

EPURON

Biodiversity Risks, Impacts & Offsets

YASS VALLEY WIND FARM PAC SUBMISSION

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1 INTRODUCTION

1.1 OVERVIEW

This report summarises the status of the biodiversity risks, impacts and offsets as they relate to the proposed Yass Valley Wind Farm.

This report is structured to provide an accessible overview of the project's:

- Biodiversity survey and assessment history Section 2.1
- Key biodiversity risks and the proposed pathways forward to reduce, manage and offset impacts Section 2.2
- Approach to impact avoidance and mitigation applied throughout the assessment process Section 2.3
- Proposed offset methodology Section 3

Included in this document are a number of Appendices that provide the additional detail to these sections, including preliminary offset credit calculations for native vegetation, threatened species and hollow bearing trees and more detailed discussion of the proposed security and management mechanisms to manage identified offset lands. A series of maps are presented in Appendix G that can be referred to when reading this report. These maps include:

- Impact areas, showing vegetation type and condition
- Proposed offset areas, showing vegetation type and condition
- Location of hollow bearing trees, by precinct
- Results of Golden Sun Moth surveys

This document demonstrates the approach to the assessment of the proposed wind farm has been rigorous and adaptive, to changes in the infrastructure layout and the changing assessment context since 2008 when site work commenced. Key risks have been 'derisked', in that clear strategies have been developed to confirm assumptions and build in a precautionary approach to managing the construction and operational impacts. Offset lands identified by the proponent are well in excess of the preliminary BioBanking offset credit requirements and in perpetuity mechanisms to secure and manage offset lands have been outlined and are in line with similar projects of this size and nature.

Note on terminology:

While the Yass Valley Wind Farm is referred to as three distinct turbine precincts and the 330kV electricity transmission connection in the planning documentation, for the purpose of the biodiversity field work and assessment, the Conroys Gap Extension precinct has historically been considered part of the Marilba precinct and earlier documents reflect this consideration.

1.2 PLANNING REQUIREMENTS

The Yass Valley Wind Farm was lodged as a part 3A assessment under the *Environmental Planning and Assessment Act (1979) (EPA Act)* in 2009, with the Director General's Requirements being issued in the same year. In March, 2014 the development was transitioned to the NSW Government's State Significant development process under Part 4 of the EPA Act.

Since lodgement of the Project Application, the policies of Government agencies (principally NSW Office of Environment and Heritage; OEH) in relation to biodiversity impact assessment and offsetting have changed. This includes changes to the classification of native vegetation condition and the introduction of new procedures such as the BioBanking methodology. Changes are currently being made to the BioBanking online calculator to better account for the impacts of linear developments and major developments, such as wind farms. These changes are ongoing, and it is not practical to apply to this project the procedures which would apply to a new project submitted today. We also note the Director General's Requirements have not changed since they were issued in 2008.

The assessment procedures applied to this project fully assess the likely impacts to biodiversity of the project. Throughout the assessment process, NGH Environmental has incorporated new requirements, conducted and supplied additional survey, assessment and management strategies, in order to adequately address issues raised by the agencies, and transcribed to the applicant via the Department of Planning and Environment.

1.3 RISK BASED APPROACH

The approach to the biodiversity assessments has been to meet the principles of:

1. **Avoid impact.** Where practical impacts to biodiversity should be avoided. This is achievable through the identification of site constraints and relocation of equipment away from higher constraint areas as much as possible.

During early investigations (2009), NGH Environmental investigated the project site, and mapped vegetation type, significance (or non-significance) of this, and habitat features. The area subject to this investigation was significantly larger than the eventual development footprint. The objective of the constraints mapping was to identify "high", "moderate" and "low" constraint areas and guide design of the wind farm, with an objective of avoiding high constraint areas where practicable.

The final infrastructure layout demonstrates the result of this iterative process. The majority of the impact would occur in low condition or low diversity pasture with no or little tree cover. All areas of Yass Daisy have been avoided.

2. **Mitigate impact.** Following detailed design of the project, more intensive surveys were undertaken. These include surveys that targeted impact zones, and species at risk of impact. This series of intensive surveys have been guided by the Director General Requirements, liaison with OEH, and the findings of each set of survey results.

Examples of mitigation strategies that have been developed and committed to by the proponent as a direct result of these surveys include 'micrositing' of infrastructure with input from an ecologist and establishment of buffers in sensitive areas (eg. Yass Daisy, areas of Commonwealth listed Endangered Ecological Community). Additionally, a framework for the Bird and Bat

Management Plan has been developed to identify key risks and management strategies for the operational phase of the project.

3. **Offset impact.** Where impacts cannot be avoided, or mitigated, these would be offset. An Offset Strategy including a Draft Offset Plan sourcing credit requirements from the NSW OEH BioBanking Assessment Methodology has been prepared. It is included as Appendix E.

This avoid, mitigate and offset risk-based approach to our assessment of the Yass Valley Wind Farm is detailed further in Section 2.3, below.

2 BIODIVERSITY ASSESSMENT RESULTS

2.1 SURVEYS AND ASSESSMENT

Detailed biodiversity assessments were undertaken for the entire site in 2009, with separate biodiversity assessments for the Coppabella and Marilba precincts (which included the Conroys Gap Extension precinct).

An additional precinct was proposed in 2009; Carrols Ridge precinct. This precinct would have accommodated 35 turbines (approx. 75MW). While included in the Preliminary Assessment, it was removed from the project and the project application amended to exclude this precinct. One of the key reasons for this decision was the potential risk of the development to the threatened Eastern Bentwing-bat, *Miniopterus schreibersii oceanensis*.

Since the initial assessment, additional areas have been added to the project, this primarily being a transmission line to the south of the project area and small areas within the Coppabella and Marilba east and west precincts. The additional areas were investigated and assessed in November 2012 and the impact of these assessed within a Supplementary Biodiversity Assessment Report.

Additional investigations included targeted surveys for threatened Yass Daisy, Squirrel Glider, Barking Owl and Bush Stone Curlew, largely in response to NSW Office of Environment and Heritage (OEH) requests. These investigations were also included in the Supplementary Biodiversity Assessment Report.

A Commonwealth Controlled Action Referral and Additional Information Report was submitted separately for the Yass Valley Wind Farm (comprising Coppabella and Marilba precincts, north of the Hume Highway) and the Conroys Gap Extension in January 2014. This included the results of the first Golden Sun Moth surveys undertaken in December 2013 for Coppabella and Marilba. These surveys identified Golden Sun Moth to occur broadly across the Marilba precinct, east and west, with a small number of sitings at the Conroys Gap Extension precinct. No Golden Sun Moth were identified at the Coppabella precinct.

Additional targeted surveys undertaken following these submissions, as follows:

- a) Follow up Golden Sun Moth surveys were undertaken, focusing on the Coppabella precinct, in December 2014 and early January 2015. No Golden Sun Moths were recorded in this precinct, concluding the survey at this precinct.
- b) Field validation of treeless pasture was undertaken with OEH in 2014. This was to ensure that degraded pasture was properly assigned to native vegetation communities, particularly Box Gum Woodland, when considering impact areas.
- c) Biometric surveys of vegetation zones at Coppabella in early December 2014. The objective was to assist us in applying the bio-banking methodology to offsetting of impacts. There are seasonal restrictions to this type of survey.
- d) Surveys to identify Superb Parrot flight paths at Coppabella Hills in spring (November) 2014. No high use areas were identified in areas where turbines were proposed during these surveys.
- e) Hollow-bearing tree aerial imagery assessment (undertaken by Epuron). This was based on a methodology developed with OEH staff, in the field (June 2014) and in a follow up teleconference to better quantify impacts to hollow bearing trees.

The work completed, extent of surveys as they apply to each precinct, and human resources put towards the survey are detailed in Appendix A. This includes a table showing the total area of each vegetation type across the surveyed areas.

2.2 IDENTIFICATION OF KEY RISKS

The biodiversity surveys and assessments, and extensive consultation with OEH and the Commonwealth Department of Environment have allowed for a thorough identification of biodiversity risks associated with the project.

A risk-based approach has guided the assessment and follow up survey work. This approach has been used to:

- Provide guidance to the proponent regarding relocation of infrastructure from sensitive areas
- Quantify impacts of the final infrastructure footprint, including operational aspects such as potential bird and bat collision risks
- Develop mitigation strategies specific to each risk (reflecting the unique nature of the project and site)
- Confirm the ability to offset any impacts which cannot otherwise be mitigated.

The key biodiversity risks and their status in terms of the ability to manage these risks is summarised in the table below. Whether the issue is a matter is listed under NSW or Commonwealth (CW) legislation, is identified in the right hand columns.

The table indicates what the risk is, why it's a risk and how this risk has been addressed by the project.

All risks are now considered manageable, with the effective implementation of the mitigation strategies that have been developed. The strategies are discussed in more detail in Section 2.3.

Table 2-1 Key biodiversity risks by precinct.

Item	Comment	Precinct affected Coppabella	NSW issue	CW issue
Box Gum Woodland (BGW)	This is the dominant native vegetation community at the site. Treed areas as well as cleared pastures, where they retain some native species, have been classified as being derived from this open woodland type. The majority of this vegetation falls within the NSW definition of the EEC, although it is of relatively low diversity in most locations, having been extensively grazed and subject to weed impacts from surrounding cropping. It is likely to continue to be placed under pressure from existing farming practices which reduce its habitat value. A very small area of the infrastructure footprint (located within the Coppabella and Marilba precincts) occurs in high diversity vegetation which is considered Commonwealth Critically Endangered Ecological Community (CEEC). Iterations of the infrastructure layout have reduced this area as much as possible for the project. Clearing of this already over cleared community is the risk from the project. Disturbance to or removal of this vegetation would occur a result of infrastructure development associated with construction of the Project. This is most relevant to transmission line infrastructure and how it affects understorey vegetation of high native species diversity. Mitigation: Design of the project has an objective of avoiding and/or minimising impact to this vegetation. Maximising impacts in the already degraded pasture areas where possible, reduce the extent of the EEC impact areas. Assessments of significance have determined the low amount of impact would not be significant for the CEEC. Commonwealth approval has been obtained for the latter impact. A commitment to micro-siting infrastructure in these areas and offsetting impacts to this vegetation at levels determined through applying the bio-banking methodology endorsed by OEH is proposed. Preliminary calculations that have utilised the OEH endorsed online credit calculation tools verify that offsets are achievable.	Coppabella Marilba Conroys Gap Extension Transmission line	Yes	Yes

Item	Comment	Precinct affected Coppabella	NSW issue	CW issue
Hollow bearing trees (HBTs)	Hollow bearing trees (HBTs) occur in open woodland and as scattered paddock trees. Hollows are a declining resource, important for many native fauna. The risk to HBTs is that further clearing or impact on this habitat resource affects hollow dependent fauna such parrots. Hollows take a very long time to form and therefore natural replacement is very slow. Impact to abundance or habitat attributes of HBT's would occur as a result of the removal of hollows within the infrastructure footprint and / or location of wind turbines nearby hollows, which may reduce their attractiveness to fauna. Mitigation: Avoidance has been achieved by the relocation of infrastructure (particularly wind turbines) in order to reduce proximity to hollows, where achievable. The proponent has also committed to micro-siting of wind turbines prior to construction where achievable to minimise impact. Where removal of HBT's cannot be avoided, there is a commitment to offset hollow-bearing trees at a 1:10 ratio as required by OEH. Estimates of the impacts on hollows and ability to offset their loss is provided in Section 7. Offsets are considered highly achievable.	Coppabella Marilba Conroys Gap Extension Transmission line	Yes	No
Threatened microbats, including Eastern Bentwing Bat	Connected woodland and hollow bearing trees provide foraging and breeding habitat for a number of threatened microbat species. Additionally a maternity cave for Eastern Bentwing Bat is located approximately 30 km south from the site. The risk to these species is two fold: 1) removal of habitat within the infrastructure footprint may reduce foraging, roosting and breeding habitat, 2) secondly, that the operation of wind turbines could result in ongoing collision risks to microbats, including the Eastern Bentwing Bat. The Carrolls Ridge portion of the project was removed in 2009 to minimise any risk resulting from its proximity to the maternity cave. Follow up bat surveys and assessment were undertaken. These identified that wind turbines are unlikely to be located within foraging distance of the Eastern Bentwing Bat maternity cave or on identified migration pathways. The clearing of habitat would not fragment or create a barrier for the movement of bats.	Coppabella Marilba Conroys Gap Extension Transmission line	Yes	No

Item	Comment	Precinct affected Coppabella	NSW issue	CW issue
	Mitigation: Bird and bat monitoring is committed to during operation to confirm the assumptions of the assessment – that impacts are expected to be low risk. Triggers within the monitoring program allow adaptive management for any unforeseen impacts that are detected. This provides a precautionary and adaptive approach to address this risk.			
Woodland birds: Regent Honeyeater, Superb Parrot	Connected woodland in moderate to good condition provides foraging habitat for both of these species. Hollows provide breeding habitat for the Superb Parrot. Although the Regent Honeyeater has not been detected onsite, it is assumed to sometimes use the site, as a precautionary approach. The risk of the project to these species is two fold: 1) removal of habitat within the infrastructure footprint may reduce foraging, nesting and breeding habitat, 2) there is concern that operation of wind turbines present a collision risk for individuals moving through the site. The results of on ground surveys (including flight path mapping at Coppabella precinct) how that turbines are not located in high use areas for the Superb Parrot. Mitigation: As for bats, Bird and bat monitoring is committed to during operation to confirm the assumptions of the assessment – that impacts are expected to be low risk. Triggers within the monitoring program allow adaptive management for any unforeseen impacts that are detected. This provides a precautionary and adaptive approach to address this risk.	Coppabella Marilba Conroys Gap Extension Transmission line	Yes	Yes
Golden Sun Moth	This species has been identified as widely spread on the Marilba precinct, including to a lesser extent the Conroys Gap Extension, both within and outside the infrastructure footprint. It is also known from surrounding areas around Yass, Rye Park, Rugby and Bango. It does not occur at Coppabella. The risk to this species centres on removal of known habitat and injury to individuals during the construction phase. No operational impacts are anticipated.	Marilba Conroys Gap Extension Transmission line	Yes	Yes

Item	Comment	Precinct affected Coppabella	NSW issue	CW issue
	The Commonwealth have specifically assessed the impacts to this species and given EPBC approval to the development with conditions in relation to impact on this species. Mitigation: By attempting to site the infrastructure in vegetation of lower value, the project has minimised impact on this species as much as possible. As part of the Commonwealth and any subsequent NSW approval, offsetting for this species will be required. Draft offset calculations using the OEH BioBanking Assessment Methodology account for this species and confirm that the project can provide offsets for the habitat required to be removed. Offsets are a commitment of this project, in consultation with OEH and the Commonwealth, as required. Refer to Appendix B and D.			
Threatened reptiles	Potential for threatened reptiles including Pink tailed Worm Lizard and Striped Legless Lizard were assessed as low after intensive survey effort. These species were not identified onsite and the vegetation and rock structures were not considered to be of high likelihood of providing quality habitat for these species. The risk to these species is in the removal of potential habitat and injury to individuals present within the footprint during construction. Mitigation: OEH have agreed to preclearance surveys for reptiles prior to construction, as a precautionary measure to confirm the assumption that these species do not occur in the impact areas (and to allow any identified threatened reptiles to be included in the offset requirements in the unlikely event that they are found during construction). The Commonwealth have no additional requirements for these species.	Coppabella Marilba Conroys Gap Extension Transmission line	Yes	No
Threatened flora: Yass Daisy	Follow up surveys and assessment have identified low impact for threatened flora species. The risk to these species is in the removal of potential habitat and removal of individuals present within the footprint during construction.	Conroys Gap Extension	Yes	Yes

Item	Comment	Precinct affected Coppabella	NSW issue	CW issue
	Mitigation: Specifically, all areas where Yass Daisy have been identified would be buffered to protect this species during construction. No impacts or offsets are anticipated.	Transmission line		

2.3 AVOID, MITIGATE, OFFSET

One important objective for biodiversity assessments prepared under Part 3A Major Projects is to demonstrate how the project has avoided impacts, minimised impacts where avoidance is not practical and offset residual impacts to achieve a maintain or improve biodiversity outcome for the project.

2.3.1 Avoid impact

Constraints mapping

In 2009, vegetation type and condition were mapped within the entire development envelope¹. The area subject to these early investigations was significantly larger than the development footprint (impact area). This biodiversity survey effort sampled the development envelope and allowed for the generation of a biodiversity constraint mapping. This identified “high”, “moderate” and “low” constraint areas, which are defined as follows:

High constraint	Red	Impacts to these areas and habitat resources are difficult to offset and should be avoided
Moderate constraint	Orange	Impacts to these areas should be avoided or specific measures taken to mitigate impacts. Losses should be offset with similar or better condition examples
Low constraint	Green	No special mitigation measures required

This level of assessment was developed to provide flexibility for future changes in the layout regarding biodiversity impact assessment – the preliminary assessment covered areas much broader than required by any specific infrastructure layout. It also allowed for maximisation of avoidance of high conservation/constraint areas early in the layout design and was also utilised throughout the planning stage of the development. It was an iterative process that allowed additional biodiversity information to be included as the layout changed over time.

Layout revisions

The proponent has, through the development of the project, undertaken a number of changes to the development layout since the 2009 submission. 152 wind turbines were first proposed. 124 wind turbines now make up the proposed layout. Changes have included revisions to reduce impact to biodiversity, as guided by the constraints mapping and detailed orthophotos showing vegetation.

Layout revisions undertaken since exhibition of the Preferred Project Report are included in Epuron’s submission (Annexure C). In terms of specific actions to avoid impacts on biodiversity, the following revisions are relevant:

- Removal of Carrolls Ridge precinct to minimise impacts to Eastern Bentwing Bat
- Avoidance of all areas identified as containing Yass Daisy
- Minor relocation of turbines 101, 102 on Marilba in response to OEH submission (impacts to native vegetation and hollow-bearing trees)

¹ The development envelope is the broad area within which infrastructure could potentially be located.

- 330kV transmission line moved approximately 230m east at Hume Highway crossing in response to recommendations following additional biodiversity field survey
- 330kV switchyard and connecting powerline moved approximately 520 m west at grid connection point in response to recommendations following additional biodiversity field survey
- Minor relocation of tracks and underground cables in various areas
- Deletion of turbines 89, 90, 91, 93, 94, 95, 96, 97, 98, 99 on Marilba and movement of wind turbine 83 into a location which reduces biodiversity impacts as a result. Provided in response to concerns of impacts to Box Gum Woodland Hollow Bearing Trees raised in meeting with OEH.
- New access track connecting two ridges on Coppabella of approximately 1km in length following feedback from landowner over potential erosion concerns.
- Alternative 330kV substation location on Coppabella in response to further site investigations and feedback from construction contractors.
- Minor relocations to 132kV powerline corridor in Coppabella Precinct in response to reclassification of biodiversity (minimising impacts to Moderate-Good Box Gum Woodland
- Micro-siting of four turbines (56, 102, 145 & 148) and consequential adjustment to the location of one turbine (144) in response to OEH concerns.

The final infrastructure changes in November 2014 were undertaken after exchange of GIS data with OEH, showing high constraint areas. A key change undertaken at the request of OEH was the removal of specific turbines from the Marilba west area, where they were located close to high densities of hollow bearing trees and woodland. Where an appropriate buffer is applied to infrastructure, this area to the south-west of the Marilba precinct is now identified as a preferred offset site. This will safeguard the biodiversity values identified in this area.

In general, the layout now achieves avoidance of high constraint areas, and includes prescriptive measures that would guide infrastructure placement in areas where development occurs in or near high constraint areas. This is discussed further below.

2.3.2 Mitigating impacts

The proponent has outlined the normal practice with respect to micro-siting of wind turbines (post approval and prior to construction) enabling a further reduction in impacts with input from an ecologist, and included this provision in the Statement of Commitments. This is particularly relevant to the location of wind turbines and electricity transmission poles in areas of high diversity Box Gum Woodland and is covered by a specific mitigation strategy. Any micro-siting to reduce impacts also reduces the offset requirements for the project, hence this is an important component to build into the detailed design and preconstruction stage.

Using this as a further opportunity to minimise and manage impacts, the proponent has committed to undertaking final micro-siting of infrastructure with input from an ecologist in the following cases:

- Golden Sun Moth construction management plan – includes a requirement to undertake additional surveys to verify the extent of Golden Sun Moth habitat within the development footprint. Micrositing of tracks and power lines would be undertaken using the latest survey data to minimise impacts as much as possible. Offsetting in areas of known habitat would be undertaken. Note, this has been completed at Coppabella indicating no Golden Sun Moths and is now only relevant to the Marilba and Conroys Extension precincts.

- To assist to minimise impacts on Commonwealth listed Critically Endangered Community. One site within the development footprint that cannot be entirely avoided by infrastructure for an overhead power line. Power poles and access can be located to minimise impacts to this community.
- One turbine (No. 138) on the edge of an area of woodland identified as a high constraint would be micro-sited to minimise any impact to the high constraint area.

This work would be implemented as part of the Biodiversity Management Plan committed to by the proponent. Additional mitigation strategies to be included in this plan include:

- Development of a Bird and Bat Monitoring and Adaptive Management Plan, to monitor and respond to any unforeseen collision impacts of turbine infrastructure.
- Establishment of buffers on sensitive features such as Yass Daisy populations (20m buffer).
- Detailed protocols to address threatened reptile finds – preclearance surveys ahead of the construction clearing in areas of rocky habitat.
- Hollow-bearing trees inventory and preclearing surveys, to fully account for all hollows that would be impacted and minimise risks to resident fauna during felling.
- The area of NSW listed Box Gum Woodland Endangered Ecological Community (EEC) to be cleared would be clearly defined. This would assist minimisation of impact during construction and allow offsets to accurately account for this removal of habitat.

