>

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**Performance Outcome (PO1) Aviation safety, integrity and efficiency**


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**Noise Monitoring**

10	<p><b>Issue:</b></p> <p>The monitoring duration should be at least six weeks to provide sufficient noise data for day and night periods.</p> <p>The noise monitoring in the assessment was conducted for four weeks and therefore did not meet the recommendation of Planning Guideline. There appears to be even less than 4 weeks of data at some locations, such as NML 5.</p> <p><b>Action:</b></p> <p>Provide additional noise monitoring data over a six-week period or provide justification for undertaking the monitoring over a lesser period.</p>	<p><b>Response:</b></p> <p>The noise monitoring campaign over a four (4) week period yielded suitable data collection to make an assessment of impacts in accordance with State Code 23.</p> <p>Further detail is provided in the Noise Assessment Technical Memo included as <b>Attachment D</b>.</p>
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**Third Party Advice**


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**Powerlink Transmission Line**

11	<p><b>Issue:</b></p> <p>The turbines are to be separated from the edge of the Powerlink transmission line easement by a distance of 1.5 times the tip height of the turbine (or greater).</p> <p><b>Action:</b></p> <p>a) Provide the coordinates (in MGA coordinates system) of the centre point of the turbines, to enable the assessment of the proximity of turbines to the edge of the Powerlink transmission easement.</p> <p>b) Provide details of any ancillary infrastructure proposed within the existing Powerlink transmission line easement including, but not limited to, roads, cables telecommunications.</p>	<p><b>Response:</b></p> <p>The proponent has provided the co-ordinates for the turbines and details of ancillary infrastructure proposed within the transmission easement, for their consideration.</p> <p>Further consultation with Powerlink is ongoing with respect to the 1.5 times the tip height buffer distance from the transmission line easement is ongoing. We understand from discussions that Powerlink may consider a reduced setback, subject to further consultation and review of relevant safety standards.</p> <p>The proponent will continue working with Powerlink to seek endorsement for a setback which is suitable and maintains the safe operation of the transmission network.</p> <p>A copy of the correspondence with Powerlink is provided as <b>Attachment E</b>.</p>
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**Western Downs Regional Council**

12	<p>Relating to transportation matters raised by Western Downs Regional Council (WDRC) regarding:</p> <ul style="list-style-type: none"> <li>■ Proposed routes change avoiding Jandowae Town;</li> </ul>	<p>The proponent is in the process of finalising infrastructure agreements with both the Western Downs Regional Council and South Burnett Regional Council, specifically relating to road infrastructure, which will reflect the proposed</p>
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**Performance Outcome (PO1) Aviation safety, integrity and efficiency**

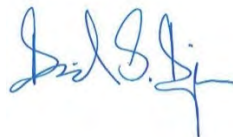
<ul style="list-style-type: none"> <li>■ Amending the TIA to provide further details;</li> <li>■ Defining the key site access locations; and</li> <li>■ Providing a structural assessment of any bridged, floodways, and stormwater culverts.</li> </ul>	<p>routes outlined in the Cambray Consulting Traffic Impact Assessment.</p> <p>It is understood however that Western Downs Regional Council will not endorse the transport route option considered through the township of Jandowae. This position has been acknowledged by the proponent and it is noted that while the route was identified, it was not chosen as the preferred route to site.</p> <p>We will continue to work with Council and other stakeholders about the transport route options and selected route, however in lieu of updating the Traffic Impact Assessment at this stage, we request this be a condition of the Development Permit. Following the selection of the transport route, pavement impact assessment will be undertaken to identify any necessary upgrade and/or traffic management requirements.</p>
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We thank you for the opportunity to provide additional advice and we trust the information provided will assist with the assessment of this project. If you have any queries regarding the above responses, please don't hesitate to contact me on 0415 740 261 or via email at [Michael.Rookwood@erm.com](mailto:Michael.Rookwood@erm.com).

Yours sincerely,



Michael Rookwood  
Senior Town and Environmental Planner



David Dique  
Partner

**ATTACHMENT A**

**SARA ADVICE NOTICE**



**Queensland Treasury**

SARA reference: 2007-17946 SDA  
 Applicant reference: 0532612

26 August 2020

White Wind No.1 Pty Ltd  
 4/201 Leichhardt Street  
 SPRING HILL QLD 4000  
 michael.rookwood@erm.com

Attention: Michael Rockwood

Dear Michael

## **SARA advice notice – Wambo Wind Farm, Diamondy**

(Advice notice given under section 35 of the Development Assessment Rules)

The State Assessment and Referral Agency (SARA) advises that your development application has not adequately demonstrated compliance with the State Development Assessment Provisions.

SARA has reviewed your application material and further to the phone conversation with you on 25 August 2020 the following issue(s) with the proposed development have been identified:

<b>Performance Outcome (PO) 1 - Aviation safety, integrity and efficiency</b>	
<b>Airspace procedures</b>	
1.	<p><b><u>Issue:</u></b></p> <p>PO1 of State code 23: Wind farm development (State code 23) requires that the safety, operational integrity and efficiency of air services and aircraft operations are not adversely affected by the location, siting, design and operation of the development.</p> <p><b><u>Action:</u></b></p> <p>Provide written endorsement by Airservices Australia and the district aerodrome supervisor stating they have no objection to the proposed development.</p>
<b>PO5 – Flora and Fauna</b>	
<b>Before and After Control Impact Study</b>	

2.	<p><b>Issue:</b> State code 23: Wind farm development – Planning guideline July 2017 (Planning Guideline) requires a Before and After Control Impact (BACI) design for Bird Utilisation Surveys where the Study Area is determined to support significant bird species.</p> <p><b>Action:</b> Provide updated Bird Utilisation Surveys that include a BACI design. A BACI design includes reference sites placed at a sufficient distance from the proposed turbine locations to obtain data outside the zone of influence of the turbines.</p>
<b>Ecological desktop assessment</b>	
3.	<p><b>Issue:</b> A search area containing the Study Area and a minimum 10 km buffer was used for the database searches. The Study Area is an irregular shape and, as such, a bounding rectangle was used (and buffered) for database searches requiring coordinate inputs. As a result, records may be further than 10 km from the Study Area boundary at some locations.</p> <p><b>Action:</b> Provide justification for the desktop search generally being limited to a 10 km buffer. For example, Red Goshawk has home ranges of 120 km<sup>2</sup> and 200 km<sup>2</sup> for females and males, respectively.</p>
<b>Survey effort and inability to conduct Collision Risk Modelling and Population Viability Analysis</b>	
4.	<p><b>Issue:</b> Field studies were undertaken over a four-day field period with an assessment of accessible sections of the Study Area.</p> <p>The Planning Guideline requires Collision Risk Modelling and Population Viability Analysis to be undertaken when determining collision risk to birds.</p> <p>Due to the lack of data obtained from the surveys, due to low abundance and diversity of bird species observed in the field studies, no modelling and analyses was subsequently undertaken to assess collision risk and other potential impacts to birds.</p> <p><b>Action:</b> Provide justification for the survey effort being limited to four days when insufficient data was collected during the field survey.</p>
<b>Greater Glider survey</b>	
5.	<p><b>Issue:</b> No spotlighting was undertaken for the Greater Glider.</p> <p>The searches for scats and scratch marks have indicated koala and greater glider presence in the Study Area, and so impact assessments have been undertaken assuming presence of these species.</p> <p><b>Action:</b></p> <p>a) Provide a reference that states that searches for scats and scratches are relevant to Greater Glider. The species is not mentioned in the Commonwealth survey guidelines for mammals. The survey guidelines for the species for Victoria, recommended by the Commonwealth Government, do not mention scratches and only mention scats with</p>

	<p>regard to predator scats.</p> <p>b) Confirm if spotlighting will be undertaken in future additional surveys.</p>
<b>Vulnerable Black-breasted Button-quail survey</b>	
6.	<p><b>Issue:</b></p> <p>The Vulnerable Black-breasted Button-quail was not considered in the filed survey techniques and has been identified as having 'A Likelihood of Occurrence' on the site.</p> <p><b>Action:</b></p> <p>Provide justification for not undertaking a targeted Black-breasted Button-quail survey.</p>
<b>Bat surveys</b>	
7.	<p><b>Issue:</b></p> <p>No harp trapping was undertaken during the field assessments for all bat species. Not all bat species can be identified to species level by ultrasonic calls, including the Vulnerable Corben's Long-eared Bat, which has been identified as having 'potential' to occur on site.</p> <p><b>Action:</b></p> <p>Confirm whether harp trapping will be undertaken in future additional surveys.</p>
<b>PO11 &amp; 12 – Acoustic amenity</b>	
<b>Sound power levels</b>	
8.	<p><b>Issue:</b></p> <p>The Planning Guideline requires predictions to be based on guaranteed sound power levels for the turbines. It is unclear if the predicted noise levels in the Noise Assessment, dated 30 July 2020, are based on guaranteed (or equivalent) noise levels.</p> <p>Generally, noise monitoring should be conducted at all sensitive land use receptors where the predicted noise level is greater than 35 dB(A).</p> <p>The two most critical locations for background noise are Non-Host Lots 8 and 12, as the predicted noise level is greater than 35 dB(A) and therefore these locations rely on elevated background noise levels to achieve compliance. Background noise monitoring has not been conducted at either of these locations; rather Host Lot F has been used to represent both locations.</p> <p>Where an assessment for a sensitive receptor is reliant on elevated background noise levels, there needs to be a high level of confidence that the measured background noise levels are representative of the noise at the sensitive receptor. Only in exceptional circumstances should a representative location be used. For Non-Host Lots 8 and 12 there is not sufficient information provided to demonstrate that the background noise will be the same as at Host Lot F.</p> <p>For example, background noise monitoring was also conducted at Host Lot I, which is a similar distance from Non-Host Lot 8 as Host Lot F. The background noise measured at Host Lot I was lower than at Host Lot F and if used as being representative for Non-Host Lot 8, would result in the criteria being exceeded.</p> <p><b>Action:</b></p> <p>Provide additional information that demonstrates that the sound power levels are indicative of the highest levels that would be guaranteed for the range of turbines being considered.</p>

9.	<p><b><u>Issue:</u></b></p> <p>The acoustic assessment includes predictions of the noise from a substation and a battery energy storage system (BESS).</p> <p><b><u>Action:</u></b></p> <p>Provide justification for the sound power levels used and provide a comparison of the predicted noise levels with the <i>Acoustic Quality Objectives</i> of the <i>Environment Protection (Noise) Policy 2019</i>.</p>
<b>Noise monitoring</b>	
10.	<p><b><u>Issue:</u></b></p> <p>The monitoring duration should be at least six weeks to provide sufficient noise data for day and night periods.</p> <p>The noise monitoring in the assessment was conducted for four weeks and therefore did not meet the recommendation of Planning Guideline. There appears to be even less than 4 weeks of data at some locations, such as NML 5.</p> <p><b><u>Action:</u></b></p> <p>Provide additional noise monitoring data over a six-week period or provide justification for undertaking the monitoring over a lesser period.</p>
<b>Third party advice</b>	
<b>Powerlink Transmission line</b>	
11.	<p><b><u>Issue:</u></b></p> <p>The turbines are to be separated from the edge of the Powerlink transmission line easement by a distance of 1.5 times the tip height of the turbine (or greater).</p> <p><b><u>Action:</u></b></p> <p>a) Provide the coordinates (in MGA coordinates system) of the centre point of the turbines, to enable the assessment of the proximity of turbines to the edge of the Powerlink transmission easement.</p> <p>b) Provide details of any ancillary infrastructure proposed within the existing Powerlink transmission line easement including, but not limited to, roads, cables telecommunications.</p>

Please note that unlike an information request, **assessment timeframes do not stop** when advice is provided by SARA.

### How to respond

It is recommended that you address these issues promptly and provide a response to SARA. If you decide not to respond, your application will be assessed and decided based on the information provided to date.

Under the [Development Assessment Rules](#) (DA Rules), the issuing of advice does not stop the assessment timeframes. If you intend to provide additional information, it should be provided in a timely manner to allow sufficient time for the information to be considered. As such, you are strongly encouraged to consider using the 'stop the clock' provisions under s32 of the DA rules, to allow sufficient time for you to consider and respond to SARA's advice; and for SARA to consider any new or changed material provided.



If you wish to utilise the 'stop the clock' provisions, you should give notice to the assessing authority (assessment manager or referral agency) whose current period you wish to stop. This can be done through MyDAS2 or via correspondence.

You are requested to upload your response and complete the relevant tasks in [MyDAS2](#).

If you require further information or have any questions about the above, please contact Danielle Harris, Principal Planner, on 34527654 or via email [DAAT@dsdmip.qld.gov.au](mailto:DAAT@dsdmip.qld.gov.au) who will be pleased to assist.

Yours sincerely



Tim O'Leary  
Manager

Development details	
Description:	Development permit Material change of use for a wind farm Operational work for clearing native vegetation
SARA role:	assessment manager
SARA trigger:	8.4.3.b - Clearing of native vegetation (Planning Regulation 2017) 4.2.21.2.b.i – Wind farms
SARA reference:	2007-17946 SDA
Assessment criteria:	State code 16: Native vegetation clearing State code 23: Wind farm development

ENQUIRIES TO:  
Kym Bannerman  
Ph: (07) 4679 4348

FILE REFS:  
A41883 & LG18.1.1.

ECM DOC SET  
4148414

YOUR REF:  
**2007-17946 SDA**

KRB:JKM

Customer Contact  
**1300 COUNCIL** (1300 268 624)  
**07 4679 4000**

[www.wdrc.qld.gov.au](http://www.wdrc.qld.gov.au)

OUR COMMUNITIES | OUR FUTURE

Address all correspondence  
to the Chief Executive Officer  
PO Box 551, DALBY, QLD 4405

[info@wdrc.qld.gov.au](mailto:info@wdrc.qld.gov.au)



20 August 2020

Development Assessment Division,  
Planning Group  
Queensland Treasury  
GPO Box 611  
**BRISBANE QLD 4001**

**ATTENTION: Danielle Harris**  
**PRINCIPAL PLANNER**  
**EMAIL: [Danielle.Harris@dsdmip.qld.gov.au](mailto:Danielle.Harris@dsdmip.qld.gov.au)**

Dear Madam

**RE: REQUEST FOR THIRD PARTY ADVICE - DEVELOPMENT APPLICATION TO ESTABLISH A WIND FARM AT 1382 DIAMONDY ROAD, DIAMONDY**

Council has reviewed the abovementioned development application and it has been determined that the following additional information is needed to assess the application:

- In relation to the project transport routes, Council does not support transporting the components through Jandowae Town and suggests that the following option be considered to avoid Towns:
  - Dalby-Jandowae Road;
  - right into Hickey's Road,
  - left into Lyndley Connection Road;
  - right into Kingaroy-Jandowae Road; and
  - local access from Niagara Road West, Woollett's Road, Diamondy Road, Wellcamp Road, Jollimont Road, and Jarail Road.
- Amend the Traffic Impact Assessment to provide details on project traffic and transport requirements including:
  - pavement widths;
  - pavement loadings;
  - suitability of horizontal and vertical alignment;
  - material supply routes for gravel, sand and concrete; and
  - transport routes for cranes, water source and supply, tower and turbine components, and substations.

.2.

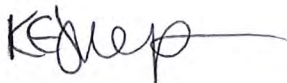
- Define the key site access locations.
- Provide a structural assessment of any bridges, floodways, and stormwater culverts (pipes/rcbc's).

Council also provides the following advice:

- It is Council's preference for the applicant to enter into a Road Infrastructure and Service Level Agreement. The Agreement is to outline the applicant's and Council's respective responsibilities. There are roads that will require attention in the immediate area to sustain the project traffic in a safe and all-weather access manner. It is also possible for the Infrastructure Agreement to require a possible security bond for Niagara Road for pavement defects and deterioration.

If you have any further enquiries in relation to this matter, please contact Council's Planning Officer Development Assessment, Kym Bannerman via email [kym.bannerman@wdrc.qld.gov.au](mailto:kym.bannerman@wdrc.qld.gov.au) or on the above telephone number.

Yours faithfully



Kate Swepson  
**PRINCIPAL PLANNER**

**ATTACHMENT B    CORRESPONDENCE WITH AIRSERVICES  
AUSTRALIA**

## Michael Rookwood

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**From:** Pavel Davidyuk <pdavidyuk@aviationprojects.com.au>  
**Sent:** Thursday, 10 September 2020 4:22 PM  
**To:** Airport Developments  
**Cc:** Heather Stafford; Keith Tonkin; Georgia Holmes; Michael Rookwood  
**Subject:** RE: 100504-01 UPDATED Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Hi John,

Thanks for the updated Airservices response on the proposed mitigation measures to the 25 nm MSA at Kingaroy Airport arising from the proposed Wambo Wind Farm.

Your cooperation is much appreciated.

Regards,

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

*Please note that I am not working on Wednesdays*

*Mobile +61 467 431 111  
Phone +61 7 3371 0788  
Fax +61 7 3371 0799  
Post PO Box 116, Toowong DC Qld 4066  
Street 19/200 Moggill Road, Taringa Qld 4068  
Web [www.aviationprojects.com.au](http://www.aviationprojects.com.au)*

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---

**From:** Airport Developments <Airport.Developments@AirservicesAustralia.com>  
**Sent:** Thursday, 10 September 2020 4:15 PM  
**To:** Pavel Davidyuk <pdavidyuk@aviationprojects.com.au>  
**Subject:** UPDATED Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Hi Pavel,

I refer to your request for an Airservices assessment of **Wambo Wind Farm**.

**Airspace Procedures**

With respect to procedures designed by Airservices in accordance with ICAO PANS-OPS and Document 9905, at various heights, WT85 (2838ft AHD), WT3 (2755ft AHD), WT1 (2795ft AHD), WT2 (2740ft AHD), WT6 (2731ft AHD), WT25 (2773ft AHD), WT22 (2740ft AHD) and WT18 (2740ft AHD) will affect the 25nm Minimum Segment Altitude (MSA) at Kingaroy aerodrome.

If the penetrating turbines are constructed at the proposed heights, the MSA north/east sector will have to be amended to exclude the said turbines.

The maximum height of the penetrating turbines without affecting any procedures at Kingaroy aerodrome is 827.8m (2716ft) AHD.

The wind farm will not affect any air route.

*Note: Procedures not designed by Airservices at Kingaroy aerodrome were not considered in this assessment.*

### **Communications/Navigation/Surveillance (CNS) Facilities**

This proposal will not adversely impact the performance of any Airservices Precision/Non-Precision Nav Aids, Anemometers, HF/VHF/UHF Comms, A-SMGCS, Radar, PRM, ADS-B, WAM or Satellite/Links.

### **Summary**

Airservices requires that the operator of Kingaroy aerodrome is consulted on the impact to MSA before any change can be supported by Airservices. Furthermore, any Airservices work associated with amending the MSA will be undertaken on a commercial basis and require further consultation.

Kind regards,

**JOHN GRAHAM**  
**AIRPORT DEVELOPMENT APPLICATIONS COORDINATOR**

#### **WORKING FROM HOME**

**Mobile** 0439 385 472

**Email** [John.Graham@airservicesaustralia.com](mailto:John.Graham@airservicesaustralia.com)

Alan Woods Building  
25 Constitution Avenue, Canberra ACT 2600



---

**From:** Airport Developments  
**Sent:** Thursday, 10 September 2020 1:56 PM  
**To:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>  
**Subject:** RE: 100504-01 Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Hi Pavel,

I have spoken with a principal planner at SARA about Airservices position on the Wambo Wind Farm development application.

Airservices cannot support the wind farm, in its presented state, as multiple turbines affect the 25nm minimum segment altitude (MSA) at Kingaroy aerodrome.

Airservices advice will remain: Airservices cannot support this proposal. Airservices requires that the operator of Kingaroy aerodrome is consulted on the impact to MSA before any change can be supported by Airservices.

Furthermore, any Airservices work associated with amending the MSA will be undertaken on a commercial basis and require further consultation.

Airservices can only support the Wambo wind farm, in its presented state, when the proponent accepts a commercial agreement with Airservices to make the required change to the 25nm MSA at Kingaroy aerodrome. Airservices accepts that the operator of Kingaroy aerodrome has been consulted on the Wambo Wind Farm as per the attachment included in your email on 01/09/2020.

Thanks.

Kind regards,

**JOHN GRAHAM**  
**AIRPORT DEVELOPMENT APPLICATIONS COORDINATOR**

**WORKING FROM HOME**

**Mobile** 0439 385 472

**Email** [John.Graham@airservicesaustralia.com](mailto:John.Graham@airservicesaustralia.com)

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25 Constitution Avenue, Canberra ACT 2600



---

**From:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>  
**Sent:** Thursday, 10 September 2020 9:52 AM  
**To:** Airport Developments <[Airport.Developments@AirservicesAustralia.com](mailto:Airport.Developments@AirservicesAustralia.com)>  
**Cc:** Michael Rookwood <[Michael.Rookwood@erm.com](mailto:Michael.Rookwood@erm.com)>; Keith Tonkin <[ktonkin@aviationprojects.com.au](mailto:ktonkin@aviationprojects.com.au)>; Heather Stafford <[hstafford@aviationprojects.com.au](mailto:hstafford@aviationprojects.com.au)>; Georgia Holmes <[gholmes@aviationprojects.com.au](mailto:gholmes@aviationprojects.com.au)>  
**Subject:** RE: 100504-01 Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Hi John,

I hope my email finds you well.

As discussed on the phone last week, I'm writing to follow up on my request regarding SARA's concerns about Airservices Australia submission response to the proposal.

ERM needs to respond this week so it would be much appreciated if we receive conditional approval to a change to the 25 MSA at Kingaroy Airport.

Regards,

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

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---

**From:** Pavel Davidyuk

**Sent:** Thursday, 3 September 2020 8:49 AM

**To:** Airport Developments <[Airport.Developments@AirservicesAustralia.com](mailto:Airport.Developments@AirservicesAustralia.com)>

**Cc:** Michael Rookwood <[Michael.Rookwood@erm.com](mailto:Michael.Rookwood@erm.com)>; Keith Tonkin <[ktonkin@aviationprojects.com.au](mailto:ktonkin@aviationprojects.com.au)>; Heather Stafford <[hstafford@aviationprojects.com.au](mailto:hstafford@aviationprojects.com.au)>; Georgia Holmes <[gholmes@aviationprojects.com.au](mailto:gholmes@aviationprojects.com.au)>

**Subject:** RE: 100504-01 Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Hi John,

Thanks for your email. I appreciate it.

However, I don't understand why do we need to get a quote for the changes at this stage. My understanding that the Proponent organises such arrangements after the approval and before the construction of the project.

What're your thoughts on this?

Regards,

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

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**From:** Airport Developments <[Airport.Developments@AirservicesAustralia.com](mailto:Airport.Developments@AirservicesAustralia.com)>  
**Sent:** Wednesday, 2 September 2020 8:20 AM  
**To:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>  
**Subject:** RE: 100504-01 Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Hi Pavel,

Thank you for sending that through. I have engaged our procedure design team to generate a quote for the changes. They will contact you.

Thanks.

Kind regards,

**JOHN GRAHAM**  
**AIRPORT DEVELOPMENT APPLICATIONS COORDINATOR**

**WORKING FROM HOME**

**Mobile** 0439 385 472

**Email** [John.Graham@airservicesaustralia.com](mailto:John.Graham@airservicesaustralia.com)

Alan Woods Building  
25 Constitution Avenue, Canberra ACT 2600



---

**From:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>  
**Sent:** Tuesday, 1 September 2020 2:40 PM  
**To:** Airport Developments <[Airport.Developments@AirservicesAustralia.com](mailto:Airport.Developments@AirservicesAustralia.com)>  
**Cc:** Keith Tonkin <[ktonkin@aviationprojects.com.au](mailto:ktonkin@aviationprojects.com.au)>; Heather Stafford <[hstafford@aviationprojects.com.au](mailto:hstafford@aviationprojects.com.au)>; Georgia Holmes <[gholmes@aviationprojects.com.au](mailto:gholmes@aviationprojects.com.au)>; Michael Rookwood <[Michael.Rookwood@erm.com](mailto:Michael.Rookwood@erm.com)>  
**Subject:** RE: 100504-01 Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Hi John,

Thanks for your time on the phone. I appreciate.

As discussed, could you please re-justify your position on the proposed changes to the 25 MSA given that South Burnett Regional Council (SBRC) has no objection to the changes.

Please kindly find attached the finalised AIA report with all stakeholder responses as well as email correspondence with SBRC in relation to changes of the 25 MSA of Kingaroy Airport.

I would appreciate an acknowledgement of this email and a likely timeframe for your response.

Should you have any questions, please do not hesitate to contact me.

Kind regards,

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

*Please note that I am not working on Wednesdays*

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**From:** Pavel Davidyuk  
**Sent:** Tuesday, 23 June 2020 1:20 PM  
**To:** Airport Developments <[Airport.Developments@AirservicesAustralia.com](mailto:Airport.Developments@AirservicesAustralia.com)>  
**Cc:** Keith Tonkin <[ktonkin@aviationprojects.com.au](mailto:ktonkin@aviationprojects.com.au)>; Heather Stafford <[hstafford@aviationprojects.com.au](mailto:hstafford@aviationprojects.com.au)>; Georgia Holmes <[gholmes@aviationprojects.com.au](mailto:gholmes@aviationprojects.com.au)>  
**Subject:** RE: 100504-01 Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Thanks for the confirmation John.

Regards

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

*Please be kindly noted that I am working from home on Mon, Tue and Thu*

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**From:** Airport Developments <[Airport.Developments@AirservicesAustralia.com](mailto:Airport.Developments@AirservicesAustralia.com)>  
**Sent:** Tuesday, 23 June 2020 11:34 AM  
**To:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>  
**Subject:** Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Hi Pavel,

I can confirm there is no impact to the RNAV procedures at Kingaroy. As per our previous response, the wind farm will only impact the MSA at Kingaroy aerodrome. Airservices requires that the operator of Kingaroy aerodrome is consulted on the impact to MSA before any change can be considered.

Kind Regards,

*John Graham*

**WORKING FROM HOME**  
**Airport Development Applications Coordinator**  
Airservices Australia

t **0439 385 472**  
e [John.Graham@airservicesaustralia.com](mailto:John.Graham@airservicesaustralia.com)



---

**From:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>  
**Sent:** Tuesday, 23 June 2020 10:50 AM  
**To:** Airport Developments <[Airport.Developments@AirservicesAustralia.com](mailto:Airport.Developments@AirservicesAustralia.com)>  
**Cc:** Keith Tonkin <[ktonkin@aviationprojects.com.au](mailto:ktonkin@aviationprojects.com.au)>; Heather Stafford <[hstafford@aviationprojects.com.au](mailto:hstafford@aviationprojects.com.au)>; Georgia Holmes <[gholmes@aviationprojects.com.au](mailto:gholmes@aviationprojects.com.au)>; 'Michael Rookwood' <[Michael.Rookwood@erm.com](mailto:Michael.Rookwood@erm.com)>  
**Subject:** RE: 100504-01 Wambo WF Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Thanks John!

Regards,

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

*Please be kindly noted that I am working from home on Mon, Tue and Thu*

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**From:** Airport Developments <[Airport.Developments@AirservicesAustralia.com](mailto:Airport.Developments@AirservicesAustralia.com)>  
**Sent:** Tuesday, 23 June 2020 10:36 AM  
**To:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>  
**Subject:** RE: 100504-01 Wambo WF Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Hi Pavel,

Will confirm with procedure design team.

Thanks.

Kind Regards,

*John Graham*

**WORKING FROM HOME**  
**Airport Development Applications Coordinator**  
Airservices Australia

t 0439 385 472

e [John.Graham@airservicesaustralia.com](mailto:John.Graham@airservicesaustralia.com)



---

**From:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>  
**Sent:** Tuesday, 23 June 2020 9:41 AM  
**To:** Airport Developments <[Airport.Developments@AirservicesAustralia.com](mailto:Airport.Developments@AirservicesAustralia.com)>  
**Cc:** Keith Tonkin <[ktonkin@aviationprojects.com.au](mailto:ktonkin@aviationprojects.com.au)>; Heather Stafford <[hstafford@aviationprojects.com.au](mailto:hstafford@aviationprojects.com.au)>; Georgia Holmes <[gholmes@aviationprojects.com.au](mailto:gholmes@aviationprojects.com.au)>  
**Subject:** RE: 100504-01 Wambo WF Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Hi John,

Thanks for your email. I appreciate it.

Could you please confirm whether or not the missed approach altitude for RNAV GNNS approach procedure for runway 16 is affected by the proposed development?

Regards,

*Pavel Davidyuk MEng MAvn CPRA*

Specialist Consultant – Aviation

Please be kindly noted that I am working from home on Mon, Tue and Thu

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**From:** Airport Developments <[Airport.Developments@AirservicesAustralia.com](mailto:Airport.Developments@AirservicesAustralia.com)>  
**Sent:** Tuesday, 23 June 2020 9:28 AM  
**To:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>  
**Cc:** Airspace Protection <[Airspace.Protection@casa.gov.au](mailto:Airspace.Protection@casa.gov.au)>  
**Subject:** Airservices Response: QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Hi Pavel,

I refer to your request for an Airservices assessment of **Wambo Wind Farm**.

### **Airspace Procedures**

With respect to procedures designed by Airservices in accordance with ICAO PANS-OPS and Document 9905, at various heights, WT85 (2838ft AHD), WT3 (2755ft AHD), WT1 (2795ft AHD), WT2 (2740ft AHD), WT6 (2731ft AHD), WT25 (2773ft AHD), WT22 (2740ft AHD) and WT18 (2740ft AHD) will affect the 25nm Minimum Segment Altitude (MSA) at Kingaroy aerodrome.

If the penetrating turbines are constructed at the proposed heights, the MSA north/east sector will have to be amended to exclude the said turbines.

The maximum height of the penetrating turbines without affecting any procedures at Kingaroy aerodrome is 827.8m (2716ft) AHD.

The wind farm will not affect any air route.

*Note: Procedures not designed by Airservices at Kingaroy aerodrome were not considered in this assessment.*

### **Communications/Navigation/Surveillance (CNS) Facilities**

This proposal will not adversely impact the performance of any Airservices Precision/Non-Precision Nav Aids, Anemometers, HF/VHF/UHF Comms, A-SMGCS, Radar, PRM, ADS-B, WAM or Satellite/Links.

## **Summary**

At this stage, Airservices cannot support this proposal. Airservices requires that the operator of Kingaroy aerodrome is consulted on the impact to MSA before any change can be supported by Airservices. Furthermore, any Airservices work associated with amending the MSA will be undertaken on a commercial basis and require further consultation.

Kind Regards,

*John Graham*

### **WORKING FROM HOME**

**Airport Development Applications Coordinator**

Airservices Australia

t **0439 385 472**

e [John.Graham@airservicesaustralia.com](mailto:John.Graham@airservicesaustralia.com)



---

**From:** Airport Developments

**Sent:** Wednesday, 27 May 2020 3:25 PM

**To:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>

**Cc:** Keith Tonkin <[ktonkin@aviationprojects.com.au](mailto:ktonkin@aviationprojects.com.au)>; Georgia Holmes <[gholmes@aviationprojects.com.au](mailto:gholmes@aviationprojects.com.au)>;

Heather Stafford <[hstafford@aviationprojects.com.au](mailto:hstafford@aviationprojects.com.au)>; Michael Rookwood <[Michael.Rookwood@erm.com](mailto:Michael.Rookwood@erm.com)>; David Dique <[David.Dique@erm.com](mailto:David.Dique@erm.com)>

**Subject:** QLD-WF-022 P2 - Wambo Wind Farm [SEC=UNCLASSIFIED]

Hi Pavel,

I have received your proposal and commenced the Airservices assessment, which takes approximately 6 weeks for completion.

If you have any questions, please contact the Airport Developments team and quote assessment code: QLD-WF-022 P2

Please note that all completed Airservices assessments are also forwarded to CASA.

Regards,

**William Zhao**

**Advisor Airport Development**

Tower Road, Melbourne Airport, Tullamarine VIC 3043

t **03 9339 2182**

e [airport.developments@airservicesaustralia.com](mailto:airport.developments@airservicesaustralia.com)



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**From:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>  
**Sent:** Monday, 25 May 2020 4:36 PM  
**To:** Airport Developments <[Airport.Developments@AirservicesAustralia.com](mailto:Airport.Developments@AirservicesAustralia.com)>  
**Cc:** Keith Tonkin <[ktonkin@aviationprojects.com.au](mailto:ktonkin@aviationprojects.com.au)>; Georgia Holmes <[gholmes@aviationprojects.com.au](mailto:gholmes@aviationprojects.com.au)>; Heather Stafford <[hstafford@aviationprojects.com.au](mailto:hstafford@aviationprojects.com.au)>; Michael Rookwood <[Michael.Rookwood@erm.com](mailto:Michael.Rookwood@erm.com)>; David Dique <[David.Dique@erm.com](mailto:David.Dique@erm.com)>  
**Subject:** RE: 100504-01\_Wambo\_WF\_AIA\_v0.2\_200525 - AsA

Dear William,

**Please note that the material contained herein is confidential and should be transmitted only within your organisation on a need to know basis.**

Aviation Projects is writing on behalf of ERM Australia Pty Ltd (ERM) in relation to the proposed Wambo Wind Farm project, which is located approximately 47 km (25 nm) west from Kingaroy Airport. The Project area is located north west of the Bunya Highway within the boundaries of Western Downs Regional Council local government area (LGA) in Queensland. ERM has engaged Aviation Projects to prepare an Aviation Impact Assessment (AIA) for the proposed Project and to formally consult with aviation agencies.

The proposed Wambo Wind Farm project will comprise of the following:

- up to 112 wind turbine generators (WTG);
- maximum overall height (tip height) of the wind turbines is up to 240 m AGL;
- highest wind turbine is T85 with ground elevation of 600 m Australian Height Datum (AHD) and overall height of 845 m AHD (2773 ft above mean sea level (AMSL));
- one proposed temporary meteorological monitoring mast (wind monitoring tower (WMT)) with a maximum height of up to 159 m (522 ft) AGL, which will be reported to Airservices Australia once the final location is confirmed prior to construction; and
- two LiDAR systems for wind speed measurement.

The purpose of the assessment is to consider the impacts on aviation safety arising from the Project.

Based on the Project layout and overall turbine blade tip height limit of 240 m AGL, the blade tip elevation of the highest wind turbine, which is WT85, will not exceed 845 m AHD (2773 ft AMSL) and:

- will not penetrate any OLS surfaces;
- **will penetrate PAN-OPS surfaces of Kingaroy Airport;**
- will not have an impact on nearby designated air routes;
- will not impact on the grid LSALT;
- will not have an impact on prescribed airspace;
- is wholly contained within Class G airspace; and
- is outside the clearance zones associated with aviation navigation aids and communication facilities.

To accommodate the Project the following mitigating action will be required:

- **25 nm MSA at Kingaroy Airport in the sector bounded by bearings 075° and 350° should be increased by 100 ft from 3700 ft AMSL to 3800 ft AMSL; and**

- **the missed approach altitudes for RNAV GNSS approach procedures for runway 16 and runway 34 should be amended to 3800 ft AMSL to safeguard the missed approach procedures.**

Please find attached the following files:

- 100504-01\_Wambo\_WF\_AIA\_v0.2\_200525.pdf
- WTG112\_Coords\_20200519\_Z.xlsx
- WWF\_112T\_Layout.kmz

Would you please provide an assessment of the proposal in respect of matters relevant to Airservices Australia.

Please note that The Airport Group and Department of Defence will be consulted about the Project.

We would appreciate an acknowledgement of this email and a likely timeframe for your response.

Should you have any questions, please do not hesitate to contact me.

Kind regards

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

*Please be kindly noted that I am working from home on Mon, Tue and Thu*

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**Phone** +61 7 3371 0788

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## Michael Rookwood

---

**From:** Michael Rookwood  
**Sent:** Friday, 11 September 2020 1:03 PM  
**To:** Michael Rookwood  
**Subject:** FW: 100504-01\_Wambo\_WF\_AIA\_v0.2\_200525 - SBRC

---

**From:** Michael Hunter <[MHunter@southburnett.qld.gov.au](mailto:MHunter@southburnett.qld.gov.au)>  
**Sent:** Thursday, 16 July 2020 5:28 PM  
**To:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>  
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**Subject:** RE: 100504-01\_Wambo\_WF\_AIA\_v0.2\_200525 - SBRC

Pavel

In reply to your email, Council has received advice regarding the proposed wind farm and there would be required change. The NE 25MSA sector will need to rise by 200ft from 3700ft to 3900ft, this will affect both instrumental Flight Procedures for the Kingaroy Airport.

The Air services procedure to runway 16 will start 200ft higher, while TQG 173 procedure to runway 34 missed approach will need to climb 200ft extra. Neither requirement is significant, either if those changes are incorporated into the existing procedures or if Airservices decides to move the sector boundary to avoid those changes. The latter change would make the SW sector larger (and shrink the NE sector with an inbound track of about b-135°) and, due to the higher requirement of Mt Mowbullan, allow these to be ignored.



The 10MSA will have to change due to Iron Leaf, but there are no dependencies on this.

I trust this information is of assistance.

Regards  
Michael

## Michael Hunter

Acting Manager NRM & Parks  
South Burnett Regional Council

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**Subject:** RE: 100504-01\_Wambo\_WF\_AIA\_v0.2\_200525 - SBRC

Hi Michael,

I hope my email finds you well.

I was wondering if you can provide an update on the progress of the Council's consultants assessment of the proposed Wambo Wind Farm? Its' been **seven (7) weeks** since we have requested for the Council's comments.

The Client plans to submit a development application this week Friday, and we need to finalise our AIA by the COB on the 16th of July.

It would be much appreciated if we receive a response by the morning on the 16th of July.

Regards

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

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**Subject:** RE: 100504-01\_Wambo\_WF\_AIA\_v0.2\_200525 - SBRC

Hi Michael,

Thanks for your response. I appreciate it.

Could you please advise when Council's consultants provide their response?

Regards,

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

**Please note that I am not working on Wednesdays**

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**Sent:** Monday, 6 July 2020 4:15 PM  
**To:** Pavel Davidyuk <[pdavidyuk@aviationprojects.com.au](mailto:pdavidyuk@aviationprojects.com.au)>

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**Subject:** RE: 100504-01\_Wambo\_WF\_AIA\_v0.2\_200525 - SBRC

Paul

Thanks for your email, I have forward your email onto Councils consultants for advice regarding this matter.

Regards

**Michael Hunter**

Acting Manager NRM & Parks  
South Burnett Regional Council  
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**Subject:** RE: 100504-01\_Wambo\_WF\_AIA\_v0.2\_200525 - SBRC

Hi Michael,

I hope my email finds you well.

I'm writing to follow up on my request for the Council's comment on the proposed Wambo WF. Could you please provide your response this week.

Regards,

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

*Please note that I am not working on Wednesdays*

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**Subject:** RE: 100504-01\_Wambo\_WF\_AIA\_v0.2\_200525 - SBRC

Hi Michael,

I hope my email finds you well.

I called earlier today to follow up my email request on the phone, but you were not available.

Could you please advise a likely timeframe of your response.

Regards

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

*Please be kindly noted that I am working from home on Mon, Tue and Thu*

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**From:** Pavel Davidyuk  
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**Subject:** RE: RE: 100504-01\_Wambo\_WF\_AIA\_v0.2\_200525 - SBRC

Hi Michael,

I'm writing to update you on the proposed Wambo WF project.

The client decided to use a different wind turbine model which will result in a change to the highest WTG. Please kindly note that:

- maximum overall height (tip height) of the wind turbines is up to 260 m AGL; and
- highest wind turbine is T85 with ground elevation of 600 m Australian Height Datum (AHD) and overall height of 865 m AHD (2838 ft above mean sea level (AMSL));

Therefore, based on the Project layout and overall turbine blade tip height limit of 260 m AGL, the blade tip elevation of the highest wind turbine, which is WT85, will not exceed 865 m AHD (2838 ft AMSL) and:

- will not penetrate any OLS surfaces;
- **will penetrate PAN-OPS surfaces of Kingaroy Airport;**
- will not have an impact on nearby designated air routes;
- will not impact on the grid LSALT;
- will not have an impact on prescribed airspace;
- is wholly contained within Class G airspace; and
- is outside the clearance zones associated with aviation navigation aids and communication facilities.

To accommodate the Project the following mitigating action will be required:

- **25 nm MSA at Kingaroy Airport in the sector bounded by bearings 075° and 350° should be increased by 200 ft from 3700 ft AMSL to 3900 ft AMSL; and**
- **the missed approach altitudes for RNAV GNSS approach procedures for runway 16 and runway 34 should be amended to 3900 ft AMSL to safeguard the missed approach procedures.**

It would be much appreciated if you let me know a likely timeframe for your response.

Regards

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

*Please be kindly noted that I am working from home on Mon, Tue and Thu*

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**Subject:** RE: 100504-01\_Wambo\_WF\_AIA\_v0.2\_200525 - SBRC

Dear Michael,

As discussed on the phone, please kindly find information on the proposed wind farm project below. Please kindly note that I've tried to send an email to Greg, but my email was bounced back.

**Please note that the material contained herein is confidential and should be transmitted only within your organisation on a need to know basis.**

Aviation Projects is writing on behalf of ERM Australia Pty Ltd (ERM) in relation to the proposed Wambo Wind Farm project, which is located approximately 47 km (25 nm) west from Kingaroy Airport. The Project area is located north west of the Bunya Highway within the boundaries of Western Downs Regional Council local government area (LGA) in Queensland. ERM has engaged Aviation Projects to prepare an Aviation Impact Assessment (AIA) for the proposed Project and to formally consult with aviation agencies.

The proposed Wambo Wind Farm project will comprise of the following:

- up to 112 wind turbine generators (WTG);
- maximum overall height (tip height) of the wind turbines is up to 240 m AGL;
- highest wind turbine is T85 with ground elevation of 600 m Australian Height Datum (AHD) and overall height of 845 m AHD (2773 ft above mean sea level (AMSL));



- one proposed temporary meteorological monitoring mast (wind monitoring tower (WMT)) with a maximum height of up to 159 m (522 ft) AGL, which will be reported to Airservices Australia once the final location is confirmed prior to construction; and
- two LiDAR systems for wind speed measurement.

The purpose of the assessment is to consider the impacts on aviation safety arising from the Project.

