lightsource bp

19 March 2020

NSW Department of Planning, Industry and Environment
Attn: Mr. Javier Canon
4 Parramatta Square, 12 Darcy Street
Parramatta NSW 2150

Dear Mr. Canon,

Wellington Solar Farm Modification 2 (SSD 8573 Mod 2)
Response to Request for Information

In response to the Department of Planning, Industry and Environment's requests for additional information in relation to the Wellington Solar Farm Modification 2 (SSD 8573 Mod 2) dated the 6th and 13th of March 2020, please find below responses to the clarifications requested, as well as attached:

- a revised Biodiversity Assessment Report (BDAR), dated March 2020; and
- the proposed project layout.

Aboriginal Cultural Heritage

In response to the comment raised by BCD in its correspondence dated 25 February 2020 regarding Wellington Solar Isolated Find 1 (IF 1), it is confirmed IF1 would be avoided, demarcated and a 5 m buffer maintained around the site to ensure no inadvertent impacts occur in accordance with the Project's Cultural Heritage Management Plan.

Transport

While an additional 60,714 PV panels would be transported to site with the proposed modified project layout, the original traffic estimates were conservative and adequately account for the transport of this additional infrastructure to site, particularly as the number of inverters to be transported to site has decreased. The estimated traffic movements will not increase from that originally proposed.

Biodiversity

A new revision of the BDAR has been issued in response to the three BDAR specific comments raised by BCD in its correspondence dated 25 February 2020. Refer to the attached revised BDAR and the below summary of how each of their comments has been specifically addressed.

1.1 Further consideration be given to excluding the gang-gang cockatoo and superb parrot as species credit species in accordance with section 6.4.1.3 of the Biodiversity Assessment Method (BAM).

The gang-gang cockatoo and superb parrot have now been excluded as species credit species in accordance with section 6.4.1.3 of the Biodiversity Assessment Method (BAM). The net credit requirement is summarised in Table 1.

Table 1: Net Biodiversity Credit Requirement

Plant Community Type (PCT) and Structure	**Condition**	**Credits**
PCT 266 Planted Woodland	Moderate to good condition	1
PCT 266 Woodland	Moderate to good condition (hollow bearing trees present)	2
Species Credit Species		**Credits**
Pink-tailed Legless Lizard (*Apraisia parapulchella*)		2

1.2 An additional SAII assessment for White Box – Yellow Box – Blakely's Red Gum EEC should be conducted in accordance with section 10.2.2 of the BAM.

An additional SAII assessment for White Box – Yellow Box – Blakely's Red Gum EEC has been undertaken in accordance with section 10.2.2 of the BAM. Refer to below as outlined in Section 9 of the revised BDAR.

'The principles used to determine if a development will have serious and irreversible impacts, include impacts that:

1. Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline, or
2. Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size, or
3. Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution, or
4. Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

The following relevant TEC has SAII potential:

- White Box Yellow Box Blakely's Red Gum Woodland.

Areas that comprise White Box Yellow Box Blakely's Red Gum Woodland EEC, have been excluded from the development footprint as much as possible. Specifically, all White Box Yellow Box Blakely's Red Gum Woodland listed as Critically Endangered Ecological Community (CEEC) under the EPBC Act, has been excluded from the development footprint. However, there is a small area of White Box Yellow Box Blakely's Red Gum Woodland EEC listed under the BC Act present within the benching and cabling for the substation. See Figure 3-3 of the revised BDAR.

The impacted area around the substation comprises:

- 0.39 ha of BC Act listed EEC that was assessed under the SSD/MOD 1 approvals and is considered an impact consistent with the existing approval.
- 0.03 ha of BC Act listed EEC that is additional to that assessed under the SSD/MOD 1 approvals.
- 0.29 ha of BC Act listed EEC that is to be excised from that assessed under SSD/MOD 1 approvals and will no longer be impacted.

In summary the impacts to EEC of the proposed development (MOD 2) are less than that originally approved under SSD/MOD1 approvals as a larger area would be excised than would be added in this MOD 2 layout.

Principle 1 (above) is the reason that White Box Yellow Box Blakely's Red Gum Woodland has been listed as Endangered under NSW BC Act and as a SAII. It has had a drastic reduction in area across its range and therefore has become highly fragmented. It is estimated that less than 4% is remaining in the NSW South Western Slopes and Southern Tablelands (OEH 2011). The following addresses that required under the BAM section 10.2.3 for impacts to an SAII entity:

a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII

Management actions have been put in place to avoid and minimise impacts to White Box Yellow Box Blakely's Red Gum Woodland. These include:

- Clearing protocols, which involve clear marking of impact areas to avoid unintended impacts White Box Yellow Box Blakely's Red Gum Woodland.
- Temporary fencing to prevent impacts to riparian zones.
- Staged clearing to minimise impacts to EEC to be retained.
- Hygiene protocols to avoid introduction or spread of weeds within EEC/CEEC to be retained.

b) the area (ha) and condition of the TEC to be impacted directly and indirectly impacted by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone.

A total of 0.42 ha of White Box Yellow Box Blakely's Red Gum Woodland is to be impacted on the site (this includes 0.03 ha of additional impact, from MOD 1 and 0.39 ha of consistent impact already approved SSD/MOD1). The 0.42 ha of White Box Yellow Box Blakely's Red Gum Woodland is composed of:

- 0.4 ha of Zone 5 PCT 266 Box Gum Woodland derived grassland (moderate to good) with a current vegetation integrity score of 30.
- 0.02 ha of Zone 2 PCT 266 Box Gum Woodland planted (moderate to good) with a current vegetation integrity score of 12.3.

This 0.42 ha area of impact is less than what was approved under SSD/MOD1 approval.

c) the extent to which the impact exceeds any threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact.

No thresholds are currently specified for this EEC.

d) The extent and overall condition of the TEC within an area of 1000 ha, and then 10,000 ha, surrounding the development footprint.

Within a 1,000 ha area of the site and surrounds there are two PCTs present that are associated with Box Gum Woodland:

- White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion PCT 266
- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 277

A total of 219 ha of Box Gum Woodland exists within 1,000 ha radius from the centre of the site. This equates to 22% of the 1000 ha area, of this 0.42 ha will be removed which is 0.19%.

Within a 10,000 ha area of the site and surrounds there are six PCTs present that are associated with Box Gum Woodland:

- Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion PCT 74
- White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion PCT 266
- White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion PCT 267
- White Box – Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion PCT 268
- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 277

- Derived grassland of the NSW South Western Slopes PCT 796

A total of 1,393 ha of Box Gum Woodland exists within 10,000 ha radius from the centre of the site (refer Footnote 1 in the revised BDAR). This equates to 14% of the total area, of this 0.42 ha will be removed which is 0.03%.

e) An estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration.

As the reduction in Box Gum Woodland is 0.42 ha which is 0.19% loss over 1000 ha it is unlikely to be a significant impact over the IBRA sub region which is 4.6 million hectares and is likely to be a smaller area of Box Gum Woodland than what was identified within 1000 or 10000 ha.

f) An estimate of the area of the candidate TEC that is in the reserve system within the IBRA region and IBRA subregion.

It is unclear how much Box Gum Woodland is preserved in the reserve system, it is considered that is poorly preserved. However, this project will fund or create preservation of Box Gum Woodland following approval and retirement of PCT 266 credits.

g) The development's proposed impacts on:

i. Abiotic factors critical to the long-term survival of the potential TEC

The development is considered to have negligible impacts on abiotic factors. The Solar Farm has minimal soil disturbance and low levels of indirect impacts on soil, air and water. In addition, the proposed development is not going to impact upon abiotic processes outside of the development that could impact upon existing Box Gum Woodland either nearby or downstream or in groundwater connected areas.

ii. Characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants

This is not applicable. All potential impacts have been considered through the SSD approval process.

iii. The quality and integrity of an occurrence of the potential TEC through threats and indirect impacts

The Box Gum Woodland that remains onsite will be mostly undisturbed through direct impacts. Measures will be undertaken to ensure indirect impacts are minimised. These include weed management, vegetation clearance protocols, avoidance of fertiliser and herbicide drift. The Biodiversity Management Plan, Vegetation Management Plan will ensure management and monitoring of the existing Box Gum Woodland to ensure it is protected and improved.

h) Direct or indirect fragmentation and isolation of an important area of the potential TEC.

The area is already highly fragmented, the development is not causing further fragmentation that will significantly impact upon the Box Gum Woodland.

i) The measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.

A Vegetation Management Plan has been developed to direct and support replanting of Box Gum Woodland species and manage existing Box Gum Woodland within the development site. The affect of

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MOD 2 is to reduce the amount of clearing of this TEC. As such, following the above asessment against SAII criteria, it is believed that the Wellington Solar Farm development, will not have a risk of Serious and Irreversible Impact for White Box Yellow Box Blakely's Red Gum Woodland.

No species established as having potential habitat onsite or likely to be impacted by the proposed development has SAII potential.'

1.3 The BDAR should be certified, and the credit calculations in the BAM calculator should be finalised.

The BDAR has been certified (refer to the 'Document Verification' page located after the cover page of the revised BDAR). The credit calculations in the BAM calculator have been finalised, as per Table 1 above. Refer to Appendix C of the revised BDAR.

Thank you and feel free to contact me on 0409 691 473 if you have any questions.

Kind regards,

Diana Mitchell
Principal Environmental Planner

ENCL:

- Wellington SF_Mod 2_Revised BDAR
- Wellington SF_Mod 2_Project Layout

BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Wellington Solar Farm BDAR: Revised Project Layout

March 2020

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DOCUMENT VERIFICATION

Project Title:	Wellington Solar Farm BDAR: Revised Project Layout
Project Number:	19-134
Project File Name:	Wellington Solar Farm BDAR

Revision	Date	Prepared by	Reviewed by	Approved by
Final v1	2/12/2019	Taylor Hume, Beth Noel	Brooke Marshall	Brooke Marshall
Final v2.1	17/01/2020	Taylor Hume, Beth Noel	Brooke Marshall	Brooke Marshall
Final V2.2	07/02/2020	Beth Noel	Brooke Marshall	Brooke Marshall
Final V2.3	13/03/2020	Beth Noel (BAAS 19015)	Brooke Marshall	Brooke Marshall

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I Beth Noel (BAAS 19015) certify that this report has been prepared on the basis of the requirements of (and information provided under) the Biodiversity Assessment Method as at 13th March 2019

Signed:.

W. www.nghconsulting.com.au
E. ngh@nghconsulting.com.au

BEGA - ACT & SOUTH EAST NSW
Suite 11, 89-91 Auckland Street (PO Box 470) Bega NSW 2550 **T.** (02) 6492 8333

NEWCASTLE - HUNTER & NORTH COAST
Unit 2, 54 Hudson Street
Hamilton NSW 2303 **T.** (02) 4929 2301

BRISBANE
Suite 4, Level 5, 87 Wickham Terrace
Spring Hill QLD 4000 **T.** (07) 3129 7633

SYDNEY REGION
Unit 18, Level 3, 21 Mary Street
Surry Hills NSW 2010 **T.** (02) 8202 8333

CANBERRA - NSW SE & ACT
8/27 Yallourn Street (PO Box 62)
Fyshwick ACT 2609 **T.** (02) 6280 5053

WAGGA WAGGA - RIVERINA & WESTERN NSW
Suite 1, 39 Fitzmaurice Street (PO Box 5464)
Wagga Wagga NSW 2650 **T.** (02) 6971 9696

GOLD COAST
PO Box 466
Tugun QLD 4224 **T.** (07) 3129 7633

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ACRONYMS AND ABBREVIATIONS

BAM	Biodiversity Assessment Methodology
BC Act	*Biodiversity Conservation Act 2016(NSW)*
BCD	Biodiversity and Conservation Division of DPIE
BDAR	Biodiversity Development Assessment Report
BGW	Box Gum Woodland
BOM	Australian Bureau of Meteorology
CEEC	Critically Endangered Ecological Community (CW listing)
Cwth	Commonwealth
DBH	Diameter at Breast Height
DNG	Derived Native Grassland
DPIE	(NSW) Department of Planning Infrastructure and Environment
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
ha	hectares
Heritage Act	*Heritage Act 1977* (NSW)
HBT	Hollow-bearing Tree
ISEPP	*State Environmental Planning Policy (Infrastructure) 2007* (NSW)
KFH	Key Fish Habitat
km	kilometres
m	Metres
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage, now BCD
PV	Photovoltaic
SSD	State Significant Development
sp/spp	Species/multiple species
TEC	Threatened Ecological Community – as defined under relevant law applying to the proposal

EXECUTIVE SUMMARY

Overview

This Biodiversity Assessment Report (BDAR) has been prepared by NGH on behalf of the proponent, Lightsource BP, who has proposed changes to Wellington Solar Farm, originally approved in May 2018 (SSD 8573). The first Modification Application for the substation extension – MOD 1 Substation Extension (NGH 2019) was approved by the Department of Planning Industry and Environment (DPIE) in December 2019. The approved SSD project has a credit requirement calculated under the 'Framework for Biodiversity Assessment' and subsequently converted using an application for reasonable equivalence to credits under the *Biodiversity Conservation Act* (BC Act). It also has a supplementary credit requirement calculated under the BC Act for an expansion to the existing Wellington substation under MOD 1.

A second Modification Application (MOD 2), this report, has been lodged to alter the indicative solar panel layout presented in the EIS. However, the entire project has *not* been reassessed under the BC Act, as this would have led to unnecessary duplication of assessment for areas that remain impacted in the new layout. These areas are already included in the reasonable equivalence credit profile. To account for new areas to be impacted and areas where impacts would now be avoided, the Biodiversity Assessment Method (BAM), pursuant to the BC Act, was applied to these 'additional' and 'excised' areas only. The *net* impact therefore becomes the updated project credit requirement.

Specifically, pursuant to the BC Act, the aim of this BDAR is to:

- identify, assess and derive the credit number for the additional areas now being impacted by the solar farm footprint, that were not impacted by the approved footprint.
- identify, assess and derive the credit number for the areas that will now be removed from the approved solar farm footprint (areas that *were* impacted but are now excised from the approved footprint).
- Reconcile the credit requirement of the original SSD approvals, MOD 1 and this proposed MOD 2 to give one updated credit requirement for the Wellington Solar Farm project.

This BDAR has been prepared to support the MOD 2 submission to Department of Planning Infrastructure and Environment.

Key results

Ecosystem credits

In terms of the impacts on vegetation and the generation of ecosystem credits, the changes proposed in MOD 2 compared with the approved footprint are summarised as follows:

- An overall additional impact of 0.02 ha of PCT 277 White Box Yellow Box Blakely's Red Gum woodland. Zone 1, this generates no credits;
- An overall reduced impact of 6.90 ha of PCT 266 – White Box grassy woodland in the upper slopes sub-region of NSW South Western Slopes. Zones 2 and 4, together now generate 3 credits for the project. For Zones 3, 5 and 6, the net effect is zero credits;
- An overall additional impact of 15.43 ha of exotic vegetation. This generates no credits.

The changes to the development footprint have resulted in an overall reduction in native vegetation being impacted and therefore a reduced credit requirement. Even though there is an overall increase in clearing, the impacts to exotic/planted areas did not generate credits. This has resulted in the footprint increasing in size but the biodiversity impacts and offset requirement being reduced.