The Biodiversity Management Plan would be prepared in consultation with OEH. The proponent shall submit the biodiversity management plan for approval prior to the preparation of an offset plan, and prior to commencement of construction. This is a commitment of the project.

2.3.3 Offsetting impacts

Where impacts to biodiversity cannot be entirely avoided or sufficiently minimised, offsetting of this impact will be undertaken. This will account for residual impacts of the project. This is set out in detail in Section 3. Offsetting would utilise the OEH approved BioBanking Assessment Methodology to determine quantum of offset required at the site.

The proponent commits to prepare an offset plan, to the satisfaction of the Director-General, to offset losses of and impacts to native vegetation including hollow-bearing trees on the site. The offset plan is to be developed in consultation with OEH. The proponent would submit the offset plan for approval prior to the commencement of construction.

3 OFFSETTING THE IMPACTS OF THE YASS VALLEY WIND FARM

Where the avoidance and mitigation strategy implemented in relation to the planning and design of the Yass Valley Wind Farm has been unable to avoid biodiversity impacts entirely or sufficiently minimise them, offsetting would be undertaken. This will utilise the OEH approved BioBanking Assessment Methodology, and meet the NSW Government objective of achieving a long term conservation outcome, by improving the condition of the offset site (see <http://www.environment.nsw.gov.au/biodivoffsets/>). Impacts such as clearing in the infrastructure footprint will be calculated and an appropriate area identified and managed for conservation in perpetuity. This will balance loss of biodiversity that would result from the development of the wind farm and is in line with NSW OEH policy documents on offsetting.

The areas to be impacted by the construction of the proposed wind farm are freehold land used for grazing and some cropping. The site has seen significant clearing of Box Gum Woodland over many decades while subjected to sustained agricultural use. The remnant vegetation at the site is also subject to ongoing land-use that is likely to result in continued degradation, particularly as mature trees die without being adequately replaced by natural regeneration and agricultural weeds make use of areas of increased nutrient and move in to replace or dominate native pastures. The site does however, include features of conservation value and by identifying and managing these areas, offsetting would secure benefits which would otherwise not exist.

While it is acknowledged that the proposed wind farm would impact areas of native vegetation, it is also recognised that it would result in a material benefit through offsetting vegetation that is at high risk of further degradation. By impacting predominantly the lower biodiversity values areas (sparse tree cover, high levels of weeds) and offsetting predominantly the higher biodiversity value areas (higher diversity, less weeds, more tree cover and hollow bearing trees), the project rationally reflects the biodiversity values of the site and obtains a long term (in perpetuity) commitment to protecting biodiversity values of the site.

3.1 REQUIREMENT TO OFFSET

The Yass Valley Wind Farm would offset all native vegetation cleared as well as account for specific threatened species and habitat features.

It is proposed that the offset will:

- Account for the final impact area of the development.
- Be guaranteed, managed and monitored in perpetuity.
- Be compliant with OEH endorsed offset guidelines and methodologies.
- Incorporate input from OEH, Local Land Services, Commonwealth Dept. of Environment and Council, as appropriate.

Work that has commenced toward these goals. This section presents:

- Underpinning guidelines in developing offsets in accordance with the NSW Biodiversity Offset Principles.
- An overview of how the offsets will be calculated and eventually implemented for the Yass Valley Wind Farm.
- The results of preliminary BioBanking calculations (which account for impacts to native vegetation and threatened species habitat).

- The results of hollow bearing tree offset estimates (supplementary to the offsetting of native vegetation and threatened species habitat).
- Mechanisms to secure the offset areas.
- Preferred offset areas that have been investigated by the proponent.

This section demonstrates that offset areas identified by the proponent are well in excess of the preliminary calculation of offset credit requirements determined using the BioBanking Assessment Methodology. It also outlines the in-perpetuity mechanisms to secure and manage offset lands that are proposed are in line with similar projects of this size and nature.

The commitments surrounding offsets ensure that no construction impact would occur prior to an offset plan, prepared to the satisfaction of the Director-General, to offset losses of and impacts to native vegetation including hollow-bearing trees on the site. The offset plan would be developed in consultation with OEH.

3.2 APPLICATION OF THE NSW BIODIVERSITY OFFSET PRINCIPLES

The approach adopted to the offsetting of Biodiversity impacts is underpinned by the biodiversity offset principles developed by the former DECCW (now OEH). Key requirements as they apply to the Yass Valley Wind Farm project are as follows:

- The aim of the offset package is to ensure that where impacts cannot be avoided, or sufficiently minimised, the residual impact would be offset in perpetuity.
- Offset land is required as part of the approval conditions for the project. The proposed offsets would not be used to satisfy approvals or assessments under other legislation.
- Monitoring would be required as part of the implementation of management actions for the offset site.
- The Offset Package would be finalised in consultation with OEH and other relevant agencies allowing any local programs or initiatives to be considered and included.
- Offsets would be comprised of private land not currently under any form of biodiversity conservation protection. In this way the land would be additional to government reserves and programs.
- A Conservation Property Vegetation Plan (CPVP) is proposed to secure the offset lands. It would be attached to the title of the offset land (one per landowner). To ensure that the CPVP is binding on successors in title, an abstract of the CPVP would be registered with the Land and Property Management Authority under the *Real Property Act 1900*. The CPVP would be a legally binding agreement under both the *Native Vegetation Act 2003* and the *Threatened Species Conservation Act 1995*.

The relation of the offset plan to meeting these key requirements are set out in more detail in Appendix E.

3.3 IMPLEMENTATION OF OFFSETS, AN OVERVIEW

The offsets must account for the final impact on biodiversity values, not the estimated impact prior to construction. It is therefore a relatively complicated process to identify and secure the land at key stages of the projects detailed planning and construction phase. Most major projects require offset strategies and preliminary planning and mapping prior to construction, with the final detail of the offset plan to reflect the field validated post construction impacts.

The following stages of implementing the Offset Package are proposed. The aim is to set out a clear path to identifying, securing and managing suitable offset lands, prior to any construction impact. After construction, a verification process (Audit) would demonstrate the actual impact areas. This would dictate the final requirement for the offset lands. Monitoring and management of the offset would be required in perpetuity.

The process for development and implementation of the offset plan is included in the table below.

Table 3-1 Implementation of offsets.

Stage	Timing
1. Offset Strategy sets out methods to;	Strategy supplied pre project approval Appendix D of this document provides the offset strategy for this project.
a. estimate loss of habitat (including hollows) required for the project.	
b. calculate the offset requirement	
c. secure the offset site in perpetuity	
d. manage the offset site in perpetuity	
2. Offset Plan reflects consultation with Local Land Services (LLS, previously CMA), Council the Commonwealth Dept. Environment and OEHL in relation to:	Post approval and prior to any impact. Should reflect the results of any Biodiversity Management Plan preclearance surveys. Appendix E of this document provides the DRAFT Offset Plan.
a. Determining the final credit requirement for the areas to be impacted.	
b. Selecting the final offset sites including accurate calculation of credits generated at both the offset site.	
c. Management planning. For each offset site:	
o Establishment of baseline data.	
o Documentation of key biodiversity risks, opportunities and relevant local initiatives.	
o Refinement of management actions specific to the site (with input from the landowner), including monitoring regime and reporting requirements.	
o Consultation with LLS and OEHL to finalise the Offset Plan (could be documented separately for each site or in one combined document).	
3. Verification of the actual area of native vegetation clearing of the constructed wind farm and transmission line.	After construction.
4. Formalisation of the security mechanism for the offset site (i.e. on the title of each involved property, including the inclusion of the management plan and its required management actions and land use restrictions).	After construction.
5. Monitoring in order to demonstrate “maintain or improve” and adapt management as required at the offset site.	During operation.

Appendix D and E set out the detail developed so far in the revised offset strategy and draft offset plan, outlined above. Key features are summarised in the sections below.

3.4 USE OF BIOBANKING ASSESSMENT METHODOLOGY

The proponent commits to using the BioBanking Assessment Methodology (BBAM) to calculate offset requirements. This method uses field data collected from the site ('biometric plot data') to score the site's biodiversity 'site value'. It results in a precise estimation of the sites biodiversity values.

The data are collected in standardised 'biometric plot surveys'. Using a 50m transect and 20x20m quadrat, the following parameters are quantified:

- Percentage cover of overstorey, midstorey and understorey (grasses, shrubs, other)
- Native species number
- Weed species number
- Habitat features (such as tree hollows, fallen timber)

A specific number of these plots must be undertaken to precisely represent the vegetation zone being assessed, in accordance with the OEH BBAM.

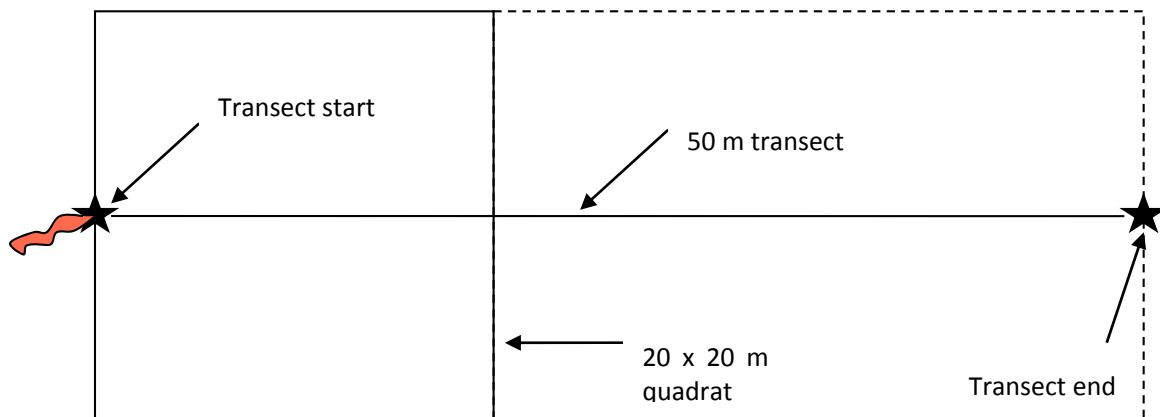


Figure 3-1 Plot data collected in transects and quadrats.

Using the plot data, broader landscape attributes such as landscape connectivity, presence of geographic and habitat features at the site as well as information contained in the Vegetation Information System (VIS) Classification database and the Threatened Species Profile Database, the online calculator determines:

- Ecosystem credits - Ecosystem credits can only be used to offset biodiversity impacts in the same ecological community, or in another community of the same formation that has an equal or greater percentage of land cleared and the same predicted threatened species².
- Species credits – Species credits can only be used to offset biodiversity impacts on the same threatened species.

The number of credits returned by the calculator must then be demonstrated to be present at the offset site, to show that the impacts can be offset at that site (or package of sites).

Changes are being made to the BBAM and online calculator to better account for the impacts of linear developments and major developments, such as wind farms. Consultation will be required with OEH in the detailed calculation of the offset requirement, to ensure the method is accurately implemented. Use of this

² Provisions are made to ensure that some substitutability is allowed, in accordance with the conservation status and location of offset options. OEH should be consulted in these cases.

method in consultation with OEH ensures that a suitable offset area will be selected prior to any construction impact.

Note: While the BBAM takes into account habitat features including hollow bearing trees, supplementary hollow bearing tree offsets have been requested by OEH. Accordingly, primary (removal) and secondary (from proximity of turbines) impacts to hollow bearing trees are assessed and offsets discussed, separately in Section 7.

3.5 PRELIMINARY ASSESSMENT USING THE BIOBANKING ASSESSMENT METHODOLOGY

3.5.1 Biodiversity impact area

Based on the current project layout and the biodiversity survey work to date, the vegetation communities have been mapped and ascribed with their vegetation type and condition. Refer to Appendix A which provides a vegetation map of the entire project area and indicates type and condition of vegetation.

The vegetation type and condition has then been assessed across the entire impact area, and broken down by precinct as outlined in Table 3-2.

Table 3-2 Vegetation impacts by precinct

Vegetation Type / Condition	Coppabella	Marilba East	Marilba West	Conroys Extension	Transmission	Grand Total
Aquatic		0.0	0.0	0.1		0.1
All		0.0	0.0	0.1		0.1
Box Gum Woodland	11.2	8.7	10.7	13.6	33.7	77.9
Low	0.7	0.5	1.6		23.0	25.8
Mod-good (high div.)	0.3		0.2		3.0	3.4
Mod-good (low div.)	10.1	8.3	8.9	13.6	7.8	48.7
Box Gum Woodland Derived Grassland	56.1	9.7	9.2	11.1	36.6	122.7
Low	2.7					2.7
Mod-good (high div.)				1.1	0.8	1.8
Mod-good (low div.)	53.4	9.7	9.2	10.0	35.9	118.2
Broad-leaved Peppermint Dry Grass Forest				0.2		0.2
Mod-good (low div.)				0.2		0.2
Exotic dominated pasture	14.7	2.2	3.1	2.2	0.8	22.9
Low	14.7	2.2	3.1	2.2	0.8	22.9
Long-leaved Box Dry Grass Forest	0.9	0.2		0.4		1.5
Mod-good (high div.)	0.3	0.0				0.3
Mod-good (low div.)	0.6	0.2		0.4		1.2
Riparian	0.1					0.1
Mod-good (low div.)	0.1					0.1
River Red Gum					0.9	0.9
Mod-good (low div.)					0.9	0.9
Grand Total	83.0	20.8	22.9	27.6	72.1	226.4

Note: calculations provided by Epuron based on GIS mapping data with vegetation type and condition determined by NGH.

3.5.2 BioBanking assessment methodology calculation

Based on the current project layout and the biodiversity survey work to date, the indicative offset requirements have been assessed in accordance with the BioBanking Assessment Methodology (BBAM). The steps in the assessment and the outputs of the assessment are discussed in Appendix B. The key outputs of the calculations are summarised in this section.

Vegetation impacts (to determine 'ecosystem credits')

The vegetation zones that would be impacted by the project and their condition are shown in the table below. From the ten identified zones, seven were used in the assessment. Zones 6, 8 and 10 were amalgamated into other appropriate zones, as explained in Appendix B.

Table 3-3 Vegetation zones within the project.

Zone ID	Mapped vegetation type	Biometric vegetation type	Biometric condition	Impact area
		Grassy Woodland		
1	Box Gum Woodland	MR528 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Low (other)	51.80
2	Box Gum Woodland	MR528 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate-good (high diversity)	3.40
3	Box Gum Woodland	MR528 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate-good (low diversity).	48.70
		Derived grassland		
4	Box Gum Woodland Derived Grassland	MR528 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate-good (high diversity)	1.80
5	Box Gum Woodland Derived Grassland	MR528 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate-good (low diversity)	118.20
		Dry sclerophyll forest (shrub/grass)		
6	Broad-leaved Peppermint Dry Grass Forest	MR533 Broad-leaved Peppermint - Nortons Box - Red Stringybark tall open forest on red clay on hills in the southern part of the NSW South Western Slopes Bioregion	Moderate-good (low diversity)	0.20
7	Long-leaved Box Dry Grass Forest	MR598 Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South Western Slopes Bioregion	Moderate-good (high diversity)	1.50
8	Long-leaved Box Dry Grass Forest	MR598 Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South Western Slopes Bioregion	Moderate-good (low diversity)	1.20
		Grassy woodland		
9	River Red Gum and riparian	MR616 Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion	Moderate-good (low diversity)	1.00
		Exotic dominated pasture		
10	Box Gum Woodland	MR528 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Low (other)	22.90
		Total		226.40

Impacts on threatened species (to determine 'species credits')

In this part of the assessment, the areas of impact on each species known to occur or assumed to occur onsite are entered. In estimating the areas of impact, the following assumptions have been made:

- Golden Sun Moth – suitable habitat equates to Box Gum Woodland (BGW) derived grassland in moderate to good condition – 25% of this in the infrastructure footprint is assumed to be actual habitat. This is considered precautionary as the species has been found only to occur in the Marilba and Conroys precincts.
- Regent Honeyeater – suitable habitat equates to BGW with tree cover in moderate to good condition – 50% of this in the infrastructure footprint is assumed to be actual habitat. This is considered precautionary as the species has not been detected onsite but is acknowledged to be able to use better quality habitat from time to time.

Based on the site surveys, it can be concluded that no other species below would be impacted.

Table 3-4 Impacts to threatened species.

Common name	Scientific name	Impacted by development	ID method	Hectares/individual	TS multiplier
Booroolong Frog	<i>Litoria booroolongensis</i>	No	Survey		1.3
Brush-tailed Phasogale	<i>Phascogale tapoatafa</i>	No	Survey		2.0
Dwarf Bush-pea	<i>Pultenaea humilis</i>	No	Survey		1.5
Eastern Pygmy-possum	<i>Cercartetus nanus</i>	No	Survey		2.
Golden Sun Moth	<i>Synemon plana</i>	Yes	Survey	30 ha	7.7
Koala	<i>Phascolarctos cinereus</i>	No	Survey		2.6
Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>	No	Survey		0
Regent Honeyeater	<i>Anthochaera phrygia</i>	Yes	Survey	55.1 ha	7.7
Rosenbergs Goanna	<i>Varanus rosenbergi</i>	No	Survey		3.3
Silky Swainson-pea	<i>Swainsona sericea</i>	No	Survey		1.8
Sloane's Froglet	<i>Crinia parvum</i>	No	Survey		1.3
Small Purple-pea	<i>Swainsona recta</i>	No	Survey		2.6
Small Scurf-pea	<i>Cullen parvum</i>	No	Survey		7.7
Squirrel Glider	<i>Petaurus norfolcensis</i>	No	Survey		2.2
Striped Legless Lizard	<i>Delma impar</i>	No	Survey		0
Tarengo Leek Orchid	<i>Prasophyllum petilum</i>	No	Survey		1.3
Yass Daisy	<i>Ammobium craspedioides</i>	No	Survey		2.1

3.5.3 Credit requirement

This is the final result of the calculations. The following credit requirements have been generated for the development site and constitute the credit requirement for the offset site. The full credit profile is provided at the end of Appendix B.

Table 3-5 Credit requirements.

Mapped vegetation type	PC type code	Biometric name	Management zone area (ha)	Ecosystem credits required
Box Gum Woodland	MR528	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	51.8	1472
Box Gum Woodland	MR528	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	3.40	132
Box Gum Woodland	MR528	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	48.70	965
Box Gum Woodland Derived Grassland	MR528	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	1.80	42
Box Gum Woodland Derived Grassland	MR528	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	118.40	0
Long-leaved Box Dry Grass Forest	MR598	Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South Western Slopes Bioregion	2.7	103
River Red Gum and riparian	MR616	MR616 Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion	1.00	33
Scientific name		Common name	TS offset multiplier	Species credits required
<i>Synemon plana</i>		Golden Sun Moth	7.7	2318
<i>Anthochaera phrygia</i>		Regent Honeyeater	7.7	4012

Using the online OEH credit converter tool, these credits were converted to areas, to provide an indicative estimate of the offset area required. The result of the credit requirements can be summarised as follows:

- 125 ha of Golden Sun Moth habitat must be demonstrated to occur within the offset lands
- 122 ha of Regent Honeyeater habitat must be demonstrated to occur within the offset lands
- 280.8 ha of Box Gum Woodland of similar condition to that being impacted must be demonstrated to occur within the offset lands
- 11.1 ha of Red Stringybark Grass Forest of similar condition to that being impacted must be demonstrated to occur within the offset lands
- 3.5 ha of River Red Gum Forest of similar condition to that being impacted must be demonstrated to occur within the offset lands

Refer to Section 3.8.3, which demonstrates the ability of the preferred offset site to meet these requirements.

Assuming a worst case scenario, that no overlap can be achieved in meeting Box Gum Woodland, Golden Sun Moth and Regent Honeyeater offsets (only the moderate to good condition vegetation will be suitable habitat for these threatened species), an additional 247 ha would be required, increasing the impacted: offset ratio to 1:2.4 (226 ha to be developed, 542.4 ha to be offset).

While the final offset area will be based on final results of the BioBanking Assessment Methodology, a precautionary approach would be to plan for an increased ratio; 1:3 is considered realistic.

Limitations of the preliminary assessment are set out in Appendix B.

3.5.4 Consideration of precinct requirements

This offset requirement (in terms of Ecosystem Credits Required) can be broken down between precincts by pro-rating each line item on a Hectare by Hectare basis between the precincts, with the results shown in Table 3-6.

Table 3-6 Preliminary offset requirement by precinct

	Offset Area required for each precinct						
	Total Impact Area (Ha)	Conroys Gap Extension	Coppabella	Marilba East	Marilba West	Transmission	Grand Total
Aquatic	0.1						
(blank)	0.1	0.2	0.0	0.1	0.0	0.0	0.3
Box Gum Woodland	77.9						
Low	25.8	0.0	2.3	1.4	4.8	70.4	78.9
Mod-good (high div.)	3.4	0.0	1.2	0.0	0.6	12.4	14.2
Mod-good (low div.)	48.7	29.0	21.6	17.6	19.0	16.5	103.8
Box Gum Woodland	122.7						
Derived Grassland							
Low	2.7	0.0	8.2	0.0	0.0	0.0	8.2
Mod-good (high div.)	1.8	2.7	0.0	0.0	0.0	1.9	4.5
Mod-good (low div.)	118.2	0.0	0.0	0.0	0.0	0.0	0.0
Broad-leaved Peppermint Dry Grass Forest	0.2						
Mod-good (low div.)	0.2	0.7	0.0	0.0	0.0	0.0	0.7
Exotic dominated pasture	22.9						
Low	22.9	6.6	44.9	6.6	9.4	2.6	70.1
Long-leaved Box Dry Grass Forest	1.5						
Mod-good (high div.)	0.3	0.0	2.2	0.0	0.0	0.0	2.2
Mod-good (low div.)	1.2	3.1	4.4	1.4	0.0	0.0	8.9
Riparian	0.1						
Mod-good (low div.)	0.1	0.0	0.4	0.0	0.0	0.0	0.4
River Red Gum	0.9						
Mod-good (low div.)	0.9	0.0	0.0	0.0	0.0	3.1	3.1
Grand Total	226.4	42.2	85.3	27.2	33.9	106.9	295.4

3.5.5 Summary

The results of this assessment show that:

- The overall vegetation offset ratio is relatively low at approximately 1 : 1.3, reflecting the low diversity of areas of derived grasslands where most impacts would occur
- Two species will require additional consideration in the offset package: the Regent Honeyeater and the Golden Sun Moth
- Notwithstanding the result of the Bio-banking Assessment Methodology, NGH Environmental considers it prudent to adopt a conservative approach and assume a preliminary assessment of the area required to achieve all offset requirements is a ratio of 1: 3 (impacted to offset area on a “like for like” basis), considering the project as a whole
- Considering the components of the project, the offset requirement is mostly driven by the impacts of the Coppabella precinct and the transmission line (this would be important in considering any staging of the broader project).