Based on the Project layout and overall turbine blade tip height limit of 240 m AGL, the blade tip elevation of the highest wind turbine, which is WT85, will not exceed 845 m AHD (2773 ft AMSL) and:

- will not penetrate any OLS surfaces;
- **will penetrate PAN-OPS surfaces of Kingaroy Airport;**
- will not have an impact on nearby designated air routes;
- will not impact on the grid LSALT;
- will not have an impact on prescribed airspace;
- is wholly contained within Class G airspace; and
- is outside the clearance zones associated with aviation navigation aids and communication facilities.

To accommodate the Project the following mitigating action will be required:

- **25 nm MSA at Kingaroy Airport in the sector bounded by bearings 075° and 350° should be increased by 100 ft from 3700 ft AMSL to 3800 ft AMSL; and**
- **the missed approach altitudes for RNAV GNSS approach procedures for runway 16 and runway 34 should be amended to 3800 ft AMSL to safeguard the missed approach procedures.**

Please find attached the following files:

- 100504-01\_Wambo\_WF\_AIA\_v0.2\_200525.pdf
- WTG112\_Coords\_20200519\_Z.xlsx
- WWF\_112T\_Layout.kmz

Would you please provide your comment(s) on the proposal in respect to matters relevant to South Burnett Regional Council as the aerodrome operator of Kingaroy Airport.

Please note that Airservices Australia, The Airport Group and Department of Defence will be consulted about the Project.

We would appreciate an acknowledgement of this email and a likely timeframe for your response.

Should you have any questions, please do not hesitate to contact me.

Kind regards

*Pavel Davidyuk MEng MAvn CPRA  
Specialist Consultant – Aviation*

*Please be kindly noted that I am working from home on Mon, Tue and Thu*



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**ATTACHMENT C    ECOLOGICAL IMPACT ASSESSMENT**



# Wambo Wind Farm

## Ecological Assessment

04 September 2020

Project No.: 0532612

Document details	
Document title	Wambo Wind Farm
Document subtitle	Ecological Assessment
Project No.	0532612
Date	04 September 2020
Version	2.0
Author	Amelia James, Sebastian Madden
Client Name	White Wind No. 1 Pty Ltd and Cubico Sustainable Investments Pty Ltd

#### Document history

Version	Revision	Author	Reviewed by	ERM approval to issue		Comments
				Name	Date	
1	A	Amelia James	Dr David Dique	Dr David Dique	20/12/2019	Draft Baseline Ecological Assessment for Client review
2	B	Amelia James	Dr Toivo Zoete	Dr David Dique	22/05/2020	Draft impact assessment for Client review
Final	0	Amelia James	Dr David Dique	Dr David Dique	08/07/2020	Final for issue
Final	1	Amelia James	Dr David Dique	Dr David Dique	24/07/2020	Updated
Final	2	Amelia James	Dr David Dique	Dr David Dique	04/09/2020	Updated

---

## Signature Page

04 September 2020


# Wambo Wind Farm

## Ecological Assessment



---

Amelia James  
Ecologist



---

Dr David Dique  
Partner In Charge

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## Acronyms and Abbreviations

ALA	Atlas of Living Australia
BACI	Before and After Control Impact
BUS	Bird Utilisation Survey
DAF	Department of Agriculture and Fisheries
DAMS	Development Assessment Mapping System
DEHP	Department of Environment and Heritage Protection
DES	Department of Environment and Science
DIWA	Directory of Important Wetlands in Australia
DNRME	Department of Natural Resources Mines and Energy
DoEE	Department of Environment and Energy
EIS	Environmental Impact Statement
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
Fisheries Act	<i>Fisheries Act 1994</i>
HES	High Ecological Significance
HEV	High Ecological Value
LC	Least Concern
MCU	Material Change of Use
MSES	Matter of State Environmental Significance
NC Act	<i>Nature Conservation Act 1992</i>
OF	Of Concern
PA	<i>Planning Act 2016</i>
PMST	Protected Matters Search Tool
PR	<i>Planning Regulation 2017</i>
RSA	Rotor Swept Area
RE	Regional Ecosystem
SDAP	State Development Assessment Provisions
SEVT	Semi-Evergreen Vine Thicket
SIG 1.1	Significant Impact Guidelines 1.1 - Matters of National Environmental Significance
SLC	Special Least Concern
SPA	<i>Sustainable Planning Act 2009</i>
SPRAT	Species Profile and Threats Database
SRI	Significant Residual Impact
TEC	Threatened Ecological Community
VM Act	<i>Vegetative Management Act 1999</i>
Water Act	<i>Water Act 2000</i>
WO	Wildlife Online
WONS	Weeds of National Significance
WTG	Wind Turbine Generator



## EXECUTIVE SUMMARY

*Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by White Wind Project No 1 Pty Ltd (White Wind) and Cubico Sustainable Investments Australia Pty Ltd (Cubico) to conduct an ecological assessment for a wind energy project in southern Queensland, the Wambo Wind Farm, herein referred to as the proposed development.*

*The proposed development involves the construction of a wind farm approximately 15 km northeast of the town of Jandowae in the Western Downs Region of Queensland. The collection of properties that are considered for the proposed development cover an area of approximately 12,760 ha and is referred to as the Study Area. The Wambo Wind Farm is a proposed ~500MW renewable energy development comprising of up to 110 wind turbines generators (WTG).*

*An ecological assessment has been undertaken to describe the ecological values of the Study Area as well as identify potential impacts to Matters of State Environmental Significance (MSES), Matters of National Environmental Significance (MNES) and to consider the ecologically relevant components of the State Development Assessment Provisions (SDAP). Ecological assessments involved a field assessment undertaken in November 2019, and desktop assessments using a number of publicly available databases, mapping and aerial imagery.*

*The majority (71.3%) of the Study Area consists of non-remnant grasslands and cleared areas supporting small to medium agricultural enterprises. Regional Ecosystem (RE) mapping shows the majority of remnant vegetation within the Study Area is classified as Least Concern and Of Concern (under the Vegetation Management Act 1999 (VM Act)). There is also a small area that contains remnant vegetation classified as Endangered (under the VM Act). The Department of Natural Resources Mines and Energy (DNRME) mapping is generally consistent with on-ground observations from field surveys. The condition of remnant vegetation within the Study Area is modified as a result of current and previous land management practices (agriculture and cattle grazing) with most woodlands dominated by a grassy understorey, including introduced grass species. Much of the remnant vegetation occurs in small to medium sized patches throughout the landscape, with some areas in the north and eastern sections connected to larger patches, including Diamondy State Forest, adjacent to the Study Area. There are some riparian areas (associated with regrowth vegetation) and small farm dams that occur throughout the Study Area. However, these are regarded as providing low habitat value due to degradation from heavy exposure to cattle.*

*In total, three EPBC Act listed threatened species (the white-throated needletail, koala and greater glider) and two listed migratory species were identified as known or likely to occur in the Study Area. A total of three MNES TECs were identified as having potential habitat occurring within the Study Area. MSES triggered for the Study Area included four NC Act listed species and regulated vegetation.*

*The project layout (including location of turbines, access tracks, batching plant, laydown areas, substations etc.) has gone through a number of iterations over a six month period. The objective of the design process has been to consider access to wind resource in combination with avoidance of ecological values. The potential impacts during construction, operation and decommissioning have been identified and evaluated, with a number of proposed management measures to mitigate impacts. Importantly, a process of pre-clearance surveys prior to construction of the proposed development footprint to support micro-siting and adjustments of infrastructure to further avoid ecological values is a key commitment.*

*The proposed development will occur across a 372.0 ha development footprint, and will lead to the clearing of 21.4 ha of habitat critical to the survival of the koala (habitat score of seven) and 21.2 ha of habitat for an important population of the greater glider. This represents 0.6% clearing of available habitat for the koala, and 0.7% habitat available for the greater glider, in the Study Area. For the three TECs that potentially occur within the Study Area, the layout design has avoided potential TEC habitat.*

*Impact assessments were undertaken against the relevant MNES and MSES impact assessment guidelines, and it was concluded that there was unlikely to be a significant impact to threatened species, migratory species and TECs listed under the EPBC Act. Furthermore, it was concluded that there was unlikely to be a significant residual impact to NC Act listed threatened species. A significant residual impact was triggered for Category B (Of Concern vegetation) MSES with the clearing of 8.2 ha of Of Concern REs that will require offsetting.*

## 1. INTRODUCTION

### 1.1 Project Background

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by White Wind and Cubico to undertake an ecological assessment for the Wambo Wind Farm renewable energy project in Queensland, herein referred to as the proposed development. This ecological assessment report will be used to support the development of approval documentation.

### 1.2 Project Description

This Project Description provides context on the Wambo Wind Farm proposed development and the design process undertaken to inform the layout of the proposed development. A description of site infrastructure including the wind turbine generators (“Turbines” or “WTGs”), access tracks, electrical components and temporary works associated with the construction phase of the proposed development and an overview of the operational phase is provided.

#### 1.2.1 Study Area and Context

The Study Area is the land allocated for the proposed development. It is approximately 12,760 ha in size, situated 15 km northeast of Jandowae and 60 km west of Kingaroy in the Western Downs Region Local Government Area, Queensland (see Figure 1.1). The Study Area incorporates the land owned by 12 individual landowners, which is made up of 44 property lots. These property lots, grouped by landowner, and their combined area are shown in Table 1-1.

**Table 1-1 Study Area Property List and Area**

Lot and RP	Size
Lots 77 and 78 on LY323; Lot 14 on LY532	675 ha
Lot 74 on LY 323; Lot 87 on LY35; Lot 24 on LY582	421 ha
Lot 52 on LY34213; Lot 7 on LY359	1,564 ha
Lot 13 on LY532; Lot 71 on LY6	662 ha
Lots 1 on RL7596; Lots 3 and 53 on RL34213; Lots 128, 129 and 130 on LY322; Lot 134 on LY348; Lot 126 on LY440; Lots 5, 6 and 8 on LY539; Lot 2 on RP52699	3,514 ha
Lot 2 on RP103421; Lot 80 on LY174	521 ha
Lots 95 and 100 on LY174; Lot 22 on LY308; Lot 133 on LY348; Lot 23 on LY542; Lot 4 on LY573; Lot 131 on SP169294	1,785 ha
Lot 97 on LY154; Lot 92 on LY174; Lot 98 on LY583; Lot 96 on LY174; Lot 132 on SP169294	1,297 ha
Lot 83 LY154; Lots 81 and 82 RP203809	1019 ha
Lots 90 and 94 on LY174; Lot 14 on LY455	802 ha
Lot 73 on LY166	257 ha
Lot 21 on LY308	261 ha
<b>Total</b>	<b>12,760 ha</b>

The Study Area is located in the Queensland Brigalow Belt bioregion and includes a range of landscape features typical of the region, from flat alluvial plains to undulating slopes of grassland with patches of eucalypt dominant and codominant open woodland. Two ephemeral watercourses, namely Diamondy Creek and Jingi Jingi Creek intersect the Study Area. The majority of the Study Area (9,100.0 ha or 71.3% of the Study Area) is cleared and used for agriculture, with remnant vegetation covering 3,248.0 ha (25.5%) and regrowth vegetation only 411.9 ha (3.2%). This regrowth vegetation includes 66.1 ha of Department of Natural Resources, Mines and Energy (DNRME) mapped regrowth and 345.8 ha of 'mixed eucalypt species' regrowth. The cleared areas are largely associated with alluvial plains near watercourses, while remnant vegetation is associated with upper slopes.

The Study Area occurs within the Rural Zone under the Western Downs Planning Scheme and is predominantly used for cattle grazing. Some cropping does occur and tends to be associated with growing cattle fodder. The Study Area is located immediately west of the 453 MW Coopers Gap Wind Farm that is currently under construction.

Agriculture is the dominant land use in the vicinity of the Study Area, although there are some protected areas in close proximity to the Study Area. Diamondy State Forest is located directly north of the Study Area and is part of a large vegetated corridor north of the Study Area, Jandowae State Forest occurs approximately 3.5 km south, and the Bunya Mountains National Park is located approximately 30 km to the southeast (see Figure 1.1).

The land which the proposed development infrastructure will be located (the development footprint) occupies 372.0 ha or 2.9% of the Study Area. Land not occupied by infrastructure following the construction and rehabilitation period, will continue to be used for rural and agricultural purposes. It is anticipated that tracks established as part of the construction of the proposed development, will aid in continued agriculture activities.

### 1.2.2 Project Specifications

The proposed development will consist of:

- Wind Turbine Generators (WTGs);
- WTG foundations and hardstand areas;
- access tracks, underground cabling and overhead transmission lines;
- Electrical connections, substations and grid connection;
- Battery Energy Storage System (BESS);
- permanent meteorological masts;
- construction compound and laydown area; and
- central operational and maintenance facility.

The proposed development will be developed in two discrete stages, or a single large-scale stage. In the case of two discrete stages, the first stage (Stage 1) would likely consist of up to 35 WTGs, primarily located in the eastern part of the Study Area, and connecting into the Chinchilla to Tarong 132kV transmission line that traverses the Study Area. The second stage (Stage 2) would likely consist of up to 77 WTGs. Stage 2 would be primarily located in the western part of the Study Area, and likely connecting into the nearby 275 kV Cooper's Gap substation using the existing 132 kV transmission corridor. In case of a single stage development, a single project of up to 110 WTGs will be delivered, with a connection utilising the same available connection points as two stage development option.

The proposed development design has been refined on a number of occasions through an interactive process with regard to a combination of environmental, wind resource, constructability, landowner and network considerations. The design refinement process has focussed on the avoidance and minimisation of environmental impacts, particularly with regard to limiting impacts to sensitive vegetation.

### Wind Turbine Generators (WTGs)

The final selection of turbine locations and turbines will be determined as part of the detailed design. However, the Study Area has been designed to accommodate the following maximum turbine dimensions (Table 1-2) so that potential impacts on environmental values can be properly considered.

**Table 1-2: Key Generation and Turbine Specifications**

Feature	Statistic
Estimated Project generation capacity	Up to 660MW*
Turbine electrical output	4.0 – 6.5 MW
Number of Turbines	Up to 110
Tip height**	Up to 280 m
Rotor diameter**	Up to 180 m

\*The actual output of the wind farm will depend on the size and type of turbine chosen during the detailed design phase. Regardless of the size of the wind farm generation capacity, the proposed development will still need to comply with the Queensland Wind Farm State Code and supporting Planning Guidelines, particularly in relation to acoustic amenity and setback criteria. The maximum specifications listed in the table provides represents a “worst case scenario for impact assessment” and provides flexibility for any innovation in turbine design between now and the time of detailed design and construction.

### Access and Infrastructure Corridors

The onsite access track layout will be designed to utilise existing tracks and consider the topography of the land, reducing the need for vegetation clearing, minimising the amount of land required for access and avoiding steep areas where possible. It is likely that approximately 80 km of access track will be required for the entire site. The following design criteria were applied to the access track and access corridor layout to minimise impacts:

- The access tracks will typically be 6 m wide, which may be expanded to 12 m to accommodate crane and delivery vehicle requirements during construction. After construction, these will be subsequently rehabilitated to a 6 m width;
- In sensitive vegetation areas, the corridor clearances have been designed to limit the clearing areas to 21 m and allow for the “just in time” delivery of the WTGs. To minimise impacts, the electrical reticulation infrastructure is designed to be located underground in the centre of the 6 m wide access track; and
- In other areas, the corridor clearances are limited to 31 m or 25 m. Clearances of 31 m will occur where two underground trenches are required for the electrical reticulation equipment. Clearances of 25 m will occur where a single electrical reticulation trench has been used. In both cases, trenches will primarily run adjacent to the access tracks.

### Grid Connection

Each WTG will be connected to the relevant on-site substation through both underground and overhead transmissions lines. Underground transmission infrastructure will be located beneath or adjacent to access corridors. Overhead transmission lines will be limited to connections between the substation and the grid. The substation will connect the proposed development to an on-site switchyard (that may be built and owned by the transmission network operator, Powerlink). This switchyard which will be the point of connection to the Queensland transmission network either via the 132 kV Chinchilla to Tarong transmission line or a 275 kV transmission line along the alignment of the 132 kV transmission line to the 275 kV Cooper’s Gap substation.

The switchyard, substation and proposed Battery Energy Storage System (BESS) are proposed to be co-located either on the:

1. south eastern area of the Study Area on Lot 90 of the LY174, immediately adjacent to the existing 132 kV Chinchilla to Tarong transmission line; or
2. central area of the Study Area on Lot 14 of the LY532, immediately adjacent to the existing 132 kV Chinchilla to Tarong transmission line; or
3. south western area of the Study Area on the block 2RP52699, immediately adjacent to the existing 132 kV Chinchilla to Tarong transmission line.

### 1.2.3 Proposed Development Timeline

Should a staged project delivery be selected, then Stage 1 is intended to start construction in Q4 2021, with an estimated 18 month construction period to full operation. Stage 2 of the proposed development will likely commence construction approximately 12 months after the first stage and will have an estimated 24 month construction period. A single staged project delivery would follow a construction timeline trajectory similar to Stage 2 above.

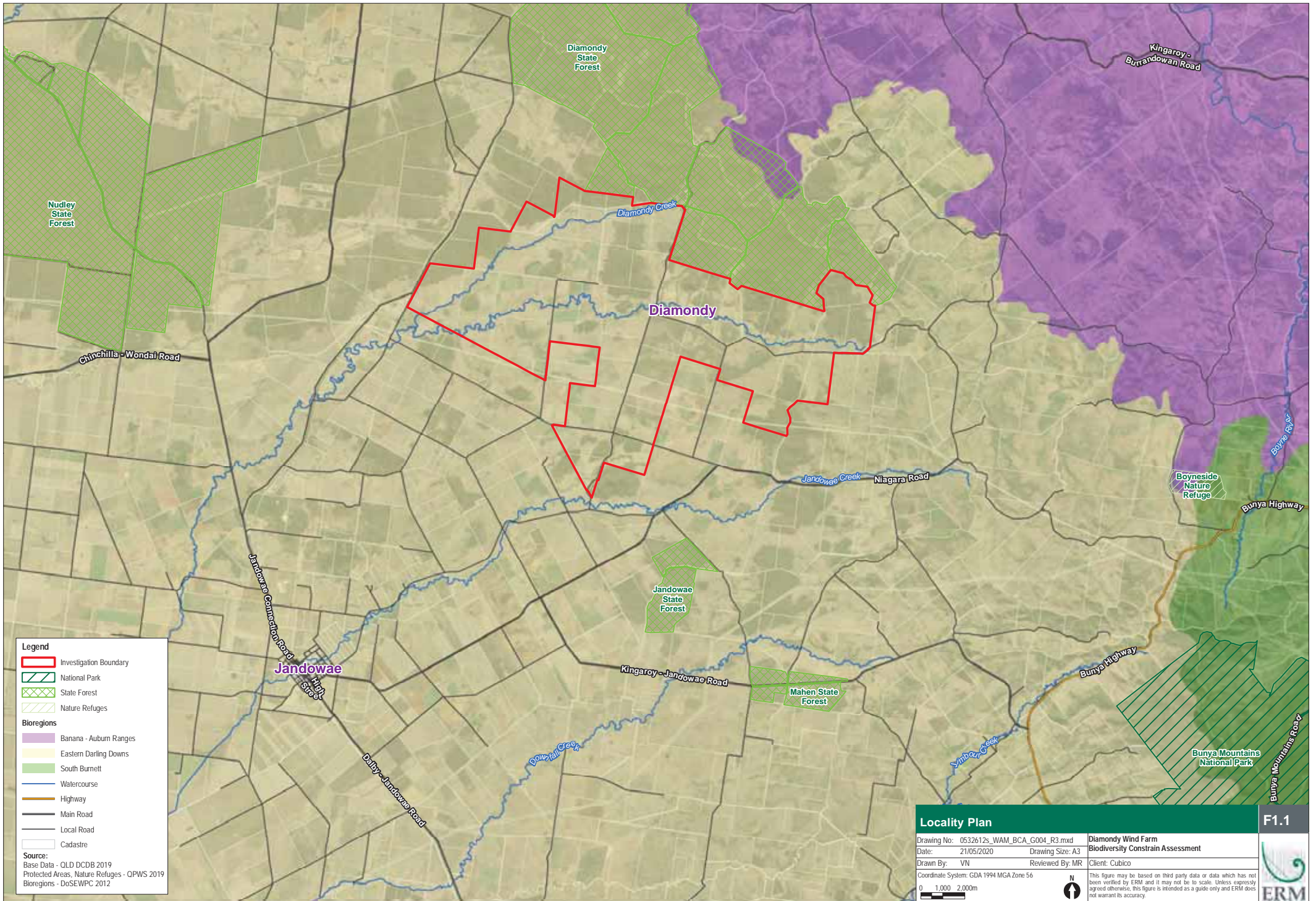
The lifetime of the proposed development is based on the WTG useful life of approximately 30 years. After 30 years, footings and any underground cabling/overhead transmission lines will be removed and the area returned to its original cattle grazing use, in consultation with the relevant landowner.

## 1.3 Objectives

The purpose of this ecological assessment report is to document potential ecological values within the Study Area based on the outcomes of desktop review and field survey and assess the potential impacts associated with the proposed development. The specific objectives are to:

- Identify the potential presence of listed threatened species and their associated habitat in the Study Area, based on desktop and field collected information;
- Describe and map ecologically significant flora and fauna habitats, including Matters of State Environmental Significance (MSES) and Matters of National Environmental Significance (MNES), based on desktop and field collected information;
- Evaluate the ecological significance (values and constraints) of the Study Area;
- Assess the potential impacts of the proposed development on the Study Area's ecological values, including specific species and groups (such as birds and bats) that may be at risk from the proposed development; and
- Provide recommendations for avoidance, mitigation and management of potential impacts to maintain the ecological values in the Study Area.





**Legend**

- Investigation Boundary
- National Park
- State Forest
- Nature Refuges

**Bioregions**

- Banana - Auburn Ranges
- Eastern Darling Downs
- South Burnett

- Watercourse
- Highway
- Main Road
- Local Road
- Cadastre

**Source:**  
 Base Data - QLD DCDB 2019  
 Protected Areas, Nature Refuges - OPWS 2019  
 Bioregions - DoSEWPC 2012

Locality Plan		F1.1
Drawing No: 0532612s_WAM_BCA_G004_R3.mxd	Date: 21/05/2020	Diamondy Wind Farm Biodiversity Constrain Assessment Client: Cubico
Drawn By: VN	Reviewed By: MR	
Coordinate System: GDA 1994 MGA Zone 56		
0 1,000 2,000m		
		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

## 2. LEGISLATIVE AND POLICY CONTEXT

This ecological assessment has been undertaken with consideration of Commonwealth, State and Local regulatory frameworks and associated legislation. Table 2-1 summarises the relevant legislation and policies to this ecological assessment.

**Table 2-1: Key Legislation and Policies**

Act/Policy	Administering Authority	Purpose
<b>Commonwealth Legislation</b>		
<i>Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)</i>	Department of the Environment and Energy (DoEE)	This act administers the protection of the environment within Australia – in particular Matters of National Environmental Significance (MNES), which include: <ul style="list-style-type: none"> <li>■ World heritage properties;</li> <li>■ National heritage properties;</li> <li>■ Wetlands of international importance;</li> <li>■ Threatened species and ecological communities;</li> <li>■ Migratory species;</li> <li>■ Commonwealth marine areas;</li> <li>■ The Great Barrier Reef Marine Park;</li> <li>■ Nuclear Actions (include. uranium mines); and</li> <li>■ Water Resources.</li> </ul>
<i>EPBC Act Environmental Offsets Policy 2012</i>	DoEE	This policy applies where a significant residual impact on an MNES is expected to occur as a result of the proposed development. The policy provides guidance on the role of offsets and when a proposed offset is considered suitable.
<b>State Legislation</b>		
<i>Planning Act 2016 / Planning Regulation 2017</i>	Department of Development, Manufacturing, Infrastructure and Planning	<i>Planning Act 2016 (PA)</i> guides Development within Queensland, while the <i>Planning Regulation 2017 (PR)</i> provides the operational requirements for the PA. Under the PR the proposed development will trigger a Material Change of Use (MCU) application and will be assessed by the State Assessment and Referral Agency (SARA) as an Assessment Manager, rather than a local planning scheme. A local planning scheme does not have jurisdiction to assess windfarms, per the <i>Planning Regulation 2017, Schedule 10, Part 21, Section 35, Division 2, Table 1 – Assessable development under s35.</i>  Additionally, a trigger for vegetation clearing will require a referral to SARA separately, where an MCU is proposed on a lot that is 5ha or larger per Schedule 10, Part 3, Section 5, Division 4, Table 1 – Assessable Development under Section 5.



Act/Policy	Administering Authority	Purpose
<p><i>State Development Assessment Provisions (SDAP), State Code 23: Wind Farm Development ("State Code 23")</i></p>	<p>Department of Infrastructure, Local Government and Planning</p>	<p>State Code 23 specifically relates to windfarm development and provides guidance regarding ecological assessment requirements. The ecological assessment is required to identify and assess the risk to flora, fauna and associated ecological systems and processes. It is then required to determine how this risk may be mitigated or managed, through siting and design of the wind farm. The ecological assessment must contain the following:</p> <ul style="list-style-type: none"> <li>■ Desktop review of available information to identify birds and bat species that may be impacted by the proposed development. This will be addresses in Section 3.2;</li> <li>■ Field surveys to map the vegetation, and identify flora and fauna species (including corridors and bird utilisation surveys and modelling as well as bat surveys). This will be addressed in Section 3.3 and Section 4;</li> <li>■ Review of vegetation and corridors including worst-case scenario for regulated vegetation. This will be addressed in Section 3.3.2 and Section 4;</li> <li>■ Species-specific studies to obtain more information on flora and fauna (birds and bats) at risk from the proposed development. This will be addressed in Sections 3.3, 4.3 and 4.4;</li> <li>■ Avoidance, mitigation and offset strategies to minimise and mitigate impacts. This will be addressed in Section 6;</li> <li>■ Implementation processes for monitoring programs associated with construction and operational phases. This will be addressed in Section 6; and</li> <li>■ Preliminary vegetation, flora and fauna, and bird and bat management plans. These management plans are attached as follows: <ul style="list-style-type: none"> <li>- Vegetation Management Plan, Appendix E;</li> <li>- Fauna Management Plan, Appendix F; and</li> <li>- Bird and Bat Management Plan, Appendix G.</li> </ul> </li> </ul>
<p><i>State Development Assessment Provisions (SDAP), State Code 16: Native Vegetation Clearing ("State Code 16")</i></p>	<p>Department of Natural Resources, Mines and Energy (DNRME)</p>	<p>State Code 16 provides the assessment criteria for assessable development that is the clearing of native vegetation under the <i>Planning Act 2016</i> (the Planning Act). It aids in the application in preparing development applications for native vegetation clearing and is consistent with the <i>Vegetation Management Act 1999</i>. State Code 16, and the relevant provisions will be applied when assessing clearing of remnant vegetation, connectivity, and clearing of remnant vegetation intersecting a watercourse.</p>
<p><i>Nature Conservation Act 1992 (NC Act)</i></p>	<p>Department of Environment and Science (DES)</p>	<p>The Act and Regulations provides a framework for the creation and management of protected areas and protection of native species. It includes designation of threatened species status, and provides for protected plant trigger areas.</p>
<p><i>Vegetation Management Act 1999 (VM Act)</i></p>	<p>DNRME</p>	<p>The VM Act is the regulatory framework for the management of vegetation using the Regional Ecosystem (RE) classification system. It regulates the broad-scale clearing of vegetation, with the intent of conserving remnant vegetation, preventing the loss of biodiversity, maintaining ecological processes and allowing for sustainable use. There are clearing exemptions for some work activities.</p>

Act/Policy	Administering Authority	Purpose
<i>Biosecurity Act 2014</i> (and Regulation)	Department of Agriculture and Fisheries (DAF)	<p>This Act provides for the management of biosecurity risks in Queensland. The Act provides measures to safeguard Queensland economy, environment, agricultural and tourism industries and way of life from pests, diseases and contaminants.</p> <p>Restricted matters are assigned a category (or categories) from 1 to 7, with each category placing restrictions on the dealings with the matter.</p>
<i>Environmental Offsets Framework (Environmental Offsets Act 2014 and Regulation, Environmental Offsets Policy Version 1.7)</i>	Department of Environment and Science (DES)	An environmental offset condition may be imposed under various State assessment frameworks for an activity that will or is likely to have a significant residual impact on a prescribed environmental matter that is a matters of state environmental significance (MSES). There is a guideline to assist in determining whether or not a significant residual impact is likely.
<i>Fisheries Act 1994</i> (Fisheries Act)	DAF	The Fisheries Act provides the principal legislative framework for the regulation around fishing activities and areas that are fish habitat within a given area. This outlines how activities are to be conducted given the importance of the habitat for fish. All waters are protected against degradation by direct or indirect impacts associated with development activities. Measures designed to protect fisheries resources include the declaration of fish habitat areas, protection of marine plants and designation of waterways for fish passage.
<i>Water Act 2000</i> (Water Act)	DNRME	The Water Act provides the framework for the planning and sustainable use and management of groundwater and surface water in Queensland. It also sets up conditions and controls the activities that may impact upon water resources and quality. The Department of Natural Resources and Mines (DNRM) Watercourse Identification Map identifies watercourses and drainage features mapped under the Water Act.
<b>Local Legislation</b>		
<i>Western Downs Planning Scheme 2017</i>	Western Downs Regional Council	The planning scheme identifies wind farms as medium impact industry. Regardless of being identified within this planning scheme, Western Downs Regional Council is not the assessment manager per the requirements of the PR.

### 3. ASSESSMENT METHODOLOGY

#### 3.1 Overview

This section outlines the methodology implemented to identify ecological values in the Study Area, inform avoidance measures, and assess likely impacts so that appropriate management and mitigation measures can be proposed.

Overall, the assessment consisted of a desktop review to identify values that may be present and to guide development of field survey sampling techniques, followed by a field survey program that collected data to describe on-ground conditions. This information was used to assess the occurrence and potential occurrence of ecological values to be considered as part of an impact assessment associated with proposed development.

#### 3.2 Desktop Review

A number of desktop sources were reviewed to identify ecological values that may occur within the Study Area. The databases and other sources considered (including a constraints desktop report for the Study Area (GHD, 2019) the Coopers Gap Wind EIS (AECOM, 2016) and Dulacca Windfarm Flora and Fauna Technical Reports (AECOM, 2019), are listed in Table 3-1. A search area containing the Study Area and a minimum 10 km buffer was used for the database searches. The Study Area is an irregular shape and, as such, a bounding rectangle was used (and buffered) for database searches requiring coordinate inputs. As a result, records may be further than 10 km from the Study Area boundary at some locations. The Protected Matters Search Tool (PMST) and Wildlife Online (WO) results were cross-checked using Atlas of Living Australia (ALA) database locations of records in the context of the actual Study Area boundary.

This desktop review adheres to the requirement in State Code 23 to undertake a desktop review of available information to identify species, particularly birds and bats that may be impacted by the proposed development. This desktop review, through the likelihood of occurrence analysis detailed in Section 3.4, and located in Appendix A, provides information on species known or likely to occur within the Study Area, based on species records, the availability of suitable habitat, breeding and roosting sites for bats, and Ramsar sites for waterbirds.

**Table 3-1: Databases Reviewed for Desktop Analysis**

Information Source	Name	Data Description
DoEE	PMST	The search tool provides predictive results of MNES based on mapping of known and potential species distribution, habitat, ecological communities and wetlands. The outputs are based on modelling results and do not necessarily reflect known records of species or communities. The features highlighted by the search are considered further through a likelihood of occurrence assessment (see Appendix A). Search area: -26.648388, 151.258670 (with a 20 km buffer around this middle point of the Study Area).
DNRME	Regional Ecosystem Version 8.0 mapping	This product maps remnant vegetation communities across Queensland and identifies communities listed as endangered, of concern or least concern status.
DNRME	Property Maps of Assessable Vegetation mapping (published 4 May 2017)	This product provides certified property scale maps indicating where landholders can clear regrowth in 'Category X' areas without further approval.
Queensland Government	MSES version 4.1 mapping	This product maps areas of MSES as defined under the Qld State Planning Policy.

Information Source	Name	Data Description
DNRME	Queensland Globe	A Google Earth based product that allows viewing of spatial data and imagery covering Queensland.
Department of Science, Information Technology and Innovation (DSTIA)	Wildlife Online (WO)	A database that contains records of wildlife sightings including threatened flora and fauna species (protected under the NC Act) that have been provided to the agency by Government departments and external organisations. Search area: -26.648388, 151.258670 (with a 20 km buffer around this middle point of the Study Area).
ala.org.au	Atlas of Living Australia (ALA)	Australia national biodiversity database (supported by the National Collaborative Research Infrastructure Strategy, CSIRO). Database contains records accessed through an interactive spatial portal. Threatened species are searched to identify known records in proximity to the Study Area.
Western Downs Regional Council	Western Downs Planning Scheme 2017	The <i>Westerns Downs Planning Scheme 2017</i> provides information relating to biodiversity, and wetland and waterway corridors.
GHD	GHD Constraints Report 2019	This recent report details the ecological constraints found in the Study Area from desktop searches. This report helped to inform research into the potential MNES, MSES and local government environmental matters which could be present in the site.
AECOM	Cooper's Gap Windfarm EIS 2016 (Chapter 12 Ecological Assessment)	This report is an ecological assessment conducted for Cooper's Gap Windfarm which sits adjacent to the east of the Study Area. It was used to gain information on ecological values surrounding the Study Area. This included information on migratory bird flight paths as well as vegetation, threatened ecological communities (TEC) and birds and bats. It was also used to inform the likelihood of occurrence assessment, particularly in relation to threatened species presence/records in the locality.
AECOM	Dulacca Renewable Energy Project – Fauna Technical Report and Flora Technical Report (2019)	This report is an ecological assessment conducted for Dulacca Windfarm which sits approximately 100 km to the west of the Study Area. It was used to gain information on ecological values with regards to the Study Area. This included information on migratory bird flight paths as well as vegetation, TECs and birds and bats. It was also used to inform the likelihood of occurrence assessment, particularly in relation to threatened species presence/records in the locality.
DoEE	Species Profile and Threats Database (SPRAT)	The SPRAT profiles and associated conservation advice documents were consulted for the following reasons: They provide detailed information for the Likelihood of Occurrence assessment on: <ul style="list-style-type: none"> <li>■ Species distribution</li> <li>■ Species habitat preferred and general</li> </ul> The conservation advice documents are particularly important for assessing TECs found in field surveys, against the listed TEC guidelines.

### 3.3 Field Surveys

#### 3.3.1 Survey Techniques and Effort

Field studies were undertaken within the Study Area in November 2019. Two ERM ecologists undertook a four day field assessment of accessible sections of the Study Area from 26 November to 30 November 2019, with a total of 120 person hours on the ground. The field survey campaign was undertaken by Sebastian Madden and Amelia James, with oversight, guidance and technical review by Dr David Dique, a 25 year experienced ecologist. David led the field survey design and was present on the first day of surveys (as a third ecologist) supporting identification of signs of listed threatened species.

The purpose of this spring survey was to identify and assess the ecological values in the Study Area, in order to inform the assessment of ecological impacts of the proposed development. The methodology adopted for the field studies focused on describing the vegetation communities present, flora and fauna habitats and their condition, and particularly threatened species and fauna groups vulnerable to windfarm impacts (ie. birds and bats). The techniques are summarised in Table 3-2. The location of surveys undertaken is shown in Figure 4-2.

Field surveys are a requirement of State Code 23 and must aim to identify bird and bat habitats, validating any of the results of the desktop reviews. Such field visits are required to cover planned areas of disturbance. The ecological findings that resulted from the November 2019 survey effort (together with the information obtained from desktop sources), conservatively account for parts of the Study Area that were unable to be sampled. Additionally, more detailed surveys are proposed and will be conducted as part of a two-stage process to inform the ultimate design of the proposed development. The two-stage design process, and the proposed field surveys for each phase, are further explained in the next section.

##### 3.3.1.1 Two-stage design process: avoiding impact

The proposed development consists of widely spaced wind turbines and associated infrastructure. Given the large size of the Study Area, and the widely spaced nature of the proposed development, the ecological surveys were undertaken in lock step with the development design process to better focus the ecological study effort and inform design. Therefore, the lay-out design of the proposed development will occur over two phases.

The first design phase is based on avoidance of identified important ecological values (vegetation and potential mapped habitat for listed threatened species) as a result of the field investigation conducted in November, 2019. The ecological findings from this survey conservatively documented important ecological values across the Study Area. Based on data collected in this first survey event, it was considered that a second phase of detailed surveys at proposed disturbance areas is an important part of avoiding ecological values in the Study Area.

The second design phase will involve on the ground micro-siting at each proposed infrastructure location (ie. access tracks, WTGs etc). Such micro-siting will involve more detailed pre-clearance surveys and assessments of all potential infrastructure locations, to determine if any ecological values, such as listed threatened species (and their habitats) or ecological communities, occur at each location. The infrastructure will be moved if such ecological values can be avoided. The pre-clearance surveys to be conducted as part of the micro-siting phase, will be designed to target known, likely and potentially occurring listed threatened species and vegetation communities in the Study Area (see Section 3.4). The pre-clearance surveys will target the proposed locations for infrastructure (eg. access tracks, WTGs etc.) and will determine the actual presence/absence of vegetation communities and listed threatened species important habitat features (eg. hollows, ground shelter, rocky crevices etc.). Proposed locations for infrastructure will be adjusted where pre-clearance surveys identify locations of TECs or important habitat features for known, likely or potentially occurring listed threatened species.

This two-phase development layout design and avoidance process allows for all planned areas of disturbance to be adequately assessed in accordance with the State Code 23 field survey requirement.

**Table 3-2: Field Surveys Undertaken within the Study Area**

Dates	Target	Techniques	Survey effort
26-29 November 2019	Vegetation and habitat assessment (including targeted threatened species surveys)	<ul style="list-style-type: none"> <li>■ Review of vegetation community mapping and assessment of habitat distribution.</li> <li>■ Assessment of habitat features present relating to relative cover and abundance of nesting/shelter/basking sites, presence of aquatic habitats, presence of foraging resources, dominant canopy species, connectivity and disturbances.</li> <li>■ Representative sampling for regional ecosystem verification</li> <li>■ Targeted surveys for threatened species identified with potential to occur, as described in the likelihood of occurrence analysis (<i>Appendix A</i>).</li> </ul>	<ul style="list-style-type: none"> <li>■ 31 individual survey areas</li> </ul>
	Bird surveys	<ul style="list-style-type: none"> <li>■ Bird Utilisation Surveys using the Band Model</li> <li>■ Roaming bird surveys between survey areas.</li> </ul>	<ul style="list-style-type: none"> <li>■ 16 individual surveys</li> </ul>
	Bat surveys	<ul style="list-style-type: none"> <li>■ Bat detection via the use of ultrasonic devices (Song Meters)</li> </ul>	<ul style="list-style-type: none"> <li>■ five Song Meters locations recording for four consecutive nights</li> </ul>

### 3.3.2 Vegetation and Habitat Assessments

Vegetation community assessments and habitat assessments were undertaken to describe the type and condition of the vegetation communities in the Study Area. The outcomes of the assessment were used to inform the likelihood of occurrence assessment of listed threatened species and threatened ecological communities or other ecological significance.

The assessments undertaken included:

- Representative sampling of Regional Ecosystems (RE). This included quaternary assessments in accordance with Neldner *et al.* (2019);
- Assessment of water features (such as dams) and habitat values;
- Recording of topographical features; and
- Defining the barriers of both disturbed and undisturbed areas.

The parameters measured during habitat assessments included:

- Context with regard to landscape features (connectivity, proximity to water);
- Condition (weeds, evidence of disturbance, invasive species);
- Breeding and roosting habitat features (hollows, nests, caves);
- Foraging sources (flowering tree species, termite mounds);
- Microhabitat presence (woody debris, leaf litter);
- Wetland presence (presence of aquatic vegetation, water depth); and
- Signs of threatened species (such as scats, scratches and tracks).



Targeted surveys for flora and fauna identified with potential to occur in the Study Area (see Appendix A) were undertaken at the same location as habitat assessments.

The targeted flora surveys were undertaken in accordance with the *Flora Survey Guidelines – Projected Plants, Nature Conservation Act 1992* ('Flora Survey Guidelines'). The Flora Survey Guidelines recommend meander surveys to be conducted in listed flora species habitat and during flowering periods. The Flora Survey Guidelines recommend searches to be conducted at the rate of one meander every two ha. For the field surveys, meander searches were undertaken at the same time as habitat assessments within flora trigger areas in the north of the Study Area, i.e. in spring. Not all plant species (e.g. grasses) exhibit diagnostic features (such as flower and fruit) at this time.

Scat and scratch marks searches were undertaken for koala as per the *Survey Guidelines for Australia's Threatened Mammal* (as listed under the EPBC Act). Scat searches are not a specific survey guideline recommendation for locating greater gliders however have been listed in the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* as a means to locate cryptic and nocturnal species. Other relevant guidelines and their recommended survey method and extent for the koala and greater glider are as follows:

- *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland*
  - Requires two 30 person minute spotlight searches of 100 x 100 m survey site; and
  - Scat and sign search can coincide with the systematic diurnal active searches, within 50 x 50 m quadrates of the survey site.

Relevant guidelines and requirements specific to the koala are as follows:

- *EPBC Act referral guidelines for the vulnerable koala*
  - Strip transects which involve diurnal distance sampling and density searches
  - Nocturnal spotlighting for smaller sites to determine presence and density; and
  - Scats – Spot Assessment Technique which involves looking at food trees for presence of koala scats.

The searches for scats and scratch marks have indicated koala presence in the Study Area, and so an impact assessment has been undertaken assuming presence of this species. Therefore the need for undertaking additional surveys to meet the guideline requirement is unlikely to provide additional information to inform impact assessments at this stage of development. Scats were also found in preferred greater glider habitat within the Study Area, indicating the species occurs within the Study Area.

An impact assessment has been undertaken for the greater glider assuming presence of this species. This was undertaken as a result of identification of scats in preferred habitat within the Study Area and the known record of the species in the Diamondy State Forest, directly to the north and adjacent to the Study Area. Additional survey effort during pre-clearance surveys will be undertaken during the second phase of the development design process, as described in Section 3.3.1. These pre-clearance surveys will include spotlighting for nocturnal species, particularly for the greater glider, in order to meet survey guidelines for this species, and define important habitat areas that should be avoided as part of the iterative design process and prior to construction.