The following details the ecosystem credits generated for the additional and excised areas for each vegetation zone for MOD 2. The net credit requirement that now applies to the project is summarised in the righthand column. Note: as the areas that are now being excised in Zones 3, 5 and 6 represent more credits than the areas now being added, the net result is that there will be no ecosystem credits required to be retired in these zones.

Zone	PCT and structure	Condition	Approved Credit Requirements		Credits Requirements Mod 2 (this report)		Updated credit requirement
			Original Approval SSD8573 (converted via reasonable equivalence)	Mod 1	Additional area credits	Excised area credits	(Net)
PCT 277							
Zone 1	PCT 277 woodland	low condition	0	0	0	0	0
PCT 266							
Zone 2	PCT 266 planted woodland	moderate to good condition	0	1	0	0	1
Zone 3	PCT 266 woodland	low condition	1	0	+1	-2	0
Zone 4	PCT 266 woodland	moderate to good condition (hollow bearing trees present)	1	0	+1	0	2
Zone 5	PCT 266 derived grassland	moderate to good condition	0	0	+1	-5	0 (-4)
Zone 6	PCT 266 derived grassland	low condition	0	0	+64	-129	0 (-65)

Species credits

In completing the site assessment for MOD 2, only the additional and excised areas were assessed on site. Targeted surveys were undertaken for candidate flora species where habitat elements were known to exist onsite. Of the flora species surveyed, none were found during targeted surveys. The majority of fauna candidate species identified in the BAM calculator were excluded from further assessment due to a lack of suitable habitat available onsite. For the remainder, due to time constraints, fauna surveys were not conducted for species that had not been previously assessed such as the Bush Stone-curlew, White-bellied Sea-eagle, Square-tailed Kite and Little Eagle. These were all assumed to be present and appropriate credits generated. Other fauna surveyed in 2016 and 2017 had sufficient data to exclude them.

In regard to Species Credit Species for MOD 2, there are no additional credits required Note: as the areas that are now being excised represent more species credits than the areas now being added for the White-bellied Sea-Eagle, Square-tailed Kite and Little Eagle, the net result is that there will be no credits required to be retired for these species.

The following details the updated (and net) species credit species generated for the project:

Species	Approved Credit Requirements		Change in credits Mod 2 (this report)		
	Original Approval	Mod 1	Additional areas	Excised areas	Updated project requirement (net)
White-bellied Sea-Eagle	0	0	+1	-2	0 (-1)
Square-tailed Kite	0	0	0	-2	0 (-2)
Little Eagle	0	0	0	-2	0 (-2)
Pink-tailed Legless Lizard	0	2	0	0	2

The net credit requirement for the Wellington Solar Farm is:

- 1 ecosystem credit for PCT 266 planted woodland
- 2 ecosystem credits for PCT 266 woodland moderate to good (with hollow bearing trees)
- 2 species credit for Pink-tailed Legless Lizard

Mitigation and management measures are proposed to adequately address impacts associated with the proposal, both directly and indirectly. The retirement of the updated credit requirement is proposed to be carried out in accordance with the NSW Biodiversity Offsets Scheme and will be achieved by either:

a) Retiring credits under the Biodiversity Offsets Scheme, or

b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or

c) Funding a biodiversity action that benefits the threatened entity impacted by the development.

1 INTRODUCTION

1.1 THE APPROVED PROJECT – WELLINGTON SOLAR FARM

Wellington Solar Farm is located 2 km north-east of Wellington in the Dubbo Regional Local Government Area (LGA). Development Consent was approved by the Executive Director Department of Planning and Environment (DPE) on May 25, 2018 (Application Number: SSD 8573) under Section 4.38 of the *Planning and Environment Act. 1979*. The development application is approved under Schedule 1, subject to the conditions in Schedules 2-4.

The conditions are required to:

- Prevent and/or minimise any adverse environmental impacts of the development
- Set standards and performance measures for acceptable environmental performance
- Provide for the ongoing environmental management of the development.

The existing consent permits the construction, operation and decommissioning of a 174 Megawatt (MW AC) photovoltaic (PV) solar farm and associated infrastructure including:

- Solar array modules.
- Substation and transformers.
- Underground transmission cable
- Battery storage facility.
- Access tracks.

The first Modification Application for the substation extension – MOD 1 Substation Extension (NGH 2019) was approved by the Department of Planning Industry and Environment (DPIE) in December 2019.

1.2 MODIFICATION APPLICATION

The proposed changes to the development are a result of the detailed design phase impacting on the arrangement of solar panel modules assumed by the previous assessment. The design aims to optimise the yield of the solar farm while minimising environmental impacts as much as possible. As these changes impact on the biodiversity credit requirement for the project, an updated credit assessment is required using the BC Act BAM calculator. This BDAR will support the second Modification Application (MOD 2) for this project.

1.3 PROPOSAL FOR THE REVISED PROJECT LAYOUT

The second Modification Application – MOD 2 Revised Project Layout (NGH 2019) was submitted to DPIE in December 2019, for changes to the Wellington Solar Farm (SF) infrastructure layout. The proposed changes to the development are a result of the detailed design phase impacting on the arrangement of solar panel modules assumed by the previous assessment. The design aims to optimise the yield of the solar farm while minimising environmental impacts as much as possible. Refer to Figure 1-1 showing the proposed development layout, Figure 1-2 showing the impact areas to be added and excised from the development footprint and Figure 1-3 shows the proposed development footprint in comparison with the approved development footprint.

Panels would be placed in additional areas within the proposal area, avoiding all exclusion zones stipulated in the modified Development Consent. The total developed area under the indicative layout presented in the EIS was 282 ha. The changes proposed:

- add approximately 30 ha to the development footprint;
- remove approximately 22 ha from the development footprint; and
- maintain a consistent impact development footprint of 258 ha.

The development footprint would now total 288 ha under the modified layout (a 6 ha or 2% increase in total development footprint). The following Table 1-1 shows a comparison of infrastructure changes from MOD 1 to MOD 2 and their impact upon the footprint (decrease vs increase).

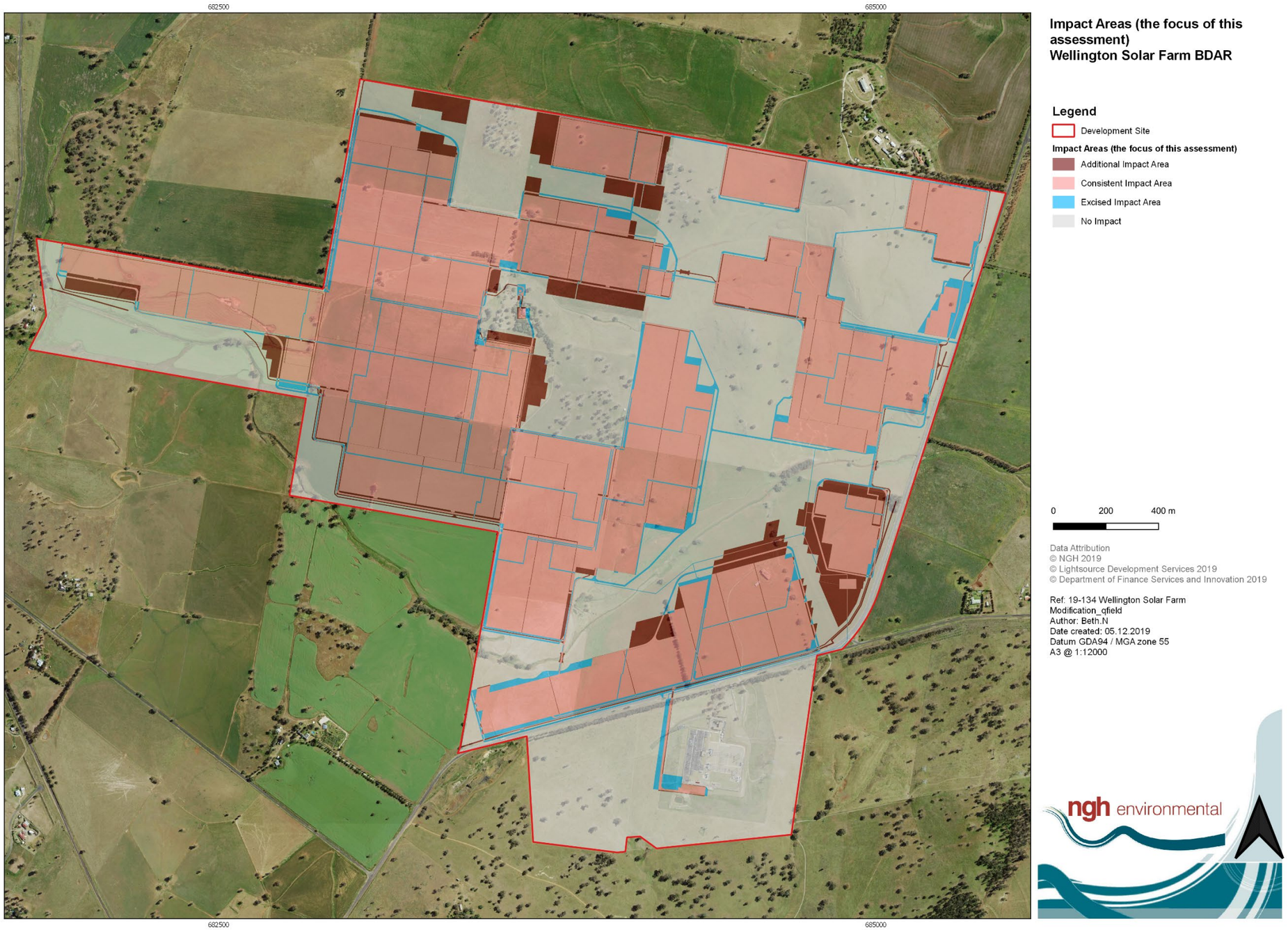
Table 1-1 Comparison of changes to infrastructure MOD 1 to MOD 2

Parameter	Approved project (MOD 1)	Modification Application (MOD 2)	Extent of change for MOD 2
Panel layout	440,000 Approximately 262* ha	500,714 280 ha	Increased by 18 ha or 7%
Battery storage facility	0.25 ha	1.46 ha	Increased by 1.21 ha or 484%
O&M facility	0.14 ha	0.02 ha	Decreased by 0.12 ha or 86%
Shed	0	0.01 ha	Increased by 0.01 ha or 100%
Homestead	0.17	0.14 ha	Decreased by 0.03 ha or 18%
Temporary construction compound	7.7 ha	1.1 ha	Decreased by 6.6 ha or 86%
Electricity and connection routes	100 m overhead transmission line	No overhead transmission line Underground cables: 15.72 km	Decreased by 100% due to incorporation of all underground cabling into existing development footprint (i.e. roads etc)

Parameter	Approved project (MOD 1)	Modification Application (MOD 2)	Extent of change for MOD 2
	Underground cables ** (length unspecified in EIS).		
Total development footprint	282 ha	288 ha	Increased by 6 ha or 2%

This is an estimate based on mapping as this value was not require for the SSD approval. This cannot be reliably calculated due to mapping limitations.*

Figure 1-1 Final project development footprint



Impact Areas (the focus of this assessment)
Wellington Solar Farm BDAR

Legend

- Development Site

Impact Areas (the focus of this assessment)

- Additional Impact Area
- Consistent Impact Area
- Excised Impact Area
- No Impact

0 200 400 m

Ref: 19-134 Wellington Solar Farm Modification_qfield
Author: Beth.N
Date created: 05.12.2019
Datum GDA94 / MGA zone 55
A3 @ 1:12000

ngh environmental

Figure 1-2 Final project development footprint, showing areas added and excised (the focus of this assessment for MOD 2)

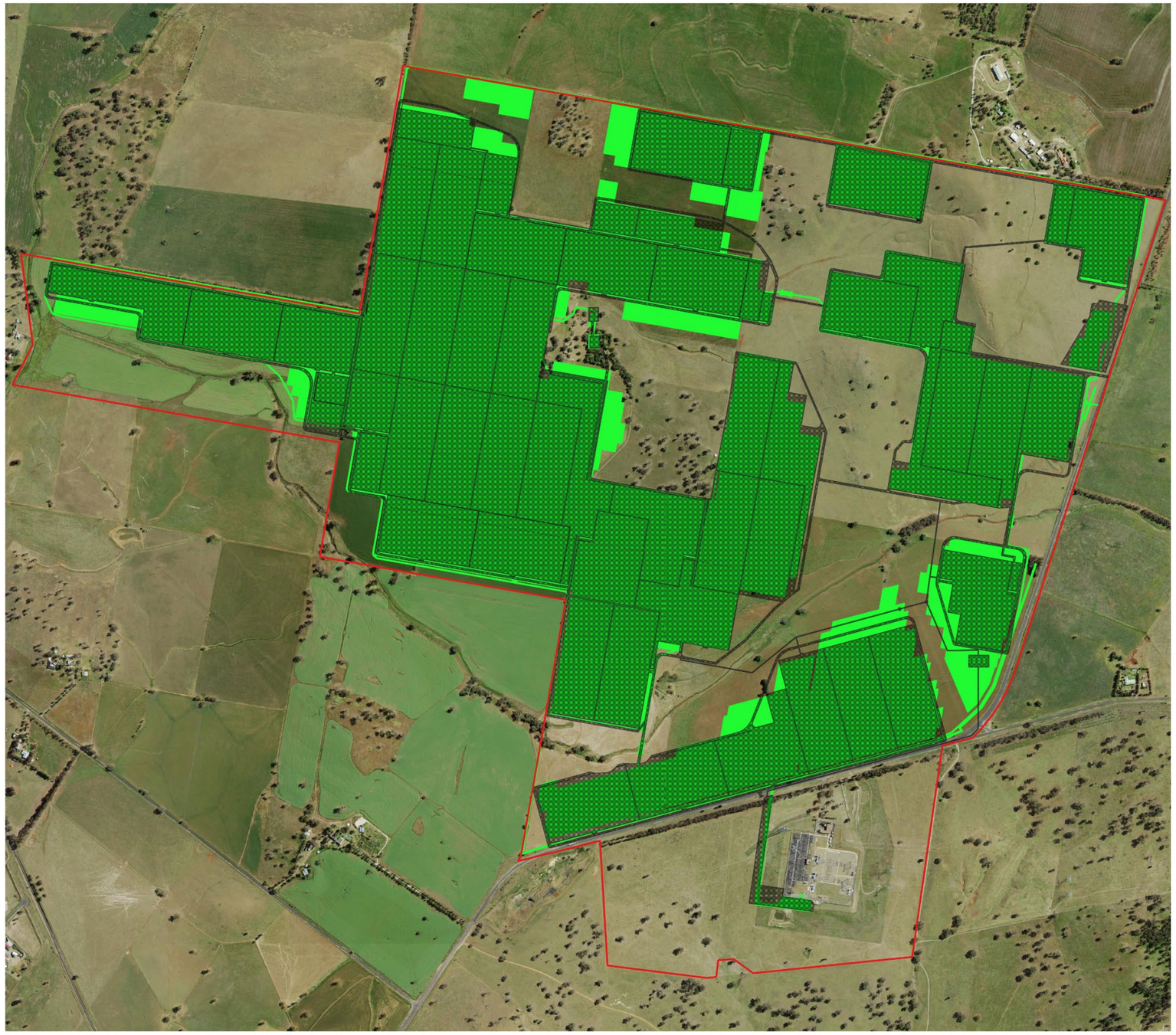


Figure 1-3 Comparison of approved development footprint impact area with proposed development footprint impact area

1.4 THE DEVELOPMENT SITE

1.4.1 Site location

The Wellington SF proposal site is located approximately 2km north east of Wellington, in western central NSW, within the Dubbo Regional Local Government Area (LGA), north and south of Goolma Rd Wellington. The Wellington SF is located to the north and south of Goolma Rd Wellington, the majority of the Wellington SF is north of Goolma Rd. The development footprint is located within the following Lots and DPs:

- Lots 89, 90, 91, 92, 99, 102, 103 and 104 of DP2987
- Lot 1 of DP34690
- Lot 1 of DP520396
- Lot 2 of DP807187
- The portion of the Crown Road Reserve between Lot 2 of DP807187 and Lot 91 of DP2987 subject to Road Closure: Public Road Closure Application [W58925; Ref 17/09541]
- Lot 1 of DP1226751, existing TransGrid Substation

The location of the proposal site is illustrated in Figure 1-3.