3.6 SUPPLEMENTARY OFFSETS: HOLLOW BEARING TREES

3.6.1 Methods

A hollow-bearing tree aerial imagery assessment was undertaken by Epuron in 2014 and updated in 2015. This was based on a methodology developed with OEH staff, in the field (June 2014) and in a follow up teleconference with OEH. It was undertaken to better quantify impacts to hollow bearing trees.

This same methodology can also be used to quantify the offset requirement for the project, as OEH have requested a 10 : 1 ratio of hollow bearing trees (HBTs) impacted to HBTs offset for the project.

Epuron completed the counts and NGH Environmental checked a sample (44 of 144 turbine sites, 27/06/14) to confirm the methods and results. The detailed methodology is provided in Appendix C. Of note:

- All turbine locations are assessed.
- All trees with a canopy diameter over 15m are assumed to have hollows.
- Depending on the location of the turbine in the landscape, a 50-100m radius is defined as the impact zone; and all trees in this zone are assumed to be impacted by the project and requiring of offsets.

3.6.2 Results – desktop assessment

Applying the methodology to the current assessment of 124 turbine sites:

- 142 stags were identified in the impact zone.
- 192 live trees assumed to be hollow bearing were identified in the impact zone.

The results are shown by precinct and separated by proximity to the turbine (within 50m or between 50-100m); a total of 334 trees would be impacted. Limited field validation suggests this number is conservative; that is, that the actual number will be less.

Table 3-7 Hollow bearing tree impact by precinct

		Conroys Ext'n (18)	Coppabella (79)	Marilba West (17)	Marilba East (10)	Total (124)
0 - 50 m	Alive	3	64	5	0	72
	Dead	0	49	5	2	56
50 - 100 m	Alive	15	88	13	4	120
	Dead	14	50	10	12	86
	Total	32	251	33	18	334

OEH require a 1 : 10 offset for impacted hollow bearing trees. On this basis, 3340 hollow bearing trees must be verified to occur at the offset site. Refer to Section 3.8.3, which demonstrates this number of trees can be found at the preferred offset site.

3.7 MECHANISMS FOR SECURING AN OFFSET SITE

It is understood that the following six options are considered by OEH as being suitable and acceptable for securing an offset site in perpetuity.

1. BioBanking Agreement (a system set up by OEH)
2. Dedication to the public reserve system
3. Conservation Agreement
4. Trust Agreement
5. Planning Agreement
6. Conservation Property Vegetation Plan (CPVP)

It is noted that option 6 (a CPVP) is only considered acceptable to OEH where the first 5 are not able to be negotiated.

A Conservation Property Vegetation Plan is preferred for the Yass Valley Wind Farm because:

- Involved landowners within the project boundary are able to be involved in the offset package, rather than involving a third party or external site. As they already own the site, no purchase of a BioBanking site is required. The management and funding arrangements can be integrated with the lease agreements that govern the hosting of wind farm infrastructure.
- Non known BioBanking sites are located in the vicinity of the project which have the capacity to provide the level of credits required. It is preferable to locate the offsets in the same vicinity as the impacts (subject to suitable buffers from infrastructure).
- The land is not adjacent to a reserve and therefore offers no benefit as a contribution to an existing reserve.
- The involved landowners land is best able to meet the offset requirements of the project, being largely the same vegetation types and of similar value.
- The operation of the wind farm for a 25-30 period on adjacent land will enable the wind farm operator to be involved in managing the offset lands in a cohesive manner.

For these reasons, the offsets are proposed to be secured within the project site boundaries, as a CPVP. In the unlikely event that this is not achievable, alternate mechanisms outlined above will be used. Several examples of this mechanism exist in NSW for approved wind farms.

Note: Regarding the timing of implementing this plan, it is noted that the offsets must account for the *final* impact on biodiversity values, not the *estimated* impact prior to construction. It is therefore a relatively complicated process to identify and secure the land at key stages of the projects detailed planning and construction phase. Most major projects require offset strategies and preliminary planning and mapping prior to construction, with the final detail of the offset plan to reflect the field validated post construction impacts. The staging is set out in Appendix D offset implementation overview.

3.8 INVESTIGATION OF SUITABLE OFFSET SITES

3.8.1 General availability of suitable offsets

At various stages during the planning and assessment stage of this project, potential offset areas have been identified and evaluated. Many additional potential areas have not yet been surveyed and some of these appear to offer high quality offsets. It is noted that several areas and not one contiguous site can be used to meet the offset criteria. It is likely that the final 'package' will comprise a number of sites.

The selection process has involved the following considerations:

- Areas of high constraint, where these areas occur sufficient distance from wind farm infrastructure, are the most likely candidates. Where they can be secured in relatively continuous areas, they would represent the least ongoing management cost as they are already in good condition. They provide good habitat values worth protecting in perpetuity.
- Areas of EEC vegetation in better quality in the lower landscape provide habitat for Superb Parrot and would offset habitat loss for this species.
- Areas of more intact woodland, provide hollow-bearing trees for a number of threatened birds and provide landscape connectivity in a relatively cleared and open landscape. Areas that increase and protect landscape connectivity area are worth protecting in perpetuity.
- Areas that have been verified as providing habitat for the Golden Sun Moth would provide offsets for this species.

Based on the investigations and assessment carried out on the project site, there is a high level of confidence that suitable offsets are available within the site boundaries or on land immediately adjacent to the site which is owned by involved landowners. Key factors contributing to this confidence include:

- Since 2008, a very broad survey coverage has been achieved. The surveyed land surrounding the impact areas provide similar habitat types and values as those that would be impacted. This is verified by on ground survey and site inspections. These areas are therefore well placed to provide a 'like for like' offset.
- A substantial amount of area is available from which to select the most suitable offset sites. While not all of the land within the project boundaries is available or suitable for offsets, by way of indication the area of land impacted by wind farm infrastructure is approximately 1.0% of the land included within the project boundaries.
- The project has been developed to reflect biodiversity constraints identified early and throughout the assessment process and therefore, the areas adjacent to the impact zones but within the project boundaries are more likely to contain better habitat values, more appropriate to an offset site that will be managed for biodiversity outcomes in perpetuity. Examples of this include:
 - large areas of connected tree cover are mostly avoided by infrastructure, being declared as high constraints due to their contribution to landscape connectivity and higher density of hollow bearing trees. These areas are available for the offset area.

- high diversity (meeting Commonwealth CEEC criteria) Box Gum Woodland of conservation significance is mostly avoided by infrastructure (less than 3 ha total impact). Additional areas are available for the offset area.
 - protocols have been developed to microsite infrastructure away from hollow-bearing trees, where possible. Areas with hollows will be included in the offset area to account for all hollows to be removed.
- In general, the lower values of the impact areas in comparison to the residual area available for offsets, suggests the final offset ratio could be even lower than the 1: 1.3 ratio determined using the Bio-banking Assessment Methodology. The 1: 1.3 ratio is derived using an OEH 'credit converter tool' that assumes the land being used for offsets is of the same value as that being impacted; substituting for land of higher value would reduce the offset area required. Note also, a precautionary approach has been adopted and a minimum ratio of 1:3 (like for like) has been advised.

The total amount of area available for use as offsets is mapped in Appendix G.3.

3.8.2 Criteria for offset sites within the project boundaries

In consultation with NGH Environmental, the proponent has indicated a preference to ensure all offset areas are well clear of areas potentially impacted by infrastructure on the site. While it is considered that an offset distance from wind turbines of 100m would be adequate, the proponent has instigated a conservative view and determined the following minimum buffers between infrastructure and offset areas:

- 300m from wind turbines (300m from centres);
- 50m from tracks, powerlines and other linear infrastructure (50m from centrelines); and
- 50m from the outer edge of all other infrastructure.

Accordingly these buffers will be applied in determining appropriate offset areas.

The investigation of suitable offset sites within the project site was undertaken as follows:

- Ineligible areas were identified including:
 - non-native areas which are not appropriate to the establishment of a biodiversity offset.
 - areas within 300m of wind turbines (centres), 50m of tracks and powerlines (centreline) and other infrastructure (boundaries).
 - areas unlikely to be agreed by the landowners to preserve as offset or where existing farm infrastructure is located.
- High value areas were assessed and highlighted for inclusion where practical. These included:
 - Areas of higher diversity.
 - Areas with special biodiversity features (such as known threatened species habitat).
- Hollow bearing trees were estimated as outlined in Section 2.

3.8.3 Identification of preferred offset sites to meet the offset requirement

The preferred offset sites, in relation to infrastructure buffers, are mapped in Appendix G.4 and discussed in terms of the offset requirement below. They have been identified as generally meeting the eligibility criteria above. This map also shows (where it is known) the type and condition of the vegetation.

Table 3-8 Preferred offset areas by precinct

Vegetation type / condition	Conroys Extension	Coppabella	Marilba	Transmission	Grand Total
Box Gum Woodland	132.4	452.4	301.6	13.1	899.4
Moderate-good (high diversity)		342.3	103.0	4.3	449.7
Moderate-good (low diversity)	132.4	110.1	198.5	8.8	449.8
Box Gum Woodland Derived Grassland	26.0	10.2	82.6	9.7	128.5
Moderate-good (high diversity)	7.2		1.2		8.4
Moderate-good (low diversity)	18.8	10.2	81.5	9.7	120.1
Box Gum Woodland, Kunzea ericoides			4.0		4.0
Moderate-good (low diversity)			4.0		4.0
Broad-leaved Peppermint Dry Grass Forest	0.0				0.0
Moderate-good (low diversity)	0.0				0.0
Long-leaved Box Dry Grass Forest	33.2	43.0			76.2
Moderate-good (high diversity)		40.0			40.0
Moderate-good (low diversity)	33.2	3.0			36.2
River Red Gum				2.0	2.0
Moderate-good (low diversity)				2.0	2.0
Yass Daisy	0.9				0.9
No survey data	0.9				0.9
No survey data	148.4	210.9	188.8	51.5	599.7
No survey data	148.4	210.9	188.8	51.5	599.7
Grand Total	341.0	716.5	577.0	76.2	1710.7

Table 3-9 outlines the offset ratio available in the preferred offset areas, excluding the areas where survey data is not yet available.

Table 3-9 Ability to meet the preliminary offset requirements

Vegetation type / condition	Offset Ratio Available					Impact Area (ha)	Preferred Offset Area (ha)
	Conroys Gap Extension	Coppabell a	Marilba	Transmiss ion	Total		
Box Gum Woodland							
Mod-good (high div.)	NA	1219.1	678.0	1.4	132.8	3.4	449.7
Mod-good (low div.)	8.4	3.9	8.1	0.3	4.5	100.2	449.8
Box Gum Woodland Derived Grassland							
Mod-good (high div.)	6.7	NA	NA	0.0	4.6	1.8	8.4
Mod-good (low div.)	1.9	0.2	4.3	0.3	1.0	118.2	120.1
Box Gum Woodland, Kunzea ericoides							
Mod-good (low div.)	NA	NA	NA	NA	NA	0.0	4.0
Broad-leaved Peppermint Dry Grass Forest							
Mod-good (low div.)	0.1	NA	NA	NA	0.1	0.2	0.0

Vegetation type / condition	Offset Ratio Available				Total	Impact Area (ha)	Preferred Offset Area (ha)
	Conroys Gap Extension	Coppabell a	Marilba	Transmiss ion			
Long-leaved Box Dry Grass Forest							
Mod-good (high div.)	NA	133.5	0.0	NA	133.5	0.3	40.0
Mod-good (low div.)	76.4	4.8	0.0	NA	29.1	1.2	36.2
Riparian							
Mod-good (low div.)	NA	0.0	NA	NA	15.2	0.1	2.0
River Red Gum							
Mod-good (low div.)	NA	NA	NA	2.2	2.2	0.9	2.0
Yass Daisy							
No survey data	NA	NA	NA	NA	NA		0.9
No survey data							
No survey data	NA	NA	NA	NA	NA	0	599.7
Grand Total						226.4	1712.7

Native vegetation

Specifically in relation to the preliminary offset requirements that have been determined using the BioBanking calculator and set out by area in Table , the areas available for use as offsets within the site boundary appear well able to satisfy the calculated requirements. These areas appear well suited to providing the offsets necessary for the project and at this stage are preferred areas for further investigation. Should these areas not be suitable then alternate areas will be used.

It is noted in some cases (e.g. river Red Gum) additional areas are required, however based on desktop review sufficient sites are expected to be found in the areas outlined and if this is not the case additional areas on site will be used.

It is noted that offsets are not required to be found within any specific precinct. Assuming the vegetation and habitat was appropriate, they could be identified anywhere within the local catchment (general rule, to be confirmed with OEH), and certainly in different precincts. The following provides an overview of the ability of each precinct to meet its own credit requirement. Large surpluses are present at both Coppabella and Marilba to ensure the transmission line can be offset.

Threatened species

The areas mapped in Appendix G.6 are known to contain habitat for Golden Sun Moth and contain the higher diversity Box Gum Woodland, preferred by this species as well as the Superb Parrot and Regent Honeyeater.

Hollow bearing trees

They include areas of higher density of hollow-bearing trees. The total number of hollows required to be found in the offset site (estimated using an agreed methodology, set out in Appendix C) is 5,855, well in excess of the offset requirement.

Summary

Table 3-10 Summary of credit requirements and offset site characteristics.

Offset requirement	Preferred offset
125 ha of Golden Sun Moth habitat	920 ha of potential habitat occurs in the higher diversity Box Gum Woodland derived grassland.
122 ha of Regent Honeyeater habitat	2,325 ha of potential habitat occurs in the Box Gum Woodland with tree cover in moderate to good condition
280.8 ha of Box Gum Woodland	3,246 ha of Box Gum Woodland (with tree cover and derived grasslands) in moderate to good condition
11.1 ha of Red Stringybark Grass Forest	132 ha of Red Stringybark Grass Forest
3.5 ha of River Red Gum Forest	2 ha of River Red Gum Forest – a small shortfall occurs for this community within the defined offset areas. It is noted that riparian vegetation was amalgamated into this zone to conduct the preliminary calculations and that 7.3 ha of River Red Gum Forest has been surveyed and occurs within the project site.
3,340 hollow bearing trees	5,855 hollow bearing trees

At this preliminary stage, the preferred offset site has been identified to address the key components of the requirement and demonstrate they can be met. It is noted that the detailed offset plan will also need to include an additional 1.5ha of River Red Gum Forest, but this may be addressed during the detailed calculations (it is noted that riparian vegetation was amalgamated into this zone to conduct the preliminary calculations and that 7.3 ha of River Red Gum Forest has been surveyed and occurs within the project site) or by adding additional lands to the package or in other ways in the broader offset package.

4 CONCLUSION

This document demonstrates:

- The site has undergone detailed survey over a period of seven years and accordingly the risks and potential impacts are well understood.
- The approach to the assessment of the proposed wind farm has been rigorous and adaptive, to changes in the infrastructure layout and the changing assessment context since 2008 when site work commenced.
- The assessment process and iterative layout development have reflected the requirement to avoid impacts as much as possible, minimise impacts where avoidance is not possible and offset residual impacts to achieve a maintain or improve biodiversity outcome for the project.
- Significant infrastructure changes have taken place over the life of the project to achieve these aims including a significant reduction in turbine numbers to avoid sensitive areas.
- Key risks have been 'derisked', in that clear strategies have been developed to confirm assumptions and build in a precautionary approach to managing the construction and operational impacts. This is underpinned by the commitment to develop a Biodiversity Management Plan in consultation with OEH, to the satisfaction of the Director-General.
- The mitigation strategies proposed (and as outlined in the Statement of Commitments prepared by the proponent) are appropriate and likely to minimise those risks and potential impacts.
- In particular the ability to undertake appropriate micro-siting of infrastructure is supported and will act to reduce biodiversity impacts further.
- The further pre-clearance survey work and adaptive management processes are in place to address any remaining uncertainty.
- The BioBanking Assessment Methodology has been committed to by the proponent for the determination of offset areas.
- Offset lands identified by the proponent are well in excess of the preliminary BioBanking offset credit requirements. This includes provision for:
 - 125 ha of Golden Sun Moth habitat
 - 122 ha of Regent Honeyeater habitat
 - 280.8 ha of Box Gum Woodland
 - 11.1 ha of Red Stringybark Grass Forest
- A 1.5 ha shortfall for River Red Gum Forest has been identified, which will be addressed by the detailed offset plan and in consultation with relevant authorities. Sufficient River Red Gum Forest is available within the project boundaries to be included as required (it is noted that riparian vegetation was amalgamated into this zone to conduct the preliminary calculations and that 7.3 ha of River Red Gum Forest has been surveyed in the project site).
- An in perpetuity mechanism to secure and manage offset lands has been outlined and is in line with similar projects of this size and nature.

Based on these factors, the biodiversity impacts of the project are considered justifiable and manageable.

APPENDICES

APPENDIX A SURVEY WORK AND ASSESSMENTS

Table A-1 Survey programs that have been undertaken for the Yass Valley Wind Farm

Year	Survey type	Coppabella	Marilba	Conroys Gap Extension	330kV Tx line
Surveys: March 2007 September November 2008 January and October 2009 Documented in Biodiversity Assessment in the EA	Biodiversity assessment including: • vegetation type and condition • threatened flora survey • bird and reptile census • bat survey • amphibian and reptile survey • constraints mapping (including areas containing high numbers of hollow bearing trees)	Yes	Yes	Yes	No
October 2009 Documented in Biodiversity Assessment in the EA	Targeted surveys for: • Squirrel glider • Bush stone curlew • Barking owl • Hollow bearing trees	Yes – 3 areas identified as having most potential to harbour these entities	No	No	No
October 2012 survey, documented in Supplementary Ecology Report, submitted November 2012	Follow up surveys for additional areas includes: • vegetation type and condition • threatened flora survey • Yass Daisy population mapping • bird and reptile census • constraints mapping	Yes	Yes	Yes	Yes
November/December 2013	Golden sun moth – initial survey	Yes	Yes	Yes	
June 2014	Field validation of treeless pasture was undertaken with OEH in 2014. This was to ensure that degraded pasture was properly assigned to native vegetation communities, particularly Box Gum Woodland, when considering impact areas.	Yes	Yes	No	No
November 2014	Sample Biometric plot data collected	Yes	No	No	No

Year	Survey type	Coppabella	Marilba	Conroys Gap Extension	330kV Tx line
November 2014	Flight path mapping Superb Parrot	Yes	No	No	No
December/January 2014-15	Golden sun moth – second survey	Yes	No	No	No

Note – Targeted surveys did not cover all areas of a precinct, but focused on either species potential habitat or new assessment areas.

Table A-2 The total area of each vegetation type across the surveyed areas.

	Conroys Extension (ha)	Coppabella (ha)	Marilba (ha)	Transmission (ha)	Grand Total (ha)
Aquatic	5.6	0.5	9.6	0.4	16.2
(blank)	5.6	0.5	9.6	0.4	16.2
Box Gum Woodland	858.9	1,630.8	1,947.7	39.7	4,477.1
Low		548.4	103.2		651.6
Moderate-good (high diversity)	133.2	485.1	125.4	5.5	749.2
Moderate-good (low diversity)	725.7	597.3	1,719.1	34.1	3,076.3
Box Gum Woodland Derived Grassland	259.5	1,402.8	739.8	212.4	2,614.4
Low		34.4			34.4
Moderate-good (high diversity)	21.1	2.2	1.4	8.9	33.6
Moderate-good (low diversity)	238.3	1,366.1	738.4	203.5	2,546.3
Box Gum Woodland, Kunzea ericoides			4.0		4.0
Moderate-good (low diversity)			4.0		4.0
Broad Leaved Peppermint Brittle Gum Dry Grass For.	0.9				0.9
Moderate-good (high diversity)	0.9				0.9
Broad-leaved Peppermint Dry Grass Forest	9.0				9.0
Moderate-good (low diversity)	9.0				9.0
Dry Shrub/ Tussock Grass Forest	36.3				36.3
Moderate-good (low diversity)	36.3				36.3
Exotic dominated pasture	61.6	313.8	202.9	5.3	583.7
Low	61.6	313.8	202.9	5.3	583.7
Long-leaved Box Dry Grass Forest	51.3	205.2	15.7		272.2
Moderate-good (high diversity)		82.0	15.7		97.7
Moderate-good (low diversity)	51.3	123.2			174.6
Pasture		383.6			383.6
Moderate-good (low diversity)		383.6			383.6
Riparian		47.3			47.3
Low		0.1			0.1
Moderate-good (high diversity)		22.7			22.7
Moderate-good (low diversity)		24.6			24.6
River Red Gum		3.1		4.2	7.3
Moderate-good (low diversity)		3.1		4.2	7.3
Grand Total	1,283.1	3,987.0	2,919.7	262.0	8,451.9

Table A-3 Complete table of impact areas by vegetation type

	Conroys Extension (ha)	Coppabella (ha)	Marilba East (ha)	Marilba West (ha)	Transmission (ha)	Grand Total
Aquatic	0.1		0.0	0.0		0.1
(blank)	0.1		0.0	0.0		0.1
Box Gum Woodland	13.6	11.2	8.7	10.7	33.7	77.9
Low		0.7	0.5	1.6	23.0	25.8
Moderate-good (high diversity)		0.3		0.2	3.0	3.4
Moderate-good (low diversity)	13.6	10.1	8.3	8.9	7.8	48.7
Box Gum Woodland	11.1	56.1	9.7	9.2	36.6	122.7
Derived Grassland						
Low		2.7				2.7
Moderate-good (high diversity)	1.1				0.8	1.8
Moderate-good (low diversity)	10.0	53.4	9.7	9.2	35.9	118.2
Broad-leaved Peppermint	0.2					0.2
Dry Grass Forest						
Moderate-good (low diversity)	0.2					0.2
Exotic dominated pasture	2.2	14.7	2.2	3.1	0.8	22.9
Low	2.2	14.7	2.2	3.1	0.8	22.9
Long-leaved Box Dry	0.4	0.9	0.2			1.5
Grass Forest						
Moderate-good (high diversity)		0.3	0.0			0.3
Moderate-good (low diversity)	0.4	0.6	0.2			1.2
Riparian		0.1				0.1
Moderate-good (low diversity)		0.1				0.1
River Red Gum					0.9	0.9
Moderate-good (low diversity)					0.9	0.9
Grand Total	27.6	83.0	20.8	22.9	72.1	226.4

APPENDIX B PRELIMINARY CREDIT CALCULATIONS

DEVELOPMENT SITE CREDIT REQUIREMENT

The Credit Calculator for Major Projects and BioBanking is the main decision support tool used in the assessment of development sites or offset sites under the NSW Offsets Policy for Major projects and the BioBanking Scheme.