### 3.3.3 Bird Surveys

Bird utilisation surveys (BUSs) involve 30 minute fix point surveys to provide data based on the species present, height, speed and direction of flight as stipulated by the Band Model (SNH 2012, Band 2000). Each fixed point survey site was located to provide a search radius of at least 100 m for small birds and up to 800 m for large birds with range finders used to determine distances. Searches primarily focused on birds most likely to be affected by the development, such as raptors (birds of prey) and large flocks of birds.

The survey guidelines for diurnal bird surveys and their requirements are as follows:

■ *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland*

- Diurnal bird surveys involve six x 5 -10 min area searches within 100 x 100 m survey site;
- Two surveys conducted in the morning (<two hours after sunrise), two in mid-morning (two to four hours after sunrise) and two in less optimal times (four hours after sunrise and two hours before sunset).

The bird surveys were conducted in accordance with the time and effort required by the survey guideline requirements.

It is also noted that specific requirements for species listed in the *Survey Guidelines for Australia's Threatened Birds* (as listed under the EPBC Act) were considered in designing the field survey program. The *Survey Guidelines for Australia's Threatened Birds* recommends that flushing, listening for foraging scratching, and platelets searches for a total of 15 hours over three days, is recommended for the black-breasted button-quail. These methods were employed in suitable habitat in the northeast of the Study Area. Additional survey effort will be required in RE 11.8.3 as part of the second design phase surveys as detailed in Section 3.3.1.1 to meet the time requirement of the survey guidelines.

The State Code 23 details the requirement for BUSs for proposed wind farm developments. Such surveys identify avian species, numbers present, height flown and site utilisation. The 2019 field study undertook BUSs in accordance with the Band Model, at waterbodies and in open areas for birds of prey. Thus, the survey effort was performed in accordance with State Code 23 requirements.

The State Code also recommends Before-After-Control-Impact (BACI) design principle for surveys where the Study Area is determined to support significant bird species. The aim of the BACI design is to compare environmental variables before and after a human activity and between the area affected by the development (impact) and an unaffected area (control) (Stewart-Oaten, 1986). In this instance, this would compare control and impact areas, before and after the construction of the windfarm, to determine if there are any avian impacts as a result of the development. Areas visited during the November 2019 field surveys, prior to construction/operation, were identified as impact areas. These areas will be revisited and resurveyed during the second design phase (pre-construction), during construction and after construction (operation phase) of the windfarm development. Additional neighbouring control sites will be selected and surveyed as part of the second design phase.

The BACI designed bird surveys include BUSs such as point, waterbody and birds of prey surveys, as was conducted during the phase one design field investigation. It is noted that the second design phase will include ongoing surveys at impact sites (at the sites already surveyed) as well as control sites that are yet to be determined. The final location of BACI survey sites will be dependent on changes in proposed infrastructure placement that may result from findings of the second phase design field program (as explained in Section 3.3.1.1).

State Code 23 also requires Collision Risk Modelling and Population Viability Analysis be conducted when determining collision risk to birds. Due to the lack of data obtained from the surveys (due to low abundance and diversity of bird species observed), it was not possible to undertake such modelling and analyses. Future BACI designed surveys will aim to collect sufficient data to undertake such analyses. However, the Bird and Bat Management Plan (attached as Appendix G) takes a conservative approach to minimising collision risk and other potential impacts to birds.

The following sections detail the specific BUSs undertaken throughout the Study Area.

### 3.3.3.1 Point Surveys

Point surveys were conducted to target diurnal woodland and riparian bird species. Two ecologists traversed suitable woodland and riparian habitats and conducted 30 minute timed surveys for all birds in the area.



### 3.3.3.2 Waterbody Surveys

Waterbody surveys were conducted in order to target aquatic species and woodland species utilising the waterbody. Observations were made from a stationary position, and birds were identified by call detection and visual observations. The Study Area contained several artificial waterbodies, likely to act as important water sources in the landscape, particularly during dry conditions.

### 3.3.3.3 Birds of Prey Surveys

Birds of prey surveys were undertaken to target the listed threatened species such as the red goshawk (*Erythrotriorchis radiatus*) and generally occurring birds of prey. Birds of prey surveys were undertaken at vantage points (e.g. large hills and extensively cleared areas) at mid-morning when birds of prey become increasingly active.

## 3.3.4 Bat Surveys

Microbat surveys were conducted to determine the presence/absence of bats within the Study Area. One ultrasonic bat detector (Anabats) was placed at each of the five survey zones in the Study Area. These devices were used to detect ultrasonic signals from bat species in the Study Area, for four consecutive survey nights.

The bat detectors were placed across representative remnant vegetation/habitat types. This included riparian woodlands and eucalypt open forest or woodlands. The detectors were specifically placed in areas that were in close proximity to potential flight paths/water sources (farm dams). The survey locations were selected on the basis that they provided the greatest likelihood of detecting an abundance and diversity of bat species.

The detectors were secured onto trees at approximately 1.8 m above the ground. They were collected and the information recorded on the Anabats was then analysed by a specialist to determine the species recorded.

The BACI design has also been implemented for bat surveys (explained in Section 3.3.3), in order to identify any impacts on bats as a result of the proposed development, with future control sites also to be determined at the conclusion of the design process.

The survey requirements and recommended survey effort and methods for bats is as follows:

#### ■ Survey guidelines for Australia's threatened bats

- Trapping methods like harp traps are recommended. Such effort is not precisely stated, but studies have found that the use of 20 or more traps a night a good for detection (Schulz, 1999). Two to three survey nights are recommended over two survey periods (Mills *et al.*, 1996).
- Echolocation call detection to be carried out for a recommended 30-60 minutes per night for four to five survey nights.
- Recommended that a variety of trapping and call detection methods are used together, where possible.

The 2019 survey effort was carried out in accordance with echolocation call detection requirements. However, no trapping methods were undertaken. As stated in Section 3.3.1, the additional surveys during the micro-siting process (phase two of the design process) will ensure that bat searches and habitat assessments are thoroughly conducted, including the use of harp traps in accordance with guidelines. Potential infrastructure locations will change according to the results of such surveys.

State Code 23 identifies that methods must be carried out to determine which bat species occur on the site. It recommends the use of survey techniques including mist nets and/or bat detection systems that record and analyse echolocation calls of bats. The 2019 survey effort involved the use of Anabat devices to detect species in the area, thus meeting the State Code 23 requirement.

### 3.3.5 Survey Conditions

Table 3-3 details the daily weather observations that were recorded for Dalby Airport (the Study Area is located approximately 55 km north of Dalby airport) during field survey periods. The weather was fine throughout the survey period, with temperatures ranging from approximately 16°C to 37°C. Rainfall in the month leading up to this 2019 survey was recorded at 2.8 mm.

**Table 3-3: Daily Weather Observations at Dalby Airport**

	Temp		Rain	9:00 AM				3:00 PM			
	Min	Max		Temp	RH	Dir	Spd	Temp	RH	Dir	Spd
	°C	°C	mm	°C	%			°C	%		
25/11/19	15.8	33.5	0	25.8	39	NE	13	32.3	17	ENE	17
26/11/19	19.8	35.0	0	26.1	46	N	28	33.2	22	NNW	22
27/11/19	19.5	37.2	2.8	27.9	45	WNW	17	36.2	11	WNW	28
28/11/19	20.8	35.9	0	28.1	44	N	22	35.1	22	NNE	11
29/11/19	21.1	37.1	0	27.9	39	NNE	20	36.8	16	N	11
30/11/19	21.5	38.0	0	29.3	28	NNW	35	36.0	15	NNW	24

Dir = wind direction

Spd = wind speed

RH = relative humidity

Source: Australian Government Bureau of Meteorology, [www.bom.gov.au](http://www.bom.gov.au)

### 3.4 Likelihood of Occurrence

Consistent with the accepted approach for ecological assessment, a likelihood of occurrence assessment was undertaken informed by desktop sources and the field survey results. Desktop sources identified a number of flora and fauna species listed under the EPBC Act (ie. PMST search) and NC Act that have previously been recorded or predicted to occur within a 10 km buffer of the Study Area. The buffered area is from here on referred to as the 'locality'. The 10 km buffer was chosen as this is the standard buffer distance utilised and adopted for the EPBC Act referral process.

The likelihood of occurrence approach refines the desktop generated list using site-specific information and specific-species habitat information obtained from field surveys. Desktop sources are indicative only and likelihood rankings, particularly in regard to the presence of preferred habitat, are conservative. The assessment ranks the likelihood of the species occurring within the Study Area through analysis of species distribution information and the presence of specific habitat attributes as identified through the desktop analysis and field survey. The criteria applied are outlined in Table 3-4.

According to the MSES methodology, preferred habitat are areas or a location which has the crucial and necessary resources needed for the maintenance of a population. This can include things like nesting and roosting habitat features or food resources. General habitat are areas that could have been used transiently by a species. It is also an area where the species has been recorded but there is not enough information to assess whether the area is preferred habitat.

Habitat and distribution information for MNES is sourced from SPRAT profiles and/or Conservation Advice where available, supplemented by other primary sources (e.g. published literature). In regards to species records, these were sourced from WO and/or ALA. For this ecology assessment, results presented in AECOM (2019) Cooper's Gap Windfarm EIS, and the AECOM (2019) Dulacca Windfarm Flora and Fauna Technical Reports, were also used to inform the likelihood of occurrence assessment of listed threatened species based on the data presented from field surveys from 2008-2013. Where species presence cannot be discounted, they are categorised as potentially to occur.

Recent records within the locality are defined as less than 20 years.

State Code 23 details that ecological assessments need to include species-specific studies to understand more information on flora and fauna that are at risk from the proposed development. The likelihood of occurrence assessment meets this requirement through analysing each species that is generated from desktop sources, considering ecological assessments from neighbouring areas and field investigations.

**Table 3-4: Likelihood of Occurrence Criteria**

	<b>Preferred habitat exists</b>	<b>General habitat exists<sup>1</sup></b>	<b>Habitat does not exist<sup>2</sup></b>
Records within Study Area (based on site surveys and recent (last 20 years) records)	Known	Known	Known
Records in the locality <sup>3</sup>	Likely	Potential	Unlikely
No records in the locality, but Study Area is within known distribution	Potential	Potential	Unlikely
No records in the locality, and Study Area is outside of distribution	Unlikely	Unlikely	Unlikely

<sup>1</sup>Habitat may be considered general, but not preferred because: some desired habitat features may be present, but not all; habitat may have poor connectivity; or habitat may be known to be disturbed.

<sup>2</sup>Based on sources reviewed and/or field survey results.

<sup>3</sup>'Locality' refers to a 10 km buffer of the Study Area.

### 3.5 Mapping

Habitats for those listed threatened species and communities known or likely to occur have been mapped, based on defined habitat preferences and conditions (as observed from field surveys) and used to inform impact assessments. Habitat mapping has not been undertaken for those species and communities with potential to occur. The RE types used to underpin the habitat mapping for the listed threatened species and communities have been recorded in the likelihood of occurrence table, informed by data obtained from desktop sources and field surveys (e.g. SPRAT profiles and/or Conservation Advice where available, supplemented by other primary sources as required).

When calculating the habitat and threatened ecological community (TEC) mapping, respective habitat and TEC dominant REs were only mapped when they made up 45% or more of a heterogeneous polygon, related to the relative likelihood of the presence of the TEC. For example, the dominant constituent RE for Brigalow TEC is 11.9.5. If this RE was found in a polygon with four other REs and was only present at 25% of the area, this polygon was excluded from mapping of the Brigalow TEC, unless field surveys identified a brigalow patch that meets key listing criteria.

### 3.6 Assumptions and Limitations

The field and desktop assessment undertaken provide an overview of the ecological values that exist within the Study Area. Surveys were undertaken in a number of sections of the Study Area to gain a general understanding of the types of species and habitat features that occur. While not all portions of the Study Area could be visited during the field survey (see below), the landscape and its features appear generally consistent throughout (based on review of other data such as aerial photography). The use of a combination of field survey data and desktop information is considered appropriate to identify potential key impacts for the current phase of the proposed development (lay-out design).

The absence of a species from a database list or observational studies does not confirm its absence from the Study Area. The lack of existing records from databases is more likely to indicate a low historic sampling effort in the region, as opposed to an absence of threatening processes and species. To overcome these limitations, the likelihood of occurrence approach takes a precautionary approach and identifies species that have potential to occur (considering habitat features), in order to assess potential impacts accordingly.

Some parts of the Study Area were inaccessible due to lack of landholder permission. To account for this, the assessments of EPBC Act listed TECs and habitat for listed threatened species used in this report are conservative estimates for these inaccessible areas. Potential TECs were assessed against criteria listed under the National Conservation Advice as well as existing RE mapping.

For those species with large home ranges, for example the red goshawk, which can have a home range of up approximately 120 km<sup>2</sup> for females and 200 km<sup>2</sup> for males (Marchant & Higgins, 1993), ecological assessments for nearby windfarms (eg. Dulacca and Cooper's Gap Windfarms) were used to support conclusions made on such species, as well as habitat suitability.

## 4. ECOLOGICAL VALUES

The following section presents the ecological values of the Study Area based on the findings from the desktop review and field surveys. A summary of MNES and MSES relevant to the Study Area is also provided.

### 4.1 Overview

The Study Area occurs within the Brigalow Belt bioregion of Queensland. The majority of the Study Area is relatively flat grazing land with some undulating hills. Two larger water courses (stream orders 3 and 4) intersect the Study Area:

- Jingi Jingi Creek bisects through the middle of the Study Area; and
- Diamondy Creek which intersects the north of the Study Area;

The majority of the Study Area (71.3%) is heavily impacted by clearing and cattle grazing, the dominant land use in the Study Area. The areas that are most heavily used for grazing are associated with alluvial flats, with notable disturbance in close proximity to permanent water sources (farm dams).

The majority of remnant vegetation is located in the northern and south-eastern parts of the Study Area, and dominated by *Corymbia citriodora* and *Eucalytus crebra*. Remnant vegetation communities are found fringing the drainage lines that meander across the Study Area. The riparian communities are associated with regional ecosystems dominated by *E. populnea* and *E. tereticornis*. Some small patches of remnant and regrowth *Acacia harpophylla* woodlands are also represented in the Study Area.

No protected areas are located within the Study Area. The closest protected areas are (Figure 1-1):

- Diamondy State Forest (directly north of and adjacent to the Study Area), historically used for timber production;
- Bunya Mountains National Park (30 km south-east of the Study Area); and
- Nudley State Forest (17 km west of the Study Area).

Diamondy State Forest is known to contain four listed threatened species of state or national significance. The two threatened flora species are *Polianthion minutiflorum* and *Zieria obovate*, and the two threatened fauna species are the greater glider (*Petauroides volans*) and the white-throated needletail (*Hirundapus caudacutus*).

### 4.2 Vegetation Communities and Habitats

#### 4.2.1 Regional Ecosystems and Regulated Vegetation

The VM Act distinguishes between vegetation that is Endangered, Of Concern, or Least Concern REs. REs are Queensland vegetation communities found within a particular bioregion that have a consistent combination of geology, landform and soil type, as determined by the Queensland Herbarium.

RE mapping shows the majority of the Study Area as RE types classed (under the VM Act) as Least Concern (LC) and Of Concern (OC). There are 13 REs mapped within the Study Area and these are summarised in Table 4-1 and shown in Figure 4-2. In general, the RE mapping was observed to be consistent with the on-ground observed conditions.

The dominant vegetation communities identified in desktop searches and verified by field surveys were *Corymbia citriodora* (RE 11.10.1) and *Eucalyptus crebra* (RE 11.5.1) woodlands. *C. citriodora* woodlands (RE 11.10.1) are dominant in the Diamondy State Forest (north of the Study Area) and occurs as several large patches of remnant vegetation adjacent to the state forest in northern parts of the Study Area. The remnant vegetation associated with creek lines is dominated by poplar box (*E. populnea*) woodlands (RE 11.3.2). There are also some small to medium sized patches of remnant brigalow (*Acacia harpophylla*) (RE 11.9.5) which are largely found in the northern and western parts of the Study Area. South of Woolletts Rd (mid-south) and in the north-eastern part, remnant vegetation is categorised as *E. crebra* woodlands (RE 11.5.1). In the centre of the Study Area, there is a private plantation of Chinchilla white gum (*E. argophloia*).

Regrowth vegetation represents a small component of the Study Area and is divided into 66.1 ha DNRME mapped regrowth vegetation and 345.8 ha of other mixed eucalypt species regrowth.

The Study Area has both some large patches of Category B with some small areas of Category C regulated vegetation. Regulated vegetation is shown in Figure 4-1.

A vegetation clearing permit will be required for any disturbance to Category B regulated vegetation, while Category C and Category R will be required to be avoided. However, disturbance to Of Concern and Endangered Regional Ecosystems will likely also require an assessment against the Significant Residual Impact Guideline (2014) with the potential to trigger offsets if impact thresholds are exceeded. Where disturbance to Least Concern Remnant Vegetation occurs that is also regarded as habitat for listed threatened species, the Significant Residual Impact Guideline (2014) will apply (also applies to MSES, regulated under the VM Act and NC Act).

#### 4.2.2 Habitats

The Study Area can be divided into seven broad habitat types. Habitats largely align with RE types and represent potential habitat for a variety of taxa. The habitats in the Study Area are mostly in moderate to low condition, with signs of degradation due to cattle grazing, erosion, and the presence of introduced flora species. A summary of these habitat types, along with their vegetation communities classifications and attributes, is provided in Table 4-2.

Essential habitat is defined as an area of habitat mapped by the State government where threatened fauna and/or flora are known to occur. No essential habitat has been mapped within the Study Area.

#### 4.2.3 Threatened Ecological Communities

The desktop review identified the potential occurrence of seven TECs listed under the EPBC Act in the Study Area. Following field surveys, evidence of potential habitat associated with constituent REs, was found for three TECs within the Study Area. These TECs are:

- Endangered semi-evergreen vine thickets (SEVT) of the Brigalow Belt (North and South) and Nandewar Bioregions, represented by RE 11.8.3 and RE 11.9.4a;
- Endangered brigalow (*Acacia harpophylla* dominant and co-dominant), represented by RE 11.9.5 and regrowth 11.9.5; and
- Endangered poplar box grassy woodland on alluvial plains, represented by RE 11.3.2.

The extent of potential habitat for these TECs in the Study Area is shown in Figure 4-3. As mentioned previously, micro-siting will occur as a part of the second phase of lay-out design. This micro-siting will include habitat assessments to confirm whether the mapped potential habitat for TECs is or is not actual TEC. If a TEC is confirmed as present within a proposed turbine location, then the development footprint will be adjusted to avoid the TEC.



### **Semi-evergreen vine thicket**

The SEVT of the Brigalow Belt (North and South) and Nandewar Bioregions TEC is represented by fifteen REs in Queensland, with two constituent RE types mapped within the Study Area (RE 11.8.3 and 11.9.4a). This TEC is dominated by *Eucalyptus melanophloia* and *Casurina cristata*. A small patch containing the characteristics of RE 11.8.3 was confirmed during field surveys to occur within the Study Area.

There was a total area of 58.0 ha of potential habitat for SEVT TEC mapped in the north-east corner of the Study Area.

### **Brigalow (*A. harpophylla* dominant and co-dominant)**

Brigalow (*A. harpophylla* dominant and co-dominant) TEC comprises 16 REs in Queensland, including RE 11.9.5 which is mapped in the Study Area. RE 11.9.5 patches were found during the survey effort of the Study Area. These patches of 11.9.5 were considered to be potential habitat for this TEC based on meeting the size and native perennial plant cover requirements. There requirements are:

- The patch is  $\geq 0.5$  ha; and
- Exotic perennial plants comprise less than 50% of total vegetation cover of the patch.

There was a total area of 97.6 ha of potential habitat for Brigalow TEC mapped in the Study Area.

### **Poplar Box Grassy Woodland on Alluvial Plains**

Poplar Box Grassy Woodland on Alluvial Plains TEC is represented by five REs in Queensland. Field surveys confirmed the presence within the Study Area of one of these, RE 11.3.2. Therefore, potential habitat for this TEC was present in the Study Area. This potential habitat aligned closely with Category C of the conservation advice National guidelines, which is:

- The crown cover of canopy trees in the patch is  $\geq 10\%$ ; and
- $<50\%$  of perennial vegetation cover on ground layer was native, the patches must have:
  - $\geq 20$  native plant spp. per patch in ground layer; and
  - $\geq 10$  mature trees/ha with  $\geq 30\text{cm}$  dbh (and/or hollows); and
  - Smaller trees, saplings or seedlings suggestive of periodic recruitment.

There was a total area of 315.3 ha of potential habitat for Poplar Box TEC mapped in the Study Area.

## **Threatened Ecological Communities in Bushfire Affected Areas**

The Australian Government Department of Agriculture, Water and the Environment (DAWE) has prioritised the importance of conserving TECs, in the wake of recent bushfire events (DAWE, 2020). The DAWE has released a list of priority TECs for each state and territory, which have had their distributions potentially affected by the bushfires in southern and eastern Australia, between 1 July 2019 and 11 February 2020. The TEC list includes a status of medium, high and very high concern in terms of their priority for impact assessment and subsequent emergency interventions to ensure their short and long term survival.

The Study Area occurs in the fire affected Natural Resource Management (NRM) Region of Condamine, Queensland. In this NRM Region, one TEC that is listed as high priority as a result of the recent bushfires and is White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland. The primary constituent REs that make up this TEC are 11.8.2a, 11.8.8, 11.9.9a, 13.3.1, 13.11.8, 13.12.8 and 13.12.9 (noting it can also be a smaller component of 11.3.23, 12.8.16, 13.3.4, 13.11.3, and 13.11.4) (Threatened Species Scientific Committee, 2006). These constituent REs were not identified within the Study Area during the desktop and field investigation. Therefore, it is unlikely that this TEC occurs in the Study Area and so no additional precautions or consideration in impact assessments are necessary.

**Table 4-1: Regional Ecosystems within the Study Area**

Regional Ecosystem	Description	Structure Category	VMA Status	Biodiversity Status	Study Area (ha)	% of Study Area
11.10.1	<i>Corymbia citriodora</i> dominates and forms a discontinuous woodland (to an open forest). Occurs on coarse-grained sedimentary rocks.	Sparse	LC	NoC	1,414.3	11.1
11.10.1a	Woodland dominated by <i>Corymbia</i> spp. ( <i>Corymbia watsoniana</i> +/- <i>C. citriodora</i> +/- <i>C. trachyphloia</i> +/- <i>C. hendersonii</i> ). Occurs on coarse-grained sedimentary rocks.	Sparse	LC	NoC	11.4	0.1
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casurina cristata</i> form an open forest +/- scattered <i>Eucalypt</i> spp. Occurs on alluvial plains	Mid-dense	E	E	26.4	0.2
11.3.2	<i>Eucalyptus populnea</i> woodland to open woodland on alluvial plains.	Sparse	OC	OC	159.2	1.2
11.3.4	Woodland to open woodland containing <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. Occurs on alluvial plains	Sparse	OC	OC	9.3	0.1
11.5.1	Woodland to open woodland canopy dominated by <i>Eucalyptus crebra</i> and/or <i>E. populnea</i> +/- <i>Callitris glaucophylla</i> , <i>Angophora leiocarpa</i> and <i>Allocasuarina luehmannii</i> . Occurs on sandplains.	Sparse	LC	NoC	904.7	7.2
11.7.4	Mixed <i>Eucalypt</i> spp. woodland that occurs on low hills and ranges with shallow soils. Species can include <i>Eucalyptus crebra</i> , <i>E. decorticans</i> , <i>Corymbia trachyphloia</i> , <i>E. tenuipes</i> , <i>C. watsoniana</i> and <i>Callitris glaucophylla</i> .	Sparse	LC	NoC	16.3	0.1
11.7.5	Shrubland +/- emergent <i>Eucalypt</i> spp. Occurs on natural scalds on highly weathered coarse-grained sedimentary rocks.	Sparse	LC	NoC	170.2	1.3
11.8.3	Semi-evergreen vine thicket occurring on Cainozoic igneous rocks. Species that may occur include <i>Acacia harpophylla</i> , <i>Casuarina cristata</i> and <i>Eucalypt</i> spp.	Dense	OC	OC	153.6	1.2
11.9.2	Woodland to open woodland of <i>Eucalyptus melanophloia</i> +/- <i>E. orgadophila</i> . Occurs on fine-grained sedimentary rocks.	Sparse	LC	OC	80.2	0.6
11.9.4a	Semi-evergreen vine thicket with emergent <i>Eucalyptus crebra</i> that occurs on hillsides.	Dense	OC	E	23.0	0.2



Regional Ecosystem	Description	Structure Category	VMA Status	Biodiversity Status	Study Area (ha)	% of Study Area
11.9.5	Open forest that is dominated by <i>Acacia harpophylla</i> and/or <i>Casurina cristata</i> . It can also be <i>A. harpophylla</i> with semi-evergreen vine thicket understorey. Occurs on fine-grained sedimentary rocks.	Mid-dense	E	E	123.2	1.0
11.9.7	Shrubby woodland dominated by a discontinuous canopy of <i>Eucalyptus populnea</i> . Occurs on fine-grained sedimentary rocks.	Sparse	OC	OC	156.3	1.2
Regrowth vegetation					66.1	0.5
Other mixed eucalypt species regrowth					345.8	2.7
Non-remnant					9,100.1	71.3
		<b>Total</b>			<b>12,760.0</b>	<b>100.0</b>



RE listing status:



E = Endangered


OC = Of Concern

NoC = No concern of present



**Table 4-2: Broad Habitats in the Study Area**

Broad Habitat and occurrence in Study Area	Structure	Habitat features / Condition	Photographic Example
<p><b>Cleared agricultural land</b> including cultivated alluvial plains, and grassland with occasional presence of <i>Eucalyptus spp.</i>, <i>Brachychiton rupestris</i> and <i>Ficus obliqua</i>.</p>	<p><b>Tree layer:</b> Sparse to absent. Occasional <i>Eucalyptus spp.</i>, <i>Brachychiton rupestris</i> and <i>Ficus obliqua</i> present.</p> <p><b>Shrub layer:</b> Sparse to absent.</p> <p><b>Ground microhabitat layer:</b> Longer tussock grasses may provide some habitat for smaller reptiles and ground-dwelling bird species. Some leaf litter and/or woody debris would provide habitat and shelter availability for smaller ground dwelling animals.</p>	<p>Provides little to no value due to the extensive clearing and grazing that has occurred. Additionally, there is a high presence of the common prickly pear (<i>Opuntia stricta</i>) on the ground level.</p> <p>Lack of hollow bearing trees means limited to no habitat availability for arboreal mammals.</p> <p>Longer tussock grasses will provide some habitat for ground dwelling mammals and reptiles. Additionally, birds of prey may take advantage of limited tree cover and hunt for smaller animals.</p>	
<p><b>Open forest dominated by <i>Acacia harpophylla</i> +/- <i>Casuarina cristata</i></b> on fine-grained sedimentary rocks. (REs 11.9.5 and 11.3.1).</p> <p>Often found fringing roads and trails throughout the Study Area. It is also found bordering <i>Eucalyptus spp.</i> and <i>Acacia spp.</i> woodlands and open forests.</p>	<p><b>Tree layer:</b> The canopy height ranges from 15-20 m and is comprised solely of <i>Acacia harpophylla</i> +/- <i>Casuarina cristata</i>.</p> <p><b>Shrub layer:</b> Generally dominated predominately by juvenile <i>Acacia harpophylla</i> +/- <i>Casuarina cristata</i>.</p> <p><b>Ground microhabitat layer:</b> The ground cover is generally very sparse. There is some leaf litter and a small amount of woody debris however not as significant as other habitats. It is less likely to support a more refined amount of reptile and other ground-dwelling species.</p>	<p>The trees present may provide habitat for birds and mammals. However there is a lack of hollows, so it may not be suitable habitat for arboreal mammals.</p> <p>This ecosystem is often found fringing RE 11.10.1 +/- RE 11.5.1. It was generally in moderate to high condition with mature trees present.</p> <p>Often found only in small patches.</p>	

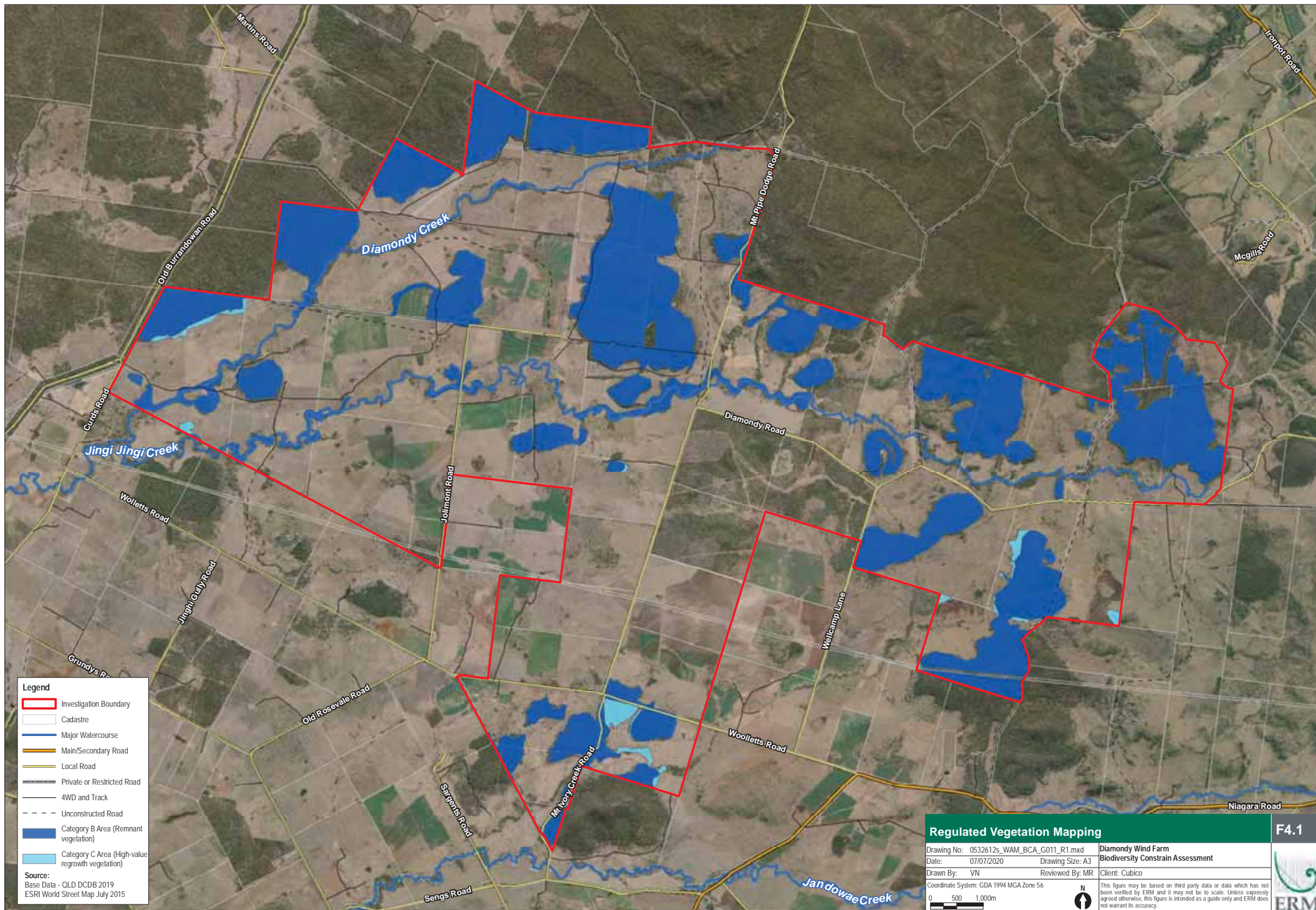
Broad Habitat and occurrence in Study Area	Structure	Habitat features / Condition	Photographic Example
<p><b>Woodland and open forest dominated by <i>Eucalyptus crebra</i> +/- <i>Angophora leiocarpa</i> +/- <i>Eucalyptus populnea</i>.</b> (RE 11.5.1).</p> <p>Occurs on sandy plains overlying weathered or unweathered bed rock.</p>	<p><b>Tree layer:</b> The canopy height ranges from 15-20 m <i>Eucalyptus crebra</i> +/- <i>Angophora leiocarpa</i> +/- <i>Eucalyptus populnea</i>. A lower tree layer dominated by <i>Allocasuarina luehmannii</i> +/- <i>Melaleuca decora</i> +/- <i>Callitris glaucophylla</i> +/- <i>Callitris endlicheri</i></p> <p><b>Shrub layer:</b> Generally sparse or absent (mainly a lower tree layer).</p> <p><b>Ground microhabitat layer:</b> The ground cover has a moderate density of grasses present. There is a moderate amount of leaf litter and woody debris present which could therefore be used as habitat for reptiles, insects and smaller ground-dwelling species.</p>	<p>In some areas in the Study Area this habitat has high amounts of hollows of varying sizes. Therefore, it is likely to provide habitat to owls and arboreal species that require hollows for shelter and nesting.</p> <p>This habitat was generally of moderate condition due to high presence of weeds, erosion caused by cattle and evidence of fire.</p>	
<p><b>Semi evergreen vine thicket +/- <i>Acacia harpophylla</i> as an emergent layer</b> (REs 11.9.4a and 11.8.3).</p> <p>Occurs on crests, mid-slopes and undulating plains and is associated with fine-grained sedimentary rocks.</p> <p>This habitat type was located in the south and parts of the eastern parts of the Study Area.</p>	<p><b>Tree layer:</b> The canopy forms an open scrub (mixture including <i>Flindersia collina</i>, <i>Siphonodon australis</i>, <i>Exocarpos latifolius</i>, <i>Elaeodendron australe subsp. integrifolia</i> and <i>Canthium odoratum forma subnitida</i>, approximately 5-7m in height).</p> <p><b>Shrub layer:</b> tall (2-6m) but sparse (predominantly <i>Breynia oblongifolia</i>, <i>Leucopogon biflorus</i>, <i>Olearia canescens</i> and <i>Alectryon diversifolius</i>.)</p> <p><b>Ground microhabitat layer:</b> The ground layer is generally very sparse and contains a mixture of tussock grasses and forbs. Vine climber species are also present in this community. Rocky debris was also moderately available to provide habitat and sheltering areas for smaller mammals and reptiles.</p>	<p>The thick vine communities may provide habitat for smaller birds who prefer dense shrubland, insects and reptiles. With limited availability of hollow bearing trees, the vegetation community is unlikely to provide suitable habitat for species that rely on hollows for breeding and shelter.</p> <p>This vegetation community is found in the north-eastern corner of the Study Area as well as some smaller patches throughout. It was bordered by heavily grazed grasslands or found within other dominant RE's (11.10.1 and 11.5.1).</p>	

Broad Habitat and occurrence in Study Area	Structure	Habitat features / Condition	Photographic Example
<p><b>Eucalypt woodland or open forest dominated by <i>Eucalyptus crebra</i> +/- <i>Corymbia citriodora</i>.</b> (REs 11.10.1 and 11.10.1a).</p> <p>Occasionally associated with <i>Eucalyptus tereticornis</i> +/- <i>Eucalyptus melanophloia</i> open woodland (RE 11.3.4)</p> <p>Dominated most areas of remnant and regrowth vegetation throughout the Study Area. Large remnant patches are evident in the middle, south and eastern parts of the Study Area.</p>	<p><b>Tree layer:</b> Sparse to mid-dense woodland dominated by <i>Eucalyptus</i> or <i>Corymbia</i> species (<i>E. crebra</i>, <i>E. melanophloia</i>, <i>E. propinqua</i>, <i>C. citriodora</i>) although occasionally other species may be present (e.g. <i>Angophora woodsiana</i>). Tree height ranges from 15-20 m.</p> <p><b>Shrub layer:</b> The midstorey ranges in height from 4-6 m, is generally sparse and consists mostly of <i>Acacia leiocalyx subsp. leiocalyx</i>.</p> <p><b>Ground microhabitat layer:</b> Sparse to dense grass layer (dependent on level of grazing). Grassy understory, high leaf litter and log availability could provide habitat and shelter for reptiles and insects as well as other smaller ground-dwelling species. Fallen debris was also commonly observed within this community and may provide further habitat for these species.</p>	<p>Hollow-bearing trees were present in this habitat, mainly in the middle and north-east parts of the Study Area. These hollows would provide habitat for nesting birds, such as owls, as well as arboreal mammals, such as the greater glider and koala.</p> <p>This vegetation community is currently grazed and shows signs of degradation and fire scars. The common prickly pear (<i>Opuntia stricta</i>) is abundant on the ground level. Better quality vegetation occurs close to escarpments and away from vehicular and cattle tracks.</p> <p>Generally of moderate to low quality due to erosion from cattle tracks and some clearing of mature trees.</p>	

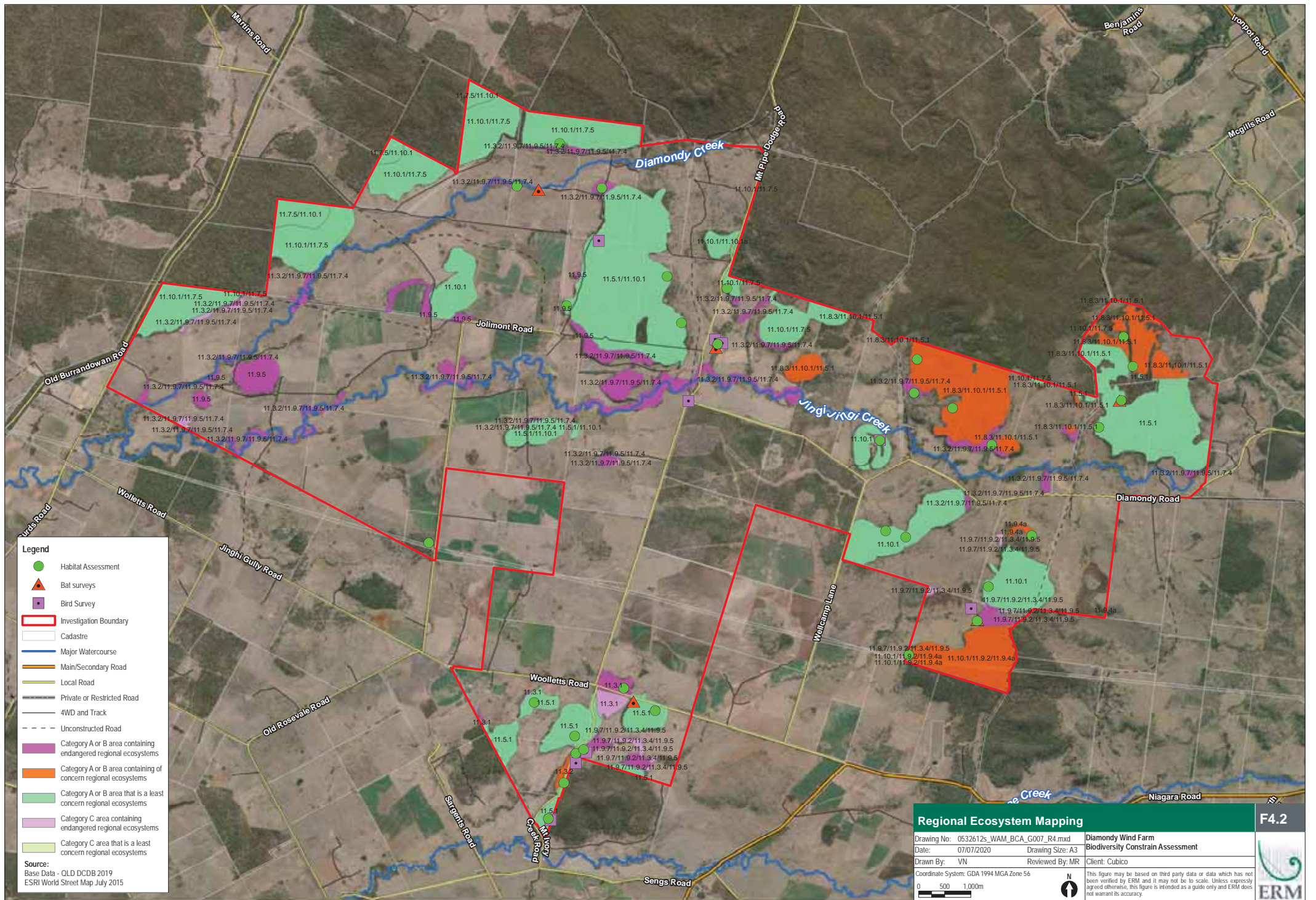


Broad Habitat and occurrence in Study Area	Structure	Habitat features / Condition	Photographic Example
<p><b>Fringing riparian woodland to open forest associated with stream channels.</b> Associated commonly with <i>E.populnea</i> and <i>A.harpophylla</i> +/- <i>A.cristata</i>. (REs 11.3.2, 11.7.4, 11.9.5, and 11.9.7).</p> <p>Occurs on a range of soil types which include sandy soils and fine-grained sedimentary rocks.</p> <p>This remnant vegetation often occurs on small slopes that descend towards the water course.</p> <p>Includes drainage features, some of which were present in open, cleared areas.</p>	<p><b>Tree layer:</b> mainly dominated by <i>E.populnea</i>, <i>E.crebra</i> and <i>A.harpophylla</i> +/- <i>A.cristata</i>. Moderately sparse. Lower canopy trees often absent.</p> <p><b>Shrub layer:</b> occasional semi-evergreen thicket understorey in areas of <i>A.harpophylla</i> dominance.</p> <p><b>Ground microhabitat layer:</b> Moderately dense grass layer (dependent on level of grazing). Often little tree coverage in the area and a lack of rocky or woody debris. There is also a generally low level of leaf matter. Therefore, may not be overly suitable shelter or habitat for smaller reptiles or ground-dwelling species.</p>	<p>Larger canopy trees provide habitat for a range of woodland-dependent and generalist species. Due to no water occurring in the water courses, it is not suitable habitat for riparian ecosystem dependent species. Presence of a small amount of hollow-bearing trees may provide suitable habitat for arboreal mammals. However, these are not in high density.</p> <p>Riparian system is very dry and the condition of the habitat is moderate to low.</p> <p>NB. In areas where there is an understorey of vine-thicket, there is suitable levels of leaf coverage and woody debris for small ground-dwelling mammals and reptile species.</p>	
<p><b>Waterbodies and drainage features</b> located throughout Study Area. These were mainly farm dams which were found in conjunction with cleared agricultural land.</p> <p>There were drainage features (creek lines) throughout the Study Area. These were often associated with fringing riparian vegetative communities as discussed above. For information on structure and habitat features of these drainage features, please refer to above habitat type.</p>	<p><b>Tree layer:</b> occasional fringing sparse to dense <i>Eucalyptus</i> spp. and <i>Acacia</i> spp.</p> <p><b>Shrub layer:</b> occasional fringing sparse to dense <i>Eucalyptus</i> spp. and <i>Acacia</i> spp.</p> <p><b>Ground microhabitat layer:</b> Sparse to dense grass layer (dependent on level of grazing). Often little tree coverage in the area and a lack of rocky or woody debris near farm dams. Therefore, may be little shelter or habitat for smaller reptiles or ground-dwelling species. Would be used as a water source rather than habitat by itself. .</p>	<p>The farm dams are shallow and were in low condition due to being eroded from heavy cattle use. These farm dams provide a refuge for a range of bird species, including birds of prey.</p> <p>Drainage features were all dry at the time of survey however if water was to be present again, these creeks would provide high habitat for many species of birds, mammals and reptiles. This is especially given that remnant vegetation is often found fringing these habitats, as discussed above.</p>	