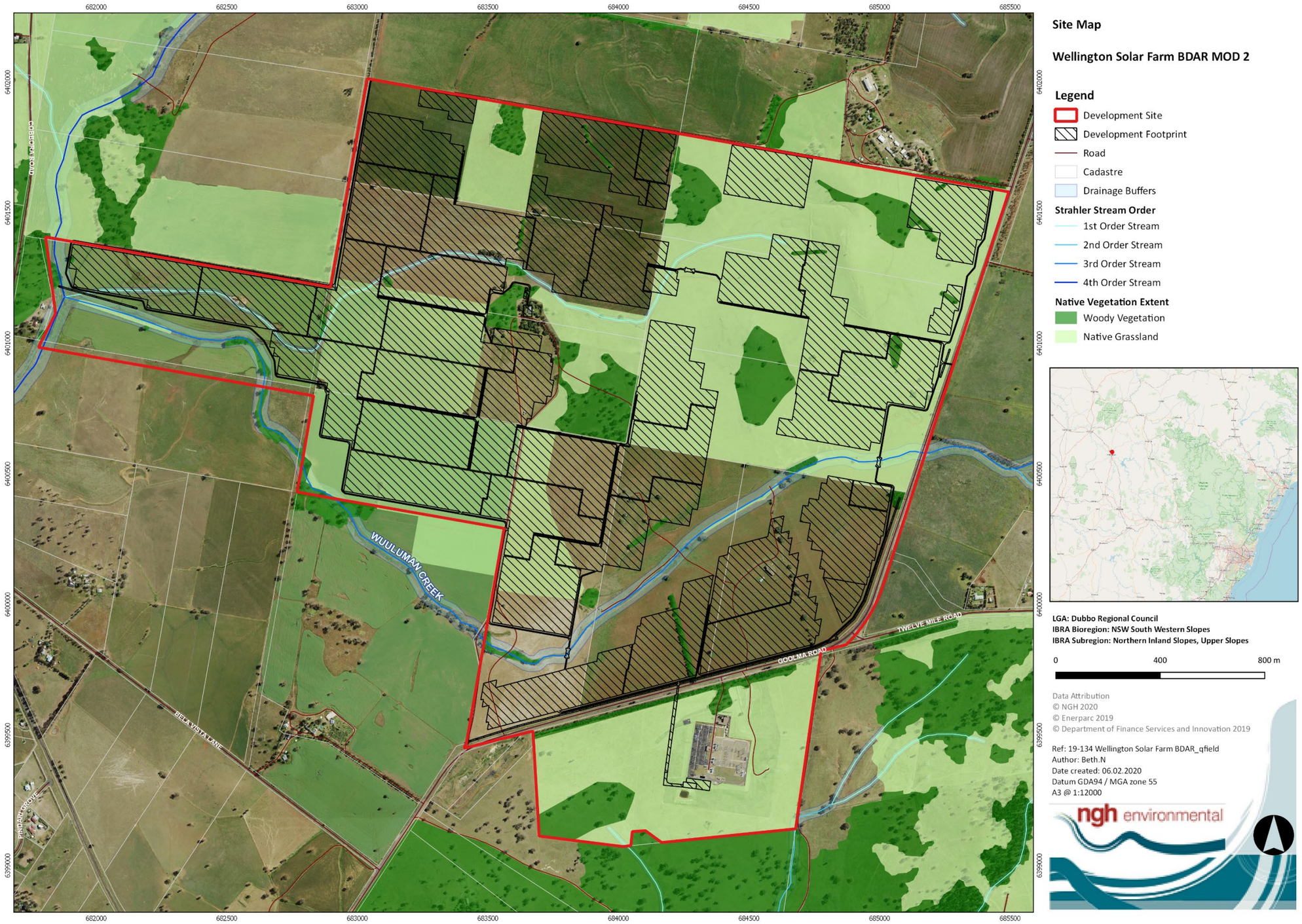
1.4.2 Site description

The proposal area is consistent with the approved Wellington Solar Farm which consists of partially native vegetation composed of PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland, PCT 266 White Box grassy woodland and Planted & Exotic vegetation. Each PCT is divided into zones depending on condition (low, moderate to good, planted) and different structural characteristics (either woodland or derived grassland).

Access to the proposal site would be from Goolma Road, on the eastern boundary of the site. The Mitchell Highway, which intersects with Goolma Road approximately 4.6 km south of the proposed site entrance, would be the major transport route for haulage and site vehicles during construction and operation of the proposal. The Mitchell Highway and Goolma Road are Oversized Over mass Load Carrying Approved Roads.

1.4.3 Construction and infrastructure requirements

Changes to the infrastructure requirements are detailed in Table 1-1 above. The total development footprint has increased as per *Figure 1-3*.



Site Map

Wellington Solar Farm BDAR MOD 2

Legend

- Development Site
- Development Footprint
- Road
- Cadastre
- Drainage Buffers

Strahler Stream Order

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream

Native Vegetation Extent

- Woody Vegetation
- Native Grassland

LGA: Dubbo Regional Council
IBRA Bioregion: NSW South Western Slopes
IBRA Subregion: Northern Inland Slopes, Upper Slopes

0 400 800 m

Ref: 19-134 Wellington Solar Farm BDAR_qfield
Author: Beth.N
Date created: 06.02.2020
Datum GDA94 / MGA zone 55
A3 @ 1:12000

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Figure 1-4 Site map

1.5 STUDY AIMS

This BDAR has been prepared by NGH on behalf of Lightsource BP. This BDAR has been prepared to support the second Modification Application to Department of Planning Infrastructure and Environment.

Two separate calculations were run in the BAM calculator to represent areas now added and excised from the solar farm development footprint. The net credit requirement will be used to update the credit requirement for the project.

This BDAR includes an assessment of impacts to protected matters listed under the federal *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). This assessment includes use of the Protected Matters Search Tool to determine potential species and communities occurring within the locality, and targeted surveys across the site to detect the presence of these entities or their habitats. Entities known or considered likely to occur have been included in the impact assessment, and Assessments of Significance have been prepared to determine the significance of impacts to these entities.

1.6 SOURCE OF INFORMATION USED IN THE ASSESSMENT

- Aerial Maps and Proposal layers provided by Lightsource BP.
- Commonwealth Department of Environment and Energy (DoEE) Species Profiles and Threats database (SPRAT) http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 2.
- NSW OEH's BioNet threatened biodiversity database
  Accessed online via login at http://www.bionet.nsw.gov.au/.
- OEH Threatened Biodiversity Profiles
  http://www.environment.nsw.gov.au/threatenedSpeciesApp/.
- Office of Environment and Heritage (OEH) (2007). Mitchell Landscapes with per cent cleared estimates.
- OEH BioNet Vegetation Classification Database (OEH 2017)
  Accessed online via login at http://www.environment.nsw.gov.au/research/Visclassification.htm.
- NSW OEH's Threatened Species Profiles
  http://www.environment.nsw.gov.au/threatenedspeciesapp/
- DPI profiles of threatened species, population, and ecological communities
- Commonwealth Department of Environment and Energy Protected Matters Search Tool
  Accessed online at http://environment.gov.au/epbc/protected-matters-search-tool
- Clean Energy Council of Australia website accessed online at
  https://www.cleanenergycouncil.org.au/technologies/geothermal.html
- Windpower Engineering and Development website accessed online at
  https://www.windpowerengineering.com/projects/guidelines-selecting-sites/
- Australia's IBRA Bioregions and sub-bioregions. Accessed
  http://environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 2.
- Lumsden L.F & Micaela J.L (2015). National Recover Plan for Southern Bent-wing Bat. Dept of Land, Water and Planning, Melbourne.

- NSW Government SEED Mapping
- Office of Environment and Heritage (OEH) (2017). Biodiversity Assessment Method.
- NSW OEH's Biodiversity Assessment Method (BAM) calculator (http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx).
- NSW Biodiversity Values Map https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap
- NSW OEH's BioNet threatened biodiversity database Accessed online via login at http://www.bionet.nsw.gov.au/.
- NSW OEH Threatened Species Profiles http://www.environment.nsw.gov.au/threatenedSpeciesApp/ and www.environment.nsw.gov.au/AtlasApp/UI_Modules/
- OEH BioNet Vegetation Classification Database (OEH 2017) Accessed online via login at http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx
- OEH VIS Mapping
- Mitchell, P. 2002 Descriptions for NSW Mitchell Landscapes version 2, NSW National Parks and Wildlife Service, Hurstville.
- NSW Planning portal online https://www.planningportal.nsw.gov.au/find-a-property

2 LANDSCAPE FEATURES

2.1 IBRA BIOREGIONS AND SUBREGIONS

The proposal is located within NSW South Western Slopes Bioregion and the Inland Slopes Subregion (IBRA v.7 2012). The geology of the region is Ordovician to Early Carboniferous, with typical landforms a mixture of Mountain Ranges, dissected plateaus, hills and ridges and plains. The dominant pre-European vegetation type is Eucalypt Dry Grassy woodland dominated by Yellow Box (*Eucalyptus melliodora*) and White Box (*Eucalyptus albens*) (ASRIS accessed 15/05/17).

The dominant IBRA subregion affected by the proposal is the Inland Slopes Subregion. This was entered in the BAM Calculator for the proposal.

2.2 NSW LANDSCAPE REGIONS AND AREA

Two Mitchell Landscapes occur within the proposal site; Mullion Slopes and Macquarie Alluvial Plains. The dominant Mitchell Landscape affected by the proposal is Mullion Slopes. This is described as (DECC 2002):

> Steep hills and strike ridges on tightly folded Ordovician andesite, conglomerate and tuff, Silurian rhyolite and shale, Devonian quartz sandstones, slate and minor limestone, general elevation 500 to 830m, local relief 200m. Stony uniform sand and loam in extensive rock outcrop along crests, stony red and brown texture-contrast soil on slopes, yellow harsh texture-contrast soil in valleys with some evidence of salinity. Gravel and sand in streambeds. Open forest to woodland of; White Gum (*Eucalyptus rossii*), Brittle Gum (*Eucalyptus mannifera*), Broad-leaved Peppermint (*Eucalyptus dives*), Red Box (*Eucalyptus polyanthemos*), Mountain Grey Gum (*Eucalyptus cypellocarpa*), White Box (*Eucalyptus albens*) with Yellow Box (*Eucalyptus melliodora*) on lower slopes and River Oak (*Casuarina cunninghamiana*) along the streams.

Macquarie Alluvial Plains is described as:

> Holocene fluvial sediments of backplain facies of the Marra Creek Formation associated with the Macquarie River main alluvial fan and distributary stream system, relief 1 to 3m. Dark yellow-brown silty clay with patches of sand and carbonate nodules deposited from suspended sediments in floodwater, often with Gilgai. Slightly elevated areas with red-brown texture-contrast soils. Open grasslands with scattered Coolibah (*Eucalyptus microtheca*), Black Box (*Eucalyptus largiflorens*), River Cooba (*Acacia stenophylla*), Bimble Box (*Eucalyptus populnea*), Belah (*Casuarina cristata*), Lignum (*Muehlenbeckia cunninghamii*) and Myall *(Acacia pendula*).

The vegetation observed on the site indicates that Mullion Slopes is the dominant landscape present onsite.

2.3 NATIVE VEGETATION

Native vegetation extent within 1500 m of the subject land was mapped using aerial imagery (Figure 2-1). The pre-European assessment of the native vegetation occurring on the subject site was woodland. Native vegetation mapping used over-storey as a surrogate for native vegetation cover and is considered conservative as this would include non-native vegetation that may still provide some habitat value. The local area's native vegetation is derived from woodland and as such, no natural grasslands are relevant to the study area. The majority of the proposal area is composed of White-box Grassy woodland and derived grasslands with the predominant remnant overstorey species consisting of White Box.

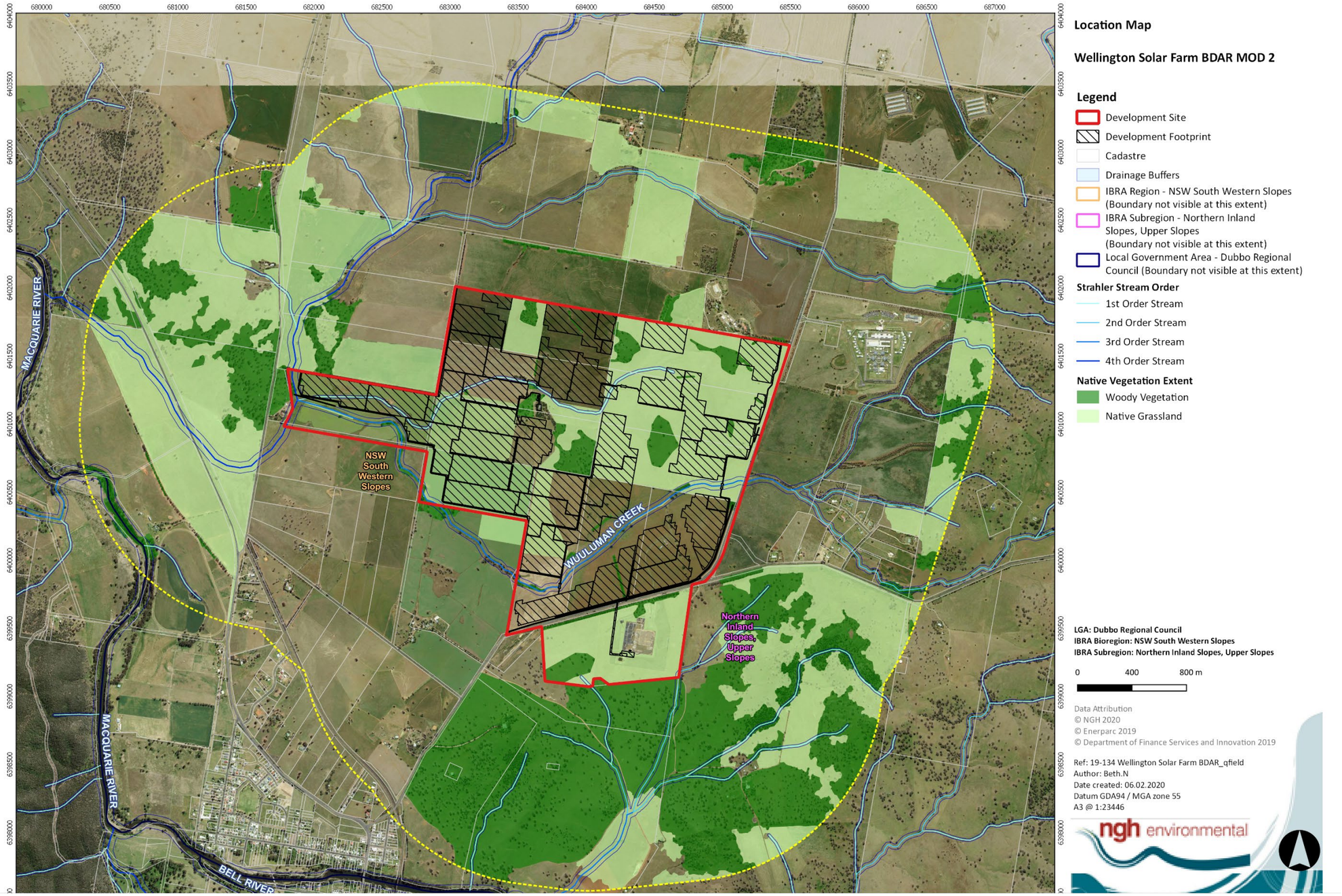

Figure 2-1 Location map

2.4 CLEARED AREAS

Cleared areas in the local area are primarily used for cropping and grazing and provide very little in terms of native fauna habitat. These areas provide suitable foraging habitat for raptors, parrots, cockatoos and macropods, and introduced species such as cats, foxes and rabbits. Approximately 1550.3 ha (53%) within the 1500 m buffer area is cleared land.