The credit calculator is a software program that applies the Framework for Biodiversity Assessment (FBA) and the BioBanking Assessment Methodology (BBAM 2014). It is used to calculate the number and type of credits required for a development or created for an offset based on information collected during the site assessment stage. The operational manual provides detailed guidelines on how to apply the assessment methodology and use the calculator.

A preliminary calculation of the credit requirement for the impact areas was undertaken in March 2015 for the Yass Valley Wind Farm project, using the OEH online BioBanking Calculator.

The project ID for the assessment was 0035/2015/1722MP and the assessment type was selected as 'Major Project'.

Impact areas have been calculated by Epuron, using the vegetation type and condition shape files provided by NGH Environmental in March 2015. (Complete table of impact areas by vegetation type, provided in Appendix A, Table A.3.

The project conforms to the definition of a *linear shaped development* according to the Framework for Biodiversity Assessment (FBA³): a development that is generally narrow in width and extends across the landscape for a distance greater than 3.5 kilometres in length. The linear landscape assessment methodology, in accordance with BBAM 2014 for major projects, has not been used however. This method has not yet been incorporated into the BioBanking credit calculator (as of February 2015). Additionally, it is noted that the patch and remnant vegetation calculations and clearing estimates were estimated using aerial imagery and were not calculated as a GIS mapping exercise. As such, credit calculations are still considered preliminary, to inform the development of a suitable offset package. Adjustments would be made to the calculations prior to the submission of the Offset Strategy and in consultation with agencies.

The following sections summarises the values entered into the BioBanking Credit Calculator (BCC) assessment.

Landscape assessment

The dominant IBRA subregion affected by the project is the Upper Slopes Murrumbidgee Subregion. This was entered in the BCC for the project (under Assessment Circle Details).

The dominant Mitchell Landscape affected by the project is Borrowa Volcanics (entered in the BCC for the project under Assessment Details).

³ The [NSW Biodiversity Offsets Policy for Major Projects](#) clarifies, standardises and improves biodiversity offsetting for major project approvals. The FBA sets out instructions for such assessments and is supported by a the Framework for Biodiversity Assessment Credit Calculator. This calculator is still in development and does not yet contain the ability to assess the project as a linear development.

Percent native vegetation cover in the landscape

One set of assessment circles (1000 and 100ha) was constructed in the BCC, centred on the study area. It is acknowledged that under a standard treatment of a development site, additional assessment circles are required. These calculations are preliminary for the purposes of estimating likely offset requirements.

Clearing estimates in the 1000 ha circles and 100 ha circles were entered as follows:

1000 ha assessment circle

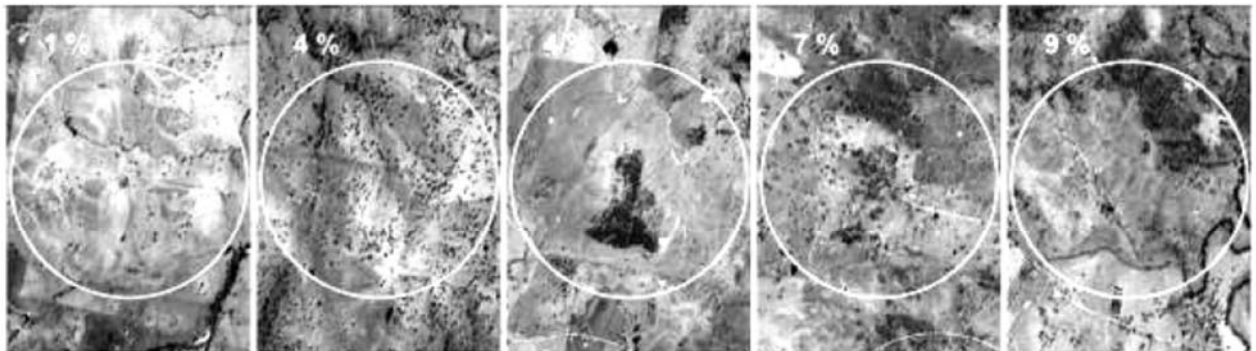
- 1000 ha before development = 11-15% native vegetation cover
- 1000 ha after development = 6-10% native vegetation cover

100 ha assessment circle

- 100 ha before development = 11-15% native vegetation cover
- 100 ha after development = 6-10% native vegetation cover

This is the estimated percentage tree cover currently at the site, estimated using the aerial imagery, with reference to Appendix 7 of the BBAM, and the amount that would be present if all clearing for the project had been undertaken. In both circles, by crossing the threshold from 11-15% down to 6-10%, a precautionary result is achieved. More accurate estimates may not cross this threshold, producing a lesser credit requirement.

<10% cover



10%–30% cover

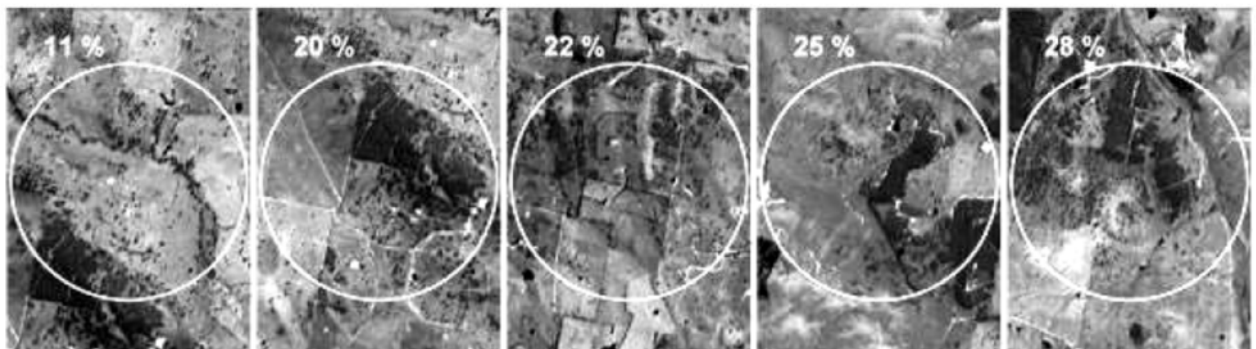


Figure B-1 Appendix 7 BBAM 2009. Guide to assessing percentage vegetation cover at the landscape scale.

Connectivity value

According to the definitions presented in the BCC, the project was not recorded to affect the following:

- State significant biodiversity link
- Regionally significant biodiversity link
- Local area biodiversity link

Considering the project construction footprint, it is noted that the project crosses the 20m riparian buffer of:

- One 4th order stream - Jugiong Creek

This was entered in the BCC assessment. As stated above, the linear landscape assessment methodology, in accordance with BBAM 2014 for major projects, has not been used.

The landscape assessment component of the BCC returned a site value score of 23.0.

Vegetation zones in the BCC

The vegetation zones that would be impacted by the project, their condition, required plot numbers and actual plot data used are shown in the table below. The resultant site value score has been calculated by the BCC.

Table B-1 Vegetation zones within the project

Zone ID	Mapped vegetation type	Biometric vegetation type	Biometric condition	Impact area	Plots required	Plots IDs used	Comment	Calculated site score
Grassy Woodland								
1	Box Gum Woodland	MR528 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Low (other)	51.80	3	1,1,1	Includes zone 10 as only one low condition zone is allowed per assessment circle.	30.21
2	Box Gum Woodland	MR528 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate-good (high diversity)	3.40	2	2,3		44.27
3	Box Gum Woodland	MR528 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate-good (low diversity)	48.70	4	15,15,16,16		18.75
Derived grassland								
4	Box Gum Woodland Derived Grassland	MR528 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate-good (high diversity)	1.80	1	14		23.44
5	Box Gum Woodland Derived Grassland	MR528 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate-good (low diversity)	118.20	6	4,5,6,7,8,14	Includes zone 6 which is less than the minimum zone size of 0.25 ha.	13.54
Dry sclerophyll forest (shrub/grass)								
6	Broad-leaved Peppermint Dry Grass Forest	MR533 Broad-leaved Peppermint - Nortons Box - Red Stringybark tall open forest on red clay on hills in the southern part of the NSW South Western Slopes Bioregion	Moderate-good (low diversity)	0.20	1		Included in zone 5 as less than minimum zone size of 0.25ha.	
7	Long-leaved Box Dry Grass Forest	MR598 Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South Western Slopes Bioregion	Moderate-good (high diversity)	1.50	2	9,9		43.23
8	Long-leaved Box Dry Grass Forest	MR598 Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South Western Slopes Bioregion	Moderate-good (low diversity)	1.20	1		No plot data for low diversity, included in zone 7 (considered precautionary).	
Grassy woodland								
9	River Red Gum and riparian	MR616 Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion	Moderate-good (low diversity)	1.00	1	13		35.94
Exotic dominated pasture								
10	Box Gum Woodland	MR528 - Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Low (other)	22.90	4		Included in zone 10 as only one low condition zone is allowed per assessment circle.	
Total				226.40				

Actual plot data obtained from the Coppabella precinct using the BioBanking Assessment Methodology (BBAM, DECC 2009) were used in this assessment. The data are collected in standardised 'biometric plot surveys'. Using a 50m transect and 20x20m quadrat, the following parameters are quantified:

- e) Percentage cover of overstorey, midstorey and understorey (grasses, shrubs, other)
- f) Native species number
- g) Weed species number
- h) Habitat features (such as tree hollows, fallen timber, proportion of regenerating species)

A specific number of these plots must be undertaken to precisely represent the vegetation zone being assessed. Where the sample data were insufficient, plots were duplicated as indicated in Table B-1 for the purpose of this preliminary credit calculation. Note: sample plot data from Coppabella precinct were used in this preliminary assessment.

The assessment requires the 'patch size' to be entered for each zone. This is the amount of native vegetation (including in low condition) that adjoins the zone. The patch size has been entered as 501 ha (the highest score allowable) for each zone, reflecting the sites connectivity to broader areas of native vegetation.

Ecosystem and threatened species credits in the BCC

Threatened species / management zones

This function allows specific areas of threatened species habitat to be mapped within each vegetation zone. For this preliminary assessment, no additional subzones were mapped. Threatened species subzones (7) were simply entered equivalent to each vegetation zone (vegetation zones shown in Table B-1).

Geographic/habitat feature

The following species habitat features were returned by the calculator. Habitat features known to occur on the development site were checked. These include the majority of features listed.

Table B-2 Geographic / habitat features (checked features occur for the development site).

Impact?	Common name	Scientific name	Feature
Yes	Golden Sun Moth	<i>Synemon plana</i>	land within a radius of 15 km west of Binalong and eastwards to the subregion's eastern-most boundary; and in a radius of 15 km from Tumut in Upper Slopes CMA subregion
Yes	Rosenbergs Goanna	<i>Varanus rosenbergi</i>	land within eastern third of subregion, south-east of a line that runs through Tarcutta and Galong in Upper Slopes CMA subregion
Yes	Small Scurf-pea	<i>Cullen parvum</i>	land within and to the east of Hay Plains in Murrumbidgee CMA subregion
Yes	Striped Legless Lizard	<i>Delma impar</i>	land containing loose surface rock, cracking surface soils or tussock clumps
Yes	Yass Daisy	<i>Ammobium craspedioides</i>	land within 50 kms of Kosciuszko National Park in Bondo (Part A) CMA subregion
Yes	Small Purple-pea	<i>Swainsona recta</i>	land containing a forb-rich grassy groundlayer
Yes	Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>	land containing surface rocks (embedded or loose)
No	Crimson Spider Orchid	<i>Caladenia concolor</i>	land within proximity to Kosciuszko National Park in Bondo (Part A) CMA subregion
Yes	Dwarf Bush-pea	<i>Pultenaea humilis</i>	As per vegetation type (poorly known)
No	Woolly Ragwort	<i>Senecio garlandii</i>	land within 10 km of Burrinjuck in Bondo (Part A) CMA subregion
Yes	Tumut Grevillea	<i>Grevillea wilkinsonii</i>	land within 25 km of Tumut in Bondo (Part A) CMA subregion
Yes	Tarengo Leek Orchid	<i>Prasophyllum petilum</i>	land east of Binalong in Upper Slopes CMA subregion
Yes	Booroolong Frog	<i>Litoria booroolongensis</i>	land within 100 m of stream or creek banks

Ecosystem credits

Based on the information entered so far, the following species are predicted by the calculator to occur; the calculations now assume these species occur and ecosystem credits have been generated for these species in the assessment.

Table B-3 Predicted threatened species

Common name	Scientific name*	TS offset multiplier	On site*
Barking Owl	<i>Ninox connivens</i>	3.0	Yes
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis subsp. gularis</i>	1.3	Yes
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus subsp. victoriae</i>	2.0	Yes
Bush Stone-curlew	<i>Burhinus grallarius</i>	2.6	Yes
Diamond Firetail	<i>Stagonopleura guttata</i>	1.3	Yes
Flame Robin	<i>Petroica phoenicea</i>	1.3	Yes
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	2.0	Yes
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	1.8	Yes
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis subsp. temporalis</i>	1.3	Yes
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata subsp. cucullata</i>	1.7	Yes
Little Eagle	<i>Hieraaetus morphnoides</i>	1.4	Yes
Little Lorikeet	<i>Glossopsitta pusilla</i>	1.8	Yes
Little Pied Bat	<i>Chalinolobus picatus</i>	2.1	Yes
Painted Honeyeater	<i>Grantiella picta</i>	1.3	Yes
Scarlet Robin	<i>Petroica boodang</i>	1.3	Yes
Speckled Warbler	<i>Chthonicola sagittata</i>	2.6	Yes
Spotted Harrier	<i>Circus assimilis</i>	1.4	Yes
Squirrel Glider population, Wagga Wagga Local Government Area	<i>Petaurus norfolcensis</i> - endangered population <i>Wagga Wagga</i>	2.2	Yes
Swift Parrot	<i>Lathamus discolor</i>	1.3	Yes
Turquoise Parrot	<i>Neophema pulchella</i>	1.8	Yes
Varied Sittella	<i>Daphoenositta chrysoptera</i>	1.3	Yes
Yellow-bellied Sheathtail-bat	<i>Saccolaimus flaviventris</i>	2.2	Yes

Threatened species credits

The following species were returned by the calculator as requiring survey (or they can also be assumed to occur). All species listed below are considered to have been adequately targeted by survey effort undertaken between 2008 and 2014 (refer to Appendix A).

Table B-4 Threatened species requiring survey.

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Booroolong Frog	<i>Litoria booroolongensis</i>	Yes	Yes										Yes
Dwarf Bush-pea	<i>Pultenaea humilis</i>										Yes	Yes	Yes
Eastern Pygmy-possum	<i>Cercartetus nanus</i>												
Golden Sun Moth	<i>Synemon plana</i>										Yes	Yes	Yes
Koala	<i>Phascolarctos cinereus</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>	Yes	Yes							Yes	Yes	Yes	Yes
Regent Honeyeater	<i>Anthochaera phrygia</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rosenbergs Goanna	<i>Varanus rosenbergi</i>	Yes	Yes									Yes	Yes
Silky Swainson-pea	<i>Swainsona sericea</i>									Yes	Yes	Yes	Yes
Small Purple-pea	<i>Swainsona recta</i>									Yes	Yes		
Small Scurf-pea	<i>Cullen parvum</i>	Yes	Yes										Yes
Squirrel Glider	<i>Petaurus norfolcensis</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Striped Legless Lizard	<i>Delma impar</i>									Yes	Yes	Yes	Yes
Tarengo Leek Orchid	<i>Prasophyllum petilum</i>										Yes	Yes	Yes
Yass Daisy	<i>Ammobium craspedioides</i>	Yes								Yes	Yes	Yes	

Site values

At this stage of the calculations, the plot data collected in each vegetation zone are entered as per Table B-5⁴. Actual plot data obtained from the Coppabella precinct using the BioBanking Assessment Methodology (BBAM, DECC 2009) were used in this assessment. The data were collected in December 2014. Table B-5 presents the plot data as it must be entered into the credit calculations.

In the credit calculations, the 'management scores' *with development* have been entered as zero for each parameter – that is, the calculator will assume that all native vegetation within the development footprint would be removed in the construction of the wind farm.

Table B-5 Plot data.

Mapped vegetation type	Vegetation type	Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overst. regen	Total length of fallen logs	Easting	Northing	Zone
Zone 1		Low condition – overstorey below benchmark, over 90% weed cover													
Box Gum Woodland	MR528 - Blakely's Red Gum...	BP 1	12	1.5	0	38	0	0	92	1	0.5	18	641686	6155976	55
Zone 2		Moderate to good condition (high diversity) – overstorey within bench mark, high native species diversity, lower weed cover													
Box Gum Woodland	MR528 - Blakely's Red Gum...	BP 2	12	10	0	50	0	0	14	0	1	59	639010	6154545	55
Box Gum Woodland	MR528 - Blakely's Red Gum...	BP 3	9	10.5	0	48	0	0	54	1	0.66	23	638555	6156113	55
Zone 3		Moderate to good condition (low diversity) – overstorey has lower % cover than zone 2, with higher % weed cover													
Box Gum Woodland	MR528 - Blakely's Red Gum...	BP 15	6	8.5	0	10	0	0	84	1	0	58	642588	6153799	55
Box Gum Woodland	MR528 - Blakely's Red Gum...	BP 16	11	6.5	0	46	0	0	84	1	0	67	645696	6152080	55
Zone 4		Moderate to good condition (high diversity) – no overstorey													
Box Gum Woodland	MR528 - Blakely's Red Gum...	BP 14	14	0	0	44	0	0	74	0	1	14	645040	614823	55

⁴ Table B-1 shows which data have been duplicated to achieve the minimum required plot number per vegetation zone.

Mapped vegetation type	Vegetation type	Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overst. regen	Total length of fallen logs	Easting	Northing	Zone
Derived Grassland															
Zone 5		Moderate to good condition (high diversity) – no overstorey													
Box Gum Woodland Derived Grassland	MR528 - Blakely's Red Gum...	BP 4	6	0	0	62	0	0	54	0	0	0	637139	6155768	55
Box Gum Woodland Derived Grassland	MR528 - Blakely's Red Gum...	BP 5	4	0	0	12	0	4	92	0	0	1	639406	6152983	55
Box Gum Woodland Derived Grassland	MR528 - Blakely's Red Gum...	BP 6	9	0	0	42	0	0	64	0	0	69	642983	6152610	55
Box Gum Woodland Derived Grassland	MR528 - Blakely's Red Gum...	BP 7	4	0	0	52	0	0	66	0	0	1	642206	6152820	55
Box Gum Woodland Derived Grassland	MR528 - Blakely's Red Gum...	BP 8	6	0	0	60	0	0	44	0	0	6.5	640709	6155537	55
Zone 7		Moderate to good condition (low diversity)													
Long-leaved Box Dry Grass Forest	MR598 Red Stringybark - Red Box...	BP 9	6	10	0	48	0	0	38	1	0.33	103	638851	6155395	55
Zone 9		Moderate to good condition (low diversity)													
River Red Gum and riparian	MR616 Yellow Box, River Red Gum...	BP 13	6	9.5	2.5	26	0	0	28	1	1	0	640432	6158835	55

Impacts on threatened species

In this section, the areas of impact on each species known to occur or assumed to occur onsite are entered.

Note, in estimating the areas of impact, the following assumptions have been made:

- Golden Sun Moth – suitable habitat equates to Box Gum Woodland (BGW) derived grassland in moderate to good condition – 25% of this in the infrastructure footprint is assumed to be actual habitat. This is considered precautionary as the species has been found only to occur in the Marilba and Conroys precincts.
- Regent Honeyeater – suitable habitat equates to BGW with tree cover in moderate to good condition – 50% of this in the infrastructure footprint is assumed to be actual habitat. This is considered precautionary as the species has not been detected onsite but is acknowledged to be able to use better quality habitat from time to time.

No other species would be impacted.