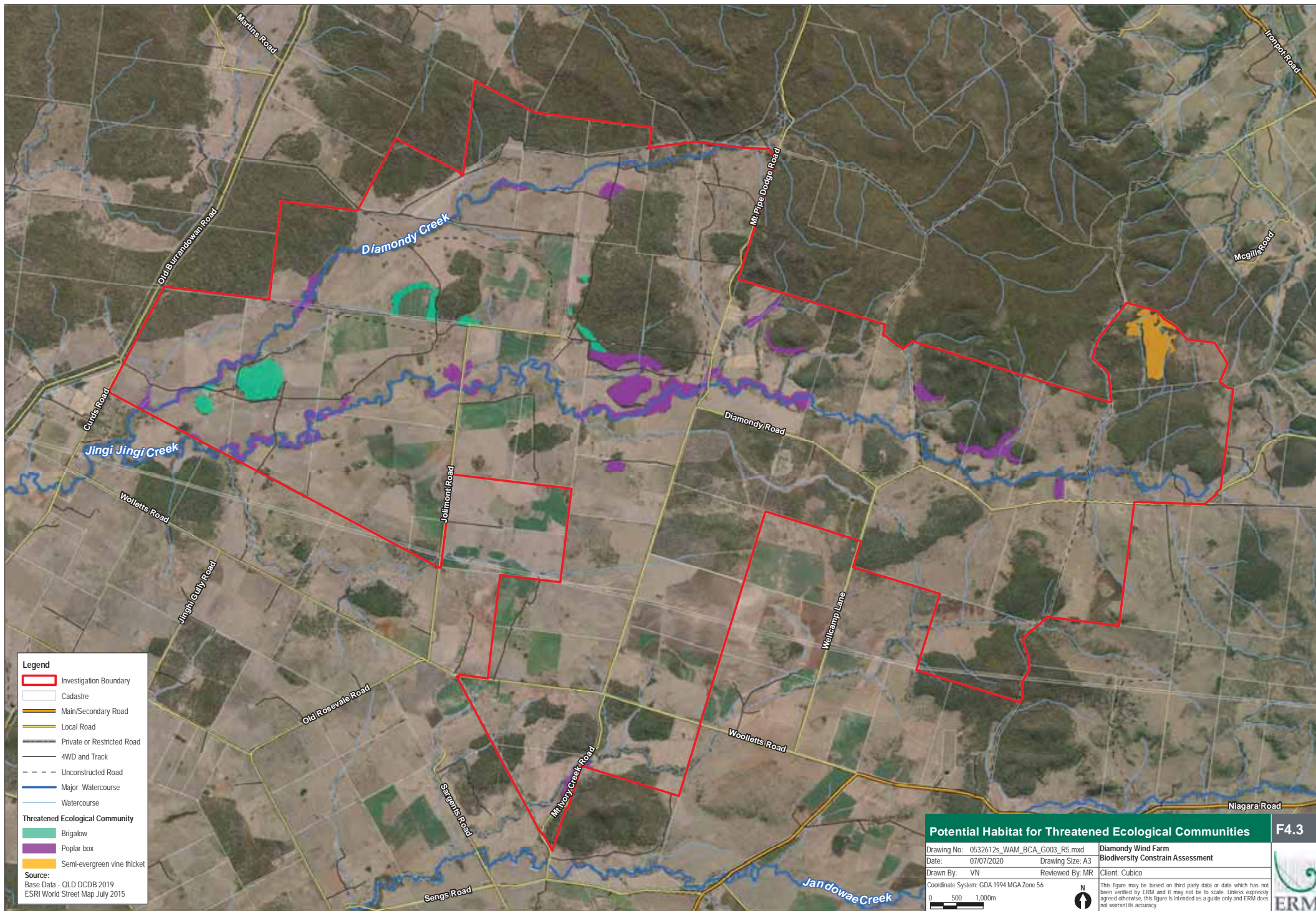


- Legend**
- Habitat Assessment
  - ▲ Bat surveys
  - Bird Survey
  - Investigation Boundary
  - Cadastre
  - Major Watercourse
  - Main/Secondary Road
  - Local Road
  - Private or Restricted Road
  - 4WD and Track
  - Unconstructed Road
  - Category A or B area containing endangered regional ecosystems
  - Category A or B area containing of concern regional ecosystems
  - Category A or B area that is a least concern regional ecosystems
  - Category C area containing endangered regional ecosystems
  - Category C area that is a least concern regional ecosystems

**Source:**  
 Base Data - QLD DCDB 2019  
 ESRI World Street Map July 2015

Regional Ecosystem Mapping		F4.2
Drawing No: 0532612s_WAM_BCA_G007_R4.mxd	Diamondy Wind Farm	
Date: 07/07/2020	Biodiversity Constrain Assessment	
Drawn By: VN	Reviewed By: MR	Client: Cubico
Coordinate System: GDA 1994 MGA Zone 56		
<small>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</small>		





**Legend**

- Investigation Boundary
- Cadastre
- Main/Secondary Road
- Local Road
- Private or Restricted Road
- 4WD and Track
- Unconstructed Road
- Major Watercourse
- Watercourse

**Threatened Ecological Community**

- Brigalow
- Poplar box
- Semi-evergreen vine thicket

**Source:**  
 Base Data - QLD DCDB 2019  
 ESRI World Street Map July 2015

<b>Potential Habitat for Threatened Ecological Communities</b>		<b>F4.3</b>
Drawing No: 0532612s_WAM_BCA_G003_R5.mxd Date: 07/07/2020 Drawn By: VN Coordinate System: GDA 1994 MGA Zone 56	<b>Diamondy Wind Farm</b> Biodiversity Constrain Assessment Client: Cubico Reviewed By: MR	 This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
0 500 1,000m 		



## 4.3 Flora Species

### 4.3.1 Threatened Flora Species

No threatened flora species were recorded during field surveys.

The DEHP Protected Plants Trigger Map (Trigger Map) does not identify any records of listed threatened flora within the Study Area, although a small part of a trigger area for two records from Diamondy State Forest occurs within the northern boundary of the Study Area.

The Trigger Map does not identify the relevant species involved in a trigger area. However, fourteen threatened flora species were identified by desktop searches as known or having the potential to occur within 10 km of the Study Area. Based on the likelihood of occurrence assessment, one species, *Cyperus clarus* was identified as 'likely' to occur within the Study Area.

This species is listed as Vulnerable under the NC Act. This species was not recorded during field surveys, however a record from 2000 exists south of the Study Area within the 10 km buffer. There are no other records for this species in the locality, with the largest cluster found in the Toowoomba region. This species grows in grassland or open woodland on heavy basalt soils. It is often associated with *Eucalyptus melanophloia* woodland with a mid-dense ground stratum of *Chrysopogon fallax* (DES, 2019). A habitat map with areas dominated by RE 11.9.2 (*E. melanophloia* dominated vegetation) is shown in Figure 4-4. The total potential habitat for *Cyperus clarus* in the Study Area is 157.6 ha.

The likelihood of occurrence assessment, identified a total of 10 flora species with the potential to occur within the Study Area. These species are listed in Table 4-3. It is noted that the pre-clearance surveys proposed as part of the micro-siting phase of layout design, will target listed flora that have been identified with potential to occur within the Study Area. This will ensure that if such species are located, appropriate mitigation measures will be taken and the development footprint will aim to avoid such species, and their habitat.

**Table 4-3: Potential Listed Flora Species within the Study Area**

Species name	Common name	EPBC Act Status	NC Act Status
<i>Cadellia pentastylis</i>	ooline	V	V
<i>Dichanthium queenslandicum</i>	king blue-grass	E	V
<i>Dichanthium setosum</i>	bluegrass	V	-
<i>Haloragis exalata</i> subsp. <i>velutina</i>	tall velvet sea-berry	V	V
<i>Homopholis belsonii</i>	Belson's panic	V	E
<i>Rhaponticum australe</i>	Austral cornflower	V	V
<i>Sophora fraseri</i>	-	V	V
<i>Thesium australe</i>	toadflax	V	V
<i>Eucalyptus argophloia</i>	Queensland western white gum	V	V
<i>Micromyrtus carinata</i>	Gurulmundi heath-myrtle	-	E

Status listing per EPBC and NC Acts: E = Endangered; V = Vulnerable; "-" = not listed.

For the full reasoning for the potential outcomes for such species, refer to Appendix A.

### 4.3.2 Introduced Flora Species

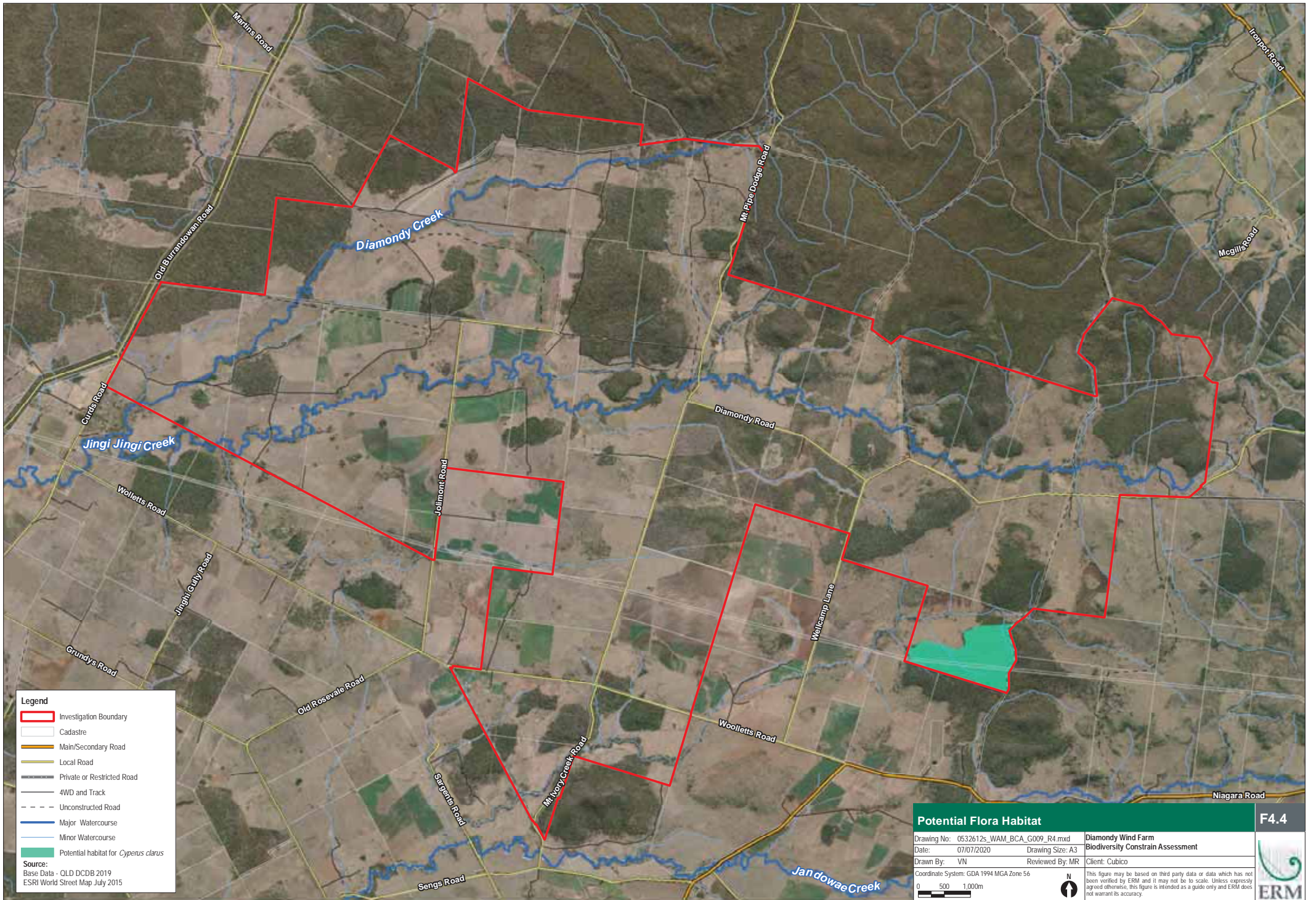
Four introduced flora species listed as weeds of national significance (WONS) and listed under the *Queensland Biosecurity Act 2014* are known to occur within the Study Area (Table 4-4). This was because they were recorded during the 2019 field survey.

**Table 4-4: Introduced Flora Known from the Study Area**

Species name	Common name	WONS	Biosecurity Act
<i>Opuntia spp.</i>	prickly pears	✓	Restricted invasive
<i>Lantana camara</i>	common lantana	✓	Prohibited invasive
<i>Parthenium hysterophorus</i>	parthenium weed	✓	Restricted invasive
<i>Solanum elaeagnifolium</i>	silver nightshade	✓	Restricted invasive

1. Species recorded through database searches only

Other introduced species recorded in the Study Area during field surveys, but not listed as WONS or under the *Biosecurity Act 2014*, are listed in Appendix C.



**Legend**

- Investigation Boundary
- Cadastre
- Main/Secondary Road
- Local Road
- Private or Restricted Road
- 4WD and Track
- Unconstructed Road
- Major Watercourse
- Minor Watercourse
- Potential habitat for *Cyperus clarus*

**Source:**  
 Base Data - QLD DCDB 2019  
 ESRI World Street Map July 2015

Potential Flora Habitat		F4.4
Drawing No: 0532612s_WAM_BCA_G009_R4.mxd	Diamondy Wind Farm Biodiversity Constrain Assessment	
Date: 07/07/2020	Drawing Size: A3	Client: Cubico
Drawn By: VN	Reviewed By: MR	
Coordinate System: GDA 1994 MGA Zone 56		
		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.



## 4.4 Fauna Species

### 4.4.1 Threatened Fauna Species

As a result of definition of habitat, review of desktop information and field surveys (which verified habitat presence), five listed threatened species are considered as 'Known' or 'Likely' to occur within the Study Area. The full assessment for all desktop identified threatened species can be found in Appendix B. A summary of listed threatened species that are known or considered likely to occur and their associated preferred/general habitat within the Study Area is provided in Table 4-6.

Figure 4-5 presents a map showing the distribution of potential preferred and general koala habitat and preferred greater glider habitat, within the Study Area. The total preferred koala and greater glider habitat is 3,150.4 ha and general koala habitat is 411.9 ha (consisting of regrowth of mixed eucalypt species and DNRME mapped regrowth).

The likelihood of occurrence assessment also identified a total of 17 fauna species with the potential to occur within the Study Area (Table 4.5). It is noted that the pre-clearance surveys proposed as part of the micro-siting phase of layout design, will target listed threatened fauna that have been identified as known, likely or having the potential to occur within the Study Area to minimise disturbance to actual/potential habitat features for these species where required.

**Table 4-5: Potential Listed Fauna Species within the Study Area**

Species name	Common name	EPBC Act Status	NC Act Status
<i>Anthochaera phrygia</i>	regent honeyeater	CE	CE
<i>Calidris ferruginea</i>	curlew sandpiper	CE, M	E
<i>Erythrotriorchis radiatus</i>	red goshawk	V	V
<i>Geophas scripta scripta</i>	southern squatter pigeon	V	V
<i>Grantiella picta</i>	painted honeyeater	V	V
<i>Lathamus discolor</i>	swift parrot	CE	E
<i>Cuculus optatus</i>	oriental cuckoo	M	SLC
<i>Motacilla flava</i>	yellow wagtail	M	SLC
<i>Calidris acuminata</i>	sharp-tailed sandpiper	M	SLC
<i>Chalinolobus dwyeri</i>	large-eared pied bat	V	V
<i>Nyctophilus corbeni</i>	Corben's long-eared bat	V	V
<i>Pteropus poliocephalus</i>	grey-headed flying fox	V	-
<i>Adclarkia cameroni</i>	brigalow woodland snail	E	V
<i>Anomalopus mackayi</i>	five-clawed worm-skink	V	E
<i>Delma torquata</i>	adorned delma	V	V
<i>Egernia rugosa</i>	yakka skink	V	V
<i>Furina dunmalli</i>	Dunmall's snake	V	-

Status listing per EPBC and NC Acts: CE = Critically Endangered; E = Endangered; V = Vulnerable; M = Migratory; LC = Least Concern; SLC = Special Least Concern.

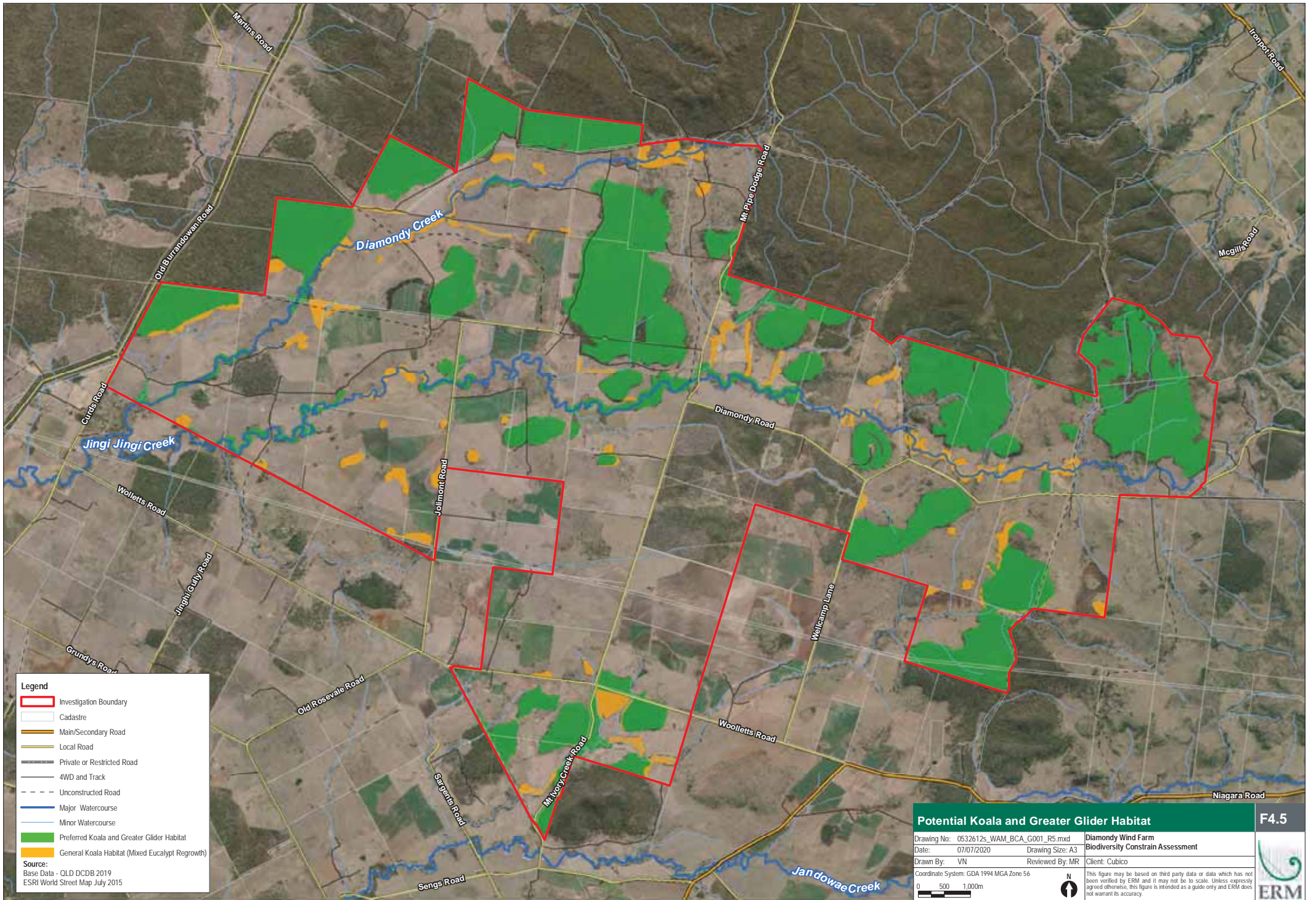
For the full reasoning for the potential outcomes for such species, refer to Appendix A.

**Table 4-6: Listed Threatened Fauna Species Known or Likely to Occur within the Study Area**

Scientific Name	Common Name	Status		Likelihood of Occurrence	Habitat definition, records and regional importance of the species
		EPBC Act	NC Act		
<i>Petauroides volans</i>	greater glider	V	V	Known	This species has been recorded within the 10 km buffer of the Study Area, in the Diamondy State Forest. The Diamondy State Forest is adjacent to and connected to vegetation within the Study Area. It has also been recorded at other state forests in the region (Nudley, Jarrah, Yarraman). Greater glider scats were identified in <i>Eucalyptus</i> woodlands in the Study Area. This species is largely found in Eucalypt forests and open woodlands. It is found in taller, montane, moist forests with older trees with abundant hollows (Kavanagh 2000; Eyre 2004). In this case the REs which were identified as general/preferred koala habitat within the Study Area were: 11.10.1/a, 11.3.2, 11.5.1, 11.7.5, 11.9.7 and 11.3.4. The greater glider requires mature eucalypt forests and so regrowth vegetation was not included in its habitat mapping. Figure 4.4 details the potential habitat for greater gliders in the Study Area.
<i>Phascolarctos cinereus</i>	koala	V	V	Known	The closest and most recent record (2011) is just south of the Study Area (within 2 km). Records are also present in the nearby Nudley State Forest and Bunya Mountains National Park. Koala scats were also located in Eucalypt forests throughout the Study Area. Thus, the koala is known to be found in the region, This species is generally found in a range of temperate to tropical forests as well as woodlands and semi-arid communities dominated by <i>Eucalyptus spp</i> (Martin & Handasyde, 1999). Koalas are also known to inhabit regrowth habitat. In this case the REs which were identified as general/preferred koala habitat within the Study Area were: 11.10.1/a, 11.3.2, 11.5.1, 11.7.5, 11.9.7 and 11.3.4. Regrowth vegetation composed of mixed eucalypt species were also included in koala habitat mapping. Figure 4.4 identifies the potential habitat for koalas in the Study Area.
<i>Hirundapus caudacutus</i>	white-throated needletail	V, M	V	Likely	This species was not located during field surveys, however a record occurs north-west of the Study Area, within the 10 km buffer. The species is recorded throughout the larger region, with a concentration of records in the Bunya Mountains NP and Barakula State Forest, more than 30 km from the Study Area. This species is predominately aerial when on migration in Australia, occasionally stopping to roost in large patches of Eucalypt forests (Coventry, 1989; Higgins, 1999). In this case, while occasional aerial observations may occur, the Study Area is unlikely to contain preferred habitat for the species, and therefore no habitat mapping has been undertaken.
<i>Plegadis falcinellus</i>	glossy ibis	M	SLC	Likely	There are records of this species within the 10 km buffer of the Study Area. Habitat for foraging and breeding is associated with freshwater lakes, salt or muddy marshes or irrigated crop land (Marchant & Higgins, 1990), which are absent from the Study Area. This species has core breeding areas within the Murray-Darling Basin in NSW Victoria, as well as the Macquarie Marshes of NSW (DoE, 2020). The species is considered to be an infrequent visitor to the Study Area, and therefore no habitat mapping has been undertaken.
<i>Tachyglossus aculeatus</i>	short-beaked echidna	-	SLC	Known	This species was located during field surveys, and closest record exists within 10km and south-east of the Study Area. Records also exist in the Diamondy State Forest north of the Study Area. This species can be found across a wide range of habitats, including open woodland, semi-arid and arid areas as well as in agricultural areas (Aplin <i>et al.</i> , 2016). Their foraging requirements include ant nests and termites mounds (Nicol <i>et al.</i> , 2011). In this case, general habitat has been determined for the entire Study Area and so it is not mapped for this reason.

Status listing per EPBC and NC Acts: V = Vulnerable; M = Migratory; SLC = Special Least Concern.





**Legend**

- Investigation Boundary
- Cadastre
- Main/Secondary Road
- Local Road
- Private or Restricted Road
- 4WD and Track
- Unconstructed Road
- Major Watercourse
- Minor Watercourse
- Preferred Koala and Greater Glider Habitat
- General Koala Habitat (Mixed Eucalypt Regrowth)

**Source:**  
 Base Data - QLD DCDB 2019  
 ESRI World Street Map July 2015

<b>Potential Koala and Greater Glider Habitat</b>		<b>F4.5</b>
Drawing No: 0532612s_WAM_BCA_G001_R5.mxd	Diamondy Wind Farm	
Date: 07/07/2020	Biodiversity Constrain Assessment	
Drawing Size: A3	Client: Cubico	
Drawn By: VN	Reviewed By: MR	
Coordinate System: GDA 1994 MGA Zone 56		
		This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

#### 4.4.2 Birds

A combined total of 45 birds were identified during the field survey, with no listed threatened species observed. Birds were recorded in a variety of habitats including, non-native grasslands, eucalyptus woodlands, riparian corridors, rocky outcrops, and waterbodies. In general, bird abundance was regarded as low. The Study Area contained a number of active and abandoned small and medium sized nests. There were three bird of prey nests identified within the Study Area. Waterbodies supported a high diversity and abundance of birds in comparison to other habitats. This may be associated with the dry conditions observed across the landscape.

Please see Appendix B for a full list of birds identified during the surveys.

##### 4.4.2.1 Woodland and Open-Forest Species

The vast majority of birds recorded during field surveys were woodland-dwelling, low-flying species. These species require woodland dominated by *Eucalypt*, *Callitris* and *Acacia spp.*, often with hollows for nesting and roosting habitat (BirdLife, 2019). Woodland areas are often associated with a large amount of fallen timber and leaf matter on the ground. The woodland bird species require this habitat feature as it allows their food source of insects and small-reptiles to be available in sufficient abundance. Additionally, woodlands often are associated with a moderate grass layer which provides another level of habitat complexity for these smaller bird species to use for shelter as well as foraging (BirdLife, 2019). Woodland species were only observed flying to the maximum height of the woodland canopy.

##### 4.4.2.2 Raptors

A total of three raptor species were observed during field surveys. These species were:

- Wedge tail eagle (*Aquila audax*)
- Nankeen kestrel (*Falco cenchroides*)
- Brown falcon (*Falco berigora*)

Raptors were observed infrequently and in low numbers, with only six sightings of three species across the four day field survey. Wedge tail eagle sightings were often only over cleared agricultural areas, close to water sources (farm dams). This species was also located in the mid-north section of the Study Area, perched within an *E. crebra* (RE 11.10.1) open forest. There was one potential wedge tail eagle nest located in the eastern section of the Study Area, however this could not be verified as an active nest.

Nankeen kestrel sightings were only recorded in the eastern part of the Study Area. This species was seen hovering at heights greater than 50 m above the ground over cleared agricultural areas as well as over sparse open forests dominated by *E. crebra* (11.10.1).

These raptor species mostly prefer woodland and open area habitat (Olsen, 1995). They fly at heights in order to hunt out prey on the ground in open/cleared areas or within woodlands and sparse open forests.

##### 4.4.2.3 Migratory Species

No listed migratory species were observed during the field survey. However, the white-throated needletail and glossy ibis are considered likely to occur within the Study Area.

A record from 2002 for the white-throated needletail occurs north-west of the Study Area, within the 10 km buffer. The species is recorded throughout the wider region, with a high number of records in the Bunya Mountains NP and Barakula State Forest, more than 30 km from the Study Area. This species does not breed in Australia, rather spending non-breeding season in Australasia. It is predominately aerial in Australia, and therefore is likely to fly across the Study Area, but not breed and roost here.



There are several records for the glossy ibis within the 10 km buffer of the Study Area. Its habitat for foraging and breeding is usually associated with freshwater lakes, salt or muddy marshes or irrigated crop land (Marchant & Higgins, 1990). This species has core breeding areas within the Murray-Darling Basin in NSW and Victoria, as well as the Macquarie Marshes of NSW (DoE, 2020). Therefore, it is likely to only occasionally frequent the Study Area, as no core breeding habitat is present.

There are four listed migratory species that have been concluded as having the potential to occur within the Study Area, per the likelihood of occurrence assessment (Appendix A). These species were the curlew sandpiper (*Calidris ferruginea*), oriental cuckoo (*Cuculus optatus*), yellow wagtail (*Motacilla flava*) and sharp-tailed sandpiper (*Calidris acuminata*). As mentioned previously, pre-clearance surveys proposed as part of the micro-siting phase of layout design, will target listed migratory species that have been identified as likely or potential to occur within the Study Area. This will ensure that if such species are located, appropriate mitigation measures will be taken and the development footprint will avoid such species, and their habitat.

### Migratory Flyways

There are no documented migratory flyways that occur over the Study Area. The East Asia/Australasia Flyway is the most common and frequented flyway travelled by migratory shorebirds *en route* to, and within, Australia (BirdLife International, 2020). This flyway occurs over a total of 84,765,020 km<sup>2</sup> and occurs through 37 countries, including Australia (BirdLife International, 2020). This flyway extends from Arctic Russia and North America, to the southern extents of Australia and New Zealand (BirdLife International, 2020). This flyway predominately traverses the coastal extents of Australia, occasionally travelling inward through parts of South Australia and Western Australia (BirdLife International, 2020). When examining the records of the listed migratory shorebirds species triggered in the desktop searches, the vast majority of incidental records are consistent with the coastal routes of the East Asia/Australasia Flyway. Additionally, when examining the records of non-shorebird migratory birds, these species too traverse coastal areas.

Migratory flyways are known to correspond with the vast majority of Important Bird and Biodiversity Areas (IBAs). Such IBAs are globally known for their importance in bird conservation, particularly due to the number of migratory and/or threatened species that are found there. The East Asia/Australasia Flyway triggers a total of 1,184 migratory IBAs (BirdLife International, 2020), none of which occur within, or in close proximity to the Study Area.

Therefore, it is concluded that the Study Area does not fall within an important flyway or IBA for migratory birds.

### 4.4.3 Bats

A total of nine bat species were recorded in the Study Area (Table 4-7). None of the species identified are listed as threatened under the NC Act or EPBC Act. A total of 2,501 calls were detected as bat calls. The most diverse areas of bat call data came from the south-eastern and north-western sampling sites of the Study Area. These areas were characterised as being within 1 km of a water source (farm dam) with open forests or woodlands dominated by *E. crebra* (11.5.1).



**Table 4-7: Results of Echolocation Analysis**

Scientific Name	Common Name	EPBC Act Status	NC Act Status
<i>Austronomus australis</i>	white-striped freetail-bat	-	LC
<i>Chalinolobus gouldii</i>	Gould's wattled bat	-	LC
<i>Chalinolobus nigrogriseus</i>	hoary wattled bat	-	LC
<i>Miniopterus australis</i>	little bent-wing bat	-	LC
<i>Miniopterus oriana<sup>1</sup></i>	large bent-wing bat	-	LC
<i>Mormopterus ridei</i>	eastern free-tailed bat	-	LC
<i>Saccolaimus flaviventris</i>	yellow-bellied sheathtail bat	-	LC
<i>Rhinolophus megaphyllus</i>	eastern horseshoe bat	-	LC
<i>Vespadelus pumilis</i>	eastern forest bat	-	LC

<sup>1</sup> synonymous with *Miniopterus schreibersii oceanensis* and *Miniopterus oriana oceanensis*.

The freetail bats recorded (family Molossidae) include white-striped free-tailed bat (*Austronomus australis*), eastern free-tailed bat (*Mormopterus ridei*). Australian molossids have been recorded from habitats of closed forest to desert. The habitat must supply roosting sites which may be buildings, hollow trees or rock crevices in rocky outcrops, river banks or even under stones. These species feed on a range of insects from moths to hard-shelled beetles (Allison, 1989).

The wattled bats recorded, Gould's wattled bat (*Chalinolobus gouldii*) and hoary wattled bat (*Chalinolobus nigrogriseus*), can be found in a wide range of habitats, including forests and woodlands and typically roost in tree hollows. These species prefer a diet of moths and beetles, but will eat other insects if available (Churchill, 2008).

The bent-winged bats recorded, little bent-wing bat (*Miniopterus australis*) and large bent-wing bat (*Miniopterus oriana*), occupy well-timbered habitats, often in wetter areas or in close proximity to water features. These species typically roost in caves or other man-made structures and show a dietary preference for moths (Churchill, 2008).

The sheathtail bat recorded, yellow-bellied sheathtail bat (*Saccolaimus flaviventris*), has a diet preference for beetles, and is found in nearly all habitats, utilising large tree hollows for roosting (Armstrong & Lumsden, 2017).

The eastern-horseshoe bat (*Rhinolophus megaphyllus*) and eastern-forest (*Vespadelus pumilis*) bat are similar in that they are both found in closed forests habitats, with a diet consisting of a wide variety of insects (Armstrong & Aplin, 2017).

#### 4.4.4 Introduced Fauna Species

Three introduced fauna species were recorded in the Study Area during field surveys, including domestic dog (*Canis lupus familiaris*), hare (*Lepus capensis*) and common myna (*Acridotheres tristis*).

While not recorded, it is expected that the Study Area may provide suitable habitat for the cane toad (*Rhinella marina*), cat (*Felis catus*), pig (*Sus scrofa*), red fox (*Vulpes vulpes*), house mouse (*Mus musculus*) and rat (*Ratus ratus*).

## 4.5 Watercourses and Wetlands

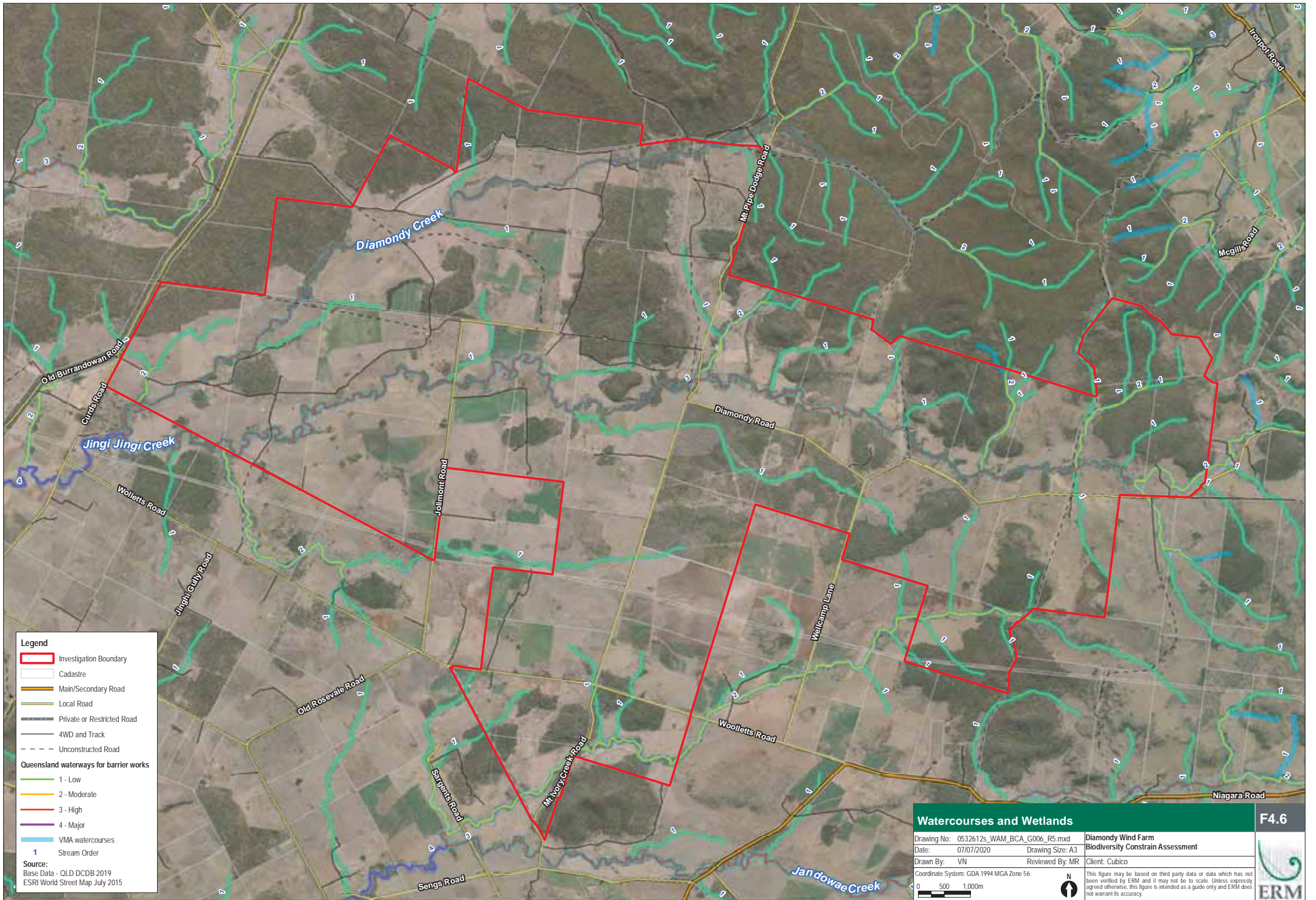
The Study Area is situated within the Balonne-Condamine drainage basin, and contains watercourses and drainage lines that drain south-west into the Murray Darling Basin. The main watercourses that intersect the Study Area are Jingi Jingi Creek and Diamondy Creek. There are also a number of minor tributaries that drain the Study Area. DNRME provides mapping for 'vegetation management watercourses and drainage features' that are used when assessing MSES. There are a number of dams that also occur throughout the Study Area. These are generally of low quality and are heavily used and impacted by cattle.

There are two waterways deemed as high risk Queensland waterways, for waterway barrier works per the Fisheries Act, which occur in the Study Area. These are Jingi Jingi Creek which occurs throughout the middle section of the Study Area, and Diamondy Creek which traverses the north-western section of the Study Area. Jingi Jingi creek is classified as stream order four, as per the VM Act, and Diamondy Creek is classified as stream order three, as per the VM Act. A number of moderate and low risk waterways, with respect to waterway barrier works, also occur throughout the Study Area. There are a number of stream order one, two and three waterways that also occur, per the VM Act.

There are no general ecological significance (GES) Wetland Management Trigger Areas in the Study Area. There are no wetlands of international importance associated with the Study Area. There are also no high ecological value (HEV) waterways and wetlands, nor high ecological significance (HES) wetlands that occur within the Study Area.

Figure 4-6 shows the relevant drainage features mapped throughout the Study Area.





**Legend**

- Investigation Boundary
- Cadastre
- Main/Secondary Road
- Local Road
- Private or Restricted Road
- 4WD and Track
- Unconstructed Road

**Queensland waterways for barrier works**

- 1 - Low
- 2 - Moderate
- 3 - High
- 4 - Major

**VMA watercourses**

- Stream Order

**Source:**  
 Base Data - QLD DCDB 2019  
 ESRI World Street Map July 2015

Watercourses and Wetlands		F4.6
Drawing No: 0532612s_WAM_BCA_G006_R5.mxd	Date: 07/07/2020	<b>Diamond Wind Farm</b> Biodiversity Constrain Assessment Client: Cubico
Date: 07/07/2020	Drawing Size: A3	
Drawn By: VN	Reviewed By: MR	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
Coordinate System: GDA 1994 MGA Zone 56		
0 500 1,000m	N	

## 4.6 Matters of National Environmental Significance

The MNES within the Study Area are summarised in Table 4-8. Three listed threatened fauna species, one flora species, two migratory species and three TECs have been identified as known or likely to occur within the Study Area (Table 4-8).

**Table 4-8: MNES within the Study Area**

Matter	Relevance to the Study Area
World heritage properties	There are no world heritage properties within the Study Area.
National heritage properties	There are no national heritage properties within the Study Area.
Wetlands of international importance	There are no wetlands of international importance associated with the Study Area.
Threatened species and ecological communities	<p>There are three EPBC Act listed threatened species that are known or are considered likely to occur within the Study Area:</p> <ul style="list-style-type: none"> <li>■ greater glider (<i>Petauroides volans</i>);</li> <li>■ koala (<i>Phascolarctos cinereus</i>); and</li> <li>■ white-throated needletail (<i>Hirundapus caudacutus</i>);</li> </ul> <p>There is potential habitat for three TECs within the Study Area:</p> <ul style="list-style-type: none"> <li>■ Semi-Evergreen Vine Thicket;</li> <li>■ Brigalow (<i>A. harpophylla</i> dominant and co-dominant); and</li> <li>■ Poplar Box Grassy Woodland on Alluvial Plains.</li> </ul>
Migratory species	<p>There are two migratory species that are regarded as likely to occur within the Study Area:</p> <ul style="list-style-type: none"> <li>■ white-throated needletail (<i>Hirundapus caudacutus</i>); and</li> <li>■ glossy ibis (<i>Plegadis falcinellus</i>).</li> </ul>
Commonwealth marine area	There are no Commonwealth marine areas within the Study Area
The Great Barrier Reef Marine Park	The Great Barrier Reef is not associated with the Study Area.
Nuclear actions	N/A to this proposed development.
Water resources	N/A to this proposed development.

Section 4.2.3 describes the potential TEC's occurring within the Study Area, and Section 4.4.1 describes the listed threatened species habitats in the Study Area. A summary of threatened and migratory species and ecological communities is listed in Table 4-9.

The full likelihood of occurrence for potential and likely species is attached in Appendix A.