In relation to the development footprint, 'non-native vegetation' was treated as a vegetation zone for the purposes of assessment for candidate species.

2.5 RIVERS AND STREAMS

An un-named 1st order watercourse runs from the northern part of the development proposal through to the western boundary of the proposal area where it joins the Macquarie River. A 3rd order watercourse named Wuuluman Creek runs from the eastern boundary through the middle of the development proposal area to the western boundary of the site where it joins the Macquarie River a 9th order watercourse approximately 2.5 km downstream, see Figure 2-1.

2.6 WETLANDS

No wetlands occur within or adjacent to the development site. The closest Nationally Important Wetland downstream from the proposal area is the Macquarie Marshes located approximately 150 km downstream.

2.7 CONNECTIVITY FEATURES

To date, no biodiversity corridor plans have been approved by the Chief Executive of the Environment, Energy and Science Division of DPIE.

2.8 AREAS OF GEOLOGICAL SIGNIFICANCE

The nearest site of geological significance are the Wellington Caves and phosphate mine, approximately 10 km south of the subject land.

2.9 AREAS OF OUTSTANDING BIODIVERSITY VALUE

The area occupied by Wuuluman Creek and associated riparian zone is shown on the Biodiversity Values map (OEH 2018) as being within the proposal area see Figure 2-2.

2.10 SITE CONTEXT COMPONENTS

The proposal conforms to the definition of a *site-based development* under the Biodiversity Assessment Methodology. The site-based development assessment methodology has been used in this BAM assessment.

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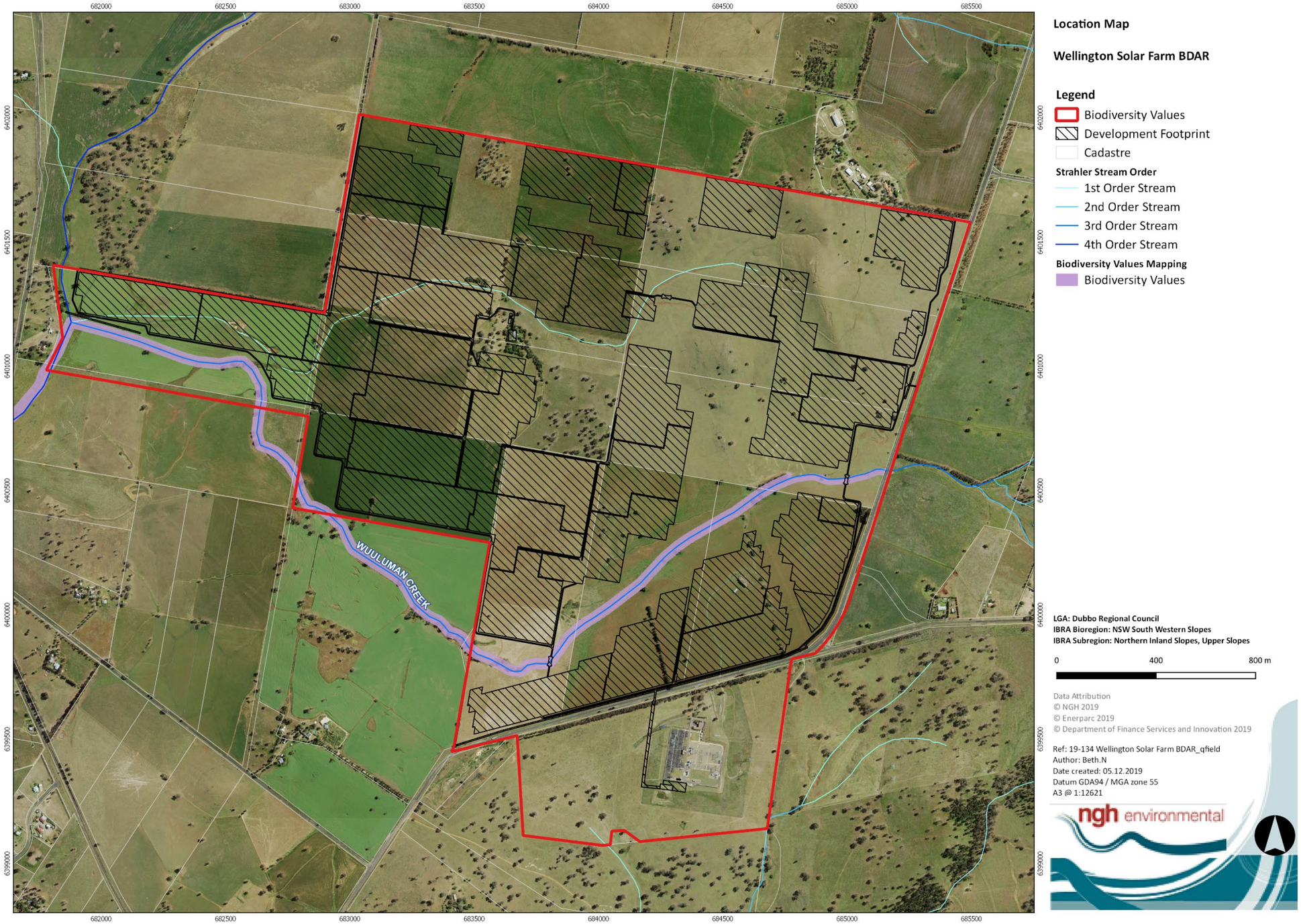


Figure 2-2 Biodiversity Values Mapping in relation to the development site

3 NATIVE VEGETATION

3.1 NATIVE VEGETATION EXTENT

Percent Native Vegetation was calculated by estimating the presence of any native vegetation based on aerial imagery within the 1500m buffer. Unless verified by visual inspection, areas containing grasslands inside the 1500 m buffer were assumed to be non-native grasslands because of existing farming operations in the surrounding landscape and because it could not be verified by site survey. The landscape surrounding the Wellington Solar Farm property contained similar land management practices and it was therefore assumed that groundcover was primarily dominated by native species.

The total area within the 1500 m buffer from the subject site is 2949 ha. The native vegetation woody cover within the 1500 m buffer area surrounding the development proposal is 539 ha or 18%. The non-woody vegetation is 860 ha, or 29% cover based on the vegetation survey in 2017 (NGH 2017). These results were entered into the BAM calculator. The remaining vegetation cover is assumed to be exotic cropping or introduced pastures and covers 1550.3 ha.

The native vegetation mapped with woody and non-woody vegetation covering approximately 1399 ha or 47% of the buffer area, refer to Figure 3-1 for the mapped vegetation within the development extent.

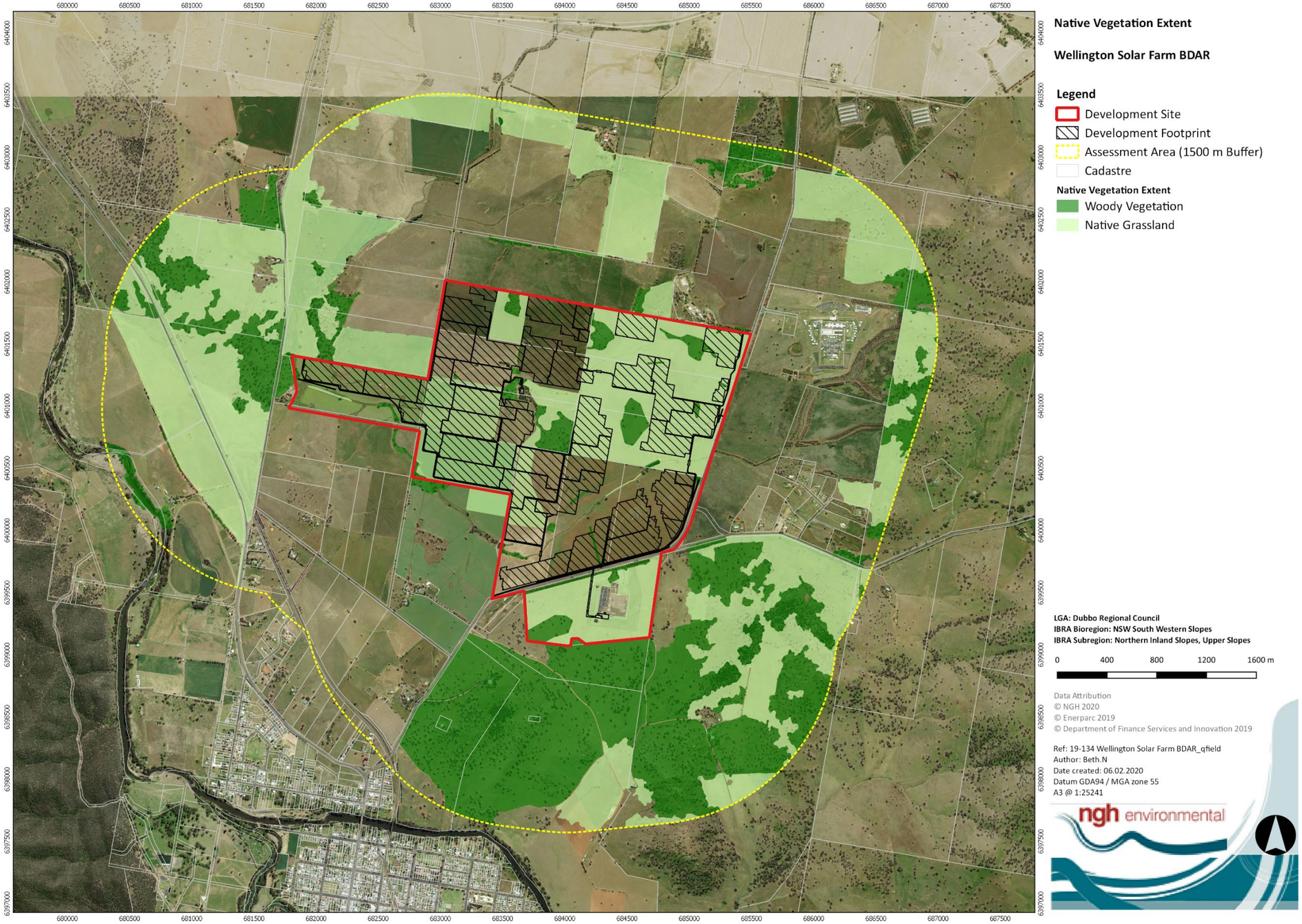


Figure 3-1 Native vegetation extent within the assessment area

3.2 PLANT COMMUNITY TYPES (PCTS)

3.2.1 Methods to assess PCTs

The PCTs within the proposal area are White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes (PCT 266) and Blakely's Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes (PCT 277).

Areas that would now be impacted and areas that would now be excised from the approved layout are shown below with the plot number collected to represent them.

Table 3-1 PCT Zones additional and excised impacts - White Box Grassy Woodland

Zone	Plant Community Type and Condition - Zones	Additional Impact (ha)	Excised impact (ha)	Plots
1	PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland – low condition	0.03	0.01	1
2	PCT 266 White Box grassy woodland – planted, moderate to good condition	0	0.03	1
4	PCT 266 White Box grassy woodland – moderate to good condition	0.01	0	1
3	PCT 266 White Box grassy woodland – low condition	0.06	0.22	1
5	PCT 266 White Box grassy woodland derived grassland – moderate to good condition	0.05	0.34	1
6	PCT 266 White Box grassy woodland derived grassland – low condition	4.12	10.39	3
	TOTAL	**4.24**	**11.14**	**8**

These zones and plot locations are shown on Figure 3-2.