Table B-6 Impacts to threatened species

Common name	Scientific name	Impacted by development	ID method	Hectares/individuals	TS multiplier
Booroolong Frog	<i>Litoria booroolongensis</i>	No	Survey		1.3
Brush-tailed Phasogale	<i>Phascogale tapoatafa</i>	No	Survey		2.0
Dwarf Bush-pea	<i>Pultenaea humilis</i>	No	Survey		1.5
Eastern Pygmy-possum	<i>Cercartetus nanus</i>	No	Survey		2.
Golden Sun Moth	<i>Synemon plana</i>	Yes	Survey	30 ha	7.7
Koala	<i>Phascolarctos cinereus</i>	No	Survey		2.6
Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>	No	Survey		0
Regent Honeyeater	<i>Anthochaera phrygia</i>	Yes	Survey	55.1 ha	7.7
Rosenbergs Goanna	<i>Varanus rosenbergi</i>	No	Survey		3.3
Silky Swainson-pea	<i>Swainsona sericea</i>	No	Survey		1.8
Sloane's Froglet	<i>Crinia parvum</i>	No	Survey		1.3
Small Purple-pea	<i>Swainsona recta</i>	No	Survey		2.6
Small Scurf-pea	<i>Cullen parvum</i>	No	Survey		7.7
Squirrel Glider	<i>Petaurus norfolcensis</i>	No	Survey		2.2
Striped Legless Lizard	<i>Delma impar</i>	No	Survey		0
Tarengo Leek Orchid	<i>Prasophyllum petilum</i>	No	Survey		1.3

Common name	Scientific name	Impacted by development	ID method	Hectares/individuals	TS multiplier
Yass Daisy	<i>Ammobium craspedioides</i>	No	Survey		2.1

CREDIT REQUIREMENT SUMMARY

This is the final result of the calculations. The following credit requirements have been generated for the development site and constitute the credit requirement for the offset site. The full credit profile is provided at the end of Appendix B.

Table B-7 Credit requirements for development site and offset site.

Mapped vegetation type	PC type code	Biometric name	Management zone area (ha)	Loss in Landscape Value	Loss in site value score	EEC Offset Multiplier	Credits req for TS	TS with highest credit req	TS offset multiplier	Ecosystem credits required
Box Gum Woodland	MR528	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	51.8	23.0	30.21	3.0	0		0.0	1472
Box Gum Woodland	MR528	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	3.40	23.0	44.27	3.0	132	Barking Owl	3.0	132
Box Gum Woodland	MR528	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	48.70	23.0	18.75	3.0	965	Barking Owl	3.0	965
Box Gum Woodland Derived Grassland	MR528	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	1.80	23.0	23.44	3.0	42	Barking Owl	3.0	42
Box Gum Woodland Derived Grassland	MR528	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	118.40	23.0	13.54	3.0	1883	Barking Owl	3.0	0
Long-leaved Box Dry Grass Forest	MR598	Red Stringybark - Red Box - Long-leaved Box	2.7	23.0	43.23	1.0	103	Barking Owl	3.0	103

Mapped vegetation type	PC type code	Biometric name	Management zone area (ha)	Loss in Landscape Value	Loss in site value score	EEC Offset Multiplier	Credits req for TS	TS with highest credit req	TS offset multiplier	Ecosystem credits required
		- Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South Western Slopes Bioregion								
River Red Gum and riparian	MR616	MR616 Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion	1.00	23.0	35.94	3.0	33	Barking Owl	3.0	33
Scientific name			Common name			TS offset multiplier		Species credits required		
<i>Synemon plana</i>			Golden Sun Moth			7.7		2318		
<i>Anthochaera phrygia</i>			Regent Honeyeater			7.7		4012		

INTERPRETATION OF THE CREDIT RESULTS

Put simply, in terms of the mapped vegetation types, three broad vegetation communities require offsets:

1. Box gum woodland
2. Long-leaved Box Dry Grass Forest
3. River Red Gum Forest

Additionally, these offset areas must *either* be seen to contain suitable habitat for:

4. Golden Sun Moth – in BGW derived grassland in moderate to good condition and
5. Regent Honeyeater – in BGW with tree cover in moderate to good condition

Or additional lands must be added to the offset to meet this requirement.

Similarly, the offset land will also be required to show the required number of hollow bearing trees are present (as discussed in Section 7) or additional lands must be added to the offset to meet this requirement.

LIMITATIONS

Limitations that should be understood when interpreting these credit results include:

- Assessment methodology – a ‘linear development assessment’ best addresses this type of pattern of clearing. This feature is not yet available in the BCC (as of February 2015). In the absence of this, one landscape assessment circle has been used to assess landscape value scores.
- Patch vegetation calculations and clearing estimates were estimated using aerial imagery and were not calculated as a GIS mapping exercise.
- Plot data from a sample of sites at Coppabella precinct were used for these calculations. Some inconsistencies appear to result in the calculations that aren’t entirely consistent with our expectations, including the high credit number for low condition vegetation and lower site scores for vegetation expected to be in better condition. The collection and use of plot data for the actual offset plan calculations would be undertaken in consultation with OEH to ensure that the results are appropriate to the site.
- Surveys have been used to identify which species would be impacted by the development and offset. However, follow up surveys are still required for the Golden Sun Moth at the Marilba site.

Considering the above points, credit calculations are still considered preliminary, to inform the development of a suitable offset package. Adjustments would be made to the calculations prior to the submission of the Offset Strategy and in consultation with agencies including OEH.

OFFSET SITE AREA REQUIRED

Using the credit profile in the section above, the OEH credit conversion tool was used to estimate the size of the offset area required.

The calculations can be summarised as follows:

- 125 ha of Golden Sun Moth habitat must be demonstrated to occur within the offset lands
- 122 ha of Regent Honeyeater habitat must be demonstrated to occur within the offset lands

- 280.8 ha of Box Gum Woodland of similar condition to that being impacted must be demonstrated to occur within the offset lands
- 11.1 ha of Red Stringybark Grass Forest of similar condition to that being impacted must be demonstrated to occur within the offset lands
- 3.5 ha of River Red Gum Forest of similar condition to that being impacted must be demonstrated to occur within the offset lands

As stated above, there will be an additional hollow bearing tree requirement, as discussed in Section 7.

CONCLUSION

Assuming threatened species credits can be found within the general vegetation offsets, the overall low offset ratio (226 ha to be developed, requiring 295.4 ha to be offset; a ratio of 1 : 1.3) reflects what is known to be large areas of degraded pasture dominating the impact areas. However, caution is suggested.

The plot data used are based on site vegetation mapping built on since 2008. Field validation in 2014 found discrepancies that could reflect both the seasonality of the data and broader land use and climate changes since initial mapping in 2008. A commitment of the project is to base the offset plan on validated vegetation mapping and therefore, the results of these calculations are preliminary.

Additional areas may be required to secure suitable Golden Sun Moth and Regent Honeyeater habitat and sufficient hollow bearing trees to meet these requirements. Assuming a worst case scenario, that no overlap can be achieved in meeting Box Gum Woodland, Golden Sun Moth and Regent Honeyeater offsets (only the moderate to good condition vegetation will be suitable habitat for these threatened species), an additional 247 ha would be required, increasing the impacted: offset ratio to 1 : 2.4 (226 ha to be developed, 542.4 ha to be offset).

Assuming this still does not meet the requirement for hollows, a precautionary approach would be to plan for an increased ratio – 1:3 is recommended.

Step 1 - List the outstanding credit requirements				
Next step >>				
Species credits				
Number of different threatened species to offset	2	select the number of species using the drop-down in cell B3		
Species Name	Outstanding number of species credits required	Threatened species response to gain value (Tg value)	Total area of the polygon(s) identified for the species in the assessment	Estimated area of land required to offset outstanding species credits
<i>golden sun moth</i>	2318	0.40	30	125
<i>regent honeyeater</i>	4012	0.75	55.1	122
Total number of outstanding species credits	6330	Sub-total of the area of land required to offset outstanding ecosystem credits		247
Ecosystem credits				
Number of different vegetation types to offset	3	select number of vegetation types using the drop-down in cell B18		
Vegetation type and/or code	Vegetation formation	Outstanding number of ecosystem credits required	Median ecosystem credits created per hectare	Area of land required to offset outstanding ecosystem credits
bgw	grassy woodland	2611	9.3	280.8
red stringybark	dry sclerophyl forest	103	9.3	11.1
river red gum	grassy woodland	33	9.3	3.5
Total number of outstanding ecosystem credits		2747	Sub-total area of land to offset outstanding ecosystem credits	295.4

FULL CREDIT PROFILE GENERATED BY BBC

Biodiversity credit report



This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 24/03/2015

Time: 8:40:39AM

Calculator version: v4.0

Major Project details

Proposal ID: 0035/2015/1722MP

Proposal name: Yass Valley Wind Farm

Proposal address:

Proponent name: Epuron

Proponent address:

Proponent phone:

Assessor name: Brooke Marshall

Assessor address: 1/216 Carp St Bega NSW 2250

Assessor phone: 64928333

Assessor accreditation: 0035

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	223.90	2,610.95
Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South Western Slopes Bioregion	2.70	103.00
Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion	1.00	33.00
Total	227.60	2,747

Credit profiles

1. Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (MR528)

Number of ecosystem credits created	1,139
IBRA sub-region	Upper Slopes - Murrumbidgee

Offset options - Plant Community types	Offset options - IBRA sub-regions
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (MR528) White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (MR561) Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (MR677)	Upper Slopes - Murrumbidgee and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (MR528)

Number of ecosystem credits created	1,472
IBRA sub-region	Upper Slopes - Murrumbidgee

Offset options - Plant Community types	Offset options - IBRA sub-regions
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (MR528) White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (MR561) Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (MR677)	Upper Slopes - Murrumbidgee and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

3. Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion, (MR616)

Number of ecosystem credits created

33

IBRA sub-region

Upper Slopes - Murrumbidgee

Offset options - Plant Community types	Offset options - IBRA sub-regions
Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion, (MR564) Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion, (MR565) Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions, (MR566) Riverine Western Grey Box grassy woodland of the semi-arid (warm) climate zone, (MR615) Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion, (MR616)	Upper Slopes - Murrumbidgee and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

4. Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South Western Slopes Bioregion, (MR598)

Number of ecosystem credits created

103

IBRA sub-region

Upper Slopes - Murrumbidgee

Offset options - Plant Community types	Offset options - IBRA sub-regions
Apple Box - Broad-leaved Peppermint - Red Stringybark shrubby hill open forest in the upper NSW South Western Slopes Bioregion and adjacent South Eastern Highlands Bioregion, (MR508) Apple Box - Nortons Box - Blakely's Red Gum valley flat moist grassy tall open forest in the southern NSW South Western Slopes Bioregion and adjoining South Eastern Highlands Bioregion, (MR511) Riparian Blakely's Red Gum - Broad-leaved Sally woodland - tea-tree - bottlebrush - wattle shrubland wetland of the NSW South Western Slopes Bioregion and South Eastern Highlands Bioregion, (MR527) Broad-leaved Peppermint - Nortons Box - Red Stringybark tall open forest on red clay on hills in the southern part of the NSW South Western Slopes Bioregion, (MR533) Broad-leaved Sally grass - sedge woodland on valley flats and swamps in the NSW South Western Slopes Bioregion and adjoining South Eastern Highlands Bioregion, (MR534) Mugga Ironbark - Inland Scribbly Gum - Red Box shrub/grass open forest on hills in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (MR578) Nortons Box - Red Box - White Box tussock grass open forest of the southern section of the NSW South Western Slopes Bioregion, (MR585) Nortons Box - Red Stringybark grassy tall open forest on sheltered slopes in the Tumbarumba - Murray River region of the NSW South Western Slopes Bioregion, (MR586) Red Box - Red Stringybark - Nortons Box hill heath shrub - tussock grass open forest of the Tumut region, (MR592) Red Stringybark - Red Box - Long-leaved Box - Inland Scribbly Gum tussock grass - shrub low open forest on hills in the southern part of the NSW South Western Slopes Bioregion, (MR598) White Box - Blakely's Red Gum - Red Box - Red Stringybark shrubby woodland on shallow soils on metamorphic hills in the Albury region of the NSW South Western Slopes Bioregion, (MR642) Mugga Ironbark - mixed box woodland on hills in the Cowra - Boorowa - Young region of the NSW South Western Slopes Bioregion, (MR674)	Upper Slopes - Murrumbidgee and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Golden Sun Moth	Synemon plana	30.10	2,318
Regent Honeyeater	Anthochaera phrygia	52.10	4,012

APPENDIX C HOLLOW BEARING TREE IMPACT ESTIMATE

24 MARCH 2015

HOLLOW BEARING TREE AERIAL IMAGERY ASSESSMENT METHODOLOGY

The aerial assessment of Hollow Bearing Trees was performed using imagery from the New South Wales Land & Property Information department and Microsoft Bing.

The methodology for performing the aerial assessment for Hollow Bearing Trees was developed during a site visit to the Yass Valley Wind Farm site on 17 & 18 June 2014 with officers and managers from the Office of Environment and Heritage and confirmed during a teleconference with the Office of Environment & Heritage, the Department of Planning & Environment, nghenvironmental & Epuron on 24 June 2014. The agreed methodology is described below.

Methodology agreed for Hollow Bearing Tree assessment

- All turbine locations to be assessed
- All trees with a canopy diameter over 15m should be counted as having potential for hollows.
- All stags (standing dead trees) should be counted.
- Where the wind turbine generator (WTG) is on the top of a hill with land sloping away from the location a 50m radius from the WTG should be used as the potential impact zone within which suitable trees should be identified and counted. This method has been used if the surrounding terrain falls by 10m in altitude over a length of 50m i.e. gradient $\Rightarrow 20\%$
- Where the wind turbine generator (WTG) is located with flat land adjacent or the adjacent land slopes upwards a 100m radius from the WTG should be used as the potential impact zone within which suitable trees should be identified and counted.
- Where the wind turbine generator (WTG) is on land which slopes up on one side and down on the other (i.e. side of a hill) a 100m radius from the WTG should be used on the flat and uphill side and a 50m radius on the downward sloping side as the potential impact zone within which suitable trees should be identified and counted.
- It is proposed that where tree density is high (9 locations identified) the treed area has been outlined and 15m diameter circles applied to fill the space. This is considered conservative as in these denser areas, many canopies are likely to be less than 15m.

Epuron (Michael Kurnik) completed the counts and nghenvironmental (Brooke Marshall) checked a sample (44 of 144 turbine sites, 27/06/14) to confirm the methods and results.

RESULTS

The initial results upon which OEH based their August 2014 assessment of 144 turbine sites were:

- 154 stags were identified
- 367 live trees of canopy diameter greater than 15m were identified, and assumed to be hollow bearing

42 turbine sites had no stags or trees greater than 15m within the specified buffer zones.

Since the OEH assessment four turbine locations of particular concern have been relocated to reduce the number of HBTs impacted and the number of wind turbines has been reduced from 144 to 124.

Following the same methodology described above the current assessment of 124 turbine sites is:

- 142 stags were identified
- 192 live trees of canopy diameter greater than 15m were identified and assumed to be hollow bearing.

This updated assessment has also been broken down by precinct:

		Conroys Ext'n (18)	Coppabella (79)	Marilba West (17)	Marilba East (10)	Total (124)
0 - 50 m	Alive	3	64	5	0	72
	Dead	0	49	5	2	56
50 - 100 m	Alive	15	88	13	4	120
	Dead	14	50	10	12	86
	Total	32	251	33	18	334

See the table following for details of HBTs at each turbine location. Sample site mapping is provided overleaf.

CONCLUSION

In the process of relocating the four turbines of concern each location was visited and the HBTs verified. While the predicted number of HBTs impacted at these four locations was 157, the ground truthing exercise revealed that the actual number of HBTs within 100m of these four turbines was 83. Following the relocation, the HBTs potentially impacted at these locations was 28.

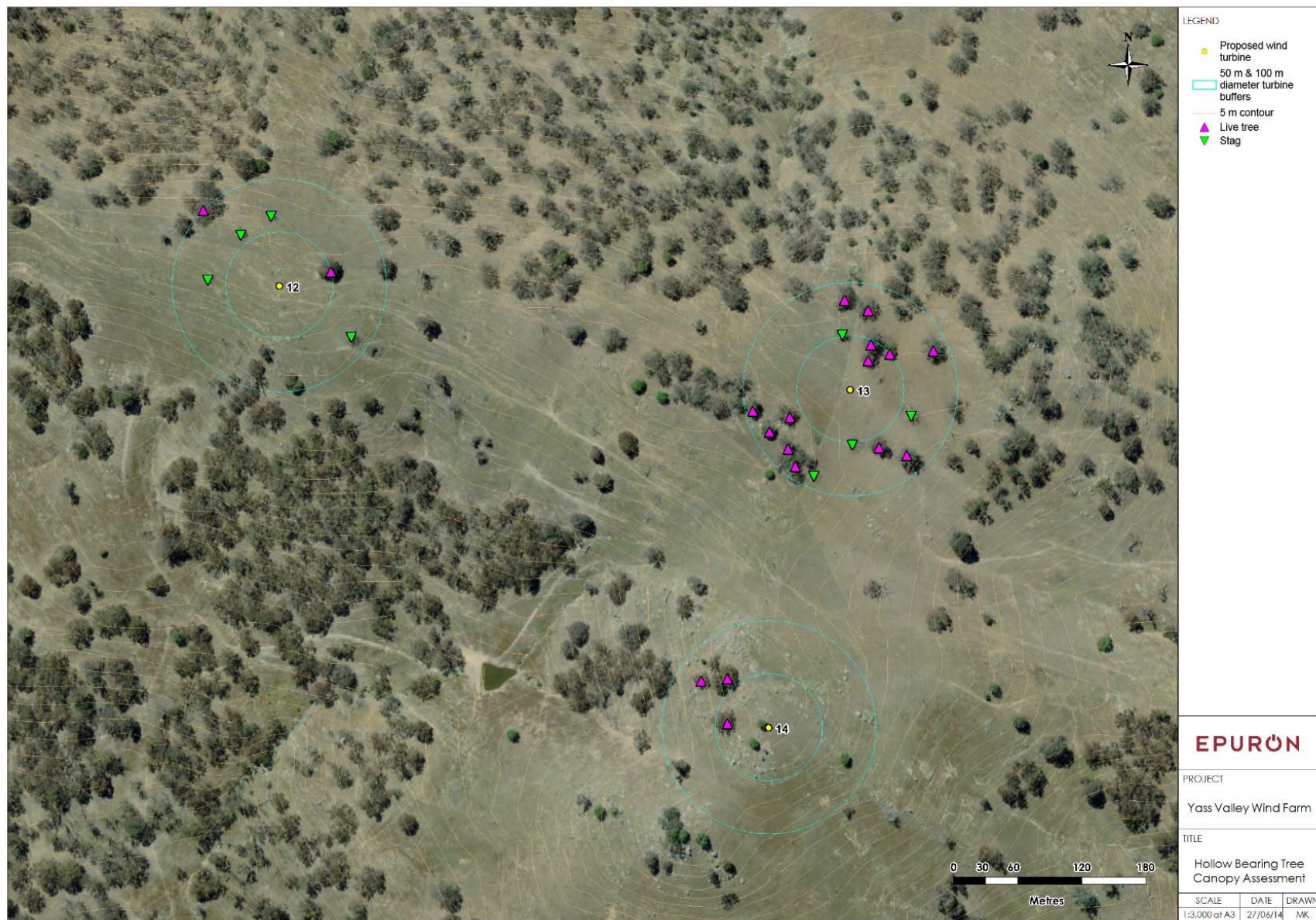
The relocation of the four turbines noted above and the removal of a further 10 turbine locations brings the total number of potential hollow bearing trees with direct and indirect impacts down from the original estimate of 521 to 334 using the agreed methodology which appears conservative.