**Table 4-9: Summary of MNES Potential Habitat within the Study Area**

MNES matter	Total habitat in Study Area	RE type
<i>EPBC Act listed species (threatened and/or migratory)</i>		
greater glider ( <i>Petauroides volans</i> )	<b>3,150.4 ha (remnant vegetation)</b>	11.10.1/a, 11.3.2, 11.5.1, 11.7.5, 11.9.7, 11.3.4
koala ( <i>Phascolarctos cinereus</i> )	<b>3,150.4 ha (remnant vegetation) and 411.9 ha (regrowth vegetation)</b>	11.10.1/a, 11.3.2, 11.5.1, 11.7.5, 11.9.7, 11.3.4 + regrowth habitat (DNRME mapped regrowth and other mixed eucalypt species regrowth)



MNES matter	Total habitat in Study Area	RE type
<i>EPBC Act listed species (threatened and/or migratory)</i>		
white-throated needletail ( <i>Hirundapus caudacutus</i> )	<b>Considered as exclusively aerial – no habitat mapped</b>	No applicable REs
glossy ibis ( <i>Plegadis falcinellus</i> )	<b>Considered occasional visitor to farm dams – no habitat mapped</b>	No applicable REs
<i>EPBC Act listed threatened TECs</i>		
Brigalow TEC	<b>97.6 ha (potential habitat)</b>	11.9.5
Poplar box TEC	<b>315.3 ha (potential habitat)</b>	11.3.2
SEVT TEC	<b>58.0 ha (potential habitat)</b>	11.8.3

#### 4.6.1 Migratory Species

Section 4.4.2.3 above discusses the potential presence of migratory species. As discussed in that Section the glossy ibis and white-throated needletail are considered likely to occur within the Study Area.

#### 4.6.2 Important Wetlands

No RAMSAR wetlands are located within or near the Study Area. The closest Ramsar wetland is Currawinya Lakes, which is located in Currawinya, approximately 270 km west of Dalby.

A search of the Directory of Important Wetlands in Australia (DIWA) in Queensland did not result in the identification of any nationally important wetlands were identified within the Study Area.

### 4.7 Matters of State Environmental Significance

MSES are defined within the *Queensland Environmental Offsets Policy 2014* for Significant Residual Impacts (SRI) and prescribed activities assessable under the Sustainable Planning Act 2009 (SPA). SPA has been superseded by the PA, but the Policy only references the SPA at this time. The MSES within the Study Area considered as part of this assessment are summarised in Table 4-10. MSES requiring assessment include regulated vegetation and protected wildlife habitat. These MSES values have been identified as occurring within the Study Area, as outlined in Sections 4.2, 4.3.1, 4.4.1 and 4.5 above.

**Table 4-10: MSES within the Study Area**

Matter	Relevance to the Proposed Development	Assessment
Regulated Vegetation	<ol style="list-style-type: none"> <li>1. Category B remnant vegetation – there is 560.9 ha of ‘Of Concern’, and 487.9 ha of ‘Endangered’ remnant vegetation within the Study Area.</li> <li>2. Category C high value regrowth – there is 83.5 ha of high value regrowth (Category C) within the Study Area.</li> <li>3. Defined distance of a watercourse – There are several watercourses regulated under the VM Act identified as stream orders one to four within the Study Area, which have regulated vegetation within the defined distance that will be impacted.</li> <li>4. Wetland – there are no wetlands within the Study Area. Therefore, no remnant vegetation occurs within 100 m of a wetland.</li> <li>5. Essential Habitat – there is no essential habitat within the Study Area.</li> </ol>	<ol style="list-style-type: none"> <li>1. <b>Required</b></li> <li>2. <b>Required</b></li> <li>3. <b>Required</b></li> <li>4. Not Required</li> <li>5. Not Required</li> </ol>
Connectivity Areas	The Study Area is largely cleared (71.3%) with the occurrence of some remnant vegetation (25.5%) and regrowth vegetation (3.2%). The main connectivity areas, within the 5 km and 20 km radius, are to the north of the Study Area (Diamondy State Forest) and to the south of the Study Area (Bunya Mountains National Park), and will not be affected by the proposed development. The remnant vegetation within the Study Area is largely not connected to these areas.	Not required
Wetlands and Watercourses	In accordance with the Development Assessment Mapping System (DAMS) mapping, there are no wetlands or watercourses mapped as high ecological significance, or high ecological value, within the Study Area.	Not required
Designated Precincts in Strategic Environmental Areas	In accordance with the DAMS mapping, no Regional Interest areas are recorded over the Study Area. This mapping is in accordance with the <i>Regional Planning Interests Act 2014</i> which governs the framework for Strategic Environmental areas.	Not required
Protected Wildlife Habitat	Habitat for three listed threatened species (two fauna and one flora) and one special least concern (SLC) fauna species was identified to occur within the Study Area. <ul style="list-style-type: none"> <li>■ greater glider (<i>Petauroides volans</i>) (3,150.4 ha preferred habitat);</li> <li>■ koala (<i>Phascolarctos cinereus</i>) (3,150.4 ha preferred and 411.9 ha general habitat);</li> <li>■ short-beaked echidna (<i>Tachyglossus aculeatus</i>) (12,760.0 ha general habitat); glossy ibis (<i>Plegadis falcinellus</i>) (no habitat mapped); and</li> <li>■ <i>Cyperus clarus</i> (157.6 ha preferred habitat).</li> </ul>	<b>Required</b>
Protected Areas	There are no national parks, conservation parks or protected areas under the NC Act within the Study Area, please refer to Figure 1.1.	Not required
Declared Fish Habitat Areas and Highly Protected Zones of State Marine Parks	In accordance with DAMS mapping, there are no declared fish habitat areas within the Study Area	Not required

Waterways Providing for Fish Passage	In accordance with DAMs mapping, there are some low and moderate risk of impacts on Queensland Waterways with Fish Passages (Streams) within the Study Area. However, no waterway barrier works that prohibit fish movement will be undertaken as part of the proposed development.	Not required
Marine Plants	There are no marine plant communities within the Study Area.	Not required
Legally Secured Offset Areas	There are no legally secured offset areas within the Study Area.	Not required

#### 4.8 Western Downs Regional Council Planning Scheme

The Western Downs Regional Council Planning Scheme 2017 incorporates overlay codes and mapping relating to biodiversity, and wetland and waterway corridors. The overlay code refers to overlay mapping consistent with MSES mapping for:

- Protected Area;
- Wildlife Habitat;
- Regulated Vegetation;
- HES wetlands;
- HEV waters (wetland);
- HEV (watercourse); and
- Regulated Vegetation (intersecting a watercourse).

These MSES features have been described in Section 4.7, and impact assessment is provided in Section 5.



## 5. PROJECT ACTIVITIES AND POTENTIAL IMPACTS

The proposed development has the potential to impact on the ecological values in the Study Area during its construction, operation and decommissioning phases. The activities likely to result in potential ecological impacts are listed below for each phase. The impact assessment considers quantification of all three stages of the proposed development.

### 5.1 Construction Phase Activities

The key activities likely to impact ecological resources during construction are:

- Vegetation clearing for new access tracks, temporary construction compounds and laydown areas, borrow pits, water storages; concrete batching plant; turbine pads; trenches for power and instrumentation cables; electrical substation and overhead power-lines; and associated earthworks;
- Excavating trenches;
- Blasting for turbine foundations (if required); and
- Construction traffic movements and plant operation (rock crushing and concrete batching plant).

The duration of construction works is anticipated to be from 18 to 24 months in length.

The development footprint is 372.0 ha and includes a permanent impact to 21.2 ha of remnant vegetation associated with clearing for infrastructure, and 350.8 ha of cleared agricultural land. Post-construction, the cleared areas will be maintained as part of the fire protection management for infrastructure. There is 8.2 ha of Of Concern REs and 13.0 ha of Least Concern REs impacted by the permanent removal of remnant vegetation, with the breakdown per RE and corresponding habitat summarised below:

- 5.5 ha of RE 11.10.1 (LC), eucalypt woodland or open forest dominated by *Eucalyptus crebra* +/- *Corymbia citriodora* habitat;
- 7.5 ha RE 11.5.1 (LC), woodland and open forest dominated by *Eucalyptus crebra* +/- *Angophora leiocarpa* +/- *Eucalyptus populnea* habitat;
- 1.2 ha RE 11.9.4a (OC) and 6.9 ha RE 11.8.3 (OC), semi evergreen vine thicket +/- *Acacia harpophylla* as an emergent layer habitat; and
- 0.1 ha RE 11.9.7 (OC), fringing riparian woodland to open forest associated with stream channels habitat.

The impacts to listed threatened species habitat (MNES and MSES) are provided in Sections 7.1 and 7.2.

### 5.2 Operations Phase Activities

Potential impacts during the operations phase include:

- Operation of the turbines for a period of approximately 30 years; and
- Routine maintenance and servicing of turbines, access tracks, and infrastructure as required.

### 5.3 Decommissioning Phase Activities

If a decision was taken to decommission the proposed development, this would involve:

- Dismantling and removal of turbines;
- Removal of the substation;
- Responsible disposal of infrastructure removed from site according to the waste hierarchy; and
- Rehabilitation of all disturbed land in accordance with good practice at the time.

Underground cabling would be left *in situ*. Hardstanding pads up to 1 m below ground level would be removed with the remainder abandoned. Excavations would be backfilled and rehabilitated. Access tracks could be retained on site for the continued benefit of the landholder, or they could be rehabilitated.

In general, potential impacts as a result of the construction phase relate to habitat loss and disturbance. Operational impacts are limited to bird and bat collisions with operational turbines. Decommissioning impacts are similar to those that might occur during the construction phase but likely to be of much lower magnitude. At the end of decommissioning, the site would be fully rehabilitated (to the extent agreed with the landholder).

A summary of impacts to ecological values is summarised in Table 5-1.

**Table 5-1: Potential Impacts to Ecological Values**

Impact	Relevance to the Proposed Development
<p>Clearing remnant and regrowth vegetation and the resultant loss of habitat for native fauna</p>	<p>There are two endangered and five of concern RE types located within the Study Area. Clearing for the proposed development will impact a total of 8.2 ha of the Of Concern RE types, and will not impact Endangered RE types. The proposed development includes an area of 13.0 ha of Least Concern remnant vegetation within the Development Footprint.</p> <p>There will be loss of vegetation that will result in the loss of habitat for some native and potentially threatened fauna. Such habitats would likely be used for foraging and potentially for breeding of some species.</p> <p>However, the area to be impacted represents a small portion of the overall amount of remnant vegetation within the Study Area. Additionally, the landscape is already highly modified and cleared for agricultural and cattle grazing purposes, and so contains limited habitat value for species present. Nevertheless, despite minimising impacts where possible, vegetation clearing will result in the permanent removal of these vegetation types and the habitat values they provide for native flora and fauna for the life of the development.</p>
<p>Indirect impacts to adjacent habitat areas as a result of noise, blasting, dust, runoff and erosion, including impacts to downstream environments</p>	<p>Construction traffic movements and plant operations will result in noise and dust and have the potential to negatively impact adjacent vegetation communities and habitats. Construction vehicle movements may result in accidental killing and injury of fauna.</p> <p>Noise disturbances have the potential to influence breeding, roosting or foraging behaviour of native fauna. Studies suggest that the consistency of noise is more important than volume, with irregular and unpredictable noise being more disruptive to wildlife (Jones et al., 2015), as may be emitted during construction and decommissioning. For the general native fauna community, individuals may relocate to adjacent areas during times of noise disturbance.</p> <p>Blasting will result in disturbance to wildlife through vibration, noise and possibly injury from fly rock. Blasting would occur infrequently but has the effect of displacing nearby wildlife from retained foraging and breeding habitat.</p> <p>Dust generated by vehicle and machinery movements has the potential to smother vegetation directly adjacent to the works and inhibit plant growth and palatability for native fauna. These effects, however, would be localised. There are measures available to limit dust generation and dispersion.</p> <p>Dust, noise and vibration impacts will also impact sensitive receivers in the Study Area. Nonetheless, the layout and design will minimise such impacts through avoiding turbine locations within close proximity to such sensitive receivers.</p>
<p>Indirect impacts to adjacent habitat areas as a result of an introduction or spread of weed and pest species</p>	<p>As a result of the removal of vegetation during the construction phase, there is potential for the introduction and/or spread of weeds and pests species throughout the Study Area. This introduction or spread of such weeds and pests could be a result of on foot movement, vehicular movement and the disruption and movement of vegetation. Such weed and pest species have the potential to negatively impact native flora and fauna communities through competition for resources and/or predation.</p>

Impact	Relevance to the Proposed Development
	<p>The majority of the Study Area and surrounds are highly cleared and modified areas of cattle grazing property, where introduced flora are common. Four WONS were recorded throughout the Study Area: prickly pear, common lantana, parthenium weed and silver nightshade. Three introduced fauna species were recorded in the Study Area during field surveys, including domestic dog, hare and common myna. Additionally, a number of introduced flora and fauna species are considered as potentially present throughout the Study Area.</p>
<p>Direct mortality or injury to native fauna during construction and operations</p>	<p>The peak traffic periods will be during the construction period with operational vehicle movements likely to be minimal. While many fauna groups are highly mobile (e.g. birds) and are likely to move when machinery and vehicles approach, other less mobile groups (e.g. reptile and amphibians) may be more vulnerable to this impact.</p> <p>Similarly, there will be excavation (construction only) which may provide a trapping hazard for some fauna groups (e.g. amphibians, small reptiles and small mammals).</p>
<p>Fragmentation of connectivity areas</p>	<p>The Study Area is a highly disturbed and modified landscape which has been cleared for pastoral and cattle grazing purposes. There are a number of existing cleared vehicle and cattle tracks. There are some remnant and regrowth patches of vegetation that occur throughout, and outside of, the Study Area.</p> <p>The Developmental Footprint will result in the clearing of some portions of these remnant and regrowth patches and some further small linear clearings for additional access tracks. However, fragmentation is limited based on the dispersed nature of the small amounts of clearings that will occur. Access tracks are relatively narrow, and are unlikely to represent an obstacle for many species.</p>
<p>Impacts from turbine collision to birds and bats</p>	<p>The operation of the turbines has the potential to lead to direct mortality or injury of fauna, in particular birds and bats. Risks to birds from windfarm developments are highest in areas where large numbers of birds congregate e.g. Tarifa in Spain or Altamont Pass in the USA. At these locations, millions of birds migrate annually and must pass through large windfarm areas. Windfarm development in areas of lower importance to birds and bats record substantially lower impacts (EPHC, 2010). As discussed in Section 4.4.2.3, the Study Area occurs outside of migratory flyways of migratory bird species that have the potential, or are likely, to occur.</p> <p>Where birds and bats do not avoid turbines, it is expected that on these few occasions, injury or mortality may occur. The bird sightings (particularly raptors) were so few in number that modelling of bird abundance and density became unfeasible. Therefore, any incidental mortalities of species in the Study Area are likely to be few, and unlikely to affect species populations as a whole.</p> <p>Any incidental mortality is linked closely to the turbine RSA height. RSA height refers to the area containing Rotor Swept Area (RSA), i.e. the area between the tips of the rotor blades of a wind turbine generator (WTG). The RSA height to be adopted for the proposed development is &gt;40 m. RSA is important to note as it typically dictates the risk of impacts to birds and bats. Those species found to be flying at or above RSA are typically more at risk from barotrauma and rotor collision than those that fly below the RSA. This has been exhibited within studies and technical reports at other wind farms, such as in Bango Wind Farm's Ecological Assessment (2019) and Dulacca Renewable Energy Project Fauna Technical Report (2018).</p> <p>The results of one long term study on Australian bird and bat mortality monitoring at two Tasmanian wind farms with varying RSA heights (between 27 m to 125 m) are available. Wind farm one comprising of 37 WTG's monitored over eight years, and wind farm two comprising of 25 WTGs monitored over three years, concluded that mortality rates for birds and bats were relatively low. The survey detected a total of 245 bird mortalities, equivalent to 0.66 birds per WTG per year, and 54 bat mortalities, equivalent to 0.13 bats per WTG per year (Hull &amp; Cawthen, 2013). Tree roosting or migratory bats have also been found to be more prone to fatalities at wind farms overseas than other groups and while Australasian studies are limited, a study on the Gould's wattled bat indicates that there is a higher risk of collision fatality for high-flying, open-air foraging bats (Hull &amp; Cawthen, 2013). This puts approximately four of the nine species of microbats in the Study Area at a greater risk, these being:</p>

Impact	Relevance to the Proposed Development
	<ul style="list-style-type: none"> <li>■ yellow-bellied sheathtail;</li> <li>■ Gould's wattled bat;</li> <li>■ large bent-wing bat; and</li> <li>■ white-striped freetail.</li> </ul> <p>Nonetheless, given the small area of habitat occupied by the turbines relative to the entire Study Area, and that the bat species recorded at the Study Area are in moderate to low abundance and tend to forage within the woodland canopy, the risk of bat injury or mortality is regarded as relatively low.</p> <p>It is noted that the identified birds of prey species are capable and have been observed to fly at RSA heights. However, studies committed to birds of prey species, such as the Wedge-tailed Eagle assessed in the Bango Wind Farm Ecological Assessment (2019), identify collisions to occur with a 99% avoidance rate (or approximately 0.28% of individuals). Studies have also indicated that the level of bird use at the site and behaviour are important factors for assessing risk. I.e. raptor fatalities appear to increase as raptor abundance increases; other species appear to avoid collisions with turbines (NWCC, 2010). The impact of collision to birds of prey species, with so few species in the study area, would not be considered adverse.</p> <p>Of the birds surveyed for the proposed development, the vast majority of birds recorded were woodland-dwelling, low-flying species. These species require woodland dominated by <i>Eucalypt</i>, <i>Calitris</i> and <i>Acacia spp.</i>, often with hollows for nesting and roosting habitat (BirdLife, 2019). Woodland species were only observed flying to the maximum height of the woodland canopy, or below.</p> <p>While few studies have been conducted to investigate the significant impacts of RSA on collision incidence, it is considered that passerine species, due to their fast flight patterns and high flight, and migratory species, may be more at risk than other species (Erickson <i>et al.</i>, 2001). The field surveys identified no migratory or passerine species that would be at greater risk to collision.</p> <p>Overall, collision rates are considered to be very low for the majority of Australian bird species, including those recorded at the Study Area and surrounds (Smales, 2005). Empirical evidence shows that birds have a very high rate i.e. 99%, of wind turbine avoidance (Smales, 2005; Whitfield &amp; Madders, 2005; Pendlebury, 2006). This applies to raptor species as well as smaller birds.</p>
Barotrauma	<p>Barotrauma is a result of moving turbines creating a drop in atmospheric pressure at the tip of the turbine blades. This can result in rapid or excessive pressure changes that can cause tissue damage to air-containing structures. Species most at risk of barotrauma are often species of microbats. This is significant as all identified bats within the study area are microbats; however none are listed as threatened or protected under the EPBC Act. Bat mortality as a result of barotrauma is highly contentious and where data is available it can report drastically varied figures such as 1.6 per WTG per year, to over 90 bats per turbine per year (Bango, 2019).</p> <p>It is known that migrating bats have an increased mortality near moving turbine blades at wind farms. However, It should also be noted that studies investigating forensic pathology data strongly suggest that the traumatic injuries (collision) sustained at wind farms is the major cause of bat mortality, and that barotrauma is a very minor cause of bat mortality (Grodskey <i>et al.</i>, 2011; and Rollins <i>et al.</i>, 2012).</p>
Disturbance to MNES and MSES	<p>Disturbance to MNES has been summarised in the impact assessment, in Section 7.</p> <p>See impact assessments in Appendix C and Appendix D.</p>

## 6. MANAGEMENT AND MITIGATION MEASURES

Potential impacts of the proposed activities will be managed in a manner consistent with the management approaches for windfarm activities, and, where relevant, additional measures will be implemented.

Impact and disturbance mitigation will follow a two-stage process, as first highlighted in Section 3.3.1 and throughout other sections of this report. The first element of impact mitigation will be determining turbine design and layout based on avoidance of vegetation and potential habitat mapped, as a result of the field investigation conducted. This will include avoidance of regulated vegetation, TECs and threatened species habitat. The second part of the impact mitigation effort will involve on the ground micro-siting at each location proposed for infrastructure. Such micro-siting will involve on the ground assessments of the potential infrastructure locations to determine if any ecological values, such as threatened species habitat, hollow bearing trees or habitat TECs, occur in that area to influence re-siting of infrastructure.

The management and mitigation measures specific to ecological values identified as a result of this assessment are provided in Table 6.1.

**Table 6-1: Key Management and Mitigation Measures**

Impact	Relevance to the Proposed Development
Clearing remnant and regrowth vegetation and the resultant loss of habitat for native fauna	<ul style="list-style-type: none"> <li>■ The two-stage impact and disturbance mitigation process will be implemented. Areas of remnant and regrowth vegetation will be avoided at the design and micro-siting stages.</li> <li>■ Areas of threatened flora and fauna habitat will be avoided at design and micro-siting stages.</li> <li>■ Where required, a qualified fauna spotter-catcher will conduct a search immediately prior to clearing of vegetation for the presence of fauna species. Where fauna (or important nesting sites for listed threatened fauna) are detected, the spotter catcher will assess and implement the most appropriate method to avoid or minimise impacts as a result of clearing.</li> <li>■ To prevent unnecessary land and vegetation disturbance, vehicles and equipment will be retained within the approved work zone.</li> <li>■ Workers will be made sure of management requirements during inductions and through regular checks during construction.</li> <li>■ A Vegetation Management Plan will be implemented to ensure that clearing is undertaken in accordance with legislative standards and requirements. This Management Plan is attached as Appendix E.</li> </ul>
Indirect impacts to adjacent habitat areas as a result of noise, blasting, dust, runoff and erosion, including impacts to downstream environments	<ul style="list-style-type: none"> <li>■ Dust will be minimised through engineering controls on machinery and other available dust suppression controls, such as sprinklers.</li> <li>■ Where identified, as required a qualified fauna spotter-catcher will conduct a search immediately prior to clearing of vegetation for the presence of fauna species. Where fauna are detected, the spotter catcher will assess and implement the most appropriate method to avoid or minimise impacts on that fauna as a result of clearing.</li> <li>■ Staff and contractors will be made aware through general site induction and training of the potential to generate dust emissions and mitigation and management measures that should be implemented.</li> <li>■ Vehicles, plant and machinery will comply with site-specific speed limits to minimise dust generation.</li> <li>■ Sediment and erosion control to be managed in accordance with the Queensland Erosion and Sediment Control Plan and the Contractor's erosion and sediment control procedures.</li> <li>■ Where required, watercourse crossing points will be adequately stabilised to prevent erosion.</li> <li>■ Construction activities must not interfere or block natural drainage e.g. disturbing channel contours.</li> <li>■ Water barrier works must not occur, that would impact on the movement of fish.</li> </ul>

Impact	Relevance to the Proposed Development
<p>Indirect impacts to adjacent habitat areas as a result of an introduction or spread of weed and pest species</p>	<ul style="list-style-type: none"> <li>■ A biosecurity plan will be developed and implemented for the Project. This will include measures such as vehicle wash downs, weed certification and obligations to stick to access tracks throughout the Study Area.</li> <li>■ Activities will be planned so that movement of vehicles, plant, machinery and equipment avoid moving between properties as required.</li> <li>■ Access to a landholder's property will not occur unless authorised under a landuse agreement.</li> <li>■ Weed management and control methods will depend upon the location, weed species identified, the degree of the infestation, relevant landholder agreement or conduct and compensation agreements provisions, and local, state and national regulatory requirements.</li> <li>■ Imported material able to transport weed seed will be assessed to ensure they are free of contamination, disease and invasive weeds.</li> <li>■ WONS and Restrictive Invasive species will be identified and monitoring in the Study Area. Appropriate weed monitoring will occur to ensure new weed species are identified and recorded.</li> <li>■ Staff and contractors will be given information on the location and consequences of biosecurity threats in the Study Area.</li> </ul>
<p>Direct mortality or injury to native fauna during construction and operations</p>	<ul style="list-style-type: none"> <li>■ Where identified as required a qualified fauna spotter-catcher will conduct a search immediately prior to clearing of vegetation for the presence of fauna species. Where fauna are detected, the spotter catcher will assess and implement the most appropriate method to avoid or minimise impacts on that fauna as a result of clearing.</li> <li>■ No driving will occur in unauthorised areas, and will be carried out at safe speeds that are designated for the Study Area.</li> <li>■ Injured, sick or dead fauna will be recorded and reported, during and after the construction and operation phases. This can be carried out by a fauna spotter-catcher.</li> </ul>
<p>Fragmentation of connectivity areas</p>	<ul style="list-style-type: none"> <li>■ Infrastructure will be located preferentially avoiding, then minimise isolating, fragmenting, edge effects or dissecting tracts of native vegetation.</li> <li>■ Turbines will maximise the use of areas that are less vegetated, to avoid and minimise clearing of mature trees. This can be achieved across many parts of the Study Area given the highly cleared nature of the landscape with low density of larger patches of remnant vegetation.</li> <li>■ Clear marking of areas to be impacted and non-impacted, ensuring that the clearing footprint does not extend further than expected to create unnecessary fragmentation.</li> </ul>
<p>Impacts from turbine collision</p>	<ul style="list-style-type: none"> <li>■ The two-stage impact and disturbance mitigation process will be implemented. Areas of bird habitat will be avoided in the design and then further avoided when micro-siting occurs.</li> <li>■ Development of a Bird and Bat Management Plan that considers the impacts that will occur to birds and mitigation measures to address these is attached in Appendix G.</li> </ul> <p>Measures to address potential collision risk include the following which have been successfully applied to avoid bird and bat mortalities in the United States (Arnett, 2013):</p> <ul style="list-style-type: none"> <li>■ Locating turbines away from key bird and bat habitats (waterways and drainage lines); and</li> <li>■ Through design of a turbine with a blade sweep area &gt;40 m above ground level to provide a collision-free foraging zone within the canopy and 20 m above the canopy; and</li> <li>■ Low wind speed curtailment where rotors are feathered to prevent turning at wind speeds below the manufacturer's cut in speed of 3 m/s.</li> </ul>



Impact	Relevance to the Proposed Development
Barotrauma	<ul style="list-style-type: none"> <li>■ As mentioned for impacts from turbine collision, a Bird and Bat Management Plan has been designed to assist in mitigating impacts to bats, including additional surveys prior to determining final design. It is found in Appendix G.</li> <li>■ Impact mitigation is mainly ensuring the turbine layout largely avoids microbat habitat, which includes woodlands and open forests.</li> <li>■ Additionally, reducing lights on operating turbines will help to reduce insect presence, thus limiting potential feeding opportunities for bats close to the turbines.</li> </ul>
Disturbance to MNES and MSES	<ul style="list-style-type: none"> <li>■ Specific Management Plans will be developed to manage and mitigate impacts to listed threatened species known or likely to occur within the Study Area. Such plans include a Fauna Management Plan (attached as Appendix F) and a Vegetation Management Plan (attached as Appendix E).</li> <li>■ Vegetation will only be removed that has been approved to be cleared;</li> <li>■ Micro-siting will occur at all potential turbine locations and areas deemed to contain koala and greater glider habitat will largely be avoided. Koala habitat will be searched by a spotter catcher before clearing, and trees will not be removed that have active koalas in them;</li> <li>■ Where disturbance to threatened species habitat (or potential TEC habitat) has to occur, individuals and surrounding micro-habitat features (like logs etc.) will be translocated to suitable areas (if possible).</li> </ul>



## 7. IMPACT ASSESSMENT

### 7.1 MNES Impact Assessment

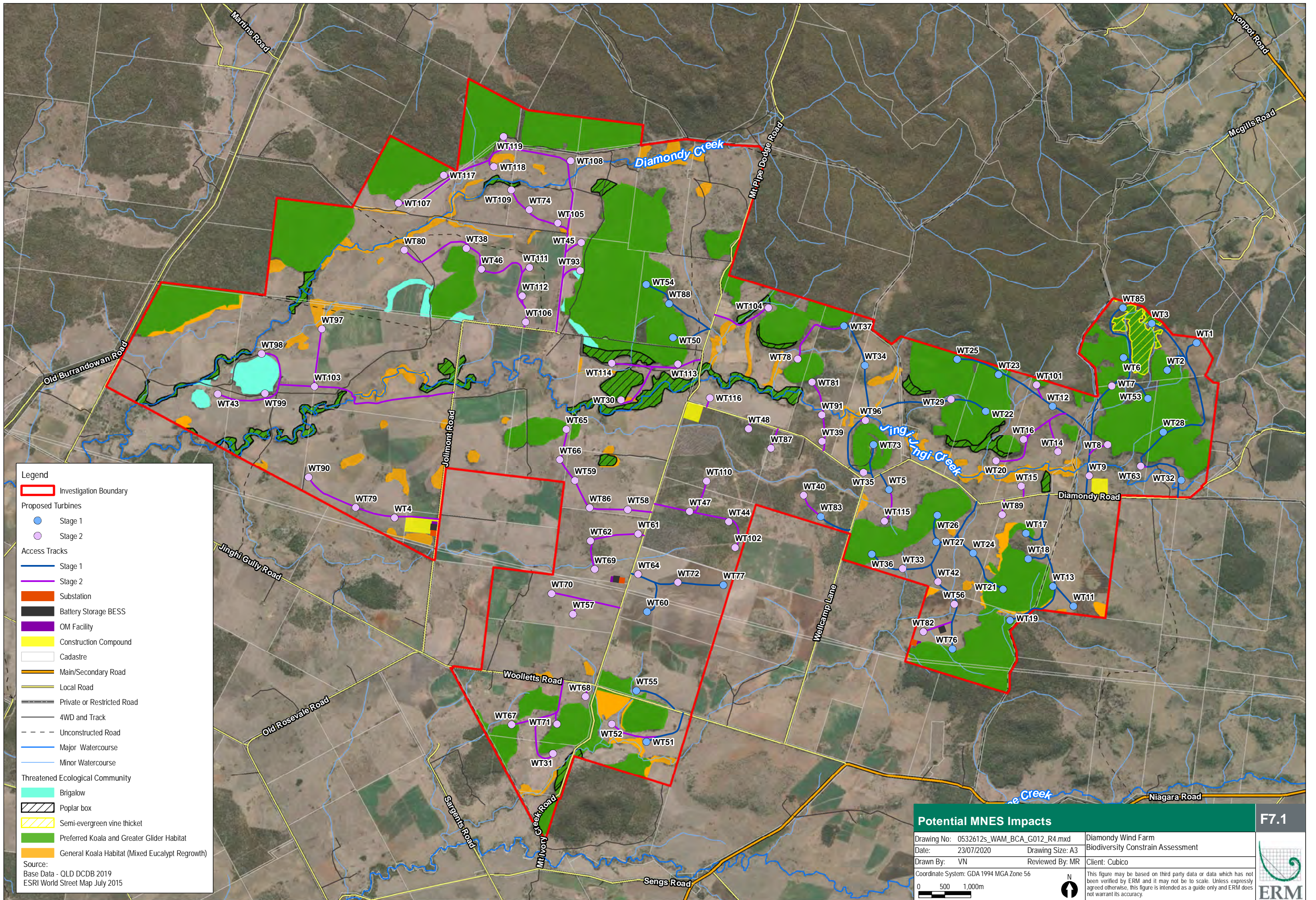
The significance of impacts to MNES are determined against the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (SIG 1.1) (DoE, 2013), assuming the controls and mitigation measures in Section 6 are implemented. Seven MNES were identified as part of this ecological assessment and a summary of the results of the significant impact assessments can be found below in Table 7-1. Figure 7-1 highlights the development footprint that will potentially affect MNES within the Study Area. Note, it is likely that the actual area of disturbance may be lower than that documented in this impact assessment, as a result of further avoidance associated with micro-siting pre-clearance surveys. Detailed significant impact assessments for each MNES, in accordance with guidelines, is provided in Appendix C.

**Table 7-1: MNES Significant Impact Assessment Summary**

Matter	Study Area (ha)	Indicative Development Footprint (ha)	Comments	Impact Significance
koala	3,150.4 ha (remnant) 411.9 ha (regrowth – DNRME mapped regrowth and other mixed eucalypt species regrowth)	21.2 ha (remnant) 0.2 ha (regrowth)	As the proposed disturbance to habitat critical to the survival of the koala (habitat score seven) is approximately 21.4 ha (0.6% of available koala habitat within the Study Area), the proposed development is unlikely to have an adverse effect on habitat critical to the survival of the koala. Additionally, due to further avoidance of koala habitat during micro siting, the already highly disturbed nature of the Study Area, the measures adopted to ensure biosecurity risks are minimised, the proposed development is unlikely to interfere with the recovery of the koala.	Not significant
greater glider	3,150.4 ha	21.2 ha	This species was conservatively concluded to be present as an important population. However, the proposed disturbance will only impact 21.2 ha (0.7% of available greater glider habitat) of greater glider habitat within the Study Area. Additionally, impact and disturbance mitigation will further avoid potential greater glider habitat via micro siting, and moving turbine locations to avoid large hollow bearing trees. Overall, the small proportion of clearings that occur in a dispersed nature across the already highly modified Study Area, are unlikely to have a significant impact on the greater glider.	Not significant
white-throated needletail	Not mapped (entirely aerial use of Study Area)	N/A ha	The white-throated needletail is a highflying hawking species that is an occasional visitor to Australia, but does not breed within central Queensland. Additionally, its migratory flightpath, which traverses the coastal extent of the Australia's eastern coast, does not occur over the Study Area. For these reasons, the Study Area is not regarded as important habitat for this species, and is unlikely to contain an ecologically significant proportion of the population. Therefore, the proposed development is unlikely to lead to a significant impact to the white-throated needletail.	Not significant

Matter	Study Area (ha)	Indicative Development Footprint (ha)	Comments	Impact Significance
glossy ibis	Not mapped (no suitable breeding or foraging habitat within the Study Area)	N/A ha	The glossy ibis has preferred breeding habitats in areas mainly restricted to NSW and Victoria. Additionally, the Study Area is highly modified. The waterways and dams that are present and that could be regarded as glossy ibis foraging habitat, are highly degraded and of low habitat value. For these reasons, the Study Area is not regarded as important habitat for this species, and is unlikely to contain an ecologically significant proportion of the population. Therefore, the proposed development is unlikely to lead to a significant impact to the glossy ibis.	Not significant
Brigalow TEC	97.6 ha potential habitat for Brigalow TEC	0 ha	No habitat critical to survival of the TEC has been identified in the Study Area. However potential Brigalow TEC habitat associated with constituent RE 11.9.5 occurs, and has been avoided through layout and design.	No impact
Poplar Box TEC	315.3 ha potential habitat for Poplar Box TEC	0 ha	No habitat critical to survival of the TEC has been identified in the Study Area. However, potential Poplar Box TEC habitat associated with constituent RE 11.3.2 occurs, and has been avoided through layout and design.	No impact
SEVT TEC	58.0 ha potential habitat for SEVT TEC	0 ha	No habitat critical to survival of the TEC has been identified in the Study Area. However potential SEVT TEC habitat associated with constituent RE 11.8.3, occurs, and has been avoided through project layout and design.	No impact





**Legend**

- Investigation Boundary
- Proposed Turbines
  - Stage 1
  - Stage 2
- Access Tracks
  - Stage 1
  - Stage 2
- Substation
- Battery Storage BESS
- OM Facility
- Construction Compound
- Cadastre
- Main/Secondary Road
- Local Road
- Private or Restricted Road
- 4WD and Track
- Unconstructed Road
- Major Watercourse
- Minor Watercourse
- Threatened Ecological Community
  - Brigalow
  - Poplar box
  - Semi-evergreen vine thicket
  - Preferred Koala and Greater Glider Habitat
  - General Koala Habitat (Mixed Eucalypt Regrowth)

Source:  
 Base Data - QLD DCDB 2019  
 ESRI World Street Map July 2015

Potential MNES Impacts		F7.1
Drawing No: 0532612s_WAM_BCA_G012_R4.mxd	Diamondy Wind Farm	
Date: 23/07/2020	Drawing Size: A3	Biodiversity Constrain Assessment
Drawn By: VN	Reviewed By: MR	Client: Cubico
Coordinate System: GDA 1994 MGA Zone 56		
0 500 1,000m	N	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.



## 7.2 MSES Impact Assessment

The two MSES within the Study Area have been considered for significant residual impact in accordance with the Queensland Environmental Offsets Policy Significant Residual Impact Guideline – Sustainable Planning Act 2009 (SRI) (DEHP 2014), with the outcomes summarised in Table 7.2. Appendix D highlights the development footprint that will potentially affect MSES within the Study Area. Note, it is likely that the actual area of disturbance may be lower than that documented in this impact assessment, as a result of further avoidance associated with micro-siting pre-clearance surveys. These outcomes assume the controls and mitigation measures in Section 6 are implemented.

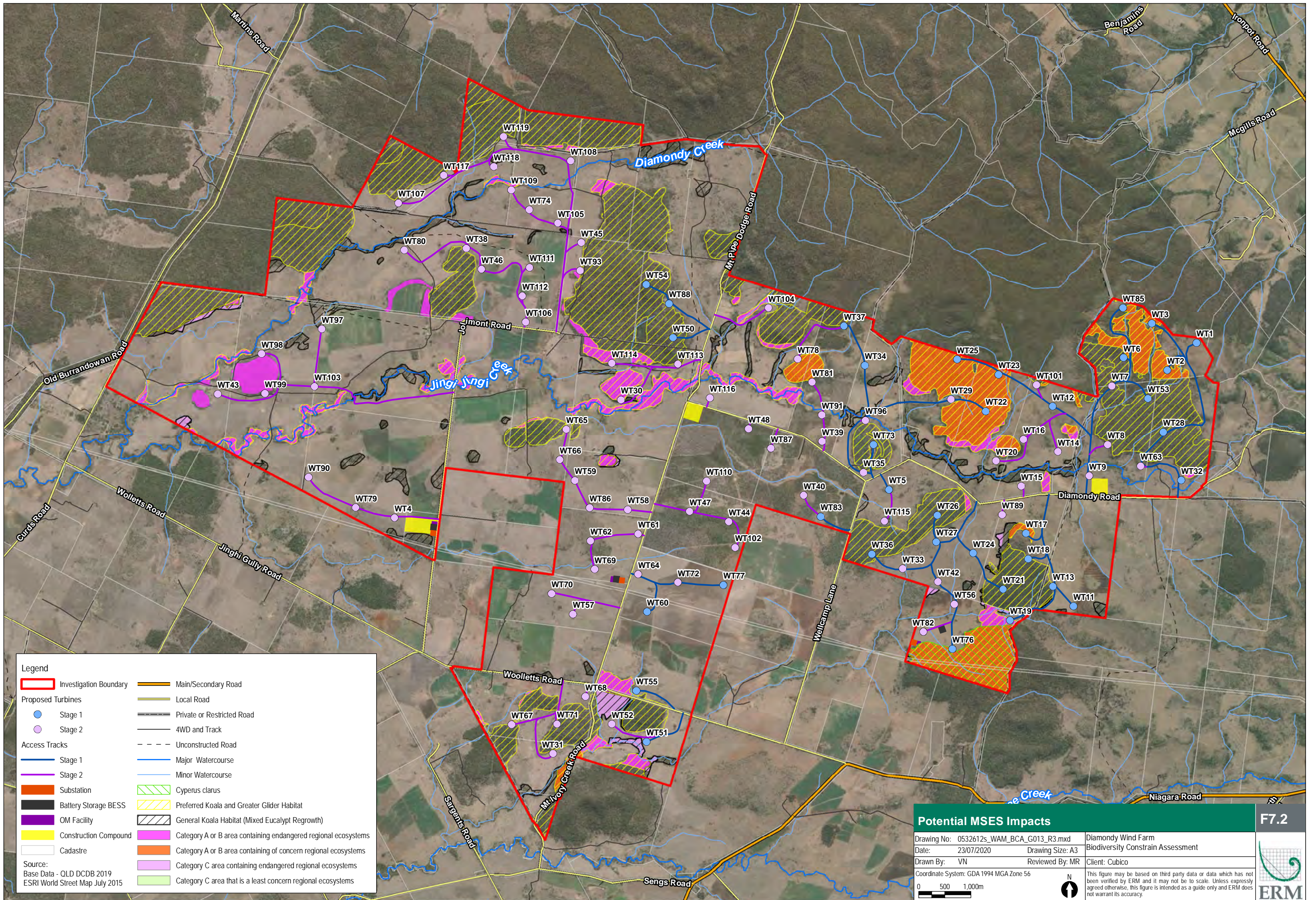
**Table 7-2: MSES Significant Residual Impact Assessment Summary**

Matter	Impact Test	Will the action cause a SRI
Regulated vegetation	<ol style="list-style-type: none"> <li>1. Category B remnant vegetation: There is 8.2 ha of Of Concern Category B (REs 11.8.3, 11.9.4a and 11.9.7) (and 0 ha of Endangered REs) remnant vegetation within the development footprint. According to the SRI guidelines, an impact of greater than 5 ha to Of Concern remnant vegetation, results in a SRI.</li> <li>2. Category C high value regrowth: There is no disturbance to Category C high value regrowth.</li> <li>3. Defined distance of a watercourse: In accordance with the SRI guideline, no waterway crossings will exceed the 25 m width linear clearing of remnant vegetation within the defined distance of a stream order 1 or 2 watercourse. Additionally, in accordance with the SRI guideline revegetation and sediment control will occur and crossing design will not interfere with existing aquatic and terrestrial habitats of the watercourse. Thus, no SRI will result.</li> </ol>	<ol style="list-style-type: none"> <li>1. SRI for impacts to Of Concern REs (11.8.3, 11.9.4a, 11.9.7)</li> <li>2. No SRI triggered</li> <li>3. No SRI triggered</li> </ol>
Protected wildlife habitat (EN, VU or SLC species)	<p>The area of habitat for protected wildlife within the indicative Development Footprint is:</p> <ul style="list-style-type: none"> <li>■ 21.4 ha of koala habitat (21.2 ha preferred and 0.2 ha general habitat – 0.6% of total habitat available);</li> <li>■ 21.2 ha of greater glider preferred habitat (0.7% of total habitat available);</li> <li>■ 372.0 ha of short-beaked echidna general habitat (2.9% of the total habitat available); and</li> <li>■ 0.5 ha of <i>Cyperus clarus</i> preferred habitat (0.3% of the total habitat available).</li> </ul> <p>Impacts to the size of the population, extent of occurrence, connectivity, contribution to threats, interference with recovery and disruption to ecologically significant locations are considered when assessed against the relevant guidelines. The impact assessment, against the <i>Queensland Environmental Offsets Policy - Significant Residual Impact Guideline</i> for each species, is contained within Appendix D. Given the small scale and dispersed nature of impacts, as well as the existing, highly disturbed nature of the Study Area, it is unlikely that there will be a SRI to these species.</p>	No SRI triggered

### 7.3 State Code 16 Requirements

This proposed development is assessable under State Code 16: Native Vegetation Clearing (State Code 16). Table 7-3 details the performance and acceptable outcomes of the State Code 16 that relate to regulated vegetation, wetlands, watercourses, essential habitat and connectivity in the Study Area, and whether the proposed development complies with such outcomes.