FLORISTIC SURVEYS

3.2.2 PCTs identified on the development site

The PCTs were determined during the survey based on plot data collected during the solar farm assessment (NGH 2017) within the development envelope and on surveys conducted in adjacent less disturbed vegetation. Within the woodland vegetation (PCT 266), the overstorey is characteristically dominated by White Box (*Eucalyptus albens*) with occasional Kurrajong (*Brachychiton populneus*). Understory vegetation is comprised of native grasses and forbs such as Cotton Panic Grass (*Digitaria brownii*), Red Grass (*Bothriochloa macra*), Windmill Grass (*Chloris truncata*), Twining Glycine (*Glycine clandestina*) and Oxalis (*Oxalis perennans*). Exotics detected in 2019 plots in PCT 266 included Barley Grass (*Hordeum leporinum),*

Spear Thistle (*Cirsium vulgare),* Burr Medic (*Medicago ploymorpha)* and Flaxleaf Fleabane (*Conyza bonariensis).*

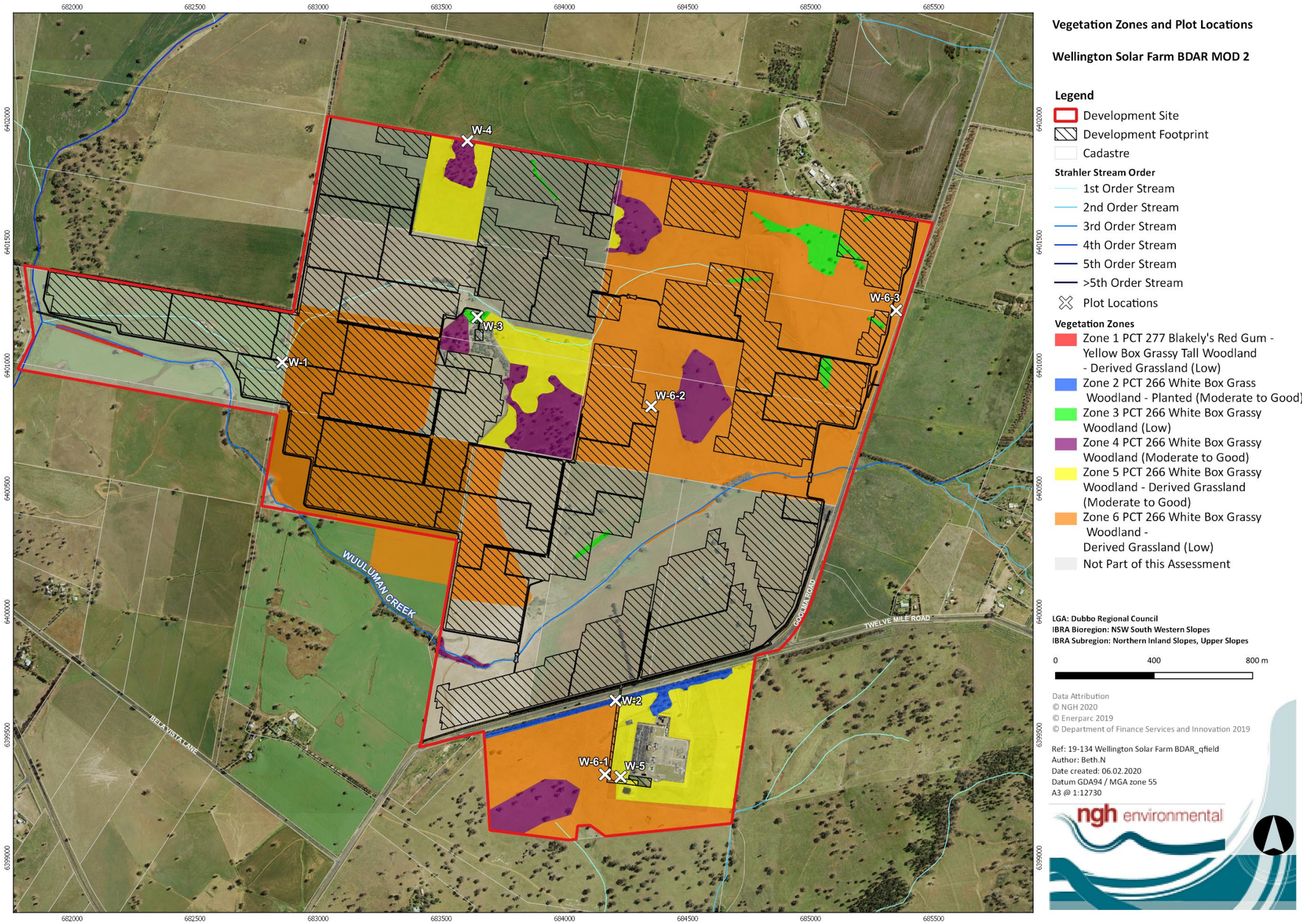
Within the woodland vegetation (PCT 277), the overstorey onsite is characteristically dominated by Yellow Box (*Eucalyptus melliodora)* and White Cypress Pine (*Callitris glaucophylla)*. Understorey is comprised of native grasses and forbs such as Spear Grasses (*Austrostipa sp*.), Wallaby Grass (*Rytidosperma caespitosum*), Nineawn Grass (*Enneapogon nigricans*), some native shrubs Creeping Saltbush (*Atriplex semibaccata*), Climbing Saltbush (*Einadia nutans*) and Black Rolypoly (*Sclerolaena muricata*) also occur in the understory. Exotics detected in 2019 plots in PCT 277 included Burr Medic (*Medicago ploymorpha)*, Barley Grass (*Hordeum leporinum),* Wireweed (*Polygonum aviculare),* Black Crumbweed (*Cheopodium melanocarpum)* and Lucerne (*Meidicago sativa).*

Within the derived grassland vegetation (PCT 266) the ground layer is dominated by Wallaby Grass (*Rytidosperma caespitosum)*, Spear Grasses (*Austrostipa aristiglumis, Austrostipa scabra, Austrostipa bigeniculata)*, Red Grass (*Bothrochloa macra*), Kangaroo Grass (*Themeda triandra*) Panic Grass (*Panicum effusum)* and exotic species including Skeleton Weed (*Chondrilla juncea)* and Barley Grass (*Hordeum leporinum).*

ENDANGERED ECOLOGICAL COMMUNITIES

PCT 266 and PCT 277 form part of the White Box – Yellow Box – Blakely's Red Gum Woodland EEC listed under the NSW BC Act.

This vegetation community is also listed under the Commonwealth EPBC Act as White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grasslands, a Critically Endangered Ecological community (CEEC). The area of Box Gum Woodland surveyed in November 2019 was not considered to be CEEC under the EPBC Act due to a lack of dominance of native species in the understorey.



Vegetation Zones and Plot Locations

Wellington Solar Farm BDAR MOD 2

Legend

- Development Site
- Development Footprint
- Cadastre

Strahler Stream Order

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream
- Plot Locations

Vegetation Zones

- Zone 1 PCT 277 Blakely's Red Gum - Yellow Box Grassy Tall Woodland - Derived Grassland (Low)
- Zone 2 PCT 266 White Box Grass Woodland - Planted (Moderate to Good)
- Zone 3 PCT 266 White Box Grassy Woodland (Low)
- Zone 4 PCT 266 White Box Grassy Woodland (Moderate to Good)
- Zone 5 PCT 266 White Box Grassy Woodland - Derived Grassland (Moderate to Good)
- Zone 6 PCT 266 White Box Grassy Woodland - Derived Grassland (Low)
- Not Part of this Assessment

LGA: Dubbo Regional Council
IBRA Bioregion: NSW South Western Slopes
IBRA Subregion: Northern Inland Slopes, Upper Slopes

0 400 800 m

Ref: 19-134 Wellington Solar Farm BDAR_qfield
Author: Beth.N
Date created: 06.02.2020
Datum GDA94 / MGA zone 55
A3 @ 1:12730

ngh environmental

Figure 3-2 Vegetation Zones and plot locations

Threatened Ecological Communities

Wellington Solar Farm BDAR

Legend

- Development Site
- Development Footprint
- Box Gum WoodlandCommonwealth EPBC Act Listed
- Box Gum Woodland NSW BC Act Listed

0 200 400 m

Data Attribution
© NGH 2020
© Lightsource Development Services 2019
© Department of Finance Services and Innovation 2019

Ref: 19-134 Wellington Solar Farm Modification_qfield
Author: Beth.N
Date created: 12.03.2020
Datum GDA94 / MGA zone 55
A3 @ 1:12729

ngh environmental

Figure 3-3 PCTs and TECs at the development site

3.2.3 Vegetation integrity assessment results

Six vegetation integrity plots were conducted within PCT 266 and one vegetation integrity plot was conducted in PCT 277 to reflect the variation in the condition of these communities. The results of the vegetation integrity assessment are provided in Table 3-2.

Table 3-2 Current vegetation integrity scores for each vegetation zone within the development site

Zone ID	Composition score	Structure score	Function score	Vegetation Integrity Score
1	41.7	0.4	14.4	6.1
2	48.9	4	9.3	12.3
3	70.9	9.2	15	21.4
4	42.6	8	54.4	26.5
5	65.4	27.5	15	30.0
6	59.9* or 58.4**	34.2* or 16.8**	14.9* or 14.8**	31.3* or 24.4**

*Additional area **Excised area

Note: the reason each area gave different vegetation integrity scores is due to the different sizes requiring different number of plots for each. The additional area only required 2 plots whilst the excised area required 3 plots.

4 THREATENED SPECIES

4.1 ECOSYSTEM CREDIT SPECIES

The following ecosystem credit species were returned by the calculator as being associated with the PCTs present on the development site.

4.1.1 Species excluded from the assessment

Table 4-1 Ecosystem credit species returned

Ecosystem Credit Species	Relevant Vegetation Zones	NSW Listing Status	National listing status
Regent Honeyeater (*Anthochaera phrygia*)	Zones 1-4	Critically endangered	Critically endangered
Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)	Zones 1-6	Vulnerable	Not listed
Gang-Gang Cockatoo (*Callocephalon fimbriatum*)	Zones 1-4	Vulnerable	Not listed
Glossy Black-cockatoo (*Calyptorhynchus lathami*)	Zones 1-4	Vulnerable	Not listed
Speckled Warbler (*Chthonicola sagittata*)	Zones 1-6	Vulnerable	Not listed
Spotted Harrier (*Circus assimilis)*	Zones 1-6	Vulnerable	Not listed
Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*)	Zones 1-4	Vulnerable	Not listed
Varied Sitella (*Daphoenositta chrysoptera*)	Zones 1-4	Vulnerable	Not listed
Spotted-tailed Quoll (Dasuyrus maculatus)	Zones 1-6	Vulnerable	Endangered
Purple-crowned Lorikeet (*Glossopsitta porphyrocephala)*	Zones 1-6	Vulnerable	Not listed
Little Lorikeet (*Glossopsitta pusilla)*	Zones 1-6	Vulnerable	Not listed
Painted Honeyeater (Grantiella picta)	Zones 1-4	Vulnerable	Vulnerable
White-bellied Sea-Eagle (*Haliaeetus leucogaster)*	Zones 1-6	Vulnerable	Not listed
Little Eagle	Zones 1-6	Vulnerable	Not listed

Ecosystem Credit Species	Relevant Vegetation Zones	NSW Listing Status	National listing status
(*Hieraaetus morphnoides)*			
Swift Parrot (*Lathamus discolour)*	Zones 1-4	Endangered	Critically endangered
Square-tailed Kite (*Lophoictinia isura)*	Zones 1-6	Vulnerable	Not listed
Hooded Robin (south-eastern form) (M*elanodryas cucullata cucullata)*	Zones 1-6	Vulnerable	Not listed
Large Bentwinged Bat (*Miniopterus orianae oceanensis)*	Zones 1-6	Vulnerable	Not listed
Turquoise Parrot (*Neophema pulchella)*	Zones 1-6	Vulnerable	Not listed
Scarlet Robin (*Petroica boodang)*	Zones 1-6	Vulnerable	Not listed
Flame Robin (*Petroica phoenicea)*	Zones 1-6	Vulnerable	Not listed
Koala (*Phascolarctos cinereus)*	Zones 1-4	Vulnerable	Vulnerable
Superb Parrot (*Polytelis swainsonii)*	Zones 1-6	Vulnerable	Vulnerable
Grey-crowned Babbler (eastern species) (*Pomatostomus temporalis temporalis)*	Zones 1-6	Vulnerable	Not listed
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Zones 1-4	Vulnerable	Vulnerable
Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris)*	Zones 1-6	Vulnerable	Not listed
Diamond Firetail (*Stagonopleura guttata)*	Zones 1-6	Vulnerable	Not listed
Masked Owl (*Tyto novaehollandiae)*	Zones 1-6	Vulnerable	Not listed

4.1.2 Species excluded from the assessment

Table 4-2 Species excluded from the assessment

Ecosystem Credit Species	Vegetation Zones Excluded	Reason for exclusion
Regent Honeyeater (*Anthochaera phrygia*)	Zone 5 -6	Insufficient habitat for foraging within grasslands, no trees or shrubs.
Gang-Gang Cockatoo (*Callocephalon fimbriatum*)	Zone 5 -6	Insufficient habitat for foraging within grasslands, no trees or shrubs.
Glossy Black-cockatoo (*Calyptorhynchus lathami*)	Zone 5 -6	Insufficient habitat for foraging within grasslands, no trees or shrubs.
Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*)	Zone 5-6	Insufficient habitat for foraging within grasslands, no fallen timber.
Varied Sitella (*Daphoenositta chrysoptera*)	Zone 5-6	Insufficient habitat for foraging within grasslands, no trees.
Painted Honeyeater (*Grantiella picta*)	Zone 5-6	Insufficient habitat for foraging within grasslands, no trees or shrubs.
Swift Parrot (*Lathamus discolour)*	Zone 5-6	Insufficient habitat for foraging within grasslands, no trees or shrubs.
Koala (*Phascolarctos cinereus)*	Zone 5-6	Insufficient habitat for foraging within grasslands, no trees.
Grey-headed Flying-fox (*Pteropus poliocephalus*)	Zone 5-6	Insufficient foraging and roosting habitat within grassland, no trees.

4.2 SPECIES CREDIT SPECIES

4.2.1 Candidate species to be assessed

The BAM Calculator predicted the following species credit species to occur at the development site.

Table 4-3 Candidate species credit species requiring assessment

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status
Ausfield's Wattle (*Acacia ausfeldii)*	Associated with *E albens, E blakelyi* and *Callitiris* spp., germination stimulated by fire	High	Vulnerable	Not listed
Yass Daisy (*Ammobium craspedioides)*	Found in moist or dry forest communities, Box Gum Woodland and secondary grassland.	High	Vulnerable	Vulnerable
Regent Honeyeater *(Anthochaera Phrygia)* (Breeding)	Inhabits temperate woodland and open forests. The species inhabits Box-ironbark woodland. Usually inhabit woodlands that have large numbers of mature trees, high canopy cover and abundance of mistletoe	High	Critically Endangered	Critically Endangered
Pink-tailed Legless Lizard *(Aprasia parapulchella)*	Inhabits sloping, open woodland areas with predominantly native grassy ground layers. Habitat is usually well drained, with rock outcrops or scattered, partially buried rocks. Commonly found beneath small, partially embedded rocks.	High	Vulnerable	Vulnerable
Bush Stone-curlew (*Burhinus grallarius)*	Inhabits open forest and woodlands with a sparse grassy ground layer and fallen timber. Nocturnal, feed on insects and small vertebrates.	High	Endangered	Not listed
Gang-gang Cockatoo *(Calyptorhynchus lathami)* (Breeding)	Generally found in tall mountain forests and woodland in spring and summer. In autumn and winter they usually move to lower altitudes in drier, more open eucalypt forests and woodland, particularly Box-gum and Box-ironbark woodlands. Favour old growth forest and woodland as nesting hollows are required. Considered to be outside of their range for breeding. Nearest Bionet record is 50km east of the development site.	High	Vulnerable	Not Listed
Glossy Black-Cockatoo *(Calyptorhynchus lathami)* (Breeding)	Inhabits open forest and woodlands where stands of she oak occur. Feeds almost exclusively on She-oak species. Depending on large hollow bearing trees for nesting.	High	Vulnerable	Not Listed