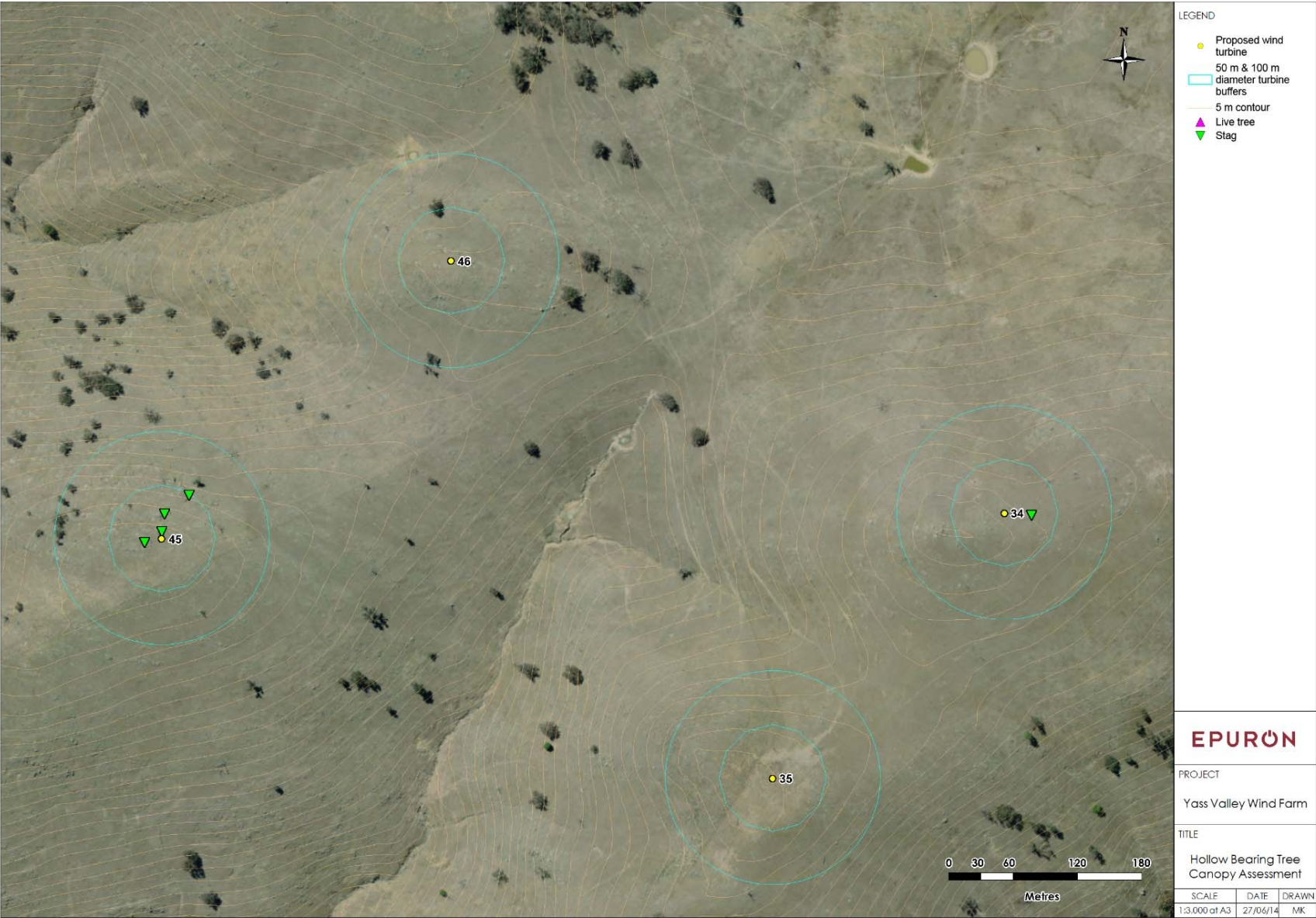
Yours sincerely,



MICHAEL KURNIK

Project Manager





124 wind turbine layout and Hollow Bearing Trees associated

Turbine ID	Number of HBTs	Turbine ID	Number of HBTs	Turbine ID	Number of HBTs	Turbine ID	Number of HBTs	Turbine ID	Number of HBTs
1	1	36	17	63	6	100	2	133	0
2	0	37	4	64	3	101	1	134	1
3	4	38	2	65	2	102	6	135	3
4	11	39	0	66	0	103	2	136	0
5	10	40	0	67	1	104	1	137	9
6	8	41	6	68	0	105	2	138	5
7	1	42	0	69	1	106	1	139	0
8	7	43	0	70	2	110	2	140	1
9	1	44	0	71	0	111	5	141	2
10	6	45	4	72	3	112	2	142	2
11	1	46	0	73	4	114	4	143	0
12	6	47	0	74	0	116	1	144	0
13	17	48	1	75	6	117	0	145	7
14	3	49	1	76	1	118	5	146	1
15	0	50	0	77	17	119	0	147	0
16	0	51	1	78	4	120	1	148	0
17	2	52	1	79	0	121	1		
18	0	53	0	80	12	123	2		
19	8	54	1	81	1	124	1		
25	1	55	1	82	0	125	0		
29	3	56	20	83	3	126	3		
30	2	57	3	84	1	127	8		
31	3	58	1	85	0	128	3		
32	0	59	4	86	2	129	5		
33	0	60	0	87	3	130	1		
34	1	61	3	88	3	131	0		
35	0	62	2	92	0	132	1		
								TOTAL	334

124 wind turbines and Hollow Bearing Trees associated

Turbine ID	Number of HBTs	Turbine ID	Number of HBTs	Turbine ID	Number of HBTs	Turbine ID	Number of HBTs	Turbine ID	Number of HBTs
COPPABELLA		35	0	62	2	MARILBA		103	2
1	1	36	17	63	6	WEST		104	1
2	0	37	4	64	3	83	3	105	2
3	4	38	2	65	2	84	1	106	1
4	11	39	0	66	0	85	0	= 10	= 18
5	10	40	0	67	1	86	2	Total	51
6	8	41	6	68	0	87	3	MRL	
7	1	42	0	69	1	88	3	CONROYS EXT	
8	7	43	0	70	2	92	0	131	0
9	1	44	0	71	0	110	2	132	1
10	6	45	4	72	3	111	5	133	0
11	1	46	0	73	4	112	2	134	1
12	6	47	0	74	0	114	4	135	3
13	17	48	1	75	6	116	1	136	0
14	3	49	1	76	1	117	0	137	9
15	0	50	0	77	17	118	5	138	5
16	0	51	1	78	4	119	0	139	0
17	2	52	1	79	0	120	1	140	1
18	0	53	0	80	12	121	1	141	2
19	8	54	1	81	1	= 17	= 33	142	2
25	1	55	1	82	0	EAST		143	0
29	3	56	20	126	3	123	2	144	0
30	2	57	3	127	8	124	1	145	7
31	3	58	1	128	3	125	0	146	1
32	0	59	4	129	5	100	2	147	0
33	0	60	0	130	1	101	1	148	0
34	1	61	3	= 79	= 251	102	6	= 18	= 32

HOLLOW BEARING TREES – OFFSET POTENTIAL

METHODS

To determine the numbers of hollow bearing trees in the preferred offset areas, a sampling approach was applied using the same methodology applied to the HBT count at wind turbine locations, as agreed with OEH.

While the original methodology had an adaptation for ground slope for trees within 100m of a wind turbine, the offset calculations do not consider ground slope, only trees of a relevant canopy diameter and stages. Offset areas for Box-Gum Woodland EEC are often areas of high tree density and canopy number has been estimated using the original agreed methodology.

The approach was;

1. To identify a significant portion on each precinct of Box-Gum Woodland in each condition class.
2. To apply the agreed methodology to the identified portion
3. To use this count to quantify the number of HBTs per hectare within that condition class portion
4. To extrapolate the total number of hectares of that condition class in the preferred offset area
5. To determine the potential availability of HBTs in the preferred offsets, by precinct, across the site

RESULTS

The following table illustrates the results of the sampling and the extrapolation to the full preferred offset sites as identified on the Preferred Offset site map. In summary,

- The number of HBTs to be offset is currently assessed under the methodology as 334.
- The ratio likely to be applied is 1:10 which would require 3,340 HBTs in the offset areas.
- This number of HBTs can easily be met in the areas identified across the site and on a precinct by precinct basis.

Estimate of Hollow Bearing Trees per Hectare

Sample Area	Precinct	Area (ha)	HBT			HBT Per Hectare
			Alive	Stag	Total	
Box Gum Woodland (Moderate-Good, High Diversity)						
Sample Area 1	COP	25	200	20	220	8.8
Sample Area 2	COP	11.2	24	9	33	2.9
Sample Area 3	MRL	8	127	0	127	15.9
Total		44.2	351	29	380	8.6
Box Gum Woodland (Moderate-Good, Low Diversity)						
Sample Area 4	MRL	30	103	35	138	4.6
Sample Area 5	COP	24	83	10	93	3.9
Total		54	186	45	231	4.3
Box Gum Woodland Derived Grassland (Moderate-Good, Low Diversity)						
Sample Area 6	MRL	14	0	2	2	0.1
Sample Area 7	MRL	8.7	1	3	4	0.5
Sample Area 8	MRL	5	7	1	8	1.6
Total		27.7	8	6	14	0.5

Calculation of Hollow Bearing Trees in Preferred Offset Areas

		Estimated Number of Hollow Bearing Trees				
Row Labels	Estimated HBT/Ha	Conroys Extension	Coppabella	Marilba	Transmission	Grand Total
Box Gum Woodland		0	0	0	0	0
Moderate-good (high diversity)	8.6	0	2943	886	37	3866
Moderate-good (low diversity)	4.3	566	471	849	38	1924
Box Gum Woodland Derived Grassland		0	0	0	0	0
Moderate-good (high diversity)	0.5	4	0	1	0	4
Moderate-good (low diversity)	0.5	9	5	41	5	61
Grand Total		579	3419	1777	79	5855

APPENDIX D REVISED OFFSET STRATEGY

HOW OFFSETS WILL BE IDENTIFIED

Native vegetation, as well as specific threatened species habitat and hollow bearing trees will be required to be offset as part of the development of the Yass Valley Wind Farm.

Areas of native vegetation

The offset requirement would be determined by the total impact area in areas of native vegetation of the construction phase. Impact area calculations have been previously clarified with OEH and include all permanent and temporary impacts. Permanent and temporary impacts are proposed to be offset.

Detailed vegetation type and condition mapping would be undertaken prior to any construction impact to update existing vegetation mapping for these areas.

BioBanking Assessment Methodology (BBAM) would be used to calculate the credit requirement, in consultation with OEH.

Threatened species

The biodiversity surveys completed at the site since 2008 include targeted threatened species surveys. The data from these surveys would be used in the BBAM to ensure that any additional threatened species credits are included in the resultant credit requirement for the project.

Additionally, several preclearance surveys are proposed that can also feed into the offset calculations. These include:

- Golden sun moth surveys to verify impact and offset areas
- Threatened reptile preclearance survey
- Hollow bearing tree inventory (see also below)

Hollow bearing trees

In 2013 OEH advice was that a 10:1 offset should be provided for hollow bearing trees.

Additional consultation with OEH determined that:

- Hollows within 50m of a turbine would either be removed or assumed to be removed, due to the expected level of impact on use by the operation of the turbine
- Hollows within 100m of a turbine would be impacted to some degree by the operation of the turbine

It is proposed that for each hollow within 50m of a turbine and for additional hollows that would be required for other infrastructure such as powerlines and tracks, that a 10:1 ratio would be included within the offset area. That is, if the nominated areas do not contain 10 times more hollows than would be removed, that additional areas would be added until this ratio is achieved.

SELECTING THE OFFSET SITES

The proponent's preference is to establish offsets within the private land holdings of the project site. This is an area of over 14,600 hectares.

The mapping and surveys undertaken to date suggest that the vegetation within the site boundary is representative of the vegetation that would be cleared and therefore allows a like for like offset criteria to be targeted.

Additional criteria that would be used to select offset sites for the Offset Package include that they are:

- Of sufficient size and composition to achieve the credit requirement calculated using the BBAM, in consultation with OEH
- Compliant with the *Principles for the use of biodiversity offsets in NSW* guidance document (refer below for explicit reference to these principles)
- Able to offset Commonwealth listed EEC to demonstrate compliance with the Commonwealth offset policy.
- Selected to minimize:
 - o Edge area
 - o Number of land holdings
- Selected to maximize:
 - o Landscape connectivity
 - o Preservation of declining habitat types and resources
- Located no closer than 300m from a wind turbine (to minimise any indirect impacts of the wind farm)
- Located no closer than 50m from other infrastructure (centrelines if linear infrastructure or boundaries otherwise) to minimise any indirect impacts of the wind farm

Preferred offset sites have been identified but would be finalised in consultation with OEH.

HOW OFFSETS WILL BE SECURED

Offsets would be governed by conservation mechanisms to ensure long-term protection and management of the site, including funding arrangements.

The proponent commits to securing a formal vehicle to manage the offset site in perpetuity. A Conservation Property Vegetation Plan (CPVP) is proposed, attached to the land title. The agreement will specify management actions and restrictions on land use, in accordance with the finalised offset plan for the site. The Local Land Services would set up the CPVP. These plans have been used for other wind farm sites, including the Gullen Range Wind Farm.

A Conservation Property Vegetation Plan (CPVP) would be implemented on each involved private land holding. The process would be driven by Epuron, with input from each landholder. The CPVP would include management actions associated with the offset area that would apply in perpetuity.

To ensure that the CPVP is binding on successors in title, an abstract of the CPVP would be registered with the Land and Property Management Authority under the *Real Property Act 1900*. The CPVP would be a legally binding agreement under both the *Native Vegetation Act 2003* and the *Threatened Species Conservation Act 1995*. The terms of the CPVP would not be affected by any changes to local or state planning rules or new listings of threatened species. A CPVP can be varied at the landholder's request, provided the variation would still improve or maintain environmental outcomes.

As the CPVP is attached to the land title, the landowner is ultimately responsible for funding the management actions required at the Offset Site and monitoring the effectiveness of their implementation. However the Proponent would take responsibility for management and would ensure the landowner has sufficient resources and information to implement the management actions for the operational life of the project, as management of offsets would form a condition of the project's consent.

Even though a CPVP is binding in perpetuity, it is acknowledged that there is less incentive to manage the offset site after the decommissioning of the wind farm. Therefore, it is proposed that the bulk of the management actions be focused in the early years of the project. Monitoring and reporting, as outlined above, would demonstrate whether this is being satisfactorily achieved and allow a point for the consent authority to intervene.

Should a CPVP not be acceptable to the relevant landowner other mechanisms shall be used which provide adequate protection in perpetuity.

HOW OFFSETS WILL BE MANAGED

It is proposed that the wind farm owner (which may be different to the current proponent) would be responsible for the management of the offset sites, during the operational life of the wind farm. The wind farm owner finances the offset site landowner to undertake management actions (such as fencing and weed control) but would retain responsibility for the management of the site. This provides surety that the actions will be undertaken, as the requirement to offset would be a condition of the wind farm owner's consent.

At the decommissioning stage, the ongoing management would be the responsibility of the landowner. It is expected that by this time the majority of the required management actions would have been undertaken and ongoing management tasks will largely coincide with routine agricultural activities. Land use restrictions will remain in place on the offset site in perpetuity so that any activities undertaken on the offset site must be compatible with the site's overall function: to improve biodiversity values.

These arrangements would be stipulated in the management plan attached to the CPVP. The management plan will be specific to the areas being managed, and developed in consultation with landholders, Local Land Services and OEH.

MEETING THE PRINCIPLES FOR BIODIVERSITY OFFSETS IN NSW

The biodiversity offset principles developed by OEH would guide the selection and management of the offset site, namely:

Impacts must be avoided first by using prevention and mitigation measures.

The aim of the offset package is to ensure that where impacts cannot be avoided, or sufficiently minimised, the residual impact would be offset in perpetuity.

All regulatory requirements must be met.

Offset land is required as part of the approval conditions for the project. The proposed offsets would not be used to satisfy approvals or assessments under other legislation.

Offsets must never reward ongoing poor performance.	<i>Monitoring would be required as part of the implementation of management actions for the offset site.</i>
Offsets will complement other government programs.	<i>The Offset Package would be finalized in consultation with OEH and the LLS, allowing any local programs or initiatives to be considered and included.</i>
Offsets must be underpinned by sound ecological principles.	<i>Selection criteria have been developed to ensure the location of offset sites is appropriate. Management measures have been outlined by an ecologist. Specific management plans would accompany each CPVP, developed in consultation with the LLS and the proponent.</i>
Offsets should aim to result in a net improvement in biodiversity over time.	<i>Management actions would be developed specific to each offset site (one per private property).</i>
Offsets must be enduring - they must offset the impact of the development for the period that the impact occurs.	<i>Native vegetation clearing impacts are deemed permanent and therefore the offset sites would be preserved and managed in perpetuity.</i>
Offsets should be agreed prior to the impact occurring.	<i>The offset criteria set out in this document form part of the project. If approved, the commitment is carried over as a condition of consent. The commitment includes consultation with OEH and the LLS to ensure the final offset package is acceptable, prior to construction impacts.</i>
Offsets must be quantifiable - the impacts and benefits must be reliably estimated.	<i>An estimation of impact has been provided based on GIS mapping. Criteria have been proposed that provide clear quantification of offsets, based on the actual area cleared.</i>
Offsets must be targeted.	<i>Refer to selection criteria.</i>
Offsets must be located appropriately.	<i>Refer to selection criteria.</i>
Offsets must be supplementary.	<i>Offsets would be comprised of private land not currently under any form of biodiversity conservation protection. In this way the land would be additional to government reserves and programs. Refer to selection criteria.</i>
Offsets and their actions must be enforceable through development consent conditions, licence conditions, conservation agreements or a contract.	<i>A CPVP would be attached to the titles of the offset land (one per landowner). To ensure that the CPVP is binding on successors in title, an abstract of the CPVP would be registered with the Land and Property Management Authority under the Real Property Act 1900. The CPVP would be a legally binding agreement under both the Native Vegetation Act 2003 and the Threatened Species Conservation Act 1995. The terms of the CPVP would not be affected by any changes to local or state</i>

planning rules or new listings of threatened species. A CPVP can be varied at the landholder's request, provided the variation would still improve or maintain environmental outcomes.

APPENDIX E DRAFT OFFSET PLAN

Building on the Offset Strategy, the Offset Plan will contain the final detail regarding:

- Characteristics of the offset site
- Verification of actual impact vs actual offset areas (and ability to match credit profiles)
- Risks and opportunities relevant to management of the offset site
- Management actions required at the offset site
- Offset site monitoring

With these issues addressed, the formalisation of the security mechanism will be implemented and management will commence at the offset site. These components will ensure the overall maintain or improve result for the project.

CHARACTERISTICS OF THE OFFSET SITE

An evaluation of the offset site to meet the credit requirement of the impact areas will be undertaken using BBAM. However, using the credit ratios from Appendix B, preferred offset sites (mapped in Appendix G.4) have been evaluated below.

The offset requirement (in terms of Ecosystem Credits Required) can be broken down between precincts by pro-rating each line item on a Hectare by Hectare basis between the precincts. This can then be used to estimate the areas required to be found at the offset site, shown in the subsequent table. The total amount of each vegetation type within the offset site is then shown.

Table E-1 Credit ratio by zone.

Zones	Hectares	BioBanking Credit Requirement	Credits per Ha	Estimated Credits required per Ha	Offset Ratio (Ha Offset Required per Ha Impact Area)
Zone 1 (BGW, Low)	51.8	1472	28	9.3	3.1
Zone 2 (BGW, Mod-Good, High Diversity)	3.4	132	39	9.3	4.2
Zone 3 (BGW, Mod-Good, Poor Diversity)	48.7	965	20	9.3	2.1
Zone 4 (BGWDG, Mod-Good)	1.8	42	23	9.3	2.5
Zone 5 (BGWDG, Low)	118.2	0	0	9.3	0.0
Zone 7 (Long leaved box, Mod-Good)	2.7	103	38	9.3	4.1
Zone 10 (Riparian, River Red Gum)	1.0	33	33	9.3	3.5

Table E-2 Area requirement by precinct.

	BioBanking Management Zone	Total Impact Area (Ha)	Offset Ratio Required (from BioBanking Methodology)	Offsets required by precinct (Ha)				Grand Total
				Coppabella	Marilba East	Marilba West	Transmission	
Aquatic		0.1						
(blank)	zone 1	0.1	3.1	0.0	0.1	0.0	0.0	0.1
Box Gum Woodland		77.9						
Low	zone 1	25.8	3.1	2.3	1.4	4.8	70.2	78.8
Moderate-good (high diversity)	zone 2	3.4	4.2	1.2	0.0	0.6	12.3	14.1
Moderate-good (low diversity)	zone 3	48.7	2.1	21.6	17.6	19.0	16.6	74.8
Box Gum Woodland Derived Grassland		122.7						
Low	zone 1	2.7	3.1	8.2	0.0	0.0	0.0	8.2
Moderate-good (high diversity)	zone 4	1.8	2.5	0.0	0.0	0.0	1.9	1.9
Moderate-good (low diversity)	zone 5	118.2	0.0	0.0	0.0	0.0	0.0	0.0
Broad-leaved Peppermint Dry Grass Forest		0.2						
Moderate-good (low diversity)	zone 1	0.2	3.1	0.0	0.0	0.0	0.0	0.0
Exotic dominated pasture		22.9						
Low	zone 1	22.9	3.1	44.8	6.6	9.4	2.6	63.4
Long-leaved Box Dry Grass Forest		1.5						
Moderate-good (high diversity)	zone 7	0.3	4.1	1.2	0.0	0.0	0.0	1.2
Moderate-good (low diversity)	zone 7	1.2	4.1	2.5	0.8	0.0	0.0	3.3
Riparian		0.1						
Moderate-good (low diversity)	zone 10	0.1	3.5	0.5	0.0	0.0	0.0	0.5
River Red Gum		0.9						
Moderate-good (low diversity)	zone 10	0.9	3.5	0.0	0.0	0.0	3.2	3.2
Grand Total		226.4		82.3	26.6	33.9	106.9	249.6

Table E-3 Preferred offset areas by precinct.

Row Labels	Coppabella	Marilba	Conroys Extension	Transmission	Grand Total
Box Gum Woodland	452.4	301.6	132.4	13.1	899.4
Moderate-good (high diversity)	342.3	103.0		4.3	449.7
Moderate-good (low diversity)	110.1	198.5	132.4	8.8	449.8
Box Gum Woodland Derived Grassland	10.2	82.6	26.0	9.7	128.5
Moderate-good (high diversity)		1.2	7.2		8.4
Moderate-good (low diversity)	10.2	81.5	18.8	9.7	120.1
Box Gum Woodland, Kunzea ericoides		4.0			4.0
Moderate-good (low diversity)		4.0			4.0
Broad-leaved Peppermint Dry Grass Forest			0.0		0.0
Moderate-good (low diversity)			0.0		0.0
Long-leaved Box Dry Grass Forest	43.0		33.2		76.2
Moderate-good (high diversity)	40.0				40.0
Moderate-good (low diversity)	3.0		33.2		36.2
River Red Gum				2.0	2.0
Moderate-good (low diversity)				2.0	2.0
Yass Daisy			0.9		0.9
No survey data			0.9		0.9
No survey data	210.9	188.8	148.4	51.5	599.7
No survey data	210.9	188.8	148.4	51.5	599.7
Grand Total	716.5	577.0	341.0	76.2	1710.7

Native vegetation

In relation to the preliminary offset requirements that have been determined using the BioBanking calculator, the areas available for use as offsets within the site boundary appear well able to satisfy the calculated requirements.