**Legend**

Investigation Boundary	Main/Secondary Road
Proposed Turbines Stage 1	Local Road
Proposed Turbines Stage 2	Private or Restricted Road
Access Tracks Stage 1	4WD and Track
Access Tracks Stage 2	Unconstructed Road
Substation	Major Watercourse
Battery Storage BESS	Minor Watercourse
OM Facility	Cyperus clarus
Construction Compound	Preferred Koala and Greater Glider Habitat
Cadastre	General Koala Habitat (Mixed Eucalypt Regrowth)
Source: Base Data - QLD DCDB 2019 ESRI World Street Map July 2015	Category A or B area containing endangered regional ecosystems
	Category A or B area containing of concern regional ecosystems
	Category C area containing endangered regional ecosystems
	Category C area that is a least concern regional ecosystems

Potential MSES Impacts		F7.2
Drawing No: 0532612s_WAM_BCA_G013_R3.mxd	Diamondy Wind Farm	
Date: 23/07/2020	Drawing Size: A3	Biodiversity Constrain Assessment
Drawn By: VN	Reviewed By: MR	Client: Cubico
Coordinate System: GDA 1994 MGA Zone 56		
0 500 1,000m		N
<p>This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.</p>		



**Table 7-3: State Code 16 Provisions relevant to the Study Area**

Performance outcome	Acceptable outcome	Response
<i>Clearing associated with wetlands (public safety, relevant infrastructure activities consequential development of IPA approval, a coordinated project, extractive industry)</i>		
PO7: Clearing maintains the current extent of vegetation associated with any natural wetland to protect: <ol style="list-style-type: none"> <li>bank stability by protecting against bank erosion; and</li> <li>water quality by filtering sediments, nutrients and other pollutants; and</li> <li>aquatic habitat; and terrestrial habitat.</li> </ol>	AO7.1: Clearing does not occur in a natural wetland or within 100 m of the defining bank of any natural wetland.	<b>Complies with AO7.1</b> – There are no mapped wetlands within the Study Area.
	OR AO7.2: Clearing within 100 m of the defining bank of any natural wetland: <ol style="list-style-type: none"> <li>does not occur within 10 m of the defining bank of any natural wetland; and</li> <li>does not exceed widths in table 16.3.1 in this code.</li> </ol>	Not Applicable - <b>Complies with AO7.1</b>
	OR AO7.3: Where clearing cannot be reasonably avoided, and clearing has been reasonably minimised, an offset is provided for any acceptable significant residual impact from clearing of vegetation associated with a natural wetland (matter of state environmental significance).	Not Applicable - <b>Complies with AO7.1</b>
<i>Clearing associated with watercourses and drainage features (public safety, relevant infrastructure activities, consequential development of IPA approval, coordinated project, extractive industry)</i>		
PO11: Clearing maintains the current extent of vegetation associated with any watercourse or drainage feature to protect: <ol style="list-style-type: none"> <li>bank stability by protecting against bank erosion; and</li> <li>water quality by filtering sediments, nutrients and other pollutants; and</li> </ol>	AO11.1: Clearing does not occur in any of the following areas: <ol style="list-style-type: none"> <li>inside the defining bank of a watercourse or drainage feature; and</li> <li>within the relevant distance of the defining bank of any watercourse or drainage feature in table 16.3.2 of this code.</li> </ol>	<b>Complies with AO11.3</b> - Clearing within watercourses will be required to facilitate access throughout the site. The access tracks have been designed to avoid areas where regulated vegetation intersects a watercourse where possible, and utilises existing access tracks where available and agreements can be reached with landowners.
	OR	There are a number of locations where removal of vegetation within the watercourse is unavoidable. This includes access tracks associated with WT19, WT6, WT85, WT23 and WT25.

Performance outcome	Acceptable outcome	Response
<p>3. aquatic habitat; and terrestrial habitat.</p>	<p>AO11.2: Clearing within any watercourse or drainage feature, or within the relevant distance of the defining bank of any watercourse or drainage feature in table 16.3.2 of this code:</p> <ol style="list-style-type: none"> <li>1. does not exceed the widths in table 16.3.1 of this code; and</li> <li>2. does not occur within 10 m of the defining bank, unless clearing is required into or across the watercourse or drainage feature.</li> </ol> <p>OR</p> <p>AO11.3: Where clearing cannot be reasonably avoided, and clearing has been reasonably minimised, an offset is provided for any acceptable significant residual impact from clearing of vegetation associated with any watercourse or drainage feature (a matter of state environmental significance).</p>	<p>With the exception of WT23 and WT25 which require new access tracks, the other locations utilise existing access crossings.</p> <p>Vegetation clearing associated with WT23 and WT25 occurs within an area identified as containing Of Concern Regional Ecosystems, including a mix of Of Concern RE 11.8.3 (40%) and Least Concern RE 11.5.1 (30%), and RE 11.10.1 (30%). The Least Concern REs are identified as having a sparse structure category, while the Of Concern RE is identified as structurally dense.</p> <p>Clearing within defined distances of watercourses must not exceed thresholds listed in Table 16.3.1. Clearing must not exceed 20 m in width for sparse REs and 10 m for dense REs. There are a number of waterway crossings in Least Concern remnant vegetation that is categorised as structurally sparse. This will not exceed the State Code 16 threshold of 20 m clearings for sparse REs. There are also a number of waterway crossings impacting Of Concern (REs 11.8.3 and 11.9.4a) remnant vegetation that is categorised as structurally dense. This will not exceed the State Code 16 threshold of 10 m clearings for dense REs. The watercourse crossings comply with Table 16.3.1.</p>
<p><i>Maintaining connectivity (public safety, relevant infrastructure activities, consequential development of IPA approval, extractive industry)</i></p>		
<p>PO16: In consideration of vegetation on the land subject to the development application and on adjacent land, sufficient vegetation is retained to maintain ecological processes and remains in the landscape despite threatening processes.</p>	<p>AO16.1: Clearing occurs in accordance with table 16.3.3 in this code.</p>	<p><b>Complies with AO16.1</b> - The Study Area is largely cleared (71.3%) with the occurrence of some remnant vegetation (25.5%) and regrowth vegetation (3.2%). The main connectivity areas, within the 5 km and 20 km radius, are to the north of the Study Area (Diamondy State Forest) and to the south of the Study Area (Bunya Mountains National Park), and will not be affected by the proposed development. The remnant vegetation within the Study Area is largely not connected to these areas.</p> <p>The proposed development complies with Table 16.3.3 as clearing does not:</p> <ol style="list-style-type: none"> <li>1. occur in areas of vegetation that are less than 50 ha; and</li> <li>2. reduce the extent of vegetation to less than 50 ha; and</li> <li>3. occur in areas of vegetation less than 200 m wide; and</li> </ol>

Performance outcome	Acceptable outcome	Response
		<p>4. reduce the width of vegetation to less than 200 m; and</p> <p>5. occur where the extent of vegetation on the subject lot(s) is reduced to, or less than, 30% of the total area of the lot(s).</p>
<p><i>Conserving endangered and of concern regional ecosystems (public safety and relevant infrastructure activities, consequential development of Integrated Planning Act 1997 approval, coordinated project, extractive industry)</i></p>		
<p>PO23: Clearing maintains the current extent of endangered regional ecosystems and of concern regional ecosystems.</p>	<p>AO23.1: Clearing does not occur in an endangered regional ecosystem or an of concern regional ecosystem.</p> <p>OR</p> <p>AO23.2: Total clearing of endangered regional ecosystems and of concern regional ecosystems combined does not exceed the widths prescribed in table 16.3.1 of this code.</p> <p>OR</p> <p>AO23.3: Total clearing of endangered regional ecosystems and of concern regional ecosystems combined does not exceed areas prescribed in table 16.3.1 of this code.</p> <p>OR</p> <p>AO23.4: Where clearing cannot be reasonably avoided, and clearing has been reasonably minimised, an offset is provided for any acceptable significant residual impact from clearing of endangered regional ecosystems and of concern regional ecosystems (a matter of state environmental significance).</p>	<p><b>Alternative Solution</b> – The vegetation clearing proposed has been minimised as much as practical through the design process. Project design specifically aims to avoid disturbance to ‘Endangered’ RE, and minimises impacts to ‘Of Concern’ RE to 8.2 ha. There are 13 WTGs which remain in vegetated areas, including five (5) WTGs within the ‘Of Concern’ RE (WT25, WT2, WT22, WT17, WT23 and WT25). The impacts associated with these WTGs in particular are unavoidable as they represent areas with the highest wind yield and are not subject to landowner constraints. The areas identified as containing ‘Of Concern’ RE include a mix of ‘Least Concern’ RE 11.10.1 (30%) and RE 11.5.1 (30%), and ‘Of Concern’ RE 11.8.3 (40%). The ‘Least Concern’ REs are identified as having a ‘Sparse’ structure category, while the ‘Of Concern’ RE is identified as ‘Dense’. Having regard for this, the proposed clearing does not comply with the outcomes of Table 16.3.1 as the clearing involves 8.2 ha of Of Concern RE. The Ecological Assessment includes a Significant Residual Impact Assessment, concluding that offsets will be required.</p>

Performance outcome	Acceptable outcome	Response
<i>Essential habitat (public safety, relevant infrastructure activities, consequential development of Integrated Planning Act 1997 approval, coordinated project, extractive industry, fodder harvesting)</i>		
<p>PO24: Clearing maintains the current extent of essential habitat.</p>	<p>AO24.1: Clearing does not occur in essential habitat.</p> <p>OR</p> <p>AO24.2: Clearing in essential habitat does not exceed the widths prescribed in table 16.3.1 of this code.</p> <p>OR</p> <p>AO24.3: Clearing in essential habitat does not exceed the areas prescribed in table 16.3.1 of this code.</p> <p>OR</p> <p>AO24.4: Where clearing cannot be reasonably avoided, and clearing has been reasonably minimised, an offset is provided for any acceptable significant residual impact from clearing of essential habitat (a matter of state environmental significance).</p>	<p><b>Complies with AO24.1</b> – The Study Area does not contain any essential habitat.</p>



## 8. CONCLUSION

To assess the potential impact to ecological values associated with the proposed development, an ecological assessment was undertaken to determine the ecological values within the Study Area. The ecological assessment included one field assessment undertaken in November 2019, and a desktop assessment using a number of publicly available databases, mapping, aerial imagery and publicly available reports.

The majority of the Study Area consists of non-remnant grasslands and cleared areas. RE mapping shows the majority of vegetation within the Study Area is classified as REs classed as Least Concern and Of Concern (under the VM Act). There is a small area that contains remnant vegetation classified as Endangered (under the VM Act). The DNRME mapping is generally consistent with on-ground observations from the field investigation. The condition of vegetation within the Study Area is highly modified as a result of previous and current land management practices (agriculture and cattle grazing). Much of the remnant vegetation occurs in small to medium sized patches throughout the landscape, with some vegetation in the north and eastern sections of the Study Area connected to vegetation adjacent to the Study Area, including Diamondy State Forest. There are some riparian areas and small farm dams that occur throughout the Study Area. However, these are regarded as providing low ecological value due to degradation from heavy exposure from cattle.

In total, three EPBC Act listed threatened species (including the koala and greater glider) and two listed migratory species were identified as known or likely to occur in the Study Area. A total of three MNES TECs were identified as having potential habitat occurring within the Study Area. MSES triggered for the Study Area included four NC Act listed species and regulated vegetation.

The project layout (including location of turbines, access tracks, batching plant, laydown areas, substation etc.) has gone through a number of iterations over a six month period. The objective of the design process has been to consider access to wind resource in combination with avoidance of ecological values. The potential impacts during construction, operation and decommissioning have also been identified and evaluated, with a number of proposed management measures to mitigate impacts. Importantly, a process of pre-clearance surveys prior to construction of the proposed development footprint to support micro sighting and adjustments of infrastructure to further avoid ecological values is a key commitment.

The proposed development will occur across a 372.0 ha development footprint, and will lead to the clearing of 21.4 ha of habitat critical to the survival of the koala (habitat score of seven) (0.6% of total available habitat), 21.2 ha of habitat for an important population of the greater glider (0.7% of total available habitat) and 372.0 ha of general habitat for the echidna (2.9% of total available habitat). For each of the three TECs with potential to occur within the Study Area, that layout design has avoided potential TEC habitat.

Significant impact assessments were undertaken against the relevant MNES and MSES impact assessment guidelines, and it was concluded that there was unlikely to be a significant impact to listed threatened species, migratory species and TECs listed under the EPBC Act. Furthermore, it was concluded that there was unlikely to be significant residual impact to NC Act listed threatened species. However, a significant residual impact was triggered for Category B (Of Concern vegetation) MSES with the clearing of 8.2 ha of Of Concern REs, and will require offsetting.

A suite of management and mitigation measures have been proposed to further reduce impacts, including the development of specific Management Plans. The Management Plans include:

- Fauna Management Plan;
- Vegetation Management Plan; and
- Bird and Bat Management Plan.

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## **APPENDIX A      LIKELIHOOD OF OCCURRENCE**

Scientific Name	Common Name	Status (EPBC Act)	Status (NC Act)	Habitat Description	Suitable or preferred habitat	Records in study area	Records in locality	Distribution in locality	Likelihood of occurrence
<b>Birds (including listed migratory birds)</b>									
<i>Anthochaera phrygia</i>	regent honeyeater	CE	CE	It primarily occurs in box-ironbark woodland, but also occurs in other forest types. The species primarily feeds on nectar and, to a lesser extent, insects and their exudates (lerps and honeydew). It mainly feeds on nectar from eucalypts and mistletoes and it prefers taller and larger diameter trees for foraging.	Yes- general habitat of open forests present. No preferred mistletoe present.	No	No	Yes	Potential
<i>Calidris ferruginea</i>	curlew sandpiper	CE, M	E	This species can occur inland, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters.	Yes- general habitat of water dam present. No preferred water courses with mud or sand.	No	No	Yes	Potential
<i>Erythrotriorchis radiatus</i>	red goshawk	V	V	This species likes wooded and forested lands of tropical and warm-temperate Australia. Forests of intermediate density are favoured, or ecotones between habitats of differing densities, e.g. between rainforest and eucalypt forest, between gallery forest and woodland, or on edges of woodland and forest where they meet grassland, cleared land, roads or	Yes- general habitat of wooded forests present. No preferred ecotones present.	No	No – Additionally, this species was flagged in desktop search areas for the Dulacca or Cooper's Gap	Yes	Potential

				watercourses. This species has a large home range.			Windfarm, but not located in field surveys.		
<i>Geophas scripta scripta</i>	southern squatter pigeon	V	V	Squatter pigeon (southern) habitat is generally defined as open-forests to sparse, open-woodlands and scrub that are mostly dominated by Eucalyptus, Corymbia or Callitris species. Additionally they also favour remnant regrowth or partly modified vegetation communities that are within 3 km of water bodies.	Yes – general habitat present in grasslands but no water sources for preferred habitat.	No	No	Yes	Potential
<i>Grantiella picta</i>	painter honeyeater	V	V	The painter honeyeater lives in dry, open forests and woodlands. The species usually occurs in areas with flowering and fruiting mistletoe and flowering Eucalypts.	Yes – general open forest and woodland habitat present without preferred mistletoe.	No	No	Yes	Potential
<i>Hirundapus caudacutus</i>	white-throated needletail	V, M	V	According to Higgins (1999), this species occurs over most types of habitat, but are recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland (as cited in DSEWPC, 2019b).	Yes – no habitat present as species is aerial. But general areas where they will fly over, including open forests are present.	No	Yes	Yes	Likely

<i>Lathamus discolor</i>	swift parrot	CE	E	This bird mainly occurs in the eucalypt forests where it forages on flowers and psyllid lerps. This bird mainly occurs on inland slopes and occasionally is found on the coast.	Yes – general habitat of eucalypt forests are present, but a lack of psyllid lerps and coastal areas for preferred habitat.	No	No	Yes	Potential
<i>Rostratula australis</i>	Australian painted snipe	E	V	The Australian painted snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Marchant & Higgins (1993) stated that the Australian painted snipe can use modified habitats, such as low-lying woodlands converted to grazing pasture, sewage farms, dams, bores and irrigation schemes, however they do not necessarily breed in such habitats (as cited in DoE, 2019d).	No – no shallow terrestrial freshwater wetlands present.	No	No	Yes	Unlikely
<i>Turnix melanogaster</i>	black-breasted button-quail	V	V	The black-breasted button-quail is restricted to rainforests and forests, mostly in areas with 770-1200 mm rainfall per annum. Smyth <i>et al.</i> (2001) found that in south-eastern Queensland, they are recorded on rare occasions in open eucalypt forest (as cited in DoE, 2019e).	Yes – general habitat of forests present. Lack of preferred rainforests.	No	No – this species was not recorded in field surveys undertaken at the Cooper's Gap and Dulacca windfarms.	Yes	Potential



<i>Actitis hypoleucos</i>	common Sandpiper	M	SLC	The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats. The common sandpiper has been recorded in estuaries and deltas of streams, as well as on banks farther upstream; around lakes, pools, billabongs, reservoirs, dams and claypans, and occasionally piers and jetties.	No – no suitable coastal or wetland habitats, with suitable muddy or rocky margins, present.	No	No	Yes	Unlikely
<i>Cuculus optatus</i>	oriental cuckoo	M	SLC	The species is found in forest canopy, open wooded areas and orchards, often in hill country, also in coniferous forest and in birch ( <i>Betula</i> ) above the treeline. The species may occur in association with remnant and regrowth RE types 11.3.2, 11.3.25, 11.9.4 11.9.5, 11.9.5a, 11.9.10, 11.3.19, 11.5.1 within a project area. The species winters in many different countries, including the coastal parts of northern and eastern Australia (BirdLife International, 2015).	Yes – general habitat present, with suitable RE types.	No	Yes	Yes	Potential
<i>Monarcha trivirgatus</i>	spectacled monarch	M	SLC	The spectacled monarch prefers thick understorey in rainforests, wet gullies and waterside vegetation, as well as mangroves.	No – no thick understorey in rainforest habitat present.	No	No	Yes	Unlikely

<i>Motacilla flava</i>	yellow wagtail	M	SLC	Habitat requirements for the yellow wagtail are highly variable, but typically include open grassy flats near water. Habitats include open areas with low vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves (Garnett <i>et al.</i> , 2010). This species may occur in association with non-remnant vegetation.	Yes – preferred open grasslands and some farm dams present.	No	No	Yes	Potential
<i>Calidris melanotos</i>	pectoral sandpiper	M	SLC	In Australasia, the pectoral sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	No – no shallow fresh or saline wetlands or coastal habitats present.	No	No	Yes	Unlikely
<i>Pandion haliaetus</i>	osprey	M	V	This species occurs in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are found in lakes, large waterholes, beaches, coastal cliffs as well as inshore waters, bays and reefs.	No – no coastal or wetland habitats present.	No	No	Yes	Unlikely
<i>Apus pacificus</i>	fork-tailed swift	M	SLC	In Australia, they occur over cliffs and beaches and also over islands and sometimes well out to sea. They also occur over settled areas, including towns, urban areas and cities. They mostly occur over dry or open habitats,	Yes – general habitat over dry open habitats present. Lack of preferred	No	No – Closest record is 25 km south of the Study Area (2015). Additionally, this	Yes	Unlikely

				including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh.	coastal and riparian heathland or swamp habitat.		species was recorded flying over the Dulacca Windfarm site, 100km west of the Study Area.		
<i>Monarcha malanopsis</i>	black-faced monarch	M	SLC	The black-faced monarch mainly occurs in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest.	No – no rainforest habitat present.	No	Yes	Yes	Unlikely
<i>Myiagara cyanoleuca</i>	satin flycatcher	M	SLC	Satin flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in drier woodlands and open forests.	Yes – general habitat of eucalypt forests present. Lack of preferred breeding, foraging habitat.	No	No	Yes	Unlikely
<i>Rhipidura rufifrons</i>	rufous fantail	M	SLC	In east and south-east Australia, the rufous fantail mainly inhabits wet sclerophyll forests, often in gullies dominated by eucalypts such as tallow-wood ( <i>Eucalyptus microcorys</i> ) and mountain grey gum ( <i>E. cypellocarpa</i> ). When on passage, they are sometimes recorded in drier sclerophyll forests and woodlands,	Yes – general habitat of eucalypt forests present but a lack of wet sclerophyll forests for	No	No	Yes	Unlikely

				including spotted gum ( <i>E. maculata</i> ), yellow box ( <i>E. melliodora</i> ), ironbarks or stringybarks, often with a shrubby or heath understorey.	preferred habitat.				
<i>Plegadis falcinellus</i>	glossy ibis	M	SLC	Preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds, rice-fields and cultivated areas under irrigation. Generally roosts in trees or shrubs in areas close to water bodies.	Yes – general habitat of farm dam water source with some shrubs present. Lack of preferred water sources and riparian areas.	No	Yes	No	Likely
<i>Calidris acuminata</i>	sharp-tailed sandpiper	M	SLC	Prefers habitat on muddy edges of freshwater wetlands or brackish wetlands. Can be found at dam inland. Will often occupy coastal mudflats when ephemeral terrestrial wetlands have dried out.	No – no suitable muddy flats present.	No	Yes	Yes	Potential
<i>Gallinago hardwickii</i>	Latham's snipe	M	SLC	They usually occur in open, freshwater wetlands that have some form of shelter (usually low and dense vegetation) nearby. They generally occupy flooded meadows, seasonal or semi-permanent swamps, or open waters, but various other freshwater habitats can be used including bogs, waterholes, billabongs, lagoons, lakes, creek or river margins, river pools and floodplains.	No – lack of suitable wetlands with forms of shelter.	No	Yes	Yes	Unlikely

**Mammals**

<i>Chalinolobus dwyeri</i>	large-eared pied bat	V	V	Sandstone cliffs and fertile woodland valley habitat within close proximity of each other is habitat of importance to the large-eared pied bat. Some populations of the large-eared pied bat would rely in part on the TEC of Brigalow ( <i>Acacia harpophylla</i> dominant and co-dominant).	Yes – general habitat of brigalow present but a lack of sandstone cliffs, and woodland valley areas for roosting.	No	No	Yes	Potential
<i>Dasyurus hallucatus</i>	northern quoll	E	LC	The northern quoll occurs in a range of habitats, including open dry sclerophyll forest and woodland, riparian woodland, low dry vine thicket, the margins of notophyll vineforest, sugarcane farms and in urban areas. They are most abundant in hilly or rocky areas close to permanent water.	No – no suitable denning (rocky escarpment) habitat present.  Such rocky habitat was present in the Cooper's Gap site.	No	No - Closest known record from Bunya Mountains NP from 1990.	Yes	Unlikely
<i>Nyctophilus corbeni</i>	Corben's long-eared bat	V	V	This microbat species has a scattered distribution mostly within the Murray-Darling Basin, but with some records outside of this area. It is more common in box, ironbark and cypress pine woodland on the western slopes and plains. Its stronghold seems to be the Pilliga scrub. It roosts in tree hollows, crevices and under loose bark.	Yes - general habitat present in the form of ironbark woodlands, but preferred habitat of ironbark and cypress pine woodland	No	Yes - recorded as part of Coopers Gap ecological study (AECOM, 2016).	Yes	Potential



					generally absent.				
<i>Petauroides volans</i>	greater glider	V	V	The greater glider is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It is primarily folivorous, with a diet mostly comprising eucalypt leaves, and occasionally flowers. It is more common in taller, montane older forests which have an abundance of hollows.	Yes – preferred habitat of tall, mature eucalypt forests with hollows present.	Yes	Yes	Yes	Known
<i>Phascolarctos cinereus</i>	koala	V	V	Koalas naturally inhabit a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by Eucalyptus species as explained by Martin & Handasyde 1999 (as cited in, DoE, 2019h). Koala habitat can be broadly defined as any forest or woodland containing species that are known koala food trees, or shrubland with emergent food trees.	Yes – preferred habitat of Eucalypt forests present.	Yes	Yes	Yes	Known
<i>Pteropus poliocephalus</i>	grey-headed flying fox	V	-	It is a canopy-feeding frugivore and nectarivore, which utilises vegetation communities including rainforests, open forests, closed and open woodlands, Melaleuca swamps and Banksia woodlands. It also feeds on commercial fruit crops and on introduced tree species in urban areas. Ebv (1998) explained that the primary food source is blossom from Eucalyptus and related genera but in some areas it also utilises a wide range of rainforest fruits (as cited in, DoE, 2019i).	Yes - General foraging habitat present in woodlands. However, the Study Area is more than 50km from the closest colony (per the interactive flying-fox	No	No	Yes – but on the outer western limits of the species range, which extends to Dalby, Kingaroy and the Bunya Mountains	Potential

					viewer of the Department of Environment) and unlikely to be important foraging habitat. This interactive website shows the closest camp occurs approximately 50 km away in Chinchilla.			(AECOM, 2016).	
<i>Dasyurus maculatus maculatus</i>	spotted-tailed quoll	E	V	This species generally requires more mature wet forests. However it has been found in a range of habitats which include open and closed eucalypt woodlands, sub-alpine woodlands and coastal heathlands. Like the northern quoll, it requires denning habitats, normally in the form of rocky escarpments.	No – due to a lack of denning habitat resources.	No	No	Yes	Unlikely
<i>Tachyglossus aculeatus</i>	short beaked echidna	-	SLC	This species requires termite mounds and ant nests for foraging. Found in dry inland areas in various woodland types as well as in agricultural areas. Echidnas seek shelter under thick bushes, in hollow logs or amongst rocks.	Yes – general habitat of woodlands present. Lack of rocky and thick bush preferred habitat.	Yes	Yes	Yes	Known

Reptiles

<i>Adclarkia cameroni</i>	Brigalow woodland snail	E	V	<p>Stanisic (2011) describes the brigalow woodland snail (family Camaenidae) to be endemic to south-east Queensland, where it occurs in a small number of remnant and scattered <i>Acacia harpophylla</i> (brigalow) and eucalypt woodland patches (such as road verges and riparian corridors) on the Condamine River floodplain (as cited in, DSEWPC, 2019f).</p> <p>One known population is from St Ruth's Reserve on the Condamine River.</p>	Yes – potential general habitat present in brigalow woodland.	No	No – the closest record exists 120 km north-west of the Study Area near Dulacca (AECOM, 2019).	Unknown – documented as occurring along the Condamine River basin	Potential
<i>Adclarkia dulacca</i>	Dulacca woodland snail	E	E	<p>This species inhabits a variety of remnant and scattered habitats, such as vine thicket and <i>Acacia harpophylla</i> woodland patches on rocky outcrops with clay to loam soils, as well as Eucalyptus species and <i>Acacia shirleyi</i> woodlands on ridges.</p> <p>This species occurs in a small number of isolated populations in the areas between Miles and Dulacca, and south to Meandarra.</p>	Yes – preferred habitat of brigalow woodlands and vine thicket present.	No	No	No – Study Area occurs 80km east of Miles, and 140km east of Dulacca, where known populations occur (AECOM, 2019).	Unlikely
<i>Anomalopus mackayi</i>	five-clawed worm-skink	V	E	<p>This species is found on low open grassland with scattered trees to open grassy dry Eucalyptus and Callitris forest/woodland. This skink is often found beneath logs. They occur on red-black to deep cracking black clay loam or sandy soils (including areas that are inundation prone and adjacent rises).</p>	Yes - general habitat present in Callitris forests/ woodlands.	No	No	Yes	Potential

<i>Delma torquata</i>	adorned delma	V	V	<p>This species normally inhabits eucalypt-dominated woodlands and open-forests in Queensland Regional Ecosystem Land Zones (LZ). The regional ecosystems it prefers are ones dominated by poplar box (<i>Eucalyptus populnea</i>) on alluvial plains, lemon-scented gum (<i>Corymbia citriodora</i>) open forest on coarse-grained sedimentary rocks and poplar box/brigalow (<i>Acacia harpophylla</i>) open forests on fine-grained sedimentary rocks.</p> <p>Closest known recent records are Bunya Mountains NP (2016).</p>	Yes – preferred habitat of Poplar Box and Brigalow woodlands and open forests present.	No	No	Yes	Potential
<i>Egernia rugosa</i>	yakka skink	V	V	<p>The yakka skink is known to occur in open dry sclerophyll forest, woodland and scrub. The core habitat of this species is within the Mulga lands and Brigalow belt south bioregions.</p>	Yes – preferred habitat in the Brigalow belt south bioregion.	No	No	Yes	Potential
<i>Furina dunmalli</i>	Dunmall's snake	V	-	<p>Found in forests and woodlands on black alluvial cracking clay and clay loams dominated by Brigalow (<i>Acacia harpophylla</i>), other Wattles (<i>A. burowii</i>, <i>A. deanii</i>, <i>A. leioclyx</i>), native Cypress (<i>Callitris</i> spp.) or Bull-oak (<i>Allocasuarina luehmannii</i>).</p>	Yes – preferred habitat of Brigalow and Callitris forests present.	No	No	Yes	Potential
<i>Strophurus taenicauda</i>	golden tailed gecko	-	NT	<p>The golden-tailed gecko lives in open woodland and open forest where it shelters under loose bark and hollow limbs. Almost all</p>	Yes – general habitat of Brigalow forest	No	No	Yes	Unlikely

				known records of this species have occurred within the Brigalow Belt bioregion (Cogger, 2014).	present. Due to highly disturbed landscape, lack of preferred habitat.				
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Flora

<i>Cadellia pentastylis</i>	ooline	V	V	Ooline grows in semi-evergreen vine thickets and sclerophyll vegetation on undulating terrain of various geology, including sandstone, conglomerate and claystone. The species forms a closed or open canopy, as a dominant or commonly with white box ( <i>Eucalyptus albens</i> ) and white cypress pine ( <i>Callitris glaucophylla</i> ), with an open understorey and leaf litter dominating the forest floor.	Yes – preferred habitat of semi-evergreen vine thickets present.	No	No	Yes	Potential
<i>Dichanthium queenslandicum</i>	king blue-grass	E	V	<i>Dichanthium queenslandicum</i> occurs on black cracking clay in tussock grasslands mainly in association with other species of blue grasses, but also with other grasses restricted to this soil type. <i>Dichanthium queenslandicum</i> in mostly confined to natural grassland on the heavy black clay soils (basalt downs, basalt cracking clay, open downs) on undulating plains.	No - lack of associated species and appropriate tussock grasslands.	No	No	Yes	Potential
<i>Dichanthium setosum</i>	bluegrass	V	LC	Associated with heavy basaltic black soils and red-brown loams with clay subsoils. Often found in moderately disturbed areas. Threats	Yes – general habitat of cleared	No	No	Yes	Potential



				relate to heavy grazing, clearing for pasture improvement and cropping, fire, introduced grasses and road widening. Associated species include White Box ( <i>Eucalyptus albens</i> ), Silver-leaved Ironbark ( <i>E. melanophloia</i> ), Yellow Box ( <i>E. melliodora</i> ), Manna Gum ( <i>E. viminalis</i> ), Amulla ( <i>Myoporum debile</i> ), Purple Wire-grass ( <i>Aristida ramosa</i> ), Kangaroo Grass ( <i>Themeda triandra</i> )	grazing land present.				
<i>Haloragis exalata</i> subsp. <i>velutina</i>	tall velvet sea-berry	V	V	This species has been recorded from eucalypt forests, from rainforest margins and grasslands from near sea-level to 1000 m altitude. The species has been recorded growing on brown heavy clay (Carnarvon National Park), shallow rock loam (Bunya Mountains National Park), and basaltic soils. Associated species include <i>Eucalyptus tereticornis</i> , <i>Angophora subvelutina</i> , and <i>Acacia irrorata</i> .	Yes – preferred habitat of <i>Eucalyptus tereticornis</i> woodlands present.	No	No	Yes	Potential
<i>Homopholis belsonii</i>	Belson's panic	V	E	It occurs on rocky hills supporting white box ( <i>Eucalyptus albens</i> ) and in wilga ( <i>Geijera parviflora</i> ) woodland; flat to gently undulating alluvial areas supporting belah ( <i>Casuarina cristata</i> ) forest; and soils and plant communities of poplar box ( <i>E. populnea</i> ) woodlands. It may also be associated with shadier areas of brigalow ( <i>Acacia harpophylla</i> ), myall ( <i>A. melvillei</i> ), and weeping myall ( <i>A. pendula</i> ) communities; in mountain coolibah ( <i>E. orgadophila</i> ) communities; and on roadsides.	Yes – preferred habitat of poplar box and brigalow woodlands or open forests present.	No	No	Yes	Potential

<i>Lepidium peregrinum</i>	wandering pepper-cress	E	LC	This species grows in riparian open forest dominated by <i>Eucalyptus camaldulensis</i> and <i>Casuarina cunninghamiana</i> with a variably dense shrubby understorey of <i>Hymenanthera dentata</i> , <i>Bursaria spinosa</i> , <i>Acacia fimbriata</i> , <i>A. floribunda</i> , <i>Callistemon viminalis</i> and <i>Leptospermum brachyandrum</i> . This species was most abundant in the tussock grassland fringe of the riparian open forest.	No – lack of riparian areas present.	No	No	Yes	Unlikely
<i>Rhaponticum australe</i>	Austral cornflower	V	V	Grows in eucalypt open forest with a grassy understorey and in grasslands on black clay soil. It is often found on roadsides and on road or rail reserves associated with <i>Chloris gayana</i> , <i>Cirsium vulgare</i> , <i>Eucalyptus tereticornis</i> and <i>Angophora floribunda</i> .	Yes – preferred <i>Eucalyptus tereticornis</i> woodlands present.	No	No	Yes	Potential
<i>Sophora fraseri</i>	-	V	V	<i>Sophora fraseri</i> is a subtropical shrub that normally grows in wet sclerophyll forest and a range of rainforest types. It has been reported growing in hilly terrain on hillslopes at altitudes at altitudes from 60 to 660m, mostly shallow stony to shaly soils, of loam to clay texture derived from sandstone or basalt rocks. Associated species include: <i>Corymbia citriodora</i> , <i>Eucalyptus carnea</i> , <i>E. microcorys</i> , <i>E. acmenoides</i> , <i>E. propinqua</i> and <i>Lophostemon confertus</i> .	No – no suitable rainforest habitat present.	No	No	Yes	Potential
<i>Thesium australe</i>	toadflax	V	V	This species grows in grassland or woodland, often in damp sites. Examples of associated vegetation includes: open woodland with	Yes – general grasslands and <i>E.</i>	No	Yes – record 5km east of the Study Area	Yes	Potential

				<i>Eucalyptus tereticornis</i> and <i>E. tindaliae</i> on skeletal soils; on heavy alluvium soil in grassy <i>E. populnea</i> woodland; on black cracking clay in grassland of <i>Dichanthium sericeum</i> ; and grassland dominated by <i>Themeda triandra</i> and <i>Heteropogon contortus</i> on basaltic, rocky soils.	<i>tereticornis</i> and <i>E. populnea</i> woodlands. Not preferred due to lack of moist, damp sites.		(2010). No other recent records.		
<i>Cyperus clarus</i>	-	-	V	Grows in grassland or open woodland, in heavy soils derived from basalt. The species is associated with grasslands where <i>Aristida leptopoda</i> and <i>Panicum queenslandicum</i> occur on deep alluvial black clay; in <i>Eucalyptus melanophloia</i> woodland with mid-dense ground stratum of <i>Chrysopogon fallax</i> and growing with <i>Stemmacantha australis</i> in mountain coolibah woodland on basalt ridges.	Yes – preferred <i>E. melanophloia</i> woodland present.	No	Yes	Yes	Likely
<i>Eucalyptus argophloia</i>	Queensland western white gum	V	V	Occurs on flat to undulating country at 300-340m above sea level. It prefers deep, dark, heavy clay soils, often with strong gilgai (melon hole) development. It has been recorded growing in brigalow woodland and forest communities associated with belah, poplar box and inland grey box. Only found in a small area north-east of Chinchilla.	Yes – preferred Brigalow woodlands present.	No	Yes – however occurs as a privately owned plantation in the centre of the Study Area.	Yes	Known
<i>Acacia handonis</i>	Hando's wattle	V	V	The species grows in lateritic soil of grey sand or clayey silt with ironstone gravel, in gently undulating country. Often on stony ridges, in eucalypt woodland and open forest. The	No – lack of stony ridges with appropriate	No	No	Yes	Unlikely

				species occurs in an open forest with a sparse to dense shrub layer. Dominant trees are <i>Eucalyptus fibrosa subsp. nubila</i> and <i>E. watsoniana subsp. watsoniana</i> . <i>E. tenuipes</i> may be present, especially on hillcrests.	associated species present.				
<i>Micromyrtus carinata</i>	Gurulmundi heath-myrtle	-	E	Micromyrtus carinata inhabits the tops of laterised ridges, on shallow to deep, yellow or red sands. Associated species and vegetation include: heath dominated by this species and <i>Triodia</i> sp., <i>Homalocalyx polyandrus</i> , <i>Corymbia trachyphloia</i> and <i>Eucalyptus exserta</i> also present; pale red-brown sand over hard brown loam with associated species including recently burnt <i>Callitris</i> sp. / <i>E. exserta</i> woodland with sparse understorey of <i>Melichrus</i> sp.; low open shrubland of <i>Acacia triptera</i> ; and <i>Acacia triptera</i> shrubland with scattered <i>Melaleuca nodosa</i> .	No – lack of laterised ridges and associated species present.	No	No	No	Potential

Status listing per EPBC and NC Acts: CE = Critically Endangered; E = Endangered; V = Vulnerable; M = Migratory; LC = Least Concern; SLC = Special Least Concern; NT = Near Threatened.

Sources of habitat information for all species, unless otherwise stated, were gathered from DoEE Conservation Advice and SPRAT database: (<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>). Each of these is listed in the references species, specific to the subcategory (eg. Flora, fauna and migratory).

## **APPENDIX B      BIRD SPECIES IDENTIFIED DURING FIELD SURVEYS**



- Apostle birds (*Struthidea cinerea*)
- Australasian pipit (*Anthus novaeseelandiae*)
- Australian magpie (*Cracticus tibicen*)
- Black-chinned honeyeater (*Melithreptus gularis*)
- Black-fronted dotterel (*Elseyornis melanops*)
- Black-faced cuckoo-shrike (*Coracina novaehollandiae*)
- Blue-faced honeyeater (*Entomyzon cyanotis*)
- Brown falcon (*Falco berigora*)
- Cattle egret (*Bubulcus ibis*)
- Crested pigeon (*Ocyphaps lophotes*)
- Dollar bird (*Eurystomus orientalis*)
- Double bar finch (*Taeniopygia bichenovii*)
- Forest kingfisher (*Todiramphus macleayi*)
- Galah (*Eolophus roseicapilla*)
- Grey butcherbird (*Cracticus torquatus*)
- Ground cuckoo shrike (*Coracina maxima*)
- Indian myna (*Acridotheres tristis*)
- Laughing kookaburra (*Dacelo novaeguineae*)
- Little black cormorant (*Phalacrocorax sulcirostris*)
- Little corella (*Cacatua sanguinea*)
- Magpie-lark (*Grallina cyanoleuca*)
- Masked lapwing (*Vanellus miles*)
- Nankeen kestrel (*Falco cenchroides*)
- Noisy miner (*Manorina melanocephala*)
- Pacific black duck (*Anas superciliosa*)
- Pale-headed rosella (*Platycercus adscitus*)
- Peaceful dove (*Geopelia placida*)
- Australian pelican (*Pelecanus conspicillatus*)
- Pied butcherbird (*Cracticus nigrogularis*)
- Pied cormorant (*Phalacrocorax varius*)
- Rainbow bee-eater (*Merops ornatus*)
- Rainbow lorikeet (*Trichoglossus moluccanus*)
- Red-winged parrot (*Aprosmictus erythropterus*)
- Spiny-cheeked honeyeater (*Acanthagenys rufogularis*)
- Striped honeyeater (*Plectorhyncha lanceolata*)
- Sulphur-crested cockatoo (*Cacatua galerita*)

- Torresian crow (*Corvus orru*)
- Wedge-tail eagle (*Aquila audax*)
- White-browed babbler (*Pomatostomus superciliosus*)
- White-winged chough (*Corcorax melanorhamphos*)
- White-faced heron (*Egretta novaehollandiae*)
- Willie wagtail (*Rhipidura leucophrys*)
- Australian wood duck (*Chenonetta jubata*)
- Yellow thornbill (*Acanthiza nana*)

## **APPENDIX C      MNES SIGNIFICANT IMPACT ASSESSMENTS**

### Koala (*Phascolarctos cinereus*)

The proposed development in the Study Area is unlikely to result in a significant impact to the koala.

The *EPBC Act referral guidelines for the vulnerable koala* (Department of Environment (DoE), 2014) state that decisions as to whether an action is likely to have a significant impact on the koala typically come down to two key considerations:

- Adversely affecting habitat critical to the survival of the koala; and/or
- Interfering substantially with the recovery of the koala through the introduction or exacerbation of key threats in areas of habitat critical to the survival of the koala.

The assessment process for koala habitat involved extensive desktop reviews as well as a field investigation conducted in 2019. The results from this investigation and the desktop reviews found the Study Area to be located within the inland, Brigalow Belt South (BBS) range of the species. There were no records for the species within the Study Area, however koala scats and potential scratch marks were identified in Eucalypt forests and woodlands in the Study Area. Koala habitat has been identified within the Study Area. This habitat is characterised by Regional Ecosystems (REs) dominated by Eucalypt and *Corymbia spp*, which contain primary or secondary koala food trees. These RE's were 11.10.1/a, 11.3.2, 11.5.1, 11.7.5 and 11.9.7. The Study Area encompassed 3,150.4 ha of remnant vegetation that is koala habitat and 411.9 ha of regrowth vegetation that is koala habitat.

The EPBC Act referral guidelines (DoE, 2014) for the koala define habitat as 'critical to the survival of the koala' if it receives a score of five or more using the koala habitat assessment tool. The habitat within the Study Area has been assessed in accordance with the habitat assessment tool (refer to the following table). Based on this assessment, vegetation within the Study Area is classified as habitat critical to the survival of the koala.