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status
Eastern Pygmy-possum (*Cercartetus nanus)*	Woodlands and heath preferred. Feds on nectar and pollen from banksias, eucalypts and bottlebrushes.	High	Vulnerable	Not Listed
Large-eared Pied Bat (*Chalinolobus dwyeri*)	Roosts in caves, crevices in cliffs, old mine workings, frequenting low to mid elevation dry open forest and woodland close to these features.	Very High	Vulnerable	Vulnerable
Small Scurf-pea (*Cullen parvum*)	Plants are found in River Red Gum Woodland or Box Gum Woodland. Plants tend to die back in dry seasons and re-sprout with rain in winter or spring.	High	Endangered	Not Listed
Striped Legless Lizard (*Delma impar)*	Found occasionally in open Box Gum Woodland where grassland is dominated by tussock forming grasses such as Kangaroo Grass, Spear Grass and Poa.	Moderate	Vulnerable	Vulnerable
Euphrasia arguta (*Euphrasia arguta)*	Found in limited area near Nundle. Plants have been reported in eucalypt forest with a mixed grass and shrub understorey. Usually dies off in winter months, most active growth during January to April. It is semi parasitic and attaches to the roots of other associated plants.	High	Critically endangered	Critically endangered
Tumut Grevillea (*Grevillea wilkinsonii)*	Restricted to the NSW South-west slopes. Can be associated with Blakey's Red Gum, Yellow Box and Kurrajongs. Flowers mid-September to mid-October. Recruits readily where there is some bare ground.	High	Endangered	Endangered
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Terrestrial habitat includes woodland. Breeding habitat consists of mature tall open forest, tall woodland close to foraging habitat.	High	Vulnerable	Not Listed
Little Eagle *Hieraaetus morphnoides* (Breeding)	Occupies open eucalypt forest, woodland or open woodland. Nests in tall living trees within a remnant patch, build stick nests in winter.	Moderate	Vulnerable	Not Listed
Swift Parrot *Lathamus discolor*	Breeds in Tasmania during spring and summer. In NSW mostly occurs on the coast and south west slopes.	Moderate	Endangered	Critically Endangered

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status
(Breeding)				
Booroolong Frog (*Litoria booroolongensis)*	Requires permanent streams with fringing cover and rocks for shelter.	High	Endangered	Endangered
Square-tailed Kite *Lophoictinia isura (Breeding)*	Found in habitats including dry woodlands. Shows preference for watercourses. Has been observed in north west NSW in stony country with a ground cover of chenopods and grasses and low open eucalypt woodland.	Moderate	Vulnerable	Not Listed
Large Bent-winged Bat *Miniopterus orianae oceanensis* *(Breeding)*	Breeding habitat is within caves and manmade tunnels.	Very High	Vulnerable	Not Listed
Barking Owl *Ninox connivens* (Breeding)	Hollow bearing trees with greater than 20cm diameter and greater than 4m above the ground.	High	Vulnerable	Not Listed
Squirrel Glider (*Pteaurus norfolcensis)*	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range. Prefers a mid storey of shrub or acacia. Requires abundant tree hollows for refuge and nest sites.	High	Vulnerable	Not Listed
Brush-tailed Phascogale (*Phascogale tapoatafa)*	Depends upon hollow bearing trees and prefers to forage in trees 25cm DBH or greater. Needs multiple hollows for nesting and shelter.	High	Vulnerable	Not Listed

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status
Koala *(Phascolarctos cinereus)*	Inhabit a range of eucalypt forest and woodland communities and will utilise paddock trees. White Box *(Eucalyptus albens)* and Yellow Box (*Eucalyptus melliodora*) are secondary food trees of the Koala in this region.	High	Vulnerable	Vulnerable
Superb Parrot *(Polytelis swainsonii)*	Inhabit Box Gum and Box-Cypress-pine woodlands. They require hollow bearing trees for nesting. Considered to be outside their range for breeding, which is bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in in the west.	High	Vulnerable	Vulnerable
Tarengo Leek Orchid (*Prasophyllum petilum)*	East of Binalong, south and east of Boorowa. Found in Natural Temperate Grasslands at Boorowa and Delegate and grassy ground layer dominated by Kangaroo Grass under Box Gum Woodland in ACT. Highly susceptible to grazing.	High	Endangered	Endangered
Grey-headed Flying-fox *(Pteropus poliocephalus)*	Roosting camps are generally within 20km of a regular food source, usually found in gullies close to water in vegetation with a dense canopy. Feed on nectar from Eucalyptus, Melaleuca and Banksia species.	High	Vulnerable	Vulnerable
Small Purple-pea *(Swainsona recta)*	Was considered to occur in the understorey of woodlands and open forests dominated by Blakely's Red Gum, Yellow Box, Candlebark Gum and Long-leaf Box. It is considered likely to be extinct.	Moderate	Endangered	Endangered
Silky Swainson-pea *(Swainsona sericea)*	Found in Box Gum Woodland on South West slopes. Sometimes found in association with *Callitris* species. Regenerates from seed after fire.	High	Vulnerable	Not Listed
Golden Sun Moth (*Synemon plana)*	Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands with ground layers dominated by Wallaby grasses (possibly several species), they require bare ground between tussocks. Habitat may have also have Austrostipa species or Kangaroo Grass. They have also been known to use areas containing weeds such as Serrated Tussock.	Moderate	Endangered	Critically Endangered

Species Credit Species	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status
Masked Owl *(Tyto novaehollandiae)* (Foraging)	Inhabit dry eucalypt forests and woodlands. Require large hollow bearing trees for nesting.	High	Vulnerable	Not Listed
Zieria obcordata *(Zieria obcordata)*	Known to occupy an area near Wellington. Grow in eucalypt woodland or shrubland. Also occurs on Eucalyptus and Callitris dominated woodland with an open low shrub understorey, on moderately steep, mainly west to north facing slopes amongst granite boulders. Associated with Box Gum Woodland.	High	Endangered	Endangered

4.2.2 Inclusions and exclusions based on habitat features

The following species credit species have been either included or excluded from further assessment based on the habitat features present at the development site.

Table 4-4 Species credit species included and excluded based on habitat features

Species Credit Species	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Ausfeld's Wattle *(Acacia ausfeldii)*	Associated with *E albens*, *E blakelyi* and *Callitiris* spp.	Included	All associated tree species are present at the site. Some within the development footprint
Yass Daisy (*Ammobium craspedioides)*	Found in moist or dry forest communities, Box Gum Woodland and secondary grassland.	Excluded	Not found north of Cowra
Regent Honeyeater *(Anthochaera Phrygia)* (Breeding)	Inhabits temperate woodland and open forests. The species inhabits Box-ironbark woodland. Usually inhabit woodlands that have large numbers of mature trees, high	Included	Some woodland habitat within the development footprint

Species Credit Species	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
	canopy cover and abundance of mistletoe		
Pink-tailed Legless Lizard *(Aprasia parapulchella)*	Inhabits sloping, open woodland areas with predominantly native grassy ground layers. Habitat is usually well drained, with rock outcrops or scattered, partially buried rocks. Commonly found beneath small, partially embedded rocks.	Excluded	Some rocky habitat within the development site but not within the development footprint
Bush Stone-curlew (*Burhinus grallarius)*	Inhabits open forest and woodlands with a sparse grassy ground layer and fallen timber. Nocturnal, feed on insects and small vertebrates.	Included	Open woodland habitat, some fallen timber within development footprint
Gang-gang Cockatoo *(Calyptorhynchus lathami)* (Breeding)	Generally found in tall mountain forests and woodland in spring and summer. In autumn and winter they usually move to lower altitudes in drier, more open eucalypt forests and woodland, particularly Box-gum and Box-ironbark woodlands. Favour old growth forest and woodland as nesting hollows are required. Nearest sighting 50km away in Mudgee	Excluded	Suitable HBTs are present within the development footprint, however this species is at the edge of its range and is not considered to breed this far west.
Glossy Black-Cockatoo *(Calyptorhynchus lathami)* (Breeding)	Inhabits open forest and woodlands where stands of she oak occur. Feeds almost exclusively on She-oak species. Depending on large hollow bearing trees for nesting.	Excluded	No foraging habitat (she-oak) present within the development footprint.
Eastern Pygmy-possum (*Cercartetus nanus)*	Woodlands and heath preferred. Feeds on nectar and pollen from banksias, eucalypts and bottlebrushes.	Excluded	Insufficient foraging habitat to provide sufficient winter food.

Species Credit Species	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Large-eared Pied Bat (*Chalinolobus dwyeri*)	Roosts in caves, crevices in cliffs, old mine workings within 2km, frequenting low to mid elevation dry open forest and woodland close to these features.	Excluded	No caves, crevices or cliffs within 2km of the development footprint.
Small Scurf-pea (*Cullen parvum*)	Plants are found in River Red Gum Woodland or Box Gum Woodland. Plants tend to die back in dry seasons and re-sprout with rain in winter or spring.	Included	Box Gum woodland habitat present within development footprint.
Striped Legless Lizard (*Delma impar)*	Found occasionally in open Box Gum Woodland where grassland is dominated by tussock forming grasses such as Kangaroo Grass, Spear Grass and Poa.	Excluded	Box Gum woodland habitat present within development footprint, however outside of the expected range and without native grassland tussock structure.
Euphrasia arguta (*Euphrasia arguta)*	Found in limited area near Nundle. Plants have been reported in eucalypt forest with a mixed grass and shrub understorey. Usually dies off in winter months, most active growth during January to April. It is semi parasitic and attaches to the roots of other associated plants.	Included	Site has the potential to have a mixed grass understorey in better climatic conditions.
Tumut Grevillea (*Grevillea wilkinsonii)*	Restricted to the NSW South-west slopes. Can be associated with Blakey's Red Gum, Yellow Box and Kurrajongs. Flowers mid-September to mid-October. Recruits readily where there is some bare ground.	Included	Suitable woodland habitat and eucalypt species available within the development footprint.
White-bellied Sea-Eagle *Haliaeetus leucogaster*	Terrestrial habitat includes woodland. Breeding habitat consists of mature tall open forest, tall woodland close to foraging habitat.	Included	Woodland habitat present within the development footprint.

Species Credit Species	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Little Eagle *Hieraaetus morphnoides* (Breeding)	Occupies open eucalypt forest, woodland or open woodland. Nests in tall living trees within a remnant patch, build stick nests in winter.	Included	Woodland habitat present within the development footprint.
Swift Parrot *Lathamus discolor* (Breeding)	Breeds in Tasmania during spring and summer. In NSW mostly occurs on the coast and south west slopes.	Excluded	Breeding occurs in Tasmania.
Booroolong Frog (*Litoria booroolongensis)*	Requires permanent streams with fringing cover and rocks for shelter .	Excluded	No permanent streams within the development footprint.
Square-tailed Kite *Lophoictinia isura (Breeding)*	Found in habitats including dry woodlands. Shows preference for watercourses. Has been observed in north west NSW in stony country with a ground cover of chenopods and grasses and low open eucalypt woodland.	Included	Woodland habitat present within the development footprint.
Large Bentwinged Bat *Miniopterus orianae oceanensis* *(Breeding)*	Breeding habitat is within caves and manmade tunnels.	Excluded	No caves or other suitable breeding habitat within or adjacent the development footprint.
Barking Owl *Ninox connivens* (Breeding)	Hollow bearing trees with greater than 20cm diameter and greater than 4m above the ground.	Included	Suitable HBTs are present within the development footprint

Species Credit Species	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Squirrel Glider (*Pteaurus norfolcensis)*	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range. Prefers a mid storey of shrub or acacia. Requires abundant tree hollows for refuge and nest sites.	Included	Suitable HBTs are present within the development footprint
Brush-tailed Phascogale (*Phascogale tapoatafa)*	Depends upon hollow bearing trees and prefers to forage in trees 25cm DBH or greater. Needs multiple hollows for nesting and shelter.	Included	Suitable HBTs are present within the development footprint
Koala *(Phascolarctos cinereus)*	Inhabit a range of eucalypt forest and woodland communities and will utilise paddock trees. White Box *(Eucalyptus albens)* and Yellow Box (*Eucalyptus melliodora*) are secondary food trees of the Koala in this region.	Included	Secondary food trees available within the development footprint.
Superb Parrot ***(Polytelis swainsonii)*** ***(Breeding)***	Inhabit Box Gum and Box-Cypress-pine woodlands. They require hollow bearing trees for nesting. Considered to be outside their range for breeding, which is bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in in the west.	Excluded	Suitable HBTs are present within the development footprint, however this species is rare and at the extremities of its range. It is not considered to breed this far west.
Tarengo Leek Orchid (*Prasophyllum petilum)*	East of Binalong, south and east of Boorowa. Found in Natural Temperate Grasslands at Boorowa and Delegate and grassy ground layer dominated by Kangaroo Grass under Box Gum Woodland in ACT. Highly susceptible to grazing.	Excluded	Location is unlikely due to known populations only.

Species Credit Species	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Grey-headed Flying-fox *(Pteropus poliocephalus)* **(Breeding)**	Roosting camps are generally within 20km of a regular food source, usually found in gullies close to water in vegetation with a dense canopy. Feed on nectar from Eucalyptus, Melaleuca and Banksia species.	Included	Possible camp/roosting habitat available within the development footprint.
Small Purple-pea *(Swainsona recta)*	Was considered to occur in the understorey of woodlands and open forests dominated by Blakely's Red Gum, Yellow Box, Candlebark Gum and Long-leaf Box. It is considered likely to be extinct.	Included	Woodland habitat present within the development footprint.
Silky Swainson-pea *(Swainsona sericea)*	Found in Box Gum Woodland on South West slopes. Sometimes found in association with *Callitris* species. Regenerates from seed after fire.	Included	Woodland habitat present within the development footprint.
Golden Sun Moth (*Synemon plana)*	Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands with ground layers dominated by Wallaby grasses (possibly several species), they require bare ground between tussocks. Habitat may have also have Austrostipa species or Kangaroo Grass. They have also been known to use areas containing weeds such as Serrated Tussock.	Excluded	Not within the geographic limitations for this species.
Masked Owl *(Tyto novaehollandiae)* (Foraging)	Inhabit dry eucalypt forests and woodlands. Require large hollow bearing trees for nesting.	Included	Suitable HBTs are present within the development footprint

Species Credit Species	Habitat components and abundance on site	Included or excluded	Reason for inclusion or exclusion
Zieria obcordata *(Zieria obcordata)*	Known to occupy an area near Wellington. Grow in eucalypt woodland or shrubland. Also occurs on *Eucalyptus* and *Callitris* dominated woodland with an open low shrub understorey, on moderately steep, mainly west to north facing slopes amongst granite boulders. Associated with Box Gum Woodland.	Included	Box Gum Woodland habitat present within the development footprint, including *eucalyptus* and *callitris* species.

4.2.3 Candidate species requiring confirmation of presence or absence

The species listed in Table 4-5 are those that are considered to have habitats present at the development site. Six of these species are assumed to be present on the site. Surveys have been conducted or expert reports obtained for the remaining species. The results are summarised in Table 4-5. Details of the survey methodologies and results are provided for each surveyed species below. Targeted survey locations are mapped on Figure 4-1. Habitat for threatened species has been calculated across the entire area of each zone containing habitat suitable for that species. This is due to the fact that there have been no surveys done for raptors and the threatened species polygons for threatened parrots is 100m radius around hollow bearing trees which results in polygons greater than the calculated ecosystem impact area (see Table 4-5 for details).