It is noted that offsets are not required to be found within any specific precinct. Assuming the vegetation and habitat was appropriate, they could be identified anywhere within the local catchment (general rule, to be confirmed with OEH), and certainly in different precincts. The following provides an overview of the ability of each precinct to meet its own credit requirement. Large surpluses are present at both Coppabella and Marilba to ensure the transmission line can be offset.

Table E-4 Preferred offset areas by precinct.

Precinct	Required hectares	Hectares in preferred offset site	Surplus
Coppabella	82.3	716.5	634.2
Marilba	60.5	918	857.5
Transmission	106.9	76.2	-30.7
Total	249.7	1710.7	1461

Threatened species

The areas mapped in Appendix G.6 are known to contain habitat for Golden Sun Moth and contain the higher diversity Box Gum Woodland, preferred by this species as well as the Superb Parrot and Regent Honeyeater. 920 ha of potential Golden Sun Moth habitat occurs in the higher diversity Box Gum Woodland derived grassland. 2,325 ha of potential Regent Honeyeater habitat occurs in the Box Gum Woodland with tree cover in moderate to good condition.

Hollow bearing trees

They include areas of higher density of hollow-bearing trees. The total number of hollows required to be found in the offset site (estimated using an agreed methodology, set out in Appendix C) is 5,855, well in excess of the offset requirement.

Summary

At this preliminary stage, the preferred offset site has been identified to address the key components of the offset requirement and demonstrate they can be met. It is noted that the detailed offset plan will also need to include an additional 1.5ha of River Red Gum Forest, but this may be addressed by adding additional lands to the package or in other ways in the broader offset package.

Table E-5 Summary of credit requirements and offset characteristics.

Offset requirement	Preferred offset
125 ha of Golden Sun Moth habitat	920 ha of potential habitat occurs in the higher diversity Box Gum Woodland derived grassland.
122 ha of Regent Honeyeater habitat	2,325 ha of potential habitat occurs in the Box Gum Woodland with tree cover in moderate to good condition
280.8 ha of Box Gum Woodland	3,246 ha of Box Gum Woodland (with tree cover and derived grasslands) in moderate to good condition
11.1 ha of Red Stringybark Grass Forest	132 ha of Red Stringybark Grass Forest
3.5 ha of River Red Gum Forest	2 ha of River Red Gum Forest available – a small shortfall occurs for this community. Additional areas can be identified for this community onsite or, as the area is

Offset requirement	Preferred offset
	small, it may be addressed in other ways in the broader offset package.
3,340 hollow bearing trees	5,855 hollow bearing trees

VERIFICATION OF THE ACTUAL AREA OF NATIVE VEGETATION CLEARING

The actual area of impact of the constructed wind farm and transmission line is required to be verified, prior to finalising the CPVPs. This provides an incentive throughout construction to minimise impacts and thereby reduce the offset requirement for the project. It also verifies that the actual amount and type of clearing undertaken is offset, as required.

A detailed Biodiversity Management Plan would be prepared to guide construction. This would contain updated vegetation mapping specific to the final infrastructure layout (refer to note on micro-siting above). Verification of the actual area of native vegetation clearing can be undertaken as an audit after construction. (Incentives to minimize clearing would be an appropriate stipulation in EPC contracts).

KEY BIODIVERSITY RISKS, OPPORTUNITIES AND RELEVANT LOCAL INITIATIVES

As a background to the development of appropriate management actions for the site, key biodiversity risks, opportunities and relevant local initiatives for each site would be documented. The work undertaken at the site since 2008 will provide key information for this component, as well as liaison with Local Land Service and Council.

SITE SPECIFIC MANAGEMENT ACTIONS

Based on the risks and opportunities of zones within the offset site, management actions and a management plan would be prepared. Offset site management measures are required to be specific to each area in question. These measures aim to result in an improvement in the biodiversity values of the site and are designed to be adaptive (informed by a monitoring regime). These management measures would be incorporated into a detailed management plan for each offset site (one plan per landowner).

Management measures would be developed with reference to the BioBanking Management Plan template and with input from the LLS and OEH. Examples of likely measures are included below.

Table E-6 Example offset site management measures.

Management measure	Objective	Justification	Action	Timing
Exclusion of stock	To prevent overgrazing and encourage regeneration of native vegetation	Grazing would be likely to degrade habitat.	• Install stock proof fencing around the perimeter of the Offset Site.	• At establishment of the Offset Site. • Ongoing repairs as required.
Weed control	To minimise the occurrence of weeds within the Offset Site particularly Weeds of National Significance (WoNS) and listed noxious weeds.	Weeds compete with native species and degrade habitats.	• Survey to identify target locations for weed control. • Weed control using appropriate methodologies considering target species and landscape context.	• At establishment of the Offset Site. • Ongoing as required.
Rabbit control	To minimise the risk of the Offset Site becoming a refuge for rabbits.	Increased rabbit numbers can reduce native regeneration and support higher numbers of pest animals such as cats and foxes.	• Monitor for presence of rabbits. • Conduct baiting or controlled grazing to reduce the ability of the site to act as a refuge to rabbits. • Where possible, coordinate baiting with adjacent landowners to maximise effects	• Consideration given to action on the basis of monitoring results.

OFFSET SITE MONITORING

In order to ensure that biodiversity improvement is occurring within the offset sites (and therefore that a 'maintain or improve outcome' can be met over time), monitoring is required.

Monitoring is recommended to be repeated initially every two years. As a part of monitoring surveys, a report would be prepared to document the success or otherwise of management and adaptations required to obtain better results.

Reporting is proposed every two years to the Department of Planning and Infrastructure, until such time as this is deemed acceptable to cease. The reports would also be submitted to OEH for comment.

A decision to reduce or continue bi-annual reporting may also be made by DPI or OEH following submission of each report. A final report should be prepared prior to decommissioning of the project, to verify that a 'maintain or improve' outcome is being met and that residual management actions can largely coincide with routine agricultural land management.

As part of the development of the Offset Plan, the following information would be documented.

Baseline data

Desktop assessment

Evaluation of potential for threatened species to occur onsite, with reference to prior field work and data base searches, below:

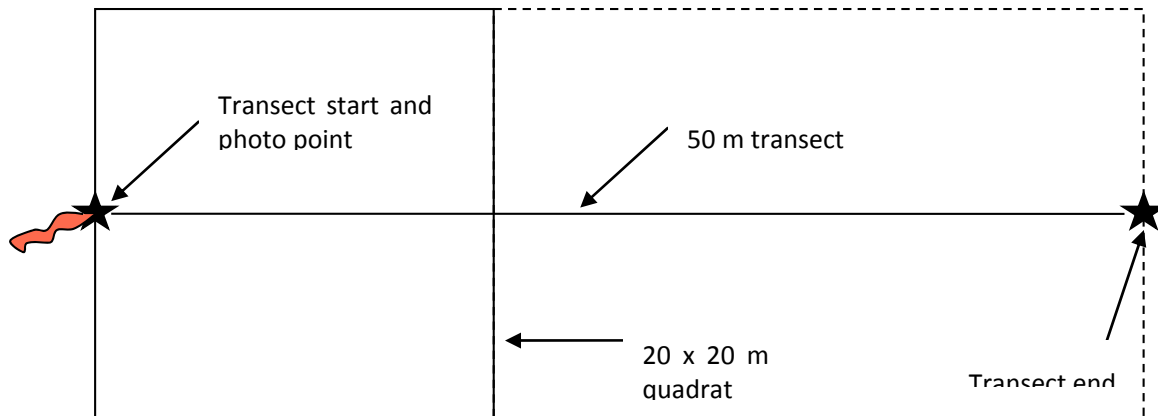
- The OEH threatened species database to identify species listed as threatened under the NSW *Threatened Species Conservation Act 1995* (TSC Act).
- The Commonwealth Department of the Environment protected matters search tool to identify species listed as threatened or migratory under the Commonwealth *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act).

Field survey

A field survey would be undertaken by an ecologist. This would include:

- Mapping of vegetation types and condition
- Establishment of monitoring plots
- On-ground validation / assessment of habitats for threatened species with the potential to occur at the site

BioBanking plots would be established in accordance with the BioBanking Assessment Methodology (BBAM, DECC 2009) to collect baseline data on vegetation structure and quality. The location of the plots would be marked using 1650mm star pickets to facilitate the replication of the plots. The ends of the star pickets would be painted white to enable easy identification in the field. Star pickets would be placed at the start and end of the 50 metre transect required by the BBAM and their co-ordinates recorded. To delineate the start point of transects, orange flagging tape would be tied to the top of the appropriate picket. The 20 x 20 metre quadrat required by the BBAM would be conducted within an area bounded by the first 20 metres of the transect and extending 10 metres either side as shown below. Photo points would be established at each of the start points of the transects, with views along the length of the transect.



Monitoring plot layout

Figure E-1 Plot data collected in transects and quadrats.

Data evaluation

Data recorded from the BioBanking monitoring plots were compared with the benchmark data for the vegetation type as provided in the BioBanking vegetation types benchmark database (DECC 2008). Monitoring plot data would also be entered into the BioBanking Credit Calculator (BBCC) version 2 to obtain a baseline site value score for dominant vegetation formations at each site.

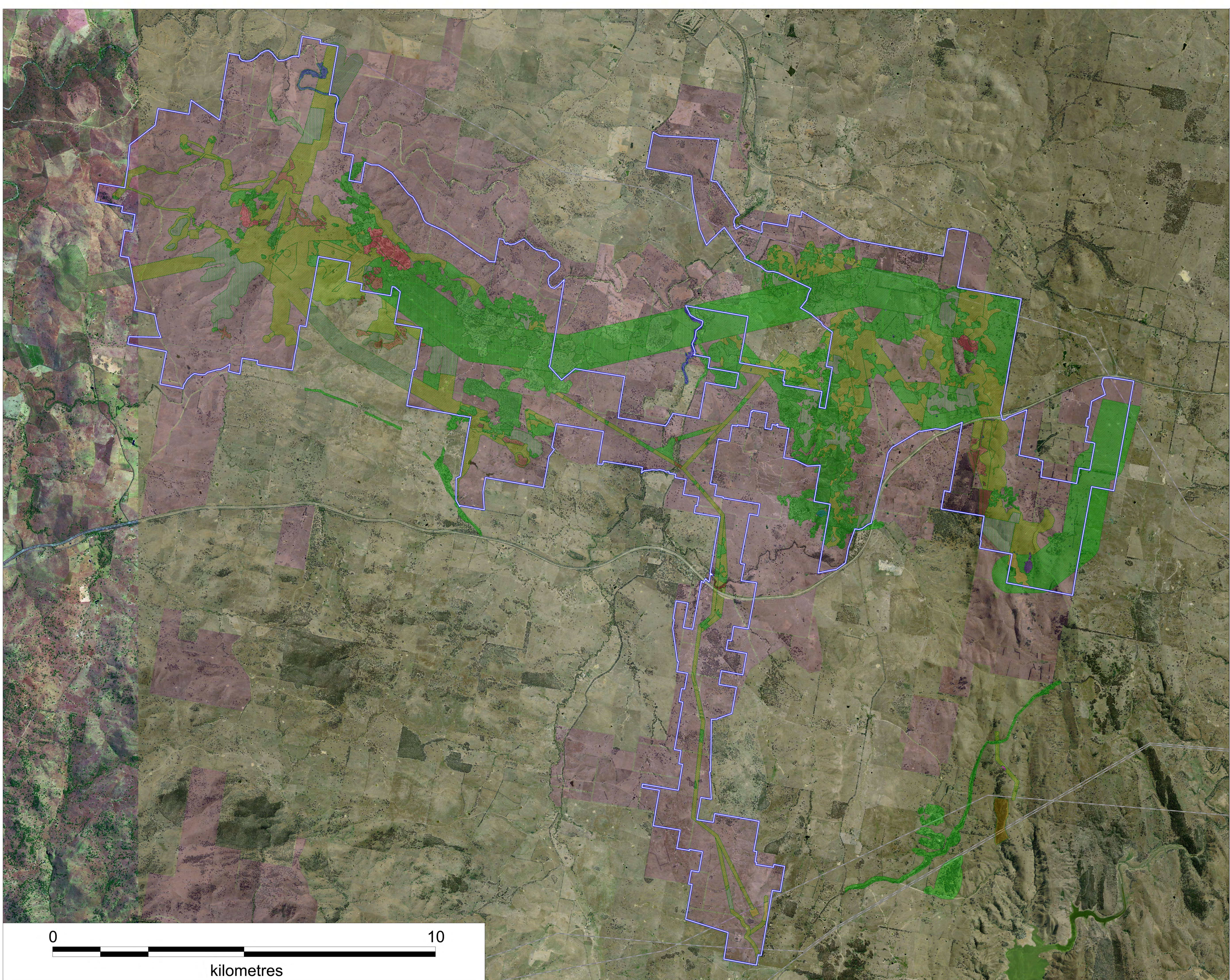
CONCLUSION - MAINTAIN OR IMPROVE

With the effective implementation of the stages outlined above, a 'maintain or improve' outcome would be achieved for the project. By the coordinated selection of offset sites over such a large area, and their management for biodiversity improvement, a regional scale beneficial biodiversity impact is anticipated. Benefits are expected to include:

- Incentive to minimize clearing during the detailed design and construction phases of the wind farm project
- Targeted and coordinated weed and feral animal management, informed by ecologists working with landowners
- Retention of declining habitat resources including hollows, fallen timber and logs, riparian habitats
- Protection of specific habitat linkages and wildlife corridors
- Improved infrastructure to assist management including fencing and access

APPENDIX G MAPS SETS

1. VEGETATION TYPE AND CONDITION ACROSS THE SITE



Map Legend

Site boundary

Involved landowners

Existing Transgrid powerline

Vegetation Condition

Low

Moderate-good (low diversity)

Moderate-good (high diversity)

Vegetation Type

Aquatic

Box Gum Woodland

Box Gum Woodland Derived Grassland

Box Gum Woodland, Kunzea ericoides

Broad Leaved Peppermint Brittle Gum Dry Grass For.

Broad-leaved Peppermint Dry Grass Forest

Dry Shrub/ Tussock Grass Forest

Exotic dominated pasture

Long-leaved Box Dry Grass Forest

Pasture

Riparian

River Red Gum

EPURON

PROJECT

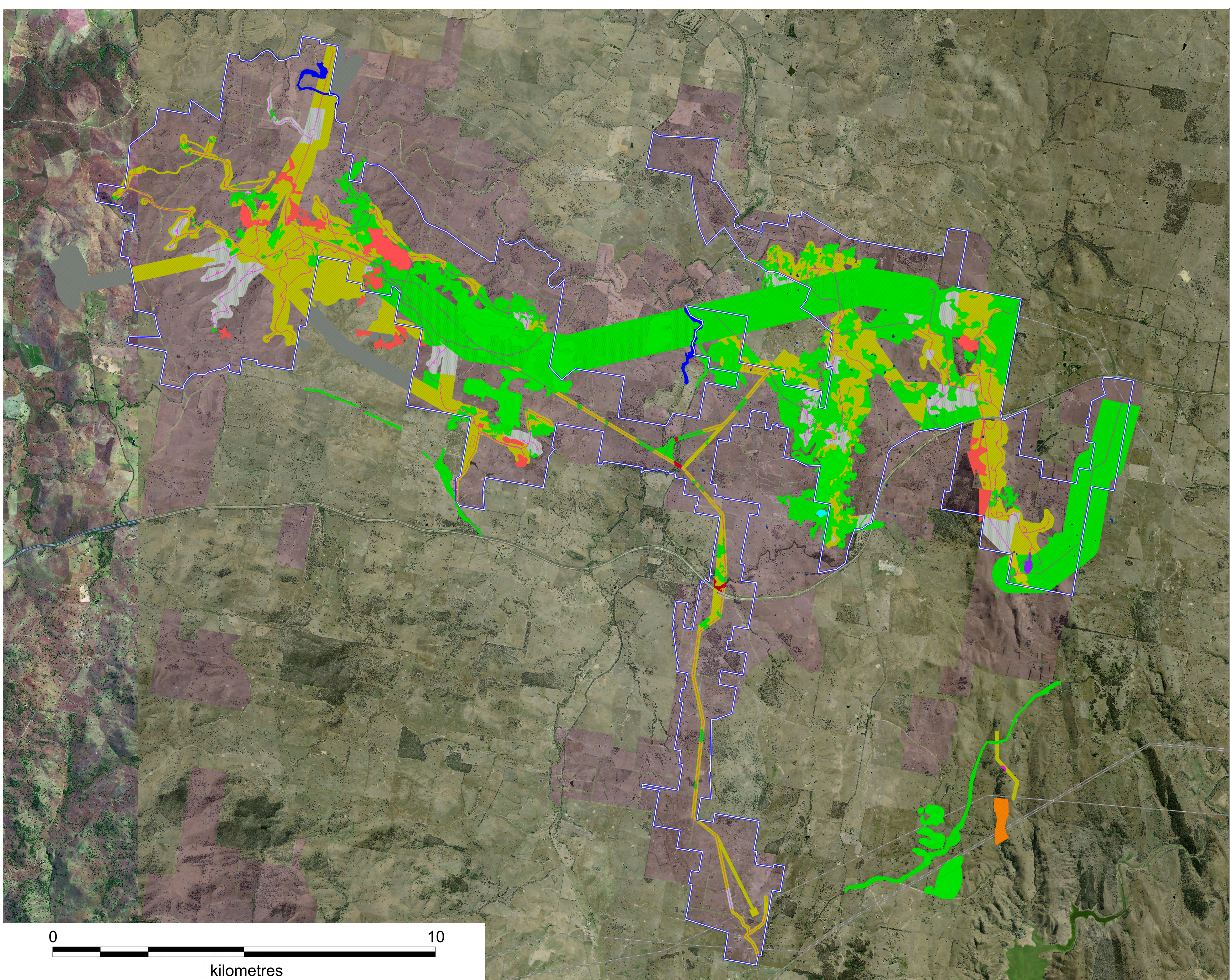
YASS VALLEY WIND FARM

TITLE

Vegetation type and condition

SCALE	DATE	DRAWN
See scalebar	25Mar15	ADD

2. VEGETATION TYPE SHOWING IMPACT AREAS



- Map Legend**
- Site boundary
 - Involved landowners
 - Existing Transgrid powerline
- Vegetation Type**
- Aquatic
 - Box Gum Woodland
 - Box Gum Woodland Derived Grassland
 - Box Gum Woodland, Kunzea ericoides
 - Broad Leaved Peppermint Brittle Gum Dry Grass For.
 - Broad-leaved Peppermint Dry Grass Forest
 - Dry Shrub/ Tussock Grass Forest
 - Exotic dominated pasture
 - Long-leaved Box Dry Grass Forest
 - Pasture
 - Riparian
 - River Red Gum
- Vegetation Condition**
- Low
 - Moderate-good (high diversity)
 - Moderate-good (low diversity)

EPURON

PROJECT

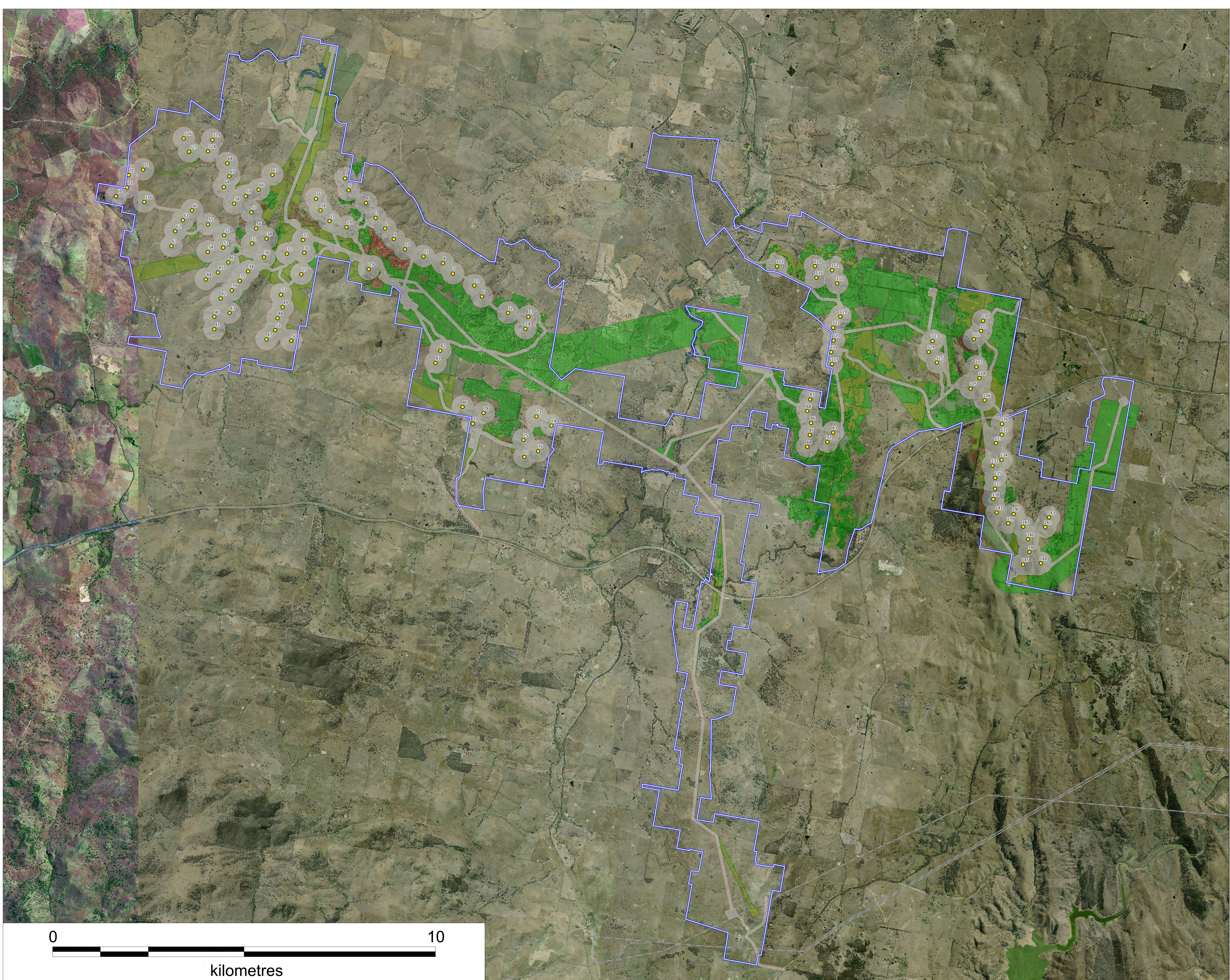
**YASS VALLEY
WIND FARM**

TITLE

Impact Area:
Vegetation type
and condition

SCALE	DATE	DRAWN
See scalebar	25Mar15	ADD

3. AVAILABLE OFFSET AREAS WITH VEGETATION TYPE AND CONDITION



Map Legend

- Site boundary
- Infrastructure buffer to offset areas
- Existing Transgrid powerline
- Proposed wind turbine