### Critical koala habitat analysis

Attribute	Description	Score
Koala Occurrence	<ul style="list-style-type: none"> <li>■ The field investigation did not directly sight any koalas. However, koala scats and potential scratch marks were found in Eucalypt forests within the Study Area.</li> <li>■ Recent records from the ALA database are known for the koala within the 10 km buffer of the Study Area. The closest and most recent record (2011) is just south of the Study Area (within 2km).</li> <li>■ Koala food trees exist within the Study Area, including primary food trees such as, <i>Eucalyptus crebra</i>, <i>E. populnea</i> and <i>E. tereticornis</i> which are associated with REs 11.5.1, 11.3.2, 11.3.4 and 11.9.7. Additionally, food tree species <i>Corymbia citriodora</i> is also present, and is associated with REs 11.10.1/a and 11.7.5. On ground observations showed the vegetative communities that contain koala food trees are generally associated with larger remnant patches of vegetation within the Study Area, as well as fringing riparian areas.</li> </ul>	+2
Vegetation Structure and Composition	The Study Area, although it has been largely cleared (71.3%), contains small to medium patches of vegetation, which contain two or more koala food tree species, including <i>E. crebra</i> , <i>E. populnea</i> , <i>E. tereticornis</i> and <i>C. citriodora</i> . Some of these patches are associated with alluvial plains. There is approximately 3,150.4 ha of remnant koala habitat and 411.9 ha of regrowth koala habitat within the Study Area.	+2

Attribute	Description	Score
Habitat Connectivity	The habitat assessment identified 3,150.4 ha of remnant vegetation that is koala habitat and 411.9 ha of regrowth vegetation that is koala habitat in the Study Area. The majority of the patches throughout the Study Area are not connected to larger remnant patches greater than 1000 ha, outside of the Study Area. Only some remnant vegetation patches in the northern section of the Study Area are connected to patches that could be greater than 1000 ha.	+1
Key Existing Threats	No evidence of koala mortality from vehicle strike or dog attack was found as part of the field investigation. However, discussion with landowners reported that some koala strikes with vehicles had occurred within the Study Area, in the past. One land owner reported seeing a deceased koala on the road side in the past two years. Additionally, the Study Area occurs in a rural landscape, where wild dogs are present. The wild dog fence runs through the centre of the Study Area and so this threat may be present to koalas.	+1
Recovery Value	<p>The interim recovery objectives for the koala are:</p> <ul style="list-style-type: none"> <li>■ Protect and conserve the quality and extent of habitat refuges for the persistence of the species during droughts and periods of extreme heat, especially in riparian environments and other areas with reliable soil moisture and fertility; and</li> <li>■ Maintain the quality, extent and connectivity of large areas of koala habitat surrounding habitat refuges.</li> </ul> <p>The Study Area occurs in an area that has been highly cleared in the past for agricultural and rural purposes. The Study Area is also connected to larger remnant vegetation, including Diamondy and Jandowae State Forests. Such State Forests contain larger amounts of Eucalypt forests that would be preferred over the vastly cleared Study Area. Additionally, the disturbance is unlikely to impact habitat that is important for achieving these interim recovery objectives. This is because clearing of habitat will be done in small and spread amounts, accounting for only 0.6% of the total koala habitat in Study Area.</p>	+1

**Total Habitat Score = 7**

The *Significant Impact Guidelines 1.1* (to be referred to as 'SIG 1.1') state that actions are likely to have a significant impact on a vulnerable species if they adversely affect habitat critical to the survival of the species (Department of Environment (DoE), 2013). Additionally, for the koala, interference with the recovery of the species should also be considered. Outcomes from an assessment in accordance with the SIG 1.1 guidelines is provided below.

#### *Adverse Effects on Habitat Critical to the Survival of the Koala*

The *EPBC Act referral guidelines for the vulnerable koala* provide a flow chart to determine if a proposed action is likely to adversely impact habitat critical to the survival of the koala. The proposed disturbance to habitat critical to the survival of the koala in the Study Area, is approximately 21.2 ha of remnant vegetation and <1 ha (0.2 ha) of regrowth vegetation (21.4 ha total).

The main impacts that will occur to koala habitat will be disturbance footprints from the turbines, as well as occasional linear vegetation clearing for placement of access tracks. Such access tracks will have little traffic impact post construction. The footprint clearing of vegetation will be small and do not involve the complete removal of large patches of habitat. Additionally, the design of the turbine layout has been executed in a way to avoid habitat and minimise impact. This impact mitigation will be based on two main stages. The first stage is in the design phase, where Project layout will avoid constituent REs (listed above) that have been identified as koala habitat within the Study Area. The second stage is micro-siting and will involve on ground investigations of infrastructure placement to further avoid important habitat features for koalas.



The potential clearing impact to koala habitat is approximately 21.4 ha (0.6% of the total habitat for koala within the Study Area). Therefore, the habitat that will be impacted is relatively minor in relation to the larger context of available koala habitat. Additionally, the clearing will not increase the level of fragmentation in the landscape. Furthermore, such clearing will not disconnect the Study Area from larger, adjacent vegetation patches or State Forests.

Based on the referral guidelines, the loss of 20 hectares or more of high quality habitat critical to the survival (habitat score of  $\geq 8$ ) is likely to have a significant impact on koalas for the purposes of the EPBC Act. The proposed development will disturb 21.2 ha of remnant vegetation and  $<1$  ha (0.2 ha) disturbance to regrowth vegetation that is habitat critical to the survival of the koala (score of seven). It is also noted that threatening processes related to dog mortality and vehicle fatalities is not likely to increase as a result of the proposed development, such that key threats are not exacerbated and will not substantially interfere with recovery efforts for the koala in the region. Therefore, the proposed impact of 21.4 ha of total habitat, is unlikely to have an adverse effect on habitat critical to the survival of the koala.

#### *Recovery of the Koala*

The proposed development is unlikely to interfere with the recovery of the koala as:

- The habitat to be removed is a small proportion of available habitat in the Study Area (0.6%), and largely avoids remnant vegetation;
- Koalas are likely present in the locality in low densities (one record from 2011) and low amounts of scats and potential scratch marks were observed during the site visit;
- The development will not substantially increase the risk of dog attack to the koala;
- The risk of vehicle strike is considered low, due to low traffic volumes, predominately daylight hour travel and restricted speeds during construction (less than 40 km) on access tracks.
- The construction and operational works will be carried out with precautionary measures that are unlikely to cause the spread or introduction of invasive species and disease; and
- Project activities are occurring in an already cleared and modified landscape that is used for agricultural and grazing purposes. Thus, the small amount of clearing of koala habitat (0.6%) is unlikely to create an increased barrier to movement for the species.

The full assessment as to why the development works will not impact the recovery of the koala, is provided in the following table.

### Impacts on Koala Recovery Assessment

Criteria	Discussion	Criteria triggered?
<i>Impacts which are likely to substantially interfere with the recovery of the koala may include one or more of the following:</i>		
Increasing koala fatalities in habitat critical to the survival of the koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities.	Wild dogs were not recorded from the field investigation, but are known from the region with a record just south of the Study Area (2 km south, 2011). Nonetheless, it is unlikely that the proposed development will increase the abundance of wild dogs to a level that would result in mortalities. This is because the Study Area occurs in a rural setting where dog-baiting practices are in place, and dogs are kept chained unless they are being used for working purposes.	No

Criteria	Discussion	Criteria triggered?
Increasing koala fatalities in habitat critical to the survival of the koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities.	The construction activities are going to take precautions to ensure that koala fatalities are avoided. The increases in vehicle traffic during the construction phase may result in koala strikes. However, efforts will be made to ensure this rate is not substantially increased from previous statistics. This will be through travelling at safe speeds (60 km/hr), and potentially implementing structures to ensure koala safety (refuge poles, koala proof fencing). Additionally, once construction is complete, vehicle traffic is expected to return to pre-construction levels.	No
Facilitating the introduction or spread of disease or pathogens for example Chlamydia or Phytophthora cinnamomi, to habitat critical to the survival of the koala, that are likely to significantly reduce the reproductive output of koalas or reduce the carrying capacity of the habitat.	It is unlikely that contact with koalas would be required during the construction and operational periods and would not result in any additional stress being placed on any resident koalas. It is therefore unlikely that Project activities would lead to the spread of diseases or pathogens relevant to the koala. Biosecurity measures will be in place, and followed, to ensure that vehicles and people entering the Study Area, follow a strict hygiene procedures.	No
Creating a barrier to movement to, between or within habitat critical to the survival of the koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the koala.	The koala referral guidelines state that artificial barriers may include infrastructure (such as roads, rail, mines, large fences etc.) without effective koala passage measures, or developments that create treeless areas more than 2 km wide. The development is occurring in areas that have already undergone amounts of clearing for agricultural and grazing purposes. Additionally, clearing will be done in small patches throughout the larger Study Area, only equalling 0.6% of available koala habitat. Therefore barriers to movement, through fragmentation, will not occur.	No
Changing hydrology which degrades habitat critical to the survival of the koala to the extent that the carrying capacity of the habitat is reduced in the long-term.	Construction activities have been assessed as unlikely to substantially affect surface or ground water flows. There will be a Water Management Plan (WMP) that will be put in place to ensure that construction and operational decisions are based on the understanding of surface and ground water catchment information. Construction and operational activities will avoid important hydrological areas and controls will be put in place to ensure contamination does not occur.	No

### Greater glider (*Petauroides volans*)

**The proposed development in the Study Area is unlikely to lead to a significant impact to the greater glider.**

The greater glider is listed as 'Vulnerable' under the EPBC Act and has been concluded as known to occur within the Study Area. The Study Area occurs in a small section of the range of the greater glider, which extends throughout eastern Australia, from Windsor Tableland in north Queensland through to central Victoria (Wombat State Forest) (Woinarski et al., 2014). Greater glider habitat consists of tall, montane Eucalypt forests with mature hollow-bearing trees (Eyre, 2004). There has been suitable greater glider habitat identified within the Study Area. Such suitable habitat was associated with the following RE types: 11.10.1/a, 11.3.2, 11.3.4, 11.5.1, 11.7.5, and 11.9.7. The total amount of greater glider habitat within the Study Area was mapped as 3,150.4 ha.

Reviews of ALA show no recent records of greater gliders within the Study Area. However, greater glider scats were observed within the Study Area, in mature forests with hollow bearing trees. Clusters of records are found within 10km of the Study Area, in the Diamondy State Forest from 2002.

The significant impact guidance for 'vulnerable' species in SIG 1.1, refers to impacts to 'important populations' of a species (DoE, 2013). Important population is defined as a population that is necessary for a species' long-term survival and recovery. This may include populations identified in recovery plans and/or are:

- Key source populations either for breeding or dispersal;
- Populations that are necessary for maintaining genetic diversity; and/or
- Populations that are near the limit of the species' range (DoE, 2013).

This species was conservatively concluded to be an important population in the Study Area and the surrounding landscape due to the following reasons. Firstly, there is an absence of detailed population data for the Study Area. Secondly, the field investigation effort did not involve spotlight surveys over multiple days, in accordance with the survey guidelines. Lastly, greater gliders scats were found during the field investigation in remnant eucalypt vegetation communities, and records exist within 10km of the Study Area in the Diamondy State Forest.

The proposed development layout and design has been assessed in the following ways. Initially, field investigations and mapping have designated a total of 3,150.4 ha of greater glider habitat within the Study Area. From this, the first component of the layout design phase was to avoid remnant vegetation identified as greater glider habitat. This included avoided the constituent REs listed above. The second component of the layout design will involve on the ground micro-siting that may result in infrastructure locations being adjusted to avoid suitable hollow bearing trees that act as potential roosting and denning sites for greater gliders.

The amount of habitat that will be impacted by the proposed development is 21.2 ha, or 0.7% of the total greater glider habitat within the Study Area. A significant impact assessment based on guidance provided in the SIG 1.1, is presented the following table.

## Significant Impact Assessment for Greater Glider.

Criteria	Description	Criteria Triggered?
<p><i>An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:</i></p>		
Lead to a long-term decrease in the size of an important population of a species,	The amount of habitat to be cleared is 21.2 ha, or 0.7% of the total amount of glider habitat within the Study Area. The impact will be clearing of small amounts of remnant patches along with small amounts of linear clearing. The design phase has avoided impact through initial design based on habitat mapping, as well as further avoidance through movement of turbines based on micro siting of suitable habitat. Additionally, the Study Area will remain connected to adjacent, larger remnant forests, like Diamondy State Forest. Therefore, the Project is unlikely to lead to a long-term decrease in the size of the population.	No
Reduce the area of occupancy of an important population,	This species is predicated to have an area of occupancy of 15,960 km <sup>2</sup> (Woinarski <i>et al.</i> , 2014). The proposed development will not lead to a reduced area of occupancy of the species, because only 21.2 ha or 0.7% of total greater glider habitat within the Study Area, will be impacted. The clearing of such small areas across the landscape, which will not remove habitat patches altogether will ensure that the area of occupancy remains the same.	No
Fragment an existing important population into two or more populations,	The clearing of 21.2 ha, or 0.7% of the total greater glider habitat will not fragment existing populations. This clearing impact will only remove small fragments of habitat patches, as well as small linear fragment of habitat, within the Study Area. Such small clearings will ensure that greater glider habitat remains connected, both within and outside of the Study Area. This is particularly important as greater gliders are known to occur in the adjacent Diamondy State Forest.	No
Adversely affect habitat critical to the survival of a species,	This habitat for greater gliders within the Study Area has been concluded to be habitat critical to the survival of the species. This is because the presence of tall, mature Eucalyptus forests with hollow bearing trees, meets the criterion of being habitat necessary for foraging, breeding, roosting or dispersal of the species.  Nonetheless, the impact will not adversely affect the habitat critical to the survival of the species. This is because clearing will occur in such small proportions of the larger landscape, accounting for 0.7% of greater glider habitat. The initial avoidance of habitat in the design phase, as well as further on the ground micro siting ensure that glider habitat, specifically hollow-bearing trees, remain for the necessary foraging, breeding, roosting and dispersal of the species.	No
Disrupt the breeding cycle of an important population,	The impacts of clearing will only occur to 0.7% of the total greater glider habitat within the Study Area. The design phase as well as micro siting have avoided Eucalypt forests, with hollow-bearing trees that are necessary for the successful breeding cycle of the species. Greater gliders generally have a home range of 1-4 ha or up to 16 ha in more open forests (Henry, 1984; Eyre, 2004). The small clearings throughout the Study Area, as well as the design and micro siting efforts to avoid suitable greater glider habitat, will not reduce the home ranges of the species. Thus, the species will still be able to successfully breed in the Study Area.	No

Criteria	Description	Criteria Triggered?
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline,	The disturbance has been calculated as 21.2 ha, or 0.7% of the total greater glider habitat within the Study Area. Thus, only a very small amount of habitat will be removed in relation to the larger context of the landscape. The initial design and micro siting have avoided the high quality mature Eucalypt forest habitat for the species. Additionally, the habitat within the Study Area will remain connected to State Forests and larger remnant patches outside of the Study Area. Thus, the small amounts of clearing in the larger context of the landscape will not remove/isolate or decrease the quality of habitat that would result in species decline.	No
Result in invasive species that are harmful to an endangered species becoming established in the endangered species' habitat,	Invasive species such as feral cats ( <i>Felis catus</i> ) and cane toads ( <i>Rhinella marina</i> ) are common pests encountered Queensland and are particularly harmful to native, threatened mammals. Both of these invasive species are known to occur in the Study Area. The Project activities during construction and operation will adopt and follow Biosecurity measures that ensure that further invasive species are not introduced into the Study Area.	No
Introduce disease that may cause the species to decline, or	There is currently limited evidence of diseases causing detrimental effects on greater glider populations in Queensland. There is also no evidence to suggest the proposed disturbance would introduce a disease that would cause the species to decline. Additionally, precautions will be taken to ensure that the spread of disease does not occur. This includes following biosecurity measures and ensuring proper personal protection equipment (PPE) is worn by construction workers.	No
Interfere with the recovery of the species.	There are no formal adopted, or made, Recovery Plans for this species. However, small and spread amount of clearing of remnant patches and linear areas, will not affect the recovery of this species. Additionally, the Study Area will remain connected to adjacent State Forests, which are known to be habitat for greater gliders. This will enable the species to be able to continually traverse the landscape, ensuring genetic viability of the population.	No



**Migratory species: white-throated needletail (*Hirundapus caudacutus*) and glossy ibis (*Plegadis falcinellus*)**

**The proposed development in the Study Area is unlikely to lead to a significant impact to any either of the migratory species.**

The white-throated needletail (*Hirundapus caudacutus*) has been identified as 'likely' to occur within the Study Area. This species does not breed in Australia, rather the white-throated needletail spends its non-breeding season in Australasia. The white-throated needletail is almost entirely aerial when in Australia (Coventry, 1989), often flying above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy. For this reason, it was regarded as 'likely' to occur flying over the Study Area, not specifically stopping to utilise any habitat areas. This species was not recorded during the 2019 field survey. However, one record of this species occurs within 10km north of the Study Area, within Diamondy State Forest from 2002.

The glossy ibis (*Plegadis falcinellus*) has been identified as 'likely' to occur within the Study Area. Glossy ibis habitat for foraging and breeding occur around freshwater lakes, salt or muddy marshes or irrigated crop land (Marchant & Higgins, 1990). This species has core breeding areas within the Murray-Darling Basin in NSW and Victoria, as well as the Macquarie Marches of NSW (DoE, 2020). This species was not recorded during the 2019 field survey, however two records exist in Jandowae, southwest of the Study Area, from 2007 and 2008. Therefore, it was concluded as likely to occasionally frequent the Study Area, but not utilising it for substantial periods, due to the lack of suitable water sources and breeding habitat.

The SIG 1.1 state that actions likely to have a significant impact on a migratory species if there is a real chance or possibility that it will:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species;
- result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or
- seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

Important habitat for migratory species is explained as:

- a. habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or
- b. habitat that is of critical importance to the species at particular life-cycle stages, and/or
- c. habitat utilised by a migratory species which is at the limit of the species range, and/or
- d. habitat within an area where the species is declining.

An ecologically significant proportion of the population can be characterised by species population status, genetic distinctiveness and species-specific behavioural patterns

The white-throated needletail does not breed in Australia and exhibits predominately aerial behaviour during its migration. Its migratory flightpath, which traverses the coastal extent of the Australia's eastern coast, does not occur over the Study Area. Additionally, this species occurs over a large range, throughout eastern and south eastern Australia. For these reasons, the Study Area is not regarded as important habitat for this species, and is unlikely to contain an ecologically significant proportion of the population.

The glossy ibis has preferred breeding habitats in areas mainly restricted to NSW and Victoria. Additionally, the Study Area is highly modified. The waterways and dams that are present and that could be regarded as glossy ibis foraging habitat, are highly degraded and of low habitat value. For these reasons, the Study Area is not regarded as important habitat for this species, and is unlikely to contain an ecologically significant proportion of the population.

As both migratory species have been concluded not be an important population, and/or ecologically significant proportion of a populations, an assessment against the SIG 1.1 has not been undertaken.

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**APPENDIX D      MSES SIGNIFICANT IMPACT ASSESSMENTS**

Species	NC Act Status	Lead to long term decrease *	Extent of occurrence*	Fragmentation *	Habitat isolation*	Invasive species	Disease	Species recovery	Disruption*	Comment
<b>FAUNA</b>										
( <i>Phascolarctos cinereus</i> ) koala	V	x	x	x	x	x	x	x	x	<ul style="list-style-type: none"> <li>■ The species was recorded, via scats and potential scratch marks, during the 2019 field survey and there is a record just south of the Study Area (2011), within the 10km buffer.</li> <li>■ The species is likely to occur at low densities, and predominately in preferred habitat of eucalypt forests, of which the Study Area contains 3,150.4 ha. The Study Area also contains 411.9 ha of regrowth vegetation that is regarded as general koala habitat. There is 21.2 ha preferred habitat and &lt;1 ha of general regrowth habitat (0.2 ha), located within the development footprint. Therefore, only 0.6% of the total koala habitat within the Study Area will potentially be impacted.</li> <li>■ Project layout will largely avoid koala habitat and further micro siting will reduce impacts through moving turbine locations away from koala habitat.</li> </ul>
( <i>Petauroides volans</i> ) greater glider	V	x	x	x	x	x	x	x	x	<ul style="list-style-type: none"> <li>■ The species was recorded, via scats, during the 2019 field survey and there is a record just north of the Study Area in Diamondy State Forest (2002), within the 10 km buffer.</li> <li>■ The species is likely to occur at low densities and predominately in preferred habitat of mature eucalypt forests with hollow bearing trees (Eyre, 2002), of which the Study Area contains 3,150.4 ha. There is only 21.2 ha of preferred glider habitat that occurs within the development footprint. This is only 0.7% of the total greater glider habitat for the Study Area.</li> <li>■ Project layout will largely avoid greater glider habitat and further micro siting will reduce impacts further via moving turbine locations away from identified hollow bearing trees that can be used as potential denning sites.</li> </ul>
( <i>Tachyglossus aculeatus</i> ) short-beaked echidna	SLC	x	x	x	x	-	-	-	x	<ul style="list-style-type: none"> <li>■ The echidna was confirmed present within the Study Area during the 2019 field survey.</li> <li>■ The species is a generalist and occurs across a variety of habitats throughout the Study Area, which includes open woodland, semi-arid and arid areas (Aplin <i>et al.</i>, 2016).</li> </ul>

Species	NC Act Status	Lead to long term decrease *	Extent of occurrence*	Fragmentation *	Habitat isolation*	Invasive species	Disease	Species recovery	Disruption*	Comment
										<ul style="list-style-type: none"> <li>This species is likely to occur at low densities. Additionally, the Study Area contains 12,760.0ha of general habitat (and only 372.0 ha or 2.9% will be disturbed within the development footprint).</li> </ul>
<b>FLORA</b>										
<i>Cyperus clarus</i>	V	x	x	x	x	x	x	x	x	<ul style="list-style-type: none"> <li>This species was not recorded during the field investigation, however a record exists just south of the Study Area, close to Jandowae State Forest, from 2000.</li> <li>This species is found in habitat dominated by <i>Eucalyptus melanophloia</i>, of which an associated RE type with <i>E. melanophloia</i> is found within the Study Area (RE 11.9.2) (DES, 2019). The Study Area contains 157.6 ha of potential preferred habitat for this species, but due to the low amount of records, this species would likely only be found at very low densities.</li> <li>0.5 ha of <i>Cyperus clarus</i> habitat occurs within the development footprint. This accounts for 0.3% of the total potential habitat for this species within the Study Area. Therefore, this small clearing is unlikely to result in a significant impact to this species.</li> </ul>
<p>NC Act listing status: V= Vulnerable; SLC= Special Least Concern.            *These parameters are criteria relevant to assessment for SLC (non-migratory) wildlife            x Indicates it is unlikely that a significant residual impact will occur            ✓ Indicates there is potential for a significant residual impact</p>										



## **APPENDIX E      VEGETATION MANAGEMENT PLAN**



# Vegetation Management Plan

Wambo Wind Farm

8 July 2020

Project No.: 0532612

Document details	
Document title	Vegetation Management Plan
Document subtitle	Wambo Wind Farm
Project No.	0532612
Date	8 July 2020
Version	1.0
Author	Ned Bowden & Amelia James
Client Name	Cubico Sustainable Investments Pty Ltd

#### Document history

Version	Revision	Author	Reviewed by	ERM approval to issue		Comments
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Draft	A	Ned Bowden	Dr David Dique	Dr David Dique	05/06/2020	
Final Draft	1	Amelia James	Dr David Dique	Dr David Dique	08/07/2020	

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## Signature Page

8 July 2020

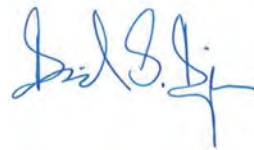
# Vegetation Management Plan

Wambo Wind Farm



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## 1. INTRODUCTION

White Wind No. 1 Pty Ltd (the Proponent) is proposing to develop a wind farm approximately 20 km northeast of the town of Jandowae in the Western Downs Region (south-east) of Queensland. The Project will comprise of approximately 110 wind turbines, with an installed capacity of up to 500MW over an area of around 12,760 hectares (ha) (the Study Area). As part of management of impacts to environmental values, a number of management plans have been prepared by Environmental Resources Management Pty Ltd (ERM). The objective of this Vegetation Management Plan (VMP) is to minimise any potential residual impacts to vegetation associated with the Project.

### 1.1 Avoidance Measures and Potential Impacts

The proposed development has the potential to directly and indirectly impact flora and fauna values within the Study Area. Generally, the greatest potential impact to biodiversity values is associated with clearing and grading activities during which vegetation and fauna habitat is removed. Where possible, vegetation disturbance associated with the proposed development has been avoided or minimised through detailed design. However, possible residual impacts to biodiversity values may include:

- Vegetation clearing;
- Fauna habitat loss;
- Mortality or injury of fauna;
- Dust impacts;
- Noise and light impacts; and
- Exacerbation of exotic flora and fauna

An ecological impact assessment was undertaken by ERM in 2020, and this management plan aims to minimise the potential residual impacts associated with the proposed development.

The key component of the vegetation management strategy is avoidance through layout design. The avoidance strategy will occur in two phases. The first design phase is based on avoidance of vegetation and potential habitat mapped as a result of the field investigation conducted, and subsequent constraints identified. The second design phase will involve pre-clearance surveys which includes on the ground micro siting at each location proposed for infrastructure (such as wind turbines). The pre-clearance surveys will assess the localised environmental values, including threatened species breeding habitat and protected plants to determine if micro-siting can be used to avoid key values.

Several more avoidance measures have been implemented, including, but not limited to, the following:

- Avoidance of woodland patches by locating infrastructure outside of these areas where possible;
- Clearly delineate approved vegetation clearance areas/ work zones to prevent over-clearing; and
- Turbines will maximise the use of areas that are less vegetated, to avoid and minimise clearing of mature trees. This can be achieved across many parts of the Study Area given the highly cleared nature of the landscape with low density of larger patches of remnant vegetation. This is included in the micro siting pre-clearance phase.

## 2. EXISTING ENVIRONMENT

The Study Area has been heavily modified by agricultural development, with the majority of the area (71.3%) cleared of native vegetation. There are a number of existing cleared vehicle and cattle tracks. Remnant areas of vegetation and regrowth vegetation exist, largely in isolated fragments or in association with three ephemeral watercourses that intersect the Study Area. There are also State Forests and National Parks in close proximity to the Study Area.

## 2.1 Landscape Attributes

The Study Area is located in the Queensland Brigalow Belt bioregion and includes a range of landscape features typical of the region, from flat alluvial plains to undulating slopes of grassland with patches of eucalypt dominant and codominant open woodland. Two ephemeral watercourses, namely Diamondy Creek and Jingi Jingi Creek intersect the Study Area. The majority of the Study Area (71.3%) is cleared and used for agriculture, with remnant vegetation covering 3,248.0 ha (25.5%) and regrowth vegetation only 411.9 ha (3.2%). This regrowth vegetation includes 66.1 ha of DNRME mapped regrowth vegetation and 345.8 ha of 'mixed eucalypt species' regrowth. The cleared areas are largely associated with alluvial plains near watercourses, while remnant vegetation is associated with upper slopes.

The Study Area is identified as being in the Rural Zone under the Western Downs Planning Scheme and is predominantly used for cattle grazing. There are a number of protected areas in close proximity to the Project Area. Diamondy State Forest is located directly north of the Study Area and the Bunya Mountains National Park is located approximately 30 km to the southeast.

## 2.2 Regional Ecosystems

The dominant REs identified in desktop searches and verified by field surveys were 11.10.1 and 11.5.1. Diamondy State Forest is dominated by RE 11.10.1 and in northern parts of the Study Area, adjacent to the state forest, are several large patches of remnant vegetation dominated by RE 11.10.1. The remnant vegetation that was associated with creek lines are dominated by poplar box woodlands (RE 11.3.2). There are also some small to medium patches of remnant Brigalow (RE 11.9.5) which are largely found in the north and western parts of the Study Area. South of Woolletts Rd (mid-south of the Study Area) and in the north-eastern area of the Study Area remnant vegetation is associated with RE 11.5.1. In the centre of the Study Area, there is a private plantation of Chinchilla white gum (*Eucalyptus argophloia*).

RE mapping shows the majority of the Study Area as RE types classed (under the VM Act) as Least Concern and Of Concern. In general, the RE mapping was observed to be consistent with the on-ground observed conditions.

Regrowth vegetation represents a small component (411.9 ha or 3.2%) of the Study Area. This regrowth vegetation consisted of two main forms:

- DNRME mapped regrowth vegetation which consisted of 66.1 ha of the Study Area; and
- Other, mixed eucalypt species regrowth, which consisted of 345.8 ha of the Study Area.

## 2.3 Threatened Ecological Communities

Following field surveys, evidence of potential habitat, relating to constituent REs, was found for three TEC's within the Study Area. These TECs are:

- Semi-evergreen vine thickets (SEVT) of the Brigalow Belt (North and South) and Nandewar Bioregions; 'Endangered', represented by constituent REs 11.8.3 and 11.9.4a;
- Brigalow (*Acacia harpophylla* dominant and co-dominant); 'Endangered', represented by RE constituent RE 11.9.5; and
- Poplar Box Grassy Woodland on Alluvial Plains, 'Endangered', represented by constituent RE 11.3.2.

### 2.3.1 *Semi-evergreen vine thicket*

The SEVT of the Brigalow Belt (North and South) and Nandewar Bioregions TEC is represented by fifteen REs in Queensland, with two constituent RE types mapped within the Study Area (RE 11.8.3 11.9.4a) This TEC is considered likely to occur based on the presence of potential habitat associated with the community, predominately *Eucalyptus melanophloia* and *Casurina cristata*, occurring within the Study Area. Additionally, a small patch of RE 11.8.3 has been confirmed to occur, in the north-east corner following field surveys.

There was a total area of 58.0 ha of potential habitat for SEVT TEC mapped in the north-east corner of the Study Area.

### 2.3.2 *Brigalow (A. harpophylla dominant and co-dominant)*

Brigalow (*A. harpophylla* dominant and co-dominant) TEC comprises 16 RE's in Queensland, where RE 11.9.5 patches were found during field surveys. These mapped patches of 11.9.5 were considered to be potential habitat for this TEC based on potentially meeting the size and native perennial plant cover requirements. There requirements are:

- The patch is  $\geq 0.5$  ha; and
- Exotic perennial plants comprise less than 50% of total vegetation cover of the patch.

There was a total area of 97.6 ha of potential habitat for Brigalow TEC mapped in the Study Area.

### 2.3.3 *Poplar Box Grassy Woodland on Alluvial Plains*

Poplar Box Grassy Woodland on Alluvial Plains TEC is represented by 5 RE's in Queensland, where 11.3.2 was found and verified in the field as occurring within the Study Area. This potential habitat aligned closely with Category C of the conservation advice National guidelines, which is:

- The crown cover of canopy trees in the patch is  $\geq 10\%$ ; and
- $<50\%$  of perennial vegetation cover on ground layer was native, the patches must have:
  - $\geq 20$  native plant spp. per patch in ground layer; and
  - $\geq 10$  mature trees/ha with  $\geq 30$  cm dbh (and/or hollows); and
  - Smaller trees, saplings or seedlings suggestive of periodic recruitment.

There was a total area of 315.3 ha of potential habitat for Poplar Box TEC mapped in the Study Area.

## 2.4 Flora Species

### 2.4.1 *Threatened Flora Species*

No threatened flora species were recorded during field surveys.

Fourteen threatened flora species were identified by desktop searches as known or having the potential to occur within 10 km of the Study Area. Based on the likelihood of occurrence assessment, one was identified as 'Likely' to occur, *Cyperus clarus*, within the Study Area.

This species is listed as Vulnerable under the NC Act. This species was not recorded during field surveys, however a record exists south of the Study Area within the 10 km buffer (2001). There are no other records in the locality with the largest cluster found in the Toowoomba region. This species grows in grassland or open woodland on heavy basalt soils. It is often associated with *Eucalyptus melanophloia* woodland with mid-dense ground stratum of *Chrysopogon fallax*.

The Protected Plants Trigger Map does not identify any records of listed threatened flora within the Study Area, although a small part of a buffer area for two records from Diamondy State Forest overlaps with the north-eastern boundary of the Study Area.

## 2.4.2 Introduced Flora Species

Four introduced flora species listed as weeds of national significance (WONS) and listed under the *Queensland Biosecurity Act 2014* are known to occur within the Study Area (Table 2-1).

**Table 2-1: Introduced Flora known from the Study Area**

Common name	Species name	WONS	Biosecurity Act
prickly pears	<i>Opuntia spp.</i>	✓	Restricted invasive
common lantana	<i>Lantana camara</i>	✓	Prohibited invasive
parthenium weed	<i>Parthenium hysterophorus</i>	✓	Restricted invasive
silver nightshade	<i>Solanum elaeagnifolium</i>	✓	Restricted invasive

1. Species recorded through database searches only

## 3. ASPECTS AND RISKS

### 3.1 Construction Activities

During the construction phase, vegetation will need to be cleared to establish a development footprint. Clearing works may impact directly on flora species. Key aspects of the Project that could result in impacts to biodiversity include:

- Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks, laydown areas). The consequences of this impact to vegetation may include:
  - Direct loss of listed flora and vegetation habitat (typically from clearing);
  - Fragmentation of connectivity areas;
  - Introduction and spread of priority weeds and pathogens; and
  - Indirect impacts to adjacent habitat areas as a result of noise, blasting, dust, runoff and erosion, including impacts to downstream environments.

### 3.2 Operational Activities

During the operational phase there are potential impacts to vegetation, these are:

- Operation of the turbines for a period of 30 years; and
- Routine maintenance and servicing of turbines, access tracks, weed management (around turbines and infrastructure) and infrastructure as required.

## 4. MANAGEMENT MEASURES

<b>Purpose</b>	The purpose of this Plan is to describe how impacts on vegetation will be minimised and managed during construction and operation of the Project.
<b>Objectives</b>	<p>The key objective of the VMP is to ensure that impacts to biodiversity are managed and are within the scope permitted by the planning approval. To achieve this objective, the following will be undertaken:</p> <ul style="list-style-type: none"> <li>• Ensure appropriate controls and procedures are implemented during construction activities to avoid (where necessary) or minimise potential adverse impacts to vegetation values in the project footprint;</li> <li>• Ensure appropriate measures are implemented to comply with relevant legislation and other requirements.</li> </ul>

<b>Targets</b>	<p>The following targets have been established for the management of vegetation impacts during construction and operation of the Project:</p> <ul style="list-style-type: none"> <li>• Ensure full compliance with the relevant legislative requirements;</li> <li>• Ensure full compliance with relevant requirements of the Development Permit;</li> <li>• No disturbance to vegetation outside the construction footprint;</li> <li>• Minimise disturbance to vegetation within the Study Area;</li> <li>• No increase in distribution of noxious weeds currently existing within the Study Area;</li> <li>• No new noxious weeds introduced to the Study Area;</li> <li>• No pollution or siltation of aquatic ecosystems, wetlands, endangered ecological communities or threatened species habitat.</li> </ul>		
<b>Key References</b>	<ul style="list-style-type: none"> <li>• <i>Nature Conservation Act 1992</i> (NC Act);</li> <li>• <i>Environmental Protection Act 1994</i> (and Regulation) (EP Act);</li> <li>• <i>Vegetation Management Act 1999</i> (VM Act);</li> <li>• <i>Biosecurity Act 2014</i> (and Regulation); and</li> <li>• <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth) (EPBC Act)</li> </ul>		
<b>Stage</b>	<b>Management Actions</b>	<b>Responsibility</b>	<b>Timing</b>
<b>Pre-Development</b>	The two-stage impact and disturbance mitigation process will be implemented. Areas of remnant and regrowth vegetation will be avoided at the design and micro siting stages	Proponent	Design
<b>Pre-Construction</b>	Pre-clearance surveys and on ground micro siting will ensure infrastructure is located in areas which avoid, and subsequently minimise edge effects and the isolation, fragmentation, or dissection of tracts of native vegetation	EPC Contractor	Prior to Construction
	A biosecurity plan will be developed and implemented for the Project. This will include measures such as vehicle wash downs, weed certification and obligations to remain on access tracks throughout the Study Area.	EPC Contractor	Pre-Start Works
<b>Construction</b>	All clearing shall be within clearly marked boundaries and in accordance with the Development Permit.	EPC Contractor	At all times
	Staff and contractors will be made aware through general site induction and training of the potential to generate dust emissions and mitigation and management measures that should be implemented.	EPC Contractor	At all times
	Include toolbox talks for site specific flora information to all field staff and contractors	EPC Contractor	Daily
	Construction activities must not interfere or block natural drainage e.g. disturbing channel contours	EPC Contractor	At all times
	Where required, watercourse crossing points will be adequately stabilised to prevent erosion	EPC Contractor	At all times
	Activities will be planned so that movement of vehicles, plant, machinery and equipment avoid moving between properties as required.	EPC Contractor	At all times
	Imported material able to transport weed seed will be assessed to ensure they are free of contamination, disease and invasive weeds	EPC Contractor	At all times



	Access roads, easements and yards will be kept weed free where practicable	EPC Contractor	At all times
	Only registered herbicides will be used by licenced weed sprayer	EPC Contractor	At all times
<b>Monitoring</b>	Weekly site inspections to review control measures during construction	EPC Contractor	Weekly
	Auditing of CEMP	EPC Contractor	Quarterly
<b>Reporting</b>	Sightings and incidents reported in daily Pre-starts during construction	EPC Contractor	Daily
	GPS co-ordinates of all MNES and MSES flora locations to be reported when clearing activities are planned.	EPC Contractor	As required
	Any cleared vegetation not designated to be cleared to be reported to HSEQ Manager	EPC Contractor	Within 24 hours
	Monthly report during construction to report on clearing activities aligned with approval requirements.	EPC Contractor	Monthly
	Annual report on weed management measures and maintenance of vegetation activities, aligned with approval requirements		Annually
<b>Corrective Action</b>	All near misses and incidents will be investigated to establish root cause. Where necessary corrective actions will be developed to improve existing processes	All Personnel	As required

## 5. CONCLUSION

The 2019 field investigation determined the ecological values and associated vegetation communities and habitats that occurred within the Study Area. As a result of this field investigation, the layout design has been informed such that the majority of remnant and regrowth vegetation within the Study Area, has been avoided.

The second phase of layout design will result in further avoidance of remnant and regrowth vegetation as a result of pre-clearance surveys. These pre-clearance surveys will assess the proposed locations for infrastructure, and adjust these accordingly if any vegetation communities or habitats for threatened species are located within the proposed locations.

Construction and operational activities that will potentially impact vegetation have been identified and subsequent mitigation measures have been outlined in this plan, in order to adequately manage these potential impacts.

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**APPENDIX F      FAUNA MANAGEMENT PLAN**



# Fauna Management Plan

Wambo Wind Farm

4 September 2020

Project No.: 0532612

Document title	Fauna Management Plan
Document subtitle	Wambo Wind Farm
Project No.	0532612
Date	4 September 2020
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Author	Ned Bowden & Amelia James
Client Name	Cubico Sustainable Investments Pty Ltd

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## Signature Page

4 September 2020

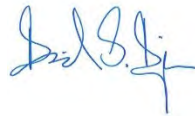
# Fauna Management Plan

Wambo Wind Farm



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## 1. INTRODUCTION

White Wind No. 1 Pty Ltd (the Proponent) is proposing to develop a wind farm approximately 20 km northeast of the town of Jandowae in the Western Downs Region (south-east) of Queensland. The proposed development will comprise of approximately 110 wind turbines, with an installed capacity of up to 600 MW over an area of around 12,760.0 hectares (ha) (the Study Area). As part of management of impacts to environmental values, a number of management plans are being prepared by Environmental Resources Management Pty Ltd (ERM).

The objective of this Fauna Management Plan (FMP) is to minimise any potential residual impacts to fauna and associated habitats from the proposed development.

### 1.1 Avoidance Measures and Potential Impacts

The proposed development has the potential to directly and indirectly impact flora and fauna values within the Study Area. Generally, the greatest potential impact to biodiversity values is associated with clearing and grading activities during which vegetation and fauna habitat is removed. Where possible, vegetation disturbance associated with the proposed development has been avoided or minimised through detailed design. However, possible residual impacts to biodiversity include:

- Vegetation clearing;
- Fauna habitat loss;
- Mortality or injury of fauna;
- Dust impacts;
- Noise and light impacts; and
- Increased presence of exotic flora and fauna

An ecological impact assessment based on desk based and field investigations was undertaken by ERM in 2020, and this management plan aims to minimise any potential residual impacts associated with the proposed development.

The key management strategy is avoidance of important fauna habitat through the layout design. The avoidance strategy will occur in two phases. The first design phase is based on avoidance of vegetation and potential habitat mapped as a result of the field investigation conducted in November 2019, and subsequent constraints identified. The second phase will involve pre-clearance surveys which includes on the ground micro-siting at each location proposed for infrastructure (such as wind turbines). The pre-clearance surveys will assess the localised environmental values, including threatened species breeding habitat and important habitat features to determine if micro-siting can be used to avoid key values. This will occur for TECs and threatened species, concluded as known, likely or potentially occurring from the likelihood of occurrence assessment.

To minimise the impacts of the proposed development, several measures have been implemented, including:

- Avoidance of remnant vegetation by locating infrastructure outside of these areas;
- Implementation of the Fauna Management Plan; and
- Where required, a qualified fauna spotter-catcher will conduct a search immediately prior to clearing of vegetation for the presence of fauna species and important habitat values. Where fauna or important habitat values are detected, the spotter catcher will assess and implement the most appropriate method to avoid or minimise impacts as a result of clearing.

## 2. EXISTING ENVIRONMENT

The Study Area has been heavily modified by agricultural development, with the majority of the area (71.3%) cleared of native vegetation. There are a number of existing cleared vehicle and cattle tracks. Remnant vegetation and regrowth vegetation exist, largely in isolated fragments or in association with three ephemeral watercourses that intersect the Study Area. There are also State Forests and National Parks in close proximity to the Study Area.

### 2.1 Landscape Attributes

The Study Area is located in the Queensland Brigalow Belt bioregion and includes a range of landscape features typical of the region, from flat alluvial plains to undulating slopes of grassland with patches of eucalypt dominant and codominant open woodland. Two ephemeral watercourses, namely Diamondy Creek and Jingi Jingi Creek intersect the Study Area. The majority of the Study Area (71.3%) is cleared and used for agriculture, with remnant vegetation covering 3,248.0 ha (25.5%) and regrowth vegetation only 411.9 ha (3.2%). This regrowth vegetation includes 66.1 ha of DNRME mapped regrowth vegetation and 345.8 ha of 'mixed eucalypt species' regrowth. The cleared areas are largely associated with alluvial plains near watercourses, while remnant vegetation is associated with upper slopes.