Table 4-5 Summary of species credit species surveyed at the development site

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count addition	Species polygon area or count excised
Ausfeld's Wattle *(Acacia ausfeldii)*	High	Surveyed 2017, not recorded during targeted surveys.	No	0 ha	0 ha
Regent Honeyeater *(Anthochaera Phrygia)* (Breeding)	Very High	Surveyed 2017, not recorded during targeted surveys, not a mapped breeding habitat area.	No	0 ha	0 ha

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count addition	Species polygon area or count excised
Bush Stone-curlew (*Burhinus grallarius)*	High	Yes, assumed present, not surveyed for in 2017 or 2019.	Yes assumed	Zone 4 0.01 ha	Zone 4 0 ha
Small Scurf-pea (*Cullen parvum*)	High	No targeted surveyed 2017, however was not detected during eight 20 x 20m floristic plots in 2019.	No	0 ha	0 ha
Euphrasia arguta (*Euphrasia arguta)*	Very High	Surveyed 2017, not recorded during targeted surveys.	No	0 ha	0 ha
Tumut Grevillea (*Grevillea wilkinsonii)*	Very High	No targeted surveyed 2017, however was not detected during eight 20 x 20m floristic plots in 2019.	No	0 ha	0 ha
White-bellied Sea-Eagle *Haliaeetus leucogaster*	High	2017 surveys conducted in May, not suitable for Raptor breeding detection.	Yes assumed	Zones 1-4 0.10 ha	Zones 1-4 0.26 ha
Little Eagle *Hieraaetus morphnoides* (Breeding)	Moderate	2017 surveys conducted in May, not suitable for Raptor breeding detection.	Yes assumed	Zones 1-4 0.10 ha	Zones 1-4 0.26 ha
Square-tailed Kite *Lophoictinia isura (Breeding)*	Moderate	2017 surveys conducted in May, not suitable for Raptor breeding detection.	Yes assumed	Zones 1-4 0.10 ha	Zones 1-4 0.26 ha
Barking Owl	High	Surveyed 2017, not recorded during targeted surveys.	No	0 ha	0 ha

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count addition	Species polygon area or count excised
Ninox connivens (Breeding)					
Squirrel Glider (*Pteaurus norfolcensis)*	High	Surveyed 2017, not recorded during targeted surveys.	No	0 ha	0 ha
Brush-tailed Phascogale (*Phascogale tapoatafa)*	High	Surveyed 2017, not recorded during targeted surveys.	No	0 ha	0 ha
Koala *(Phascolarctos cinereus)*	High	Surveyed 2017, not recorded during targeted surveys.	No	0 ha	0 ha
Grey-headed Flying-fox *(Pteropus poliocephalus)* (Breeding)	High	Surveyed 2019, not recorded during targeted surveys.	No	0 ha	0 ha
Small Purple-pea *(Swainsona recta)*	High	Surveyed 2017, not recorded during targeted surveys.	No	0 ha	0 ha
Silky Swainson-pea *(Swainsona sericea)*	High	Surveyed 2017, not recorded during targeted surveys.	No	0 ha	0 ha
Masked Owl *(Tyto novaehollandiae)* (Foraging)	High	Surveyed 2017, not recorded during targeted surveys.	No	0 ha	0 ha

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count addition	Species polygon area or count excised
Zieria obcordata *(Zieria obcordata)*	Very High	Surveyed 2017, not recorded during targeted surveys.	No	0 ha	0 ha

TARGETED SURVEYS

Targeted surveys were conducted onsite in 2016 and 2017 to assess the candidate species as determined by the Biobanking calculator in 2017. It is noted that while the indicative footprint and therefore credit requirements have changed, that the broader subject site was subject to targeted surveys and therefore the results can be applied to the additional and excised areas, for species that were returned in 2017. 2017 surveys and the survey effort applied are detailed as follows:

Fauna habitat survey

An assessment of habitat types available and their quality and suitability as threatened species habitat was conducted across the development site. Factors such as hollow bearing trees, sticknests, fallen timber, leaf litter, rocky outcrops, vegetation structure, connectivity and disturbance were noted.

Diurnal Bird Survey Effort

Six bird monitoring plots were undertaken within the development site using the area search method. These consisted of 20 minute searches within a 2 ha area in the early morning over two days. Area searches were conducted in areas of remnant woodland. One full day of opportunistic searches also occurred in areas of suitable habitat.

Nocturnal Bird Survey Effort

Numerous trees containing hollows of a suitable size for nesting were identified within the project area. Two nights of nocturnal spotlighting surveys and call playback were undertaken within woodland areas and areas containing hollow-bearing trees to observe for large forest owls in May 2017.

Nocturnal mammal survey effort

Numerous trees containing hollows of a suitable size for nesting were identified within the project area. Two nights of nocturnal spotlighting surveys and call playback were undertaken within the woodland areas in October 2017 (refer Figure 4-1).

Koala survey effort

The dominant overstorey species in the small woodland areas is White Box (*Eucalyptus albens*). White Box is listed as a secondary food tree species for the Koala in the Central and Southern Tablelands (OEH, 2016). Surveys of the woodland areas were undertaken for the Koala by actively searching each of the trees for scratchings and scats in 2017. Two nights of nocturnal spotlighting surveys were also undertaken within the

woodland areas containing hollow bearing trees (refer Figure 4-1). One Bionet record for the Koala occurred within 10km of the project in the town of Wellington

Flora survey effort

Targeted surveys were undertaken for Silky Swainson-Pea, Small Purple Pea, *Euphrasia arguta*, *Ziera obcordata, Tylophora linearis* and Bluegrass (*Dichanthium setosum*) in May and October 2016, Ausfeld's Wattle was surveyed for in October 2017. Both surveys were conducted by an ecologist from NGH environmental and were performed within the optimal detection period for these species as recommended by the Biobanking (and BAM) calculator. Areas of suitable habitat were surveyed using the parallel field traverse survey technique in accordance with the NSW Guide to Surveying Threatened Plants (OEH, 2016). Parallel field traverses were 10 metres apart in areas of open woodland and derived native grassland. Approximately 4 hours were spent surveying for these species.

In addition, 20 x 20 m BAM plots in areas of impact and or excised areas were conducted in November 2019 within Zones 1-6. Small Scurf Pea and Tumut Grevillea, if they were present within these areas, would have been detected especially with the current drought conditions and sparse groundcover in all zones.

SURVEY RESULTS

Fauna habitat survey results

A number of trees occurring within the development site were considered to be potentially hollow-bearing. An assessment was undertaken of all accessible trees within the development site to record the species, presence of hollows, tree height, diameter and the number, size and location of hollows. A total of 60 hollow-bearing trees were identified during surveys of the proposal area. Zones 1, 2 and 3 (associated with the current areas to be added and excised) were found to contain hollow bearing trees and thus would provide breeding habitat for Gang-gang Cockatoo and Superb Parrot, no stag watches or surveys for these species were conducted during the 2017 fauna surveys.

Diurnal Bird Survey Results

The Regent Honeyeater was not detected during surveys. White Box is a key foraging species for the Regent Honey Eater (OEH, 2016), however the White Box was not in flower during the time of the surveys. The regent Honeyeater is nomadic over large distances and unlikely to be detected if food sources are scarce in the area at the time of surveys. There are records of the species in the Wellington area and as such it is assumed to occur on the site from time to time when foraging resources are present.

The BCT clarifies the Regent Honeyeater is a species credit species only in mapped important areas which align with breeding habitat. The Regent Honeyeater has three key breeding areas in NSW; the Capertee Valley, Bundarra-Barraba region and the Lower Hunter (OEH 2017). The development site is not near any of the known key breeding areas. It is therefore assumed that the development site is unlikely to be a mapped important area and that species credits are not generated for this species.

Nocturnal Bird Survey Results

A single Masked Owl was recorded during spotlighting surveys in 2017. Although habitat is present on site that meets the breeding habitat constraint for this species, it is considered unlikely that the Masked Owl would use these habitat features given the context in which theses habitat features occur.

The Masked Owl is a large forest owl, it prefers uncleared or lightly cleared areas with high densities of old hollow-bearing trees (DEC 2006). Studies of woodland fragments on privately-owned and unprotected lands

in south-eastern New South Wales showed that virtually all records of the Masked Owl were associated with extensively forested areas or occurred within one kilometre of the boundary of these areas (Kavanagh and Stanton, 2002). The development site is highly cleared and fragmented with the nearest densely forested area over two kilometres to the south-west. As such, the development site is unlikely to be preferred habitat for this species. Further, breeding usually occurs in close proximity to foraging areas. Common Ringtail Possum, Greater Glider and the Sugar Glider are important prey species for large forest owls (Kavanagh and Stanton, 2002), none of which were recorded at the development site during nocturnal surveys. The development site is therefore unlikely to provide foraging habitat for the Masked Owl. The NSW Recovery Plan for large forest owls (DEC 2006) states that the Masked Owl requires old hollow eucalypts with hollows greater than 40cm wide and greater than 100cm deep for nesting. None of the hollows within the development site are greater than 40cm wide and none are likely to be 100cm deep. Based on the above it is considered unlikely that the Masked Owl would utilise the hollows within the development site for nesting. It is likely that the individual observed was resting within the development site while travelling through. As such, no breeding resources would be impacted by the proposal and species credits are not considered to be generated for this species. Bush-stone Curlew were not targeted in 2017 surveys, however the presence of fallen timber in Zone 4 allows an assumption to be made that there is habitat for this species within part of the development footprint.

Nocturnal mammal survey results

The Squirrel Glider, Brush-tailed Phascogale, Brush-tailed Rock Wallaby and Eastern Pygmy Possum were not detected during nocturnal surveys. No records of these species occur within 10km of the development site. The woodland vegetation within the proposal area supports hollow-bearing trees that could provide breeding habitat for these species. However, there are no flowering shrubs in the understory that would provide a food source for these species. The White Box Woodlands within the proposal area are sparsely vegetated, fragmented and lack connectivity to vegetation within the surrounding landscape. It is considered unlikely that the White Box trees would be utilised by these species and the development site is not considered to provide habitat for these species.

Koala survey results

No Koala's or signs of Koala's were detected during the targeted surveys of the small woodland areas within the development site. As such, the area is not considered to currently support a Koala population and it would not comprise *Core Koala Habitat* under SEPP44. As White Box is a feed species under Schedule 2 of SEPP44 and it comprises more than 15% of the total number of trees in the tree component, the area is defined as *Potential Koala Habitat* under SEPP44. The White Box Woodlands within the proposal area are sparsely vegetated, fragmented and lack connectivity to vegetation within the surrounding landscape. It is considered unlikely that the White Box trees would be utilised by the Koala on a regular basis and the development site is not considered to provide habitat for this species.

Frog survey results

The Booroolong Frog inhabits rocky permanent streams with some fringing vegetation cover and requires exposed rocks and rock crevices for breeding near and within shallow pools. No rocky permanent streams occurred within the development site and there is little to no fringing vegetation. Wuuluman Creek which runs through the development site is degraded from grazing and has no rocks or crevices present within the stream that would provide breeding habitat for this species. As no suitable habitat is present within the proposal area, it is not considered to occur within the development site.

Flora survey results

Silky Swainson-Pea (*Swainsona sericea*) is a prostrate or erect perennial up to 10cm tall (OEH, 2016). It is found in Box Gum Woodland in the Southern Tablelands and the South West Slopes. Small Purple Pea (*Swainsona recta*) is an erect perennial herb growing to 30 cm tall. It occurs in the grassy understory of woodland and open forests (OEH, 2017). Suitable habitat exists for these species within the areas of White Box grassy woodland with a native understory. Surveys for these species were undertaken within the optimal survey time. These species were not detected during the targeted surveys and as such are not considered to occur within the development site.

Euphrasia arguta is an erect annual herb up to 35 cm tall. This species is semi-parasitic and it is found in Eucalypt forests with a mixed grass and shrub understory. The nearest known current population of this species is in Nundle, over 300 km north east of the development site. Suitable habitat for this species could occur within the woodland habitat. Surveys for this species was undertaken within the optimal survey time in October. This species was not detected during the targeted surveys and as such is not considered to occur within the development site.

Ausfeld's Wattle (*Acacia ausfeldii*) was not detected during the surveys. It is a conspicuous shrub 2-4 m tall. Very few understory shrubs were detected within the development site. It is considered unlikely that the species would have been overlooked if present and as such it is not considered to occur at the development site.

Small Scurf Pea and Tumut Grevillea were not detected during 2019 20 x 20 m botanical plots within the additional and excised areas.

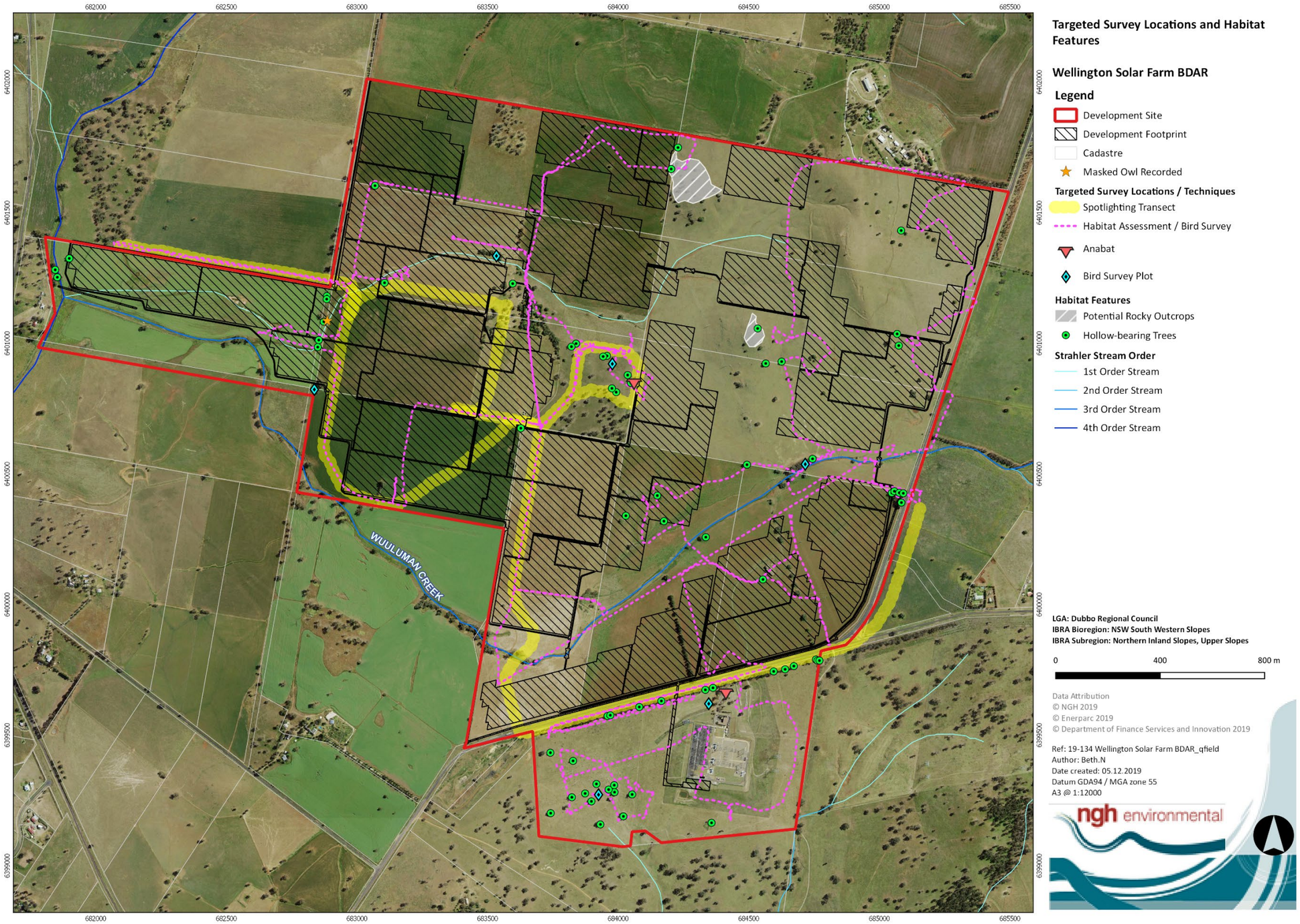


Figure 4-1 Targeted survey locations, threatened species polygons and hollow bearing trees

4.3 ADDITIONAL HABITAT FEATURES RELEVANT TO PRESCRIBED BIODIVERSITY IMPACTS

4.3.1 Occurrences of karst, caves, crevices and cliffs

There are no known occurrences of karst, caves, crevices and cliffs at the subject site.