Vegetation Condition

- Low
- Moderate-good (low diversity)
- Moderate-good (high diversity)

Vegetation Type

- Aquatic
- Box Gum Woodland
- Box Gum Woodland Derived Grassland
- Box Gum Woodland, Kunzea ericoides
- Broad-leaved Peppermint Brittle Gum Dry Grass For.
- Broad-leaved Peppermint Dry Grass Forest
- Dry Shrub/ Tussock Grass Forest
- Exotic dominated pasture
- Long-leaved Box Dry Grass Forest
- Pasture
- Riparian
- River Red Gum



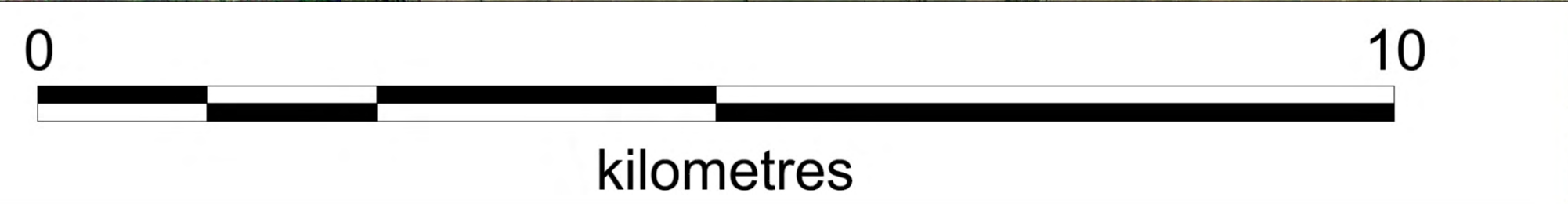
PROJECT

**YASS VALLEY
WIND FARM**

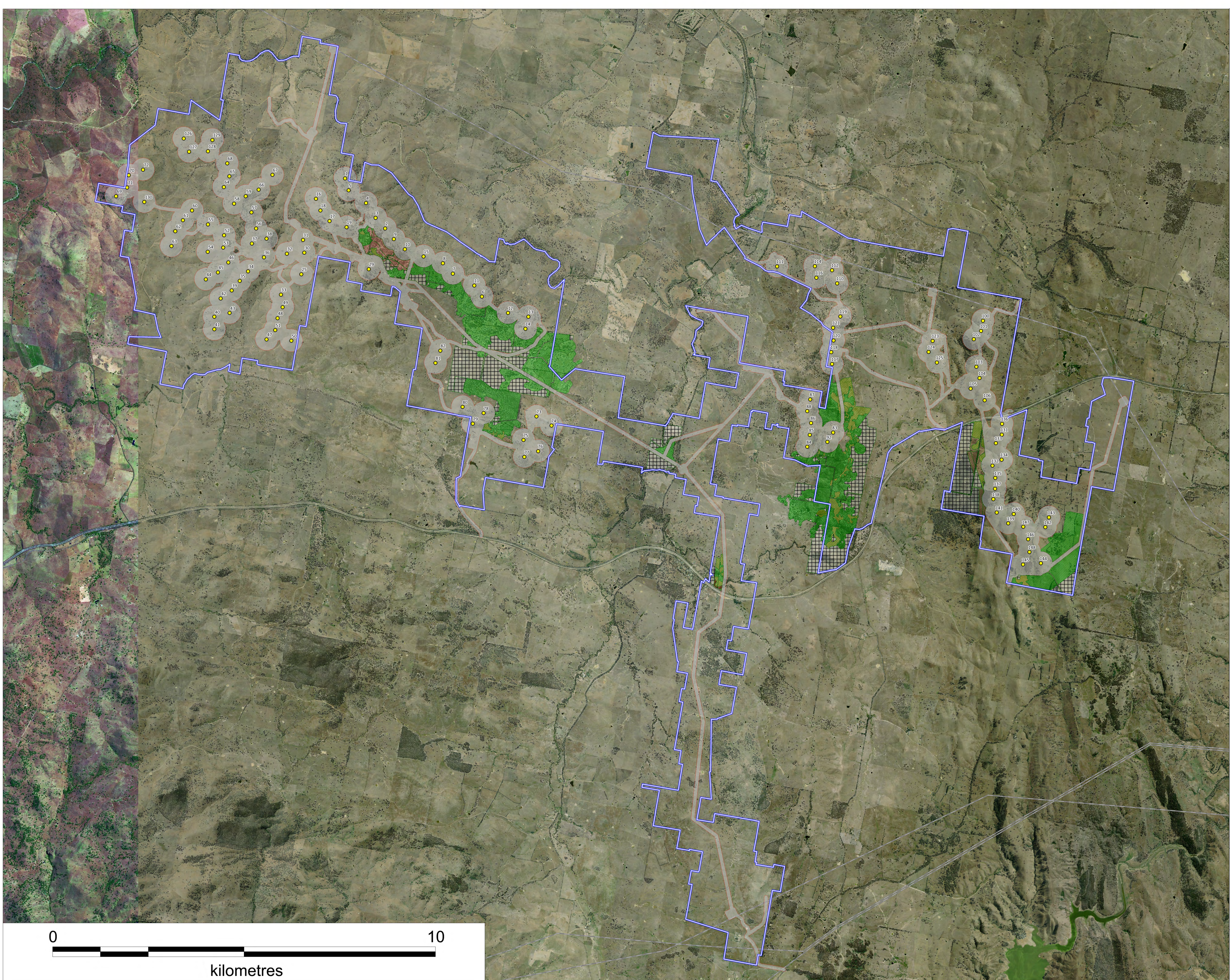
TITLE

Available offset area
with vegetation type
and condition

SCALE	DATE	DRAWN
See scalebar	25Mar15	ADD



4. PREFERRED OFFSET AREAS WITH VEGETATION TYPE AND CONDITION



Map Legend

- Site boundary
- Infrastructure buffer to offset areas
- Existing Transgrid powerline
- Proposed wind turbine

Vegetation condition

- Box Gum Woodland
- Box Gum Woodland Derived Grassland
- Box Gum Woodland, Kunzea ericoides
- Broad Leaved Peppermint Brittle Gum Dry Grass For.
- Broad-leaved Peppermint Dry Grass Forest
- Dry Shrub/ Tussock Grass Forest
- Long-leaved Box Dry Grass Forest
- Riparian
- River Red Gum
- No survey data

Vegetation Type

- Moderate-good (low diversity)
- Moderate-good (high diversity)
- No survey data



PROJECT

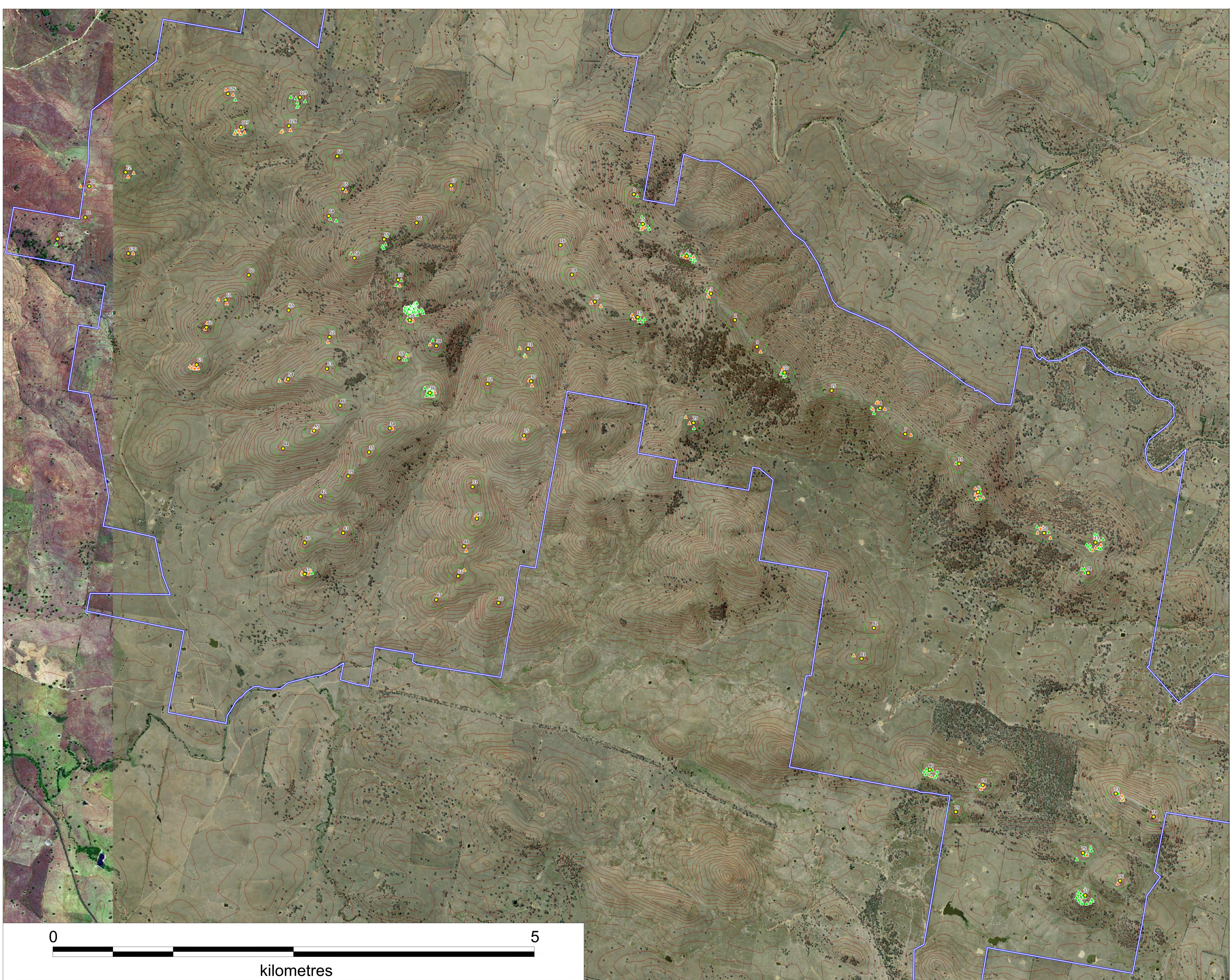
YASS VALLEY WIND FARM

TITLE

Preferred offset area with vegetation type and condition

SCALE	DATE	DRAWN
See scalebar	25Mar15	ADD

5. HOLLOW BEARING TREES BY PRECINCT



Map Legend

- Site boundary
- Existing Transgrid powerline
- Proposed wind turbine
(red buffer = 50m; Green buffer =100m)
- Hollow Bearing Trees
 - Alive
 - Dead Stags

EPURON

PROJECT

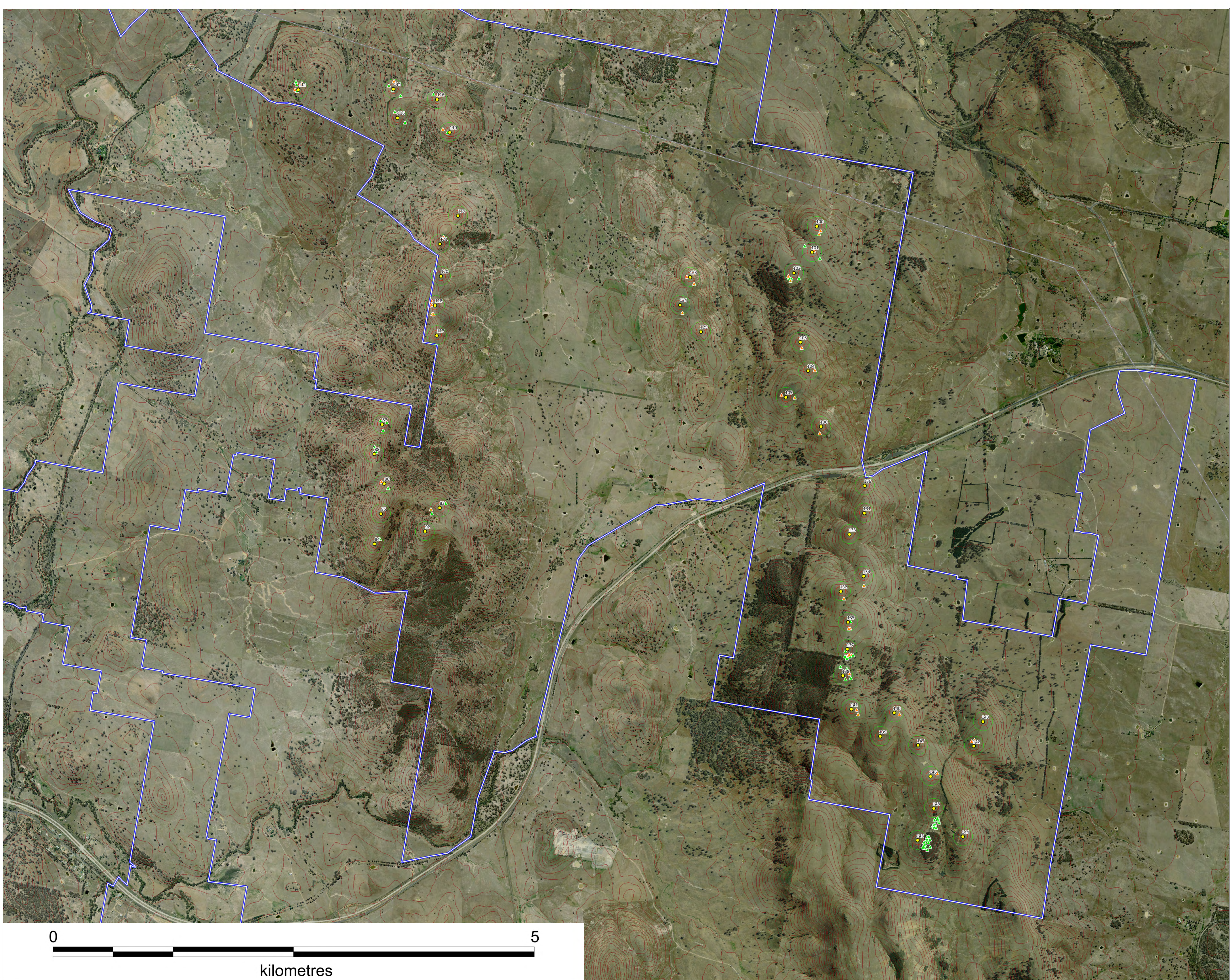
YASS VALLEY WIND FARM

TITLE

Hollow Bearing Trees
(Coppabella)

SCALE	DATE	DRAWN
See scalebar	25Mar15	ADD





Map Legend

- Site boundary
- Existing Transgrid powerline
- Proposed wind turbine
(red buffer = 50m; Green buffer =100m)
- Hollow Bearing Trees
 - Alive
 - Dead Stags

PROJECT

YASS VALLEY WIND FARM

TITLE

Hollow Bearing Trees
(Conroys Gap Extension & Marilba Precincts)

SCALE	DATE	DRAWN
See scalebar	25Mar15	ADD

6. GOLDEN SUN MOTH SURVEY RESULTS 2013-14 (TWO SEASONS)

The map includes the results of the first Golden Sun Moth surveys undertaken in December 2013 for Coppabella and Marilba and Conroys Extension:

These surveys identified Golden Sun Moth to occur broadly across the Marilba precinct, east and west, with a small number of sitings at the Conroys Gap Extension precinct. No Golden Sun Moth were identified at the Coppabella precinct.

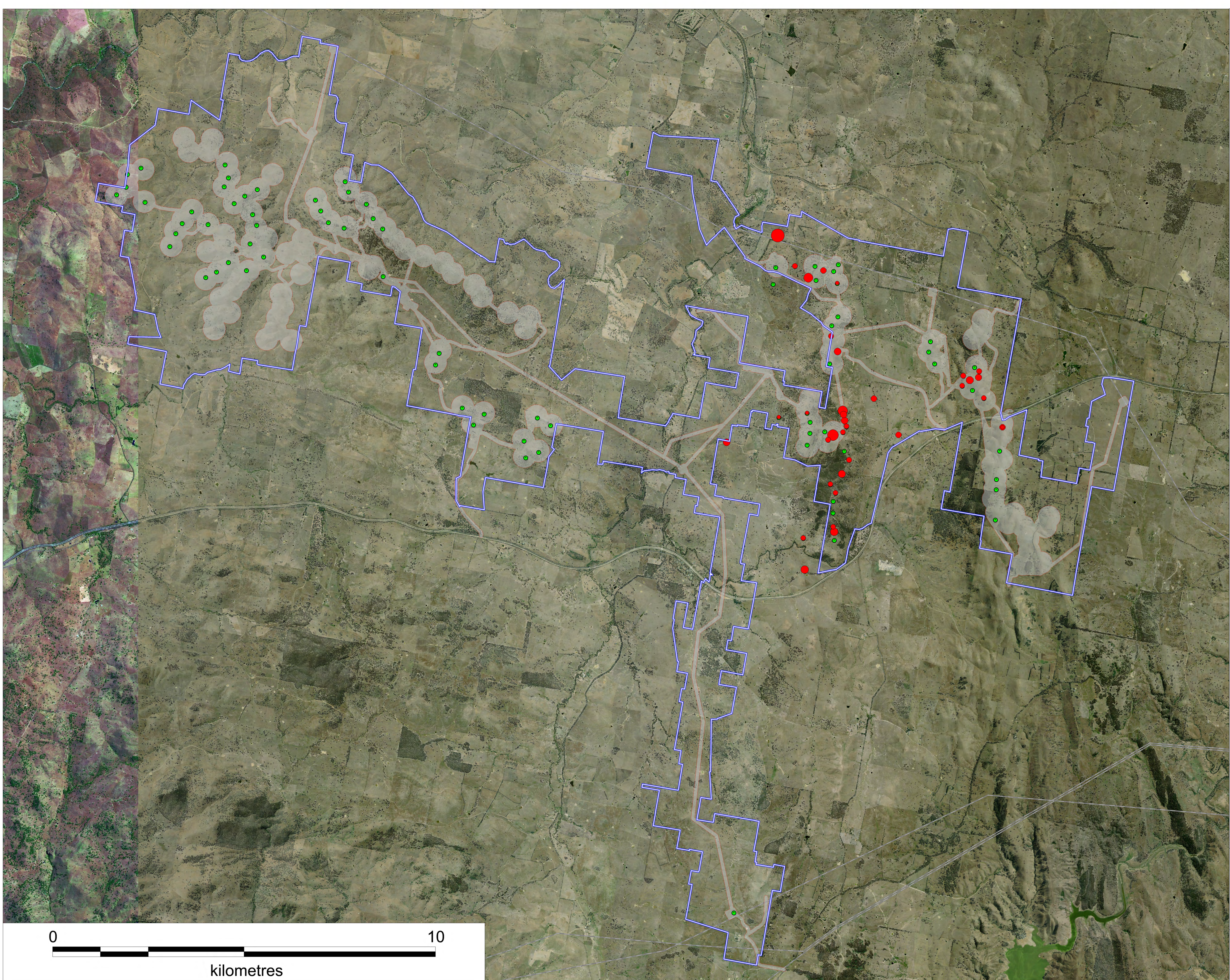
As well as the results of follow up surveys in December 2014 and January 2015 at Coppabella precinct only:

No Golden Sun Moth were identified at the Coppabella precinct, confirming very low likelihood of this species to occur at this precinct.

Each symbol represents a survey point. Colour and size indicate if and how many Golden Sun Moths were recorded in each location.

The species is generally known from grassland/woodland mosaics. As understorey varies and intergrades between exotic-dominated and native-dominated species composition, mapping potential habitat with accuracy is very difficult. It can be seen on the map provided that the species occurs within and outside of the impact zones at Marilba and Conroys Extension. This species has also been identified from surrounding areas around Yass, Rye Park, Rugby and Bango.

Offsetting for this species will be required. Draft offset calculations using the OEH BioBanking Assessment Methodology account for this species and offset mapping confirms that the project has a high level of confidence that it can provide offsets for this species, based on its occurrence in areas outside the impact area and the prevalence of its habitat type (better quality Box Gum Woodland) within the preferred offset sites. With further micro-siting as a commitment of the project and further surveys planned as part of the construction management, it is likely that impacts (and thereby offset requirements) can be further reduced.



Map Legend

- Site boundary
- Infrastructure buffer to offsets
- Existing Transgrid powerline

Golden Sun Moth Survey Locations

- Survey point - no GSM observed
- Survey point - 50 GSM observed
- Survey point - 25 GSM observed
- Survey point - 5 GSM observed



PROJECT

**YASS VALLEY
WIND FARM**

TITLE

Golden Sun Moth
Survey Results

SCALE	DATE	DRAWN
See scalebar	25Mar15	ADD