The Study Area is identified as being in the Rural Zone under the Western Downs Planning Scheme and is predominantly used for cattle grazing. There are a number of protected areas in close proximity to the Study Area. Diamondy State Forest is located directly north of the Study Area and the Bunya Mountains National Park is located approximately 30 km to the southeast.

### 2.2 Fauna

Ecological field surveys were undertaken in November, 2019 by ERM. These surveys found a total of 54 fauna species. The fauna species found were primarily native species. Following a review of desktop information in combination with the evidence found during the field surveys (which verified habitat presence), five listed species under the EPBC and NC Acts, were considered as 'Known' or 'Likely' to occur within the Study Area. These species are:

- greater glider (*Petauroides Volans*);
- koala (*Phascolarctos cinereus*);
- white-throated needletail (*Hirundapus caudacutus*);
- glossy ibis (*Plegadis falcinellus*); and
- short-beaked echidna (*Tachyglossus aculeatus*).

## 3. ASPECTS AND RISKS

### 3.1 Construction Activities

During the construction phase, vegetation will need to be cleared to establish a development footprint. Clearing works may impact on breeding places, shelter and food sources for fauna species. Key aspects of the proposed development that could result in impacts to fauna include:

- Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks). The consequences of this impact may include:
  - Direct loss of native flora and fauna habitat;
  - Injury and mortality to fauna during clearing of fauna habitat;
  - Introduction and spread of priority weeds and pathogens that impact fauna; and

- Disturbance to fallen timber, dead wood and bush rock.
- Indirect impacts identified include risks for soil and water contamination, creation of barriers to fauna movement, or the generation of excessive dust, light or noise. Where not already included as soil and water mitigation commitments of the proposal, these issues are addressed in the Section 2.3.

### 3.2 Operational Activities

Potential impacts during the operational phase can arise from three potential pathways:

- Disturbance effects that exclude fauna from habitat; and
- Barrier effects that limit fauna movement between essential resources, such as foraging and roosting areas.

## 4. MANAGEMENT MEASURES

<b>Purpose</b>	The purpose of this FMP is to describe how impacts on fauna will be minimised and managed during construction and operation of the proposed development.		
<b>Objectives</b>	<p>The key objective of the FMP is to ensure that impacts to fauna are managed and are within the scope permitted by the planning approval. To achieve this objective, the following will be undertaken:</p> <ul style="list-style-type: none"> <li>• Ensure appropriate controls and procedures are implemented during construction activities to avoid (where necessary) or minimise potential adverse impacts to biodiversity values in the project footprint;</li> <li>• Ensure appropriate measures are implemented to address the mitigation measures detailed in the Development Permit; and</li> <li>• Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements.</li> </ul>		
<b>Targets</b>	<p>The following targets have been established for the management of fauna impacts during construction of the Project:</p> <ul style="list-style-type: none"> <li>• Ensure full compliance with the relevant legislative requirements;</li> <li>• Ensure full compliance with relevant requirements of the Development Permit;</li> <li>• No disturbance to fauna outside the construction footprint;</li> <li>• Minimise disturbance to fauna within the Study Area;</li> <li>• No increase in distribution of noxious weeds currently existing within the Study Area;</li> <li>• No new noxious weeds introduced to the Study Area;</li> <li>• No fauna mortality during clearing and construction; and</li> <li>• No pollution or siltation of aquatic ecosystems, wetlands, endangered ecological communities or threatened species habitat.</li> </ul>		
<b>Key References</b>	<ul style="list-style-type: none"> <li>• <i>Nature Conservation Act 1992</i> (NC Act);</li> <li>• <i>Environmental Protection Act 1994</i> (and Regulation) (EP Act);</li> <li>• <i>Vegetation Management Act 1999</i> (VM Act);</li> <li>• <i>Biosecurity Act 2014</i> (and Regulation); and</li> <li>• <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth) (EPBC Act)</li> </ul>		
<b>Stage</b>	<b>Management Actions</b>	<b>Responsibility</b>	<b>Timing</b>
<b>Pre-Development</b>	The two-stage design process where impact and disturbance mitigation surveys and procedures will be put in place. Areas of remnant and regrowth vegetation will be avoided through development design following the constraints identified during the	Proponent	Design



	first-stage field surveys and subsequent micro-siting (pre-clearance) survey stages.		
	Design of a turbine with a blade sweep area >40 m above ground level to provide a collision-free foraging zone within the canopy and 20 m above the canopy	Proponent	Design
	Locating turbines away from key habitats (including remnant vegetation and waterways and drainage lines)	Proponent	Design
<b>Pre-Construction</b>	Pre-clearance surveys shall be undertaken prior to clearing within the marked boundaries. These pre-clearance surveys will form part of the micro-siting process, which will closely analyse potential infrastructure locations. If potential habitat for listed species occurs in such locations, development layout will be adjusted.	EPC Contractor	Prior to Construction
	Pre-clearance surveys for listed threatened fauna known, likely and with potential to occur in the Study Area within the defined development footprint. This will include spotlighting for nocturnal species such as the greater glider.	EPC Contractor	Prior to Construction
<b>Construction</b>	All clearing shall be within clearly marked boundaries and in accordance with the Development Permit.	EPC Contractor	At all times
	Implementation of the Queensland Fauna Stock Management Plan	EPC Contractor	At all times
	Where trenching and excavations are created which may entrap fauna, suitable escape measures are put in place, and excavation are checked for fauna before backfilling.	EPC Contractor	At all times
	Provide site specific information on relevant threatened species.	EPC Contractor	At all times
	Include toolbox talks for site specific fauna information during the project	EPC Contractor	Daily
	Ensure appropriate waste management (lidded bins), including food scraps, to reduce potential for feral species to become established on-site	EPC Contractor	At all times
	Access roads, easements and yards will be kept weed free where practicable	EPC Contractor	At all times
	Only registered herbicides will be used by licenced weed sprayer	EPC Contractor	At all times
<b>Monitoring</b>	Daily inspections by spotter / catcher during clearing, specifically hollow trees or food tree species	EPC Contractor	Daily
	Weekly site inspections to review fauna control measures during construction	EPC Contractor	Weekly
	Annual auditing of CEMP during construction	EPC Contractor	Quarterly
<b>Reporting</b>	Sightings and incidents reported in daily Pre-starts	EPC Contractor	Daily
	Fauna spotter-catcher will keep an inventory of any fauna species encountered with details of species, capture and release condition and capture and release GPS co-ordinates during construction	Spotter Catcher	Daily
	Injured native fauna to be reported to HSEQ Manager	EPC Contractor	Within 24 hours

<b>Corrective Action</b>	All near misses and incidents will be investigated to establish root cause. Where necessary corrective actions will be developed to improve existing processes	All Personnel	As required
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## 5. CONCLUSION

The 2019 field investigation determined the ecological values associated with vegetation communities and habitats that occurred within the Study Area. As a result of this field investigation, the layout design has been informed such that the majority of habitat for potential, likely and known threatened species within the Study Area, has been avoided.

The second phase of layout design will result in further avoidance of vegetation and threatened species habitat as a result of pre-clearance surveys. These pre-clearance surveys will assess the proposed locations for infrastructure, and adjust these accordingly if any threatened species or their associated habitats, are located within the proposed locations.

Construction and operational activities that will potentially impact threatened species have been identified and subsequent mitigation measures have been outlined in this plan, in order to adequately manage these potential impacts.

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**APPENDIX G      BIRD AND BAT MANAGEMENT PLAN**



# Bird and Bat Management Plan

Wambo Wind Farm

4 September 2020

Project No.: 0532612



Document details	
Document title	Bird and Bat Management Plan
Document subtitle	Wambo Wind Farm
Project No.	0532612
Date	4 September 2020
Version	1.0
Author	Ned Bowden & Amelia James
Client Name	Cubico Sustainable Investments Pty Ltd

#### Document history

Version	Revision	Author	Reviewed by	ERM approval to issue		Comments
				Name	Date	
Draft	A	Ned Bowden	Dr David Dique	Dr David Dique	05/06/2020	
Final Draft	1	Amelia James	Dr David Dique	Dr David Dique	08/07/2020	
Final	2	Amelia James	Dr David Dique	Dr David Dique	04/09/2020	

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## Signature Page

4 September 2020

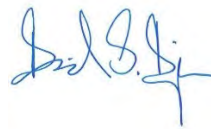
# Bird and Bat Management Plan

Wambo Wind Farm



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Michael Rookwood  
Project Manager



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## 1. INTRODUCTION

White Wind No. 1 Pty Ltd (the Proponent) is proposing to develop a wind farm approximately 20 km northeast of the town of Jandowae in the Western Downs Region (south-east) of Queensland. The proposed development will comprise of approximately 110 wind turbines, with an installed capacity of up to 500MW over an area of around 12,760.0 hectares (ha) (the Study Area). As part of management of impacts to environmental values, a number of management plans are being prepared by Environmental Resources Management Pty Ltd (ERM). The objective of this Bird and Bat Management Plan (BBMP) is to minimise any potential residual impacts to birds and bats as a result of the proposed development.

### 1.1 Avoidance Measures and Potential Impacts

The proposed development has the potential to directly and indirectly impact flora and fauna values within the Study Area. Generally, the greatest potential impact to biodiversity values is associated with clearing and grading activities during which vegetation and fauna habitat is removed. Where possible, vegetation disturbance associated with the proposed development has been avoided or minimised through detailed design. However, possible residual impacts to birds and bats include:

- Vegetation clearing;
- Habitat loss;
- Mortality or injury of fauna due to rotor strike and barotrauma;
- Dust impacts;
- Noise and light impacts; and
- Increase in exotic flora and fauna.

An ecological impact assessment including desk based and field investigations was undertaken by ERM in 2020, and this management plan aims to minimise and potential residual impacts associated with the proposed development.

The key management strategy for minimising impacts to birds and bats is avoidance through layout design. The avoidance strategy will occur in two phases. The first design phase is based on avoidance of vegetation and potential habitat mapped as a result of the field investigation conducted, and subsequent values identified. The second phase will involve pre-clearance surveys which includes on the ground micro-siting at each location proposed for infrastructure (such as wind turbines). The pre-clearance surveys will assess the localised environmental values, including important habitat values to determine if micro-siting can be used to avoid important values.

To minimise the impacts of the proposed development, several measures have been implemented, including:

- Avoidance of woodland patches by locating infrastructure outside of these areas;
- Implementation of the Bird and Bat Management Plan; and
- Where required, a qualified fauna spotter-catcher will conduct a search (pre-clearance surveys) immediately prior to clearing of vegetation for the presence of fauna species.

## 2. EXISTING ENVIRONMENT

The Study Area has been heavily modified by agricultural development, with the majority of the area (71.3%) cleared of native vegetation. There are a number of existing cleared vehicle and cattle tracks. Remnant areas of vegetation and regrowth vegetation exist, largely in isolated fragments or in association with three ephemeral watercourses that intersect the Study Area. There are also State Forests and National Parks in close proximity to the Study Area.

### 2.1 Landscape Attributes

The Study Area is located in the Queensland Brigalow Belt bioregion and includes a range of landscape features typical of the region, from flat alluvial plains to undulating slopes of grassland with patches of eucalypt dominant and codominant open woodland. Two ephemeral watercourses, namely Diamondy Creek and Jingi Jingi Creek intersect the Study Area. The majority of the Study Area (71.3%) is cleared and used for agriculture, with remnant vegetation covering 3,248.0 ha (25.5%) and regrowth vegetation only 411.9 ha (3.2%). This regrowth vegetation includes 66.1 ha of DNRME mapped regrowth vegetation and 345.8 ha of 'mixed eucalypt species' regrowth. The cleared areas are largely associated with alluvial plains near watercourses, while remnant vegetation is associated with upper slopes.

The Study Area is identified as being in the Rural Zone under the Western Downs Planning Scheme and is predominantly used for cattle grazing. There are a number of protected areas in close proximity to the Study Area. Diamondy State Forest is located directly north of the Study Area and the Bunya Mountains National Park is located approximately 30 km to the southeast.

### 2.2 Birds

A combined total of 45 birds were identified during the field survey, with no listed threatened species observed. Birds were recorded in a variety of habitats including non-native grasslands, eucalypt woodlands, riparian corridors, rocky outcrops, and waterbodies. The Study Area contained occasional active and abandoned small and medium sized nests. There were three (3) bird of prey nests identified within the Study Area. Waterbodies supported a moderate diversity and abundance of birds in comparison to other habitats, while low abundance of birds was observed across the Study Area. This may be associated with the dry conditions observed across the landscape.

A total of three birds of prey were identified during the surveys, and in low abundance. These were:

- wedge tail eagle (*Aquila audax*)
- nankeen kestrel (*Falco cenchroides*)
- brown falcon (*Falco berigora*)

*Woodland and open-forest species:*

The vast majority of birds recorded during field surveys were woodland-dwelling, low-flying species. These species require woodland dominated by *Eucalypt*, *Calitris* and *Acacia spp.*, often with hollows for nesting and roosting habitat (BirdLife, 2019). Woodland areas are often associated with a large amount of fallen timber and leaf matter on the ground. The woodland bird species require this habitat feature as it allows their food source of insects and small-reptiles to be in abundance. Woodland species were only observed flying to the maximum height of the woodland canopy, or below.

### 2.3 Bats

Ecological field surveys were undertaken in November, 2019 by ERM. These surveys found a total of 54 fauna species which included nine bats. The bat species found were all native species. None of

the bat species identified during the field surveys were listed as threatened species (**Table 2-1**). All bat species are classified as microbat species.

**Table 2-1 Bat species identified and conservation status**

Scientific Name	Common Name	EPBC Act Status	NC Act Status
<i>Austronomus australis</i>	white-striped freetail-bat	-	LC
<i>Chalinolobus gouldii</i>	Gould's wattled bat	-	LC
<i>Chalinolobus nigrogriseus</i>	hoary wattled bat	-	LC
<i>Miniopterus australis</i>	little bent-wing bat	-	LC
<i>Miniopterus oriana<sup>1</sup></i>	large bent-wing bat	-	LC
<i>Mormopterus ridei</i>	eastern free-tailed bat	-	LC
<i>Saccolaimus flaviventris</i>	yellow-bellied sheathtail bat	-	LC
<i>Rhinolophus megaphyllus</i>	eastern horseshoe bat	-	LC
<i>Vespadelus pumilis</i>	eastern forest bat	-	LC

<sup>1</sup> synonymous with *Miniopterus schreibersii oceanensis* and *Miniopterus oriana oceanensis*.

The freetail bats recorded (family Molossidae) include white-striped free-tailed bat (*Austronomus australis*), eastern free-tailed bat (*Mormopterus ridei*). Australian molossids have been recorded from habitats of closed forest to desert. The habitat must supply roosting sites which may be buildings, hollow trees or rock crevices in rocky outcrops, river banks or even under stones. These species feed on a range of insects from moths to hard-shelled beetles (Allison, 1989).

The wattled bats recorded, Gould's wattled bat (*Chalinolobus gouldii*) and hoary wattled bat (*Chalinolobus nigrogriseus*), can be found in a wide range of habitats, including forests and woodlands and typically roost in tree hollows. These species prefer a diet of moths and beetles, but will eat other insects if available (Churchill, 2008).

The bent-winged bats recorded, little bent-wing bat (*Miniopterus australis*) and large bent-wing bat (*Miniopterus oriana*) occupy well-timbered habitats, often in wetter areas or in close proximity to water features. These species typically roost in caves or other man-made structures and show a dietary preference for moths (Churchill, 2008).

The sheathtail bat recorded, yellow-bellied sheathtail bat (*Saccolaimus flaviventris*) shows a similar diet preference for beetles but differ in other aspects of their ecology. *Saccolaimus flaviventris* is found in nearly all habitats and utilises large tree hollows for roosting (Armstrong & Lumsden, 2017).

The eastern-horseshoe bat (*Rhinolophus megaphyllus*) and eastern-forest (*Vespadelus pumilis*) bat are similar in that they are both found in closed forests habitats with a diet consisting of wide variety of insects (Armstrong & Aplin, 2017).



### 3. ASPECTS AND RISKS

#### 3.1 Construction Activities

During the construction phase, vegetation will need to be cleared to establish a development footprint. Clearing works may impact on breeding places, shelter and food sources for fauna species. Key aspects of the Project that could result in impacts to biodiversity include:

- Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks). The consequences of this impact may include:
  - Direct loss of native bird and bat habitat;
  - Injury and mortality to birds and bats during clearing of fauna habitat;
  - Introduction and spread of priority weeds and pathogens that impact fauna; and
  - Disturbance to fallen timber, dead wood and bush rock.

#### 3.2 Operational Activities

Potential impacts to birds and bats during the operational phase can arise from three potential pathways:

- Direct collision of birds and bat with operating wind turbine blades or towers at rotor swept area (RSA) heights;
- Disturbance effects (such as building placement, habitat edge effects) that exclude birds and bats from habitat; and
- Barrier effects that limit bird and bat movements between essential resources, such as foraging and roosting areas.

### 4. MANAGEMENT MEASURES

<b>Purpose</b>	The purpose of this BBMP is to describe how impacts on birds and bats will be minimised and managed during construction and operation of the Project.
<b>Objectives</b>	<p>The key objective of the BBMP is to ensure that impacts to birds and bats are managed and are within the scope permitted by the planning approval. To achieve this objective, the following will be undertaken:</p> <ul style="list-style-type: none"> <li>■ Ensure appropriate controls and procedures are implemented during construction activities to avoid (where necessary) or minimise potential adverse impacts to biodiversity values in the project footprint;</li> <li>■ Ensure appropriate measures are implemented to address the mitigation measures detailed in the Development Permit; and</li> <li>■ Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements.</li> </ul>
<b>Targets</b>	<p>The following targets have been established for the management of biodiversity impacts during construction of the Project:</p> <ul style="list-style-type: none"> <li>■ Ensure full compliance with the relevant legislative requirements;</li> <li>■ Ensure full compliance with relevant requirements of the Development Permit;</li> <li>■ No disturbance to biodiversity outside the construction footprint;</li> <li>■ Minimise disturbance to biodiversity within the Study Area;</li> <li>■ No increase in distribution of noxious weeds currently existing within the Study Area;</li> <li>■ No new noxious weeds introduced to the Study Area;</li> <li>■ No fauna mortality during clearing and construction; and</li> <li>■ No pollution or siltation of aquatic ecosystems, wetlands, endangered ecological communities or threatened species habitat.</li> </ul>
<b>Key References</b>	<ul style="list-style-type: none"> <li>■ <i>Nature Conservation Act 1992 (NC Act)</i>;</li> </ul>

Stage	Management Actions	Responsibility	Timing
	<ul style="list-style-type: none"> <li>■ <i>Environmental Protection Act 1994</i> (and Regulation) (EP Act);</li> <li>■ <i>Vegetation Management Act 1999</i> (VM Act);</li> <li>■ <i>Biosecurity Act 2014</i> (and Regulation); and</li> <li>■ <i>Environment Protection and Biodiversity Conservation Act 1999</i> (Commonwealth) (EPBC Act)</li> </ul>		
<p style="text-align: center;"><b>Pre-Development</b></p>	The two-stage impact and disturbance mitigation process will be implemented. Areas of remnant and regrowth vegetation will be avoided at the design and micro-siting phases	Proponent	Design
	Design of a turbine with a blade sweep area >40 m above ground level to provide a collision-free foraging zone within the canopy and 20 m above the canopy	Proponent	Design
	Locating turbines away from key bird and bat habitats (waterways and drainage lines)	Proponent	Design
	Initial field surveys for bird and bats will be undertaken. Impacts areas to be selected as part of the Before and After Control Impact (BACI) designed bird surveys.	Proponent	Design
<p style="text-align: center;"><b>Pre-Construction</b></p>	Pre-clearing surveys shall be undertaken prior to clearing efforts within the marked boundaries. These pre-clearance surveys will form part of the micro-siting process, which will closely analyse potential infrastructure locations. If potential habitat for bats, such as riparian areas and dense woodlands, occur in such locations, development layout will be adjusted. Control areas to be selected as part of BACI designed bird surveys, Surveys will then be undertaken in the control and impact areas prior to construction beginning. The surveys will include Bird Utilisation Surveys (BUSs) such as point, waterbody and bird of prey surveys in order to determine and bat surveys via the use of echolocation call detectors and harp trapping.	EPC Contractor	Prior to Construction
	Targeted surveys to identify important habitat features of value to birds and bats in the Study Area, in particular, survey effort should attempt to identify any nesting sites of raptors so that turbines can be located at a minimum of 500 m to minimise collision risk	EPC Contractor	Prior to Construction
<p style="text-align: center;"><b>Construction</b></p>	All clearing shall be within clearly marked boundaries and in accordance with the Development Permit	EPC Contractor	At all times
	Implementation of the Queensland Fauna Stock Management Plan	EPC Contractor	At all times
	Where trenching and excavations are created which may entrap fauna, suitable escape measures are put in place, and excavation are checked for fauna before backfilling.	EPC Contractor	At all times
	Include toolbox talks for site specific bird and bat information during the project	EPC Contractor	Daily
	Ensure appropriate waste management (lidded bins), including food scraps, to reduce potential for feral species to become established on-site	EPC Contractor	At all times
	Low wind speed curtailment where rotors are feathered to prevent turning at wind speeds below the manufacturer's cut in speed of 3 m/s	EPC Contractor	At all times
	Targeted surveys to identify raptor presence and use of the Study Area. In particular, survey effort should attempt to identify any nesting sites so that turbines can be located at a minimum of 500 m to minimise collision risk.	EPC Contractor	At all times
	BACI surveys conducted at impact and controls areas during construction to determine bird and bat	EPC Contractor	Bi-annually to Quarterly

	composition, abundance and density at control and development areas. This includes BUSs and bat survey methods like call detection and harp trapping.		
<b>Monitoring</b>	Daily inspections by spotter / catcher during clearing, specifically hollow trees, roosting sites, and rocky outcrops and caves for birds and bats	EPC Contractor	Daily
	Weekly site inspections to review flora and fauna control measures during clearing and construction	EPC Contractor	Weekly
	Annual auditing of CEMP during construction	EPC Contractor	Quarterly
	BACI surveys to be conducted in the operation phase at control and impacts areas, to determine the 'after' development effect on bird and bat composition, abundance and density.	EPC Contractor	Bi-annually to Quarterly
<b>Reporting</b>	Sightings and incidents reported in daily Pre-starts	EPC Contractor	Daily
	Fauna spotter-catcher will keep an inventory of any bird and bat species encountered with details of species, capture and release condition and capture and release GPS co-ordinates during construction. This also includes carcass reporting and notification.	Spotter Catcher	Daily
	Injured native fauna to be reported to HSEQ Manager	Site Manager	Within 24 hours
<b>Corrective Action</b>	All near misses and incidents will be investigated to establish root cause. Where necessary corrective actions will be developed to improve existing processes	All Personnel	As required
<b>Operation</b>	Low wind speed curtailment where rotors are feathered to prevent turning at wind speeds below the manufacturer's cut in speed of 3 m/s	Operator	At all times

## 5. CONCLUSION

The 2019 field investigation determined the ecological values associated with bird and bat habitats that occurred within the Study Area. As a result of this field investigation, the layout design has been informed such that the majority of habitat for birds and bats within the Study Area, has been avoided.

The second phase of layout design will result in further avoidance of bird and bat habitat as a result of pre-clearance surveys. These pre-clearance surveys will assess the proposed locations for infrastructure, and adjust these accordingly if any threatened species or their associated habitats, are located within the proposed locations.

Construction and operational activities that will potentially impact to birds and bats have been identified and subsequent mitigation measures have been outlined in this plan, in order to adequately manage these potential impacts.

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**ATTACHMENT D NOISE IMPACT TECHNICAL ADIVCE MEMO**



## Technical Advice Memo

<b>To</b>	SARA
<b>From</b>	Aaron McKenzie Principal Acoustic Consultant Environmental Resources Management Australia Pty Ltd
<b>Date</b>	10 September 2020
<b>Reference</b>	0532612
<b>Subject</b>	Noise Impact Assessment Technical Advice - Wambo Wind Farm

This Technical Advice Memo has been prepared by Environmental Resources Management Australia Pty Ltd (ERM) in response to the acoustic amenity and noise monitoring items raised in SARA's advice notice, dated 26 August 2020.

We understand Sonus acoustic consultants were engaged by SARA as a third party technical review of the Noise Impact Assessment prepared by ERM to support the Wambo Wind Farm Development Application. The responses to items raised were discussed with Chris Turnbull at Sonus prior to finalising this memo.

## SOUND POWER LEVELS

### Issue Raised

*The Planning Guideline requires predictions to be based on guaranteed sound power levels for the turbines. It is unclear if the predicted noise levels in the Noise Assessment, dated 30 July 2020, are based on guaranteed (or equivalent) noise levels.*

*Generally, noise monitoring should be conducted at all sensitive land use receptors where the predicted noise level is greater than 35 dB(A).*

*The two most critical locations for background noise are Non-Host Lots 8 and 12, as the predicted noise level is greater than 35 dB(A) and therefore these locations rely on elevated background noise levels to achieve compliance. Background noise monitoring has not been conducted at either of these locations; rather Host Lot F has been used to represent both locations.*

*Where an assessment for a sensitive receptor is reliant on elevated background noise levels, there needs to be a high level of confidence that the measured background noise levels are representative of the noise at the sensitive receptor. Only in exceptional circumstances should a representative location be used. For Non-Host Lots 8 and 12 there is not sufficient information provided to demonstrate that the background noise will be the same as at Host Lot F.*

*For example, background noise monitoring was also conducted at Host Lot I, which is a similar distance from Non-Host Lot 8 as Host Lot F. The background noise measured at Host Lot I was lower than at Host Lot F and if used as being representative for Non-Host Lot 8, would result in the criteria being exceeded.*



### Action Requested

*Provide additional information that demonstrates that the sound power levels are indicative of the highest levels that would be guaranteed for the range of turbines being considered. With regard to the above, it is unclear if the predicted noise levels in the Assessment are based on guaranteed (or equivalent) noise levels.*

### ERM Response

The sound power level (L<sub>w</sub>) adopted in the assessment are equivalent to a guaranteed SWL for the turbine model being considered for the project which meets the projects noise objectives. This includes L<sub>w</sub> uncertainty for the particular turbine model based on advice from the turbine manufacturer. The project recognises noise as a potential constraint and as such is including turbine L<sub>w</sub> into consideration with the selection of turbines.

With respect to the noise monitoring, at the time monitoring was undertaken, a decision was made to progress with noise monitoring prior to finalising the turbine layout and before access agreements were in place for non-host lots. This was undertaken in the context of significant uncertainty around potential for future COVID-19 spread and likelihood of travel restrictions potentially limiting access to regional areas for Brisbane based field teams.

Since the initial monitoring was undertaken the project layout has been progressing through a layout design optimisation process which has resulted in potential noise impacts above 35dBA being identified at dwellings on non-host lots 8 and 12.

The collection of a baseline data set at all dwellings on non-host lots predicted to exceed 35dBA is a project commitment, and is expected to be a requirement of a condition of approval. Results of noise monitoring at these locations would feed into the wind farm detailed design noise modelling assessment to ensure predicted noise levels are either below 35dB or less than the night time background noise level + 5dB at non host lots.

### Issue Raised

*The acoustic assessment includes predictions of the noise from a substation and a battery energy storage system (BESS).*

### Action Requested

*Provide justification for the sound power levels used and provide a comparison of the predicted noise levels with the Acoustic Quality Objectives of the Environment Protection (Noise) Policy 2019.*

### ERM Response

The noise assessment included a preliminary assessment of noise impacts from the BESS and Substation locations under consideration. Design and selection of BESS and substation equipment has not been undertaken at this stage however it is now understood that 50MW battery is being considered. The screening model assessed an L<sub>w</sub> of 101dB from the BESS and a substation SWL of 90 dB at each BESS location. However this would be dependent on the selection of equipment and layout. The L<sub>w</sub> adopted was indicative only.

The initial screening model indicated noise levels up to:

- 33 dBA and 29 dBA at the nearest host and non-host lot to the western location,
- 32 dBA and 21 dBA at the nearest host and non-host lot to the central location
- 15 dBA and 23 dBA at the nearest host and non-host lot to the east location

The EPP Noise Policy recommends outdoor noise levels during day time and evening of 50dBA and 35dBA (LAeq 1hr) respectively, and indoor noise levels for evening and night time of 35 dBA and 30 dBA (LAeq 1hr) respectively. The screening model results, once taking into account outdoors to indoor attenuation would be expected to meet these quality objectives.

The EPP Noise Policy also recommends that background creep is prevented or minimised where it reasonable to do so. Due to the very low background noise levels, some increase in noise level would be experience at the nearest receptors to the western and central BESS locations.

Based on the modelling outputs, the eastern BESS location has the potential for high outputs of 110 – 115 dBA Lw without exceeding the quality objectives.

Ultimately the detailed design of the project infrastructure will inform the selection of specific substation and BESS infrastructure with further detailed noise assessments to be undertaken to ensure compliance the Noise Measurement Manual.

## NOISE MONITORING

### Issue Raised

*The monitoring duration should be at least six weeks to provide sufficient noise data for day and night periods.*

*The noise monitoring in the assessment was conducted for four weeks and therefore did not meet the recommendation of Planning Guideline. There appears to be even less than 4 weeks of data at some locations, such as NML 5.*

### Action Required

*Provide additional noise monitoring data over a six-week period or provide justification for undertaking the monitoring over a lesser period.*

Light winds (at ground level) and nil rain were recorded, hence achieving very high data recovery, over the 1 month monitoring period resulting in over 4000 data points captured at the majority of the monitoring locations. Within the context of the reference documents and guidelines from which the State Code 23 is based this would be considered a reasonable dataset. Notwithstanding this, the collection of a minimum 6 week baseline data set at all non-host lots predicted to exceed 35dBA is a project commitment, and is expected to be a requirement of a condition of approval.

## CONCLUDING COMMENTS

We trust the above additional information provides sufficient detail to allow the Development Application to proceed through the approval process. However, should further clarification be required in relation to these matters please don't hesitate to contact Aaron McKenzie on (02) 8584 8804 or via email at [Aaron.Mckenzie@erm.com](mailto:Aaron.Mckenzie@erm.com)

Yours sincerely,

A handwritten signature in black ink, appearing to read 'AMcKenzie', is positioned below the text 'Yours sincerely,'.

Aaron McKenzie  
Principal Acoustic Consultant

**ATTACHMENT E POWERLINK CORRESPONDENCE**

## Michael Rookwood

---

**From:** TURTON Ian (Powerlink) <iturton@powerlink.com.au>  
**Sent:** Thursday, 10 September 2020 2:36 PM  
**To:** Michael Rookwood  
**Subject:** RE: DA3820 | FW: 2007-17946 SDA Wambo Wind Farm DA - Advice Agency Referral to Powerlink  
**Attachments:** Copy of WTG\_v15c\_110T.xlsx  
**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Hi Michael,

I've reviewed the data you sent through and identified WT4, WT60, WT64, WT69, WT70, WT72, WT76, and WT79 as being within the preferred 1.5 times tip height setback. WT60 (by my calculations) may even be less than 1 times the setback (assuming a tip height of 280m). I've just used your spreadsheet to note the setback measurements of the turbines in question. I've attached if you are interested in my findings.

That being said, I have referred this new information over to our line strategies team for comment and am awaiting their response. They may be willing to consider a reduced setback, but I'll need to allow them some time to consider. I am hoping to have some feedback by the end of the week.

When establishing the 1.5 times setback, Powerlink did look across other interstate projects to see if there was a national standard. When one wasn't found we adopted the 1.5, as we concluded it would best mitigate impact from catastrophic turbine failure. If you are aware of a national standard that has informed your previous projects (ie. 1 times tip height), can you point me towards it? We would definitely consider revising our requirement if there was a nationally recognised standard.

Kind Regards,  
Ian

### Ian Turton

Planning and Approvals Advisor

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---

**From:** Michael Rookwood <Michael.Rookwood@erm.com>  
**Sent:** Thursday, 10 September 2020 2:07 PM  
**To:** TURTON Ian (Powerlink) <iturton@powerlink.com.au>  
**Subject:** RE: DA3820 | FW: 2007-17946 SDA Wambo Wind Farm DA - Advice Agency Referral to Powerlink

Hi Ian,

Just touching base in relation to the below enquiry, have you got any updates to share?

Happy to discuss further if required.

Regards,

**Michael Rookwood**

Senior Town and Environmental Planner

**ERM**

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---

**From:** TURTON Ian (Powerlink) <[iturton@powerlink.com.au](mailto:iturton@powerlink.com.au)>

**Sent:** Friday, September 4, 2020 10:40 AM

**To:** Michael Rookwood <[Michael.Rookwood@erm.com](mailto:Michael.Rookwood@erm.com)>

**Subject:** RE: DA3820 | FW: 2007-17946 SDA Wambo Wind Farm DA - Advice Agency Referral to Powerlink

Thanks Michael,

Message received. I'll review early next week and be in touch.

Ian

**Ian Turton**

Planning and Approvals Advisor

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---

**From:** Michael Rookwood <[Michael.Rookwood@erm.com](mailto:Michael.Rookwood@erm.com)>

**Sent:** Thursday, 3 September 2020 6:31 PM

**To:** TURTON Ian (Powerlink) <[iturton@powerlink.com.au](mailto:iturton@powerlink.com.au)>

**Cc:** Property Mailbox <[Property@powerlink.com.au](mailto:Property@powerlink.com.au)>; Danielle Harris <[Danielle.Harris@dsdmip.qld.gov.au](mailto:Danielle.Harris@dsdmip.qld.gov.au)>

**Subject:** RE: DA3820 | FW: 2007-17946 SDA Wambo Wind Farm DA - Advice Agency Referral to Powerlink

*ERM Reference: 0532612  
SARA Reference: 2007-17946 SDA*

Good afternoon Ian,

Thank you for your time over the phone earlier today to discuss the information requested in your below correspondence.

As requested, please find attached the co-ordinate details for the propose turbine locations and note the only infrastructure proposed within the existing transmission line easement is one access track between WT64 and WT60, and an underground electrical connection between WT57 and WT69, as shown on the attached map.

With respect to the easement clearance requirements, we note the project has been designed with 1 x tip height clearance which is consistent with other interstate wind farm projects. We therefore would like to seek clarification as to the basis for this setback provision which has the potential to impact the final constructed layout. We would also request that this be reconsidered given we understand the 132kv transmission line is scheduled for decommissioning



in 2026, and the majority of turbines within proximity of the transmission line are part of the Stage 2 and may not be operational until the transmission line is decommissioned.

Irrespective of the setback provision and the above request, we note these requirements can be accommodated through microsighting associated with the current proposed layout, and therefore should not prevent Powerlink from endorsing the project, subject to reasonable conditions.

Happy to discuss further if required.

Regards,

**Michael Rookwood**

Senior Town and Environmental Planner

**ERM**

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---

**From:** TURTON Ian (Powerlink) <[iturton@powerlink.com.au](mailto:iturton@powerlink.com.au)>

**Sent:** Tuesday, August 25, 2020 1:26 PM

**To:** Michael Rookwood <[Michael.Rookwood@erm.com](mailto:Michael.Rookwood@erm.com)>

**Cc:** Property Mailbox <[Property@powerlink.com.au](mailto:Property@powerlink.com.au)>

**Subject:** RE: DA3820 | FW: 2007-17946 SDA Wambo Wind Farm DA - Advice Agency Referral to Powerlink

Hi Michael,

Thank-you for sending this information through.

We have actually already seen this application (referred to us by SARA for third party advice to inform their information request), and responded to them last week. For your info, we asked SARA (through their IR) to seek the following information from the applicant and provide us with the response:

- Coordinates (in MGA coordinates system) of the centre point of turbines, to allow us to assess proximity of turbines to the edge of the transmission easement. As per previous wind farm developments, we seek to ensure turbines are separated (from the edge of the easement) by a distance of 1.5 times the tip height of the turbine (or greater).
- Details of any ancillary infrastructure proposed within the existing transmission line easement including (but not limited to): roads, cables telecommunications.

Happy to discuss these requirements directly with the applicant should it not be clear.

Kind Regards,

Ian

**Ian Turton**

Planning and Approvals Advisor

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**From:** SANDAVER Michael (Powerlink) <[msandaver@powerlink.com.au](mailto:msandaver@powerlink.com.au)>  
**Sent:** Tuesday, 25 August 2020 1:14 PM  
**To:** TURTON Ian (Powerlink) <[iturton@powerlink.com.au](mailto:iturton@powerlink.com.au)>  
**Subject:** FW: DA3820 | FW: 2007-17946 SDA Wambo Wind Farm DA - Advice Agency Referral to Powerlink

## Michael Sandaver

Property Assessment Coordinator

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**From:** IRELAND Kara (Powerlink) <[kireland@powerlink.com.au](mailto:kireland@powerlink.com.au)>  
**Sent:** Monday, 24 August 2020 8:34 AM  
**To:** SANDAVER Michael (Powerlink) <[msandaver@powerlink.com.au](mailto:msandaver@powerlink.com.au)>  
**Subject:** FW: DA3820 | FW: 2007-17946 SDA Wambo Wind Farm DA - Advice Agency Referral to Powerlink

Hi Michael,

Please see **attached** documents for DA3820 in Objective ID A3416465.

Thanks,  
Kara

---

**From:** Property Mailbox <[Property@powerlink.com.au](mailto:Property@powerlink.com.au)>  
**Sent:** Monday, 24 August 2020 7:30 AM  
**To:** IRELAND Kara (Powerlink) <[kireland@powerlink.com.au](mailto:kireland@powerlink.com.au)>  
**Subject:** DA3820 | FW: 2007-17946 SDA Wambo Wind Farm DA - Advice Agency Referral to Powerlink

Received: 21 August 2020  
Ack Notice: 28 August 2020  
Info Req: 4 September 2020  
Response: 18 September 2020

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**From:** Michael Rookwood <[Michael.Rookwood@erm.com](mailto:Michael.Rookwood@erm.com)>  
**Sent:** Friday, 21 August 2020 5:08 PM  
**To:** Property Mailbox <[Property@powerlink.com.au](mailto:Property@powerlink.com.au)>  
**Subject:** 2007-17946 SDA Wambo Wind Farm DA - Advice Agency Referral to Powerlink

*ERM Reference: 0532612  
SARA Reference: 2007-17946 SDA*

Good afternoon,

Environmental Resources Management Australia Pty Ltd (ERM) is writing on behalf of White Wind Project No.1 Pty Ltd (the Applicant) in relation to the submission of a Development Application for Material Change of Use – Wind Farm and Operational Works – Native Vegetation Clearing associated with the proposed Wambo Wind Farm Project (the Project). The Project consists of 110 wind turbines (circa 660MW capacity) and is proposed to be located on 12,500 ha of freehold land comprising of 43 separate lots, situated 15 km northeast of Jandowae and 60 km west of Kingaroy in the Western Downs Region Local Government Area, Queensland.

The assessment manager for the DA is the State Assessment Referral Agency (SARA), however referral to Powerlink as an advice agency is required under Schedule 10, Part 9, Division 2, Table 2, Item 1 (10.9.2.2.1) of the Planning Regulation 2017.

Please find attached the cover letter for the DA submission providing an overview of the project, along with the SARA Confirmation Notice.

The DA Submission and supporting material including the Planning Report can be found in the SARA application material database using the reference number - <https://planning.dsdmip.qld.gov.au/planning/better-development/the-development-assessment-process/the-states-role/sara-decisions>

Should you require any further information or have any questions during the course of your review please contact me on the below details.

Happy to discuss further if required.

Regards,

**Michael Rookwood**  
Senior Town and Environmental Planner

**ERM**

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**ATTACHMENT F    WDRC CORRESPONDENCE**

## Michael Rookwood

---

**From:** Joshua Petrass <Joshua.Petrass@cubicoinvest.com>  
**Sent:** Wednesday, 5 August 2020 2:57 PM  
**To:** graham.cook@wdrc.qld.gov.au  
**Cc:** john.craik@wdrc.qld.gov.au; Imcdonald; Andres Maasing  
**Subject:** RE: Wambo Wind Farm  
**Attachments:** Wambo WF Planning Report - App L - Preliminary Route Analysis.pdf

Further to my previous email, attached is the latest route analysis.

[Joshua Petrass - Development Manager](#)

+61 290 591 164(DDI) +61 429 279 271(M)  
Level 28, 161 Castlereagh St, Sydney, 2000, Australia  
[www.cubicoinvest.com](http://www.cubicoinvest.com)



---

**From:** Joshua Petrass  
**Sent:** Wednesday, 5 August 2020 2:50 PM  
**To:** graham.cook@wdrc.qld.gov.au  
**Cc:** john.craik@wdrc.qld.gov.au; Imcdonald <Imcdonald@repartners.com.au>; Andres Maasing <Andres.Maasing@cubicoinvest.com>  
**Subject:** Wambo Wind Farm

Dear Graham

Thanks for taking the time to meet with us yesterday morning. As discussed, attached are the latest versions of the traffic impact assessment as submitted with the DA. I'll follow up with the route analysis separately as it is too large to attach to this email.

Thanks for your feedback about the alternative proposed route, we have asked our consultants to have a look at it.

Are you also able to share the contact of your former offsider at South Burnett Regional Council so that we can reach to him about the eastern route?

Best regards,

[Joshua Petrass - Development Manager](#)

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## Michael Rookwood

---

**From:** Luke McDonald <lmcdonald@repartners.com.au>  
**Sent:** Friday, 11 September 2020 9:37 AM  
**To:** Michael Rookwood  
**Cc:** Joshua Petrass  
**Subject:** Fwd: Wambo Wind Farm

Michael

Lastest email from Western Downs.

Luke

----- Forwarded message -----

**From:** John Craik <[John.Craik@wdrc.qld.gov.au](mailto:John.Craik@wdrc.qld.gov.au)>  
**Date:** Mon, 31 Aug 2020 at 07:45  
**Subject:** Wambo Wind Farm  
**To:** Luke McDonald <[lmcdonald@repartners.com.au](mailto:lmcdonald@repartners.com.au)>

Morning Luke

As discussed last week, I am working on the Draft RIA. I will discuss with Graham later this week following his return from leave before forwarding to you.

FYI, I am out of office and will be returning tomorrow.

Regards  
**John Craik**  
Technical Services Manager

**WESTERN DOWNS REGIONAL COUNCIL**  
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**Phone 07 4679 4612** Mobile 0427 991 265 Fax 07 4679 4099  
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