4.3.2 Occurrences of rock

There were occurrences of rock recorded within the development site but not within the development footprint (see Figure 4-1). These consisted of small rocks (less than 15cm) sometimes scattered and sometimes embedded in the ground surface locations of outcrops are shown on Figure 4-1

4.3.3 Occurrences of human made structures and non-native vegetation

The human-made structures include the existing substation infrastructure and the transmission lines feeding into the substation. This type of infrastructure includes cyclone fencing around the site. There is a dwelling located within the development footprint, however it has been excised from the approved development footprint and thus will not be impacted. There is non-native vegetation within the proposal area, an additional 26.56 ha of exotic vegetation is now included in the development footprint with 11.26 ha excised from the development footprint, see Figure 1-2(exotic areas are in grey; not part of this assessment).

4.3.4 Hydrological processes that sustain and interact with the rivers, streams and wetlands

No threatened aquatic or semi aquatic species were determined as having habitat within the development footprint.

5 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC protected matters report was undertaken on the 08 November 2018 (10 km buffer of the development site) to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the development site (refer to APPENDIX B). Relevant to Biodiversity these include:

- Wetlands of International Importance
- Threatened Ecological Communities
- Threatened species
- Migratory species

The potential for these MNES to occur at the site are discussed below.

5.1 WETLANDS OF INTERNATIONAL IMPORTANCE

Four wetlands of international importance were returned from the protected matters report. The nearest of these (within 200 km of the development site) is the Macquarie Marshes. All other wetlands returned from the search are over 500 km away. The Macquarie Marshes occurs approximately 150km north west of the development site. It is fed by the Macquarie River. There is no apparent connectivity between the development site and the Macquarie River.

5.2 THREATENED ECOLOGICAL COMMUNITIES

Five threatened ecological communities were found in the protected matters report. These were the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia, which is listed Endangered Community, Natural Temperate Grassland of the South Eastern Highlands which is Critically Endangered, Poplar Box Grassy Woodland on Alluvial Plains listed as an Endangered Community, Weeping Myall Woodlands which is Endangered and White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland which is a Critically Endangered Community.

There is White Box – Yellow Box Blakely's Red Gum Grassy Woodland and Derived Grassland present within the development footprint, however due to the fact that the understorey is dominated by exotics it would not be classified as EPBC listed Critically Endangered Ecological Community (CEEC).

5.3 THREATENED SPECIES

There were eight threatened flora, ten threatened birds, seven mammals, two reptiles and four fish returned from the protected matters report. The additional mammal since 2017 is the Greater Glider. Of these 31 species, seventeen were considered to have the potential to utilise the habitats within the development footprint:

- Regent Honeyeater (Anthochaera phrygia) – Critically Endangered EPBC Act
- Swift Parrot (Lathamus discolor) – Critically Endangered EPBC Act
- Koala (Phascolarctos cinereus) – Vulnerable EPBC Act
- Corben's Long-eared Bat (Nyctophilus corbeni) – Vulnerable EPBC Act
- Large-eared Pied Bat (*Chalinolobus dwyeri)* – Vulnerable EPBC Act.
- Small Purple Pea (*Swainsona recta*) – Endangered EPBC Act.
- Euphrasia arguta (*Euphrasia arguta)* - Endangered EPBC Act.

- Painted Honey-eater (*Grantiella picta)* – Vulnerable EPBC Act.
- Spotted-tailed Quail – Endangered EPBC Act.
- Brush-tailed Rock-wallaby – Vulnerable EPBC Act.
- Grey-headed Flying-fox (*Pteropus poliocephalus)* – Vulnerable EPBC Act.
- Pink-tailed Worm-lizard (*Aprasia parapulchella)* – Vulnerable EPBC Act.
- Striped Legless Lizard (*Delma impar)* – Vulnerable EPBC Act.
- Tarengo Leek Orchid (*Prasophyllum petilum)* – Endangered EPBC Act
- Bluegrass (*Dichanthium setosum)* – Vulnerable EPBC Act.
- Tylophora linearis (*Tylophora linearis*) – Endangered EPBC Act.

Surveys in 2017 (NGH, 2017) and flora surveys and assessment in 2019, demonstrate that the Swift Parrot, Regent Honeyeater, Koala, Euphrasia arguta, Painted Honey-eater, Large-eared Pied Bat, Spotted-tailed Quoll, Brush-tailed Rock-wallaby, Grey-headed Flying-fox, Striped Legless Lizard, Pink-tailed Legless Lizard, Small Purple-pea, Tarengo Leek Orchid, Tylophora linearis and Bluegrass are unlikely to occur within the development footprint. The remaining species are assessed further in section 10.1.3 and APPENDIX B, assessment was conducted in relation to the Corben's Long-eared Bat, and Superb Parrot to determine whether a referral to the Commonwealth was necessary.

5.4 MIGRATORY SPECIES

Eleven listed migratory species were returned from the protected matters report. A habitat assessment was conducted for these species. Two of these species could occur on the site on occasion. – the Forktailed Swift, White-throated Needletail. However, as these species are almost exclusively aerial (DoE, 2015) impacts to these species are considered unlikely.

Name	Scientific Name	Habitat Present	Impact
Fork-tailed Swift	*Apus pacificus*	Present	Unlikely – almost exclusively aerial species.
White-throated Needletail	*Hirundapus caudacutus*	Present	Unlikely – almost exclusively aerial species
Yellow Wagtail	*Motacilla flava*	Absent – No wetlands, mangroves or dense vegetation within the development site.	Unlikely – No suitable habitat
Satin Flycatcher	*Myiagra cyanoleuca*	Absent – No wet forests within development site	Unlikely – No suitable habitat
Rufous Fantail	*Rhipidura rufifrons*	Absent – No wet forests/mangroves within development site	Unlikely – No suitable habitat
Common Sandpiper	*Actitis hypoleucos*	Absent – No wetlands or mudflats within development site	Unlikely – No suitable habitat
Sharp-tailed Sandpiper	*Calidris acuminate*	Absent -No wetlands or mudflats within development site	Unlikely – No suitable habitat
Pectoral Sandpiper	*Calidris melanotos*	Absent – No mudflats within development site	Unlikely – No suitable habitat
Curlew Sandpiper	*Calidris ferruginea*	Absent – No mudflats within development site	Unlikely – No suitable habitat

Name	Scientific Name	Habitat Present	Impact
Latham's Snipe	*Gallinago hardwickii*	Absent – No wetlands within development site	Unlikely – No suitable habitat
Eastern Curlew	*Numenius madagascariensis*	Absent – No mudflats within development site	Unlikely – No suitable habitat

6 AVOID AND MINIMISE IMPACTS

6.1 AVOIDING AND MINIMISING IMPACTS ON NATIVE VEGETATION AND HABITAT

6.1.1 Site selection and proposal planning phase

A preliminary constraints analysis was conducted by NGH Environmental (2017) which informed the site layout design. Vegetation constituting the highest ecological constraints such as forming components of EECs and providing threatened flora and fauna habitat were avoided as far as practical. Key changes to the proposal design included the avoidance of areas of White Box grassy woodland in moderate to good condition, streams and rocky outcrops.

The addition and excision of areas within the approved development footprint have resulted in a further reduction in biodiversity impacts by reducing the development footprint's impact on native vegetation whilst continuing to avoid the CEEC White Box grassy woodland.

6.1.2 Proposal components – consideration of alternate modes or technologies

All efforts have been made to minimise the impacts within the development footprint. This assessment is required due to final changes made during the detailed design phase; the design aims to optimise the yield of the solar farm while minimising environmental impacts as much as possible.

6.2 AVOIDING AND MINIMISING PRESCRIBED BIODIVERSITY IMPACTS

The BC Regulation (clause 6.1) identifies actions that are prescribed as impacts to be assessed under the biodiversity offsets scheme:

a) Impacts of development on the habitat of threatened species or ecological communities associated with:
   - There are no karst, caves, crevices, cliffs or other geological features within the development footprint.
   - There are some rocks within the development footprint that will be impacted, however due to the reduction in the development footprint there should be less impact due to the proposed changes described in this report.
   - There is a heritage building within the development footprint. Commitments have been made to avoid impacting on the heritage values of this site.
   - There are impacts to non-native vegetation within the development footprint including an additional impact area of 26.41 ha with 10.55 ha excised, totalling 15.86 ha impacted. However, the addition of exotic vegetation to be impacted has enabled an overall reduction in native vegetation impacts.

b) Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range
   - This is a highly fragmented landscape, connectivity has limitations in this setting, the excision of woodland areas will assist in maintaining the remaining connectivity features within the development footprint. Species such as Koala which are highly mobile are unlikely to utilise the development footprint.

c) Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining)

- Water quality is unlikely to be impacted by the proposed changes to the development footprint.

d) Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.

- An increase in vehicle strike risk to threatened species is unlikely to occur as a result of the proposed changes to the development footprint.

7 IMPACTS UNABLE TO BE AVOIDED

7.1 DIRECT IMPACTS

The construction and operational phases of the Wellington Solar Farm have the potential to impact biodiversity values at the site that cannot be avoided. However, the changes proposed in Mod 2 reduce the impacts on native vegetation Direct impacts attributable to the construction, operational and decommissioning phases include:

- Disturbances to native vegetation, soil, water and air quality
- Potential to impact on cultural features and values
- Noise generated by equipment and traffic movements
- Public safety and hazards
- Public amenity

Table 7-1 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	Consequence
Direct impacts				
Habitat clearance for permanent and temporary construction facilities (e.g. solar infrastructure, transmission lines, compound sites, stockpile sites, access tracks)	4.32 ha additional clearing, 11.03 excised clearing. **Total reduction in clearing 6.71 ha**	Regular	Construction phase	• Direct loss of native flora and fauna habitat including semi mature trees • Potential loss of groundcover resulting in unstable ground surfaces • Injury and mortality to fauna during clearing of fauna habitat • Introduction and spread of noxious weeds and pathogens • Disturbance to fallen timber, dead wood and bush rock
Loss of Threatened Ecological Community – White Box Grassy Woodland – planted, remnant and derived grassland		Regular	Construction phase	• Loss of woodland and derived vegetation areas

Nature of impact	Extent	Frequency	Duration and timing	Consequence
Impacts to Wuuluman Creek and riparian vegetation		Rare	Construction phase	• Water quality impacts could occur during construction
Displacement of resident fauna		Regular	Construction phase	• Loss trees, particularly hollow bearing trees will result in displacement of fauna.
Injury or death of fauna		Rare	Construction and operational phase	• Possible injury or death to fauna could occur as a result of machinery and/or traffic movement
Disruption to connectivity		Rare	Construction and operational phase	• Clearing as a result of the proposed development will result in possible disruption to connectivity which is already limited across the development footprint
Removal of habitat features e.g. HBTs		Rare	Construction and operational phase	• Removal of HBTs will result in displaced fauna. However, the changes to the development footprint will not significantly increase this impact
Shading by solar infrastructure	112 ha	Constant	Operation phase	• Potential loss of groundwater resulting in unstable ground surfaces and potential sedimentation of adjacent waterways
Existence of permanent solar infrastructure	288 ha	Constant	Operation phase	• Collision risk to birds and microbats (fencing, array infrastructure).

7.1.1 Changes in vegetation integrity scores

The changes in vegetation integrity scores as a result of clearing are documented for each vegetation zone in Table 7-2 below.

Table 7-2 Current and future vegetation integrity scores for each vegetation zone within the development site

Zone ID	PCT	EEC and/or threatened species habitat?	Area (ha) added	Area (ha) excised	Current vegetation Integrity Score	Future vegetation Integrity Score
1	277 Woodland mod-good	Yes	0.03	0.01	6.1	0.00
2	266 planted woodland mod-good	Yes	0.00	0.03	12.3	0.00
3	266 woodland low	Yes	0.06	0.22	21.4	0.00
4	266 woodland mod-good	Yes	0.01	0.00	26.5	0.00
5	266 derived grassland mod to good	Yes	0.05	0.34	30	0.00
6	266 derived grassland low	Yes	4.12	10.55	31.3* 24.4**	0.00

*Additional area **Excised area

Note: the reason each area gave different vegetation integrity scores is due to the different sizes requiring different number of plots for each. The additional area only required 2 plots whilst the excised area required 3 plots.

7.1.2 Loss of species credit species habitat or individuals

The loss of species credit species habitat or individuals as a result of clearing is documented in Table 7-3 below.

Table 7-3 Summary of species credit species loss at the development site

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost (additional)	Area of habitat or count of individual lost (excised)
Bush Stone-curlew (*Burhinus grallarius)*	2	0.01 ha	0 ha
White-bellied Sea-Eagle (*Haliaeetus leucogaster)*	2	0.10 ha	0.26 ha
Little Eagle (*Hieraaetus morphnoides)*	1.5	0.10 ha	0.26 ha
Square-tailed Kite (*Lophoictinia isura)*	1.5	0.10ha	0.26 ha

7.1.3 Loss of hollow-bearing trees

No additional hollow bearing trees are to be lost when compared with the approved development footprint. One additional HBT would be impacted, however one HBT is to be excised making the total loss of HBTs 16 with no net change in HBT loss.

7.2 INDIRECT IMPACTS

Indirect impacts include the follow-on or cascading impacts on local community and the potential to impact existing and future land uses. See Table 7-4 below for details of proposed indirect impacts.

Table 7-4 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Indirect impacts (those listed below are included in the BAM)					
Inadvertent impacts on adjacent habitat or vegetation	Unknown	Rare	Construction Phase: Short – term.	Zone 1 PCT 277 woodland low 0.03 ha Zone 3 PCT 266 woodland low 0.06 ha Zone 4 PCT 266 woodland mod-good 0.01 ha Zone 5 PCT 266 derived grassland mod-good 0.05 ha Zone 6 PCT 266 derived grassland low 4.12 ha	Direct loss of native flora and fauna habitat
Reduced viability of adjacent habitat due to edge effects	Unknown	Permanent impact	Operational phase: Long-term.	Zone 1 PCT 277 woodland low 0.03 ha Zone 3 PCT 266 woodland low 0.06 ha Zone 4 PCT 266 woodland mod-good 0.01 ha Zone 5 PCT 266 derived grassland mod-good 0.05 ha Zone 6 PCT 266 derived grassland low 4.12 ha	Disturbances caused from increased infrastructure presence.
Reduced viability of adjacent habitat due to noise, dust or light spill	Unknown	Temporary (construction)	Construction Phase: Short – term.	Zone 1 PCT 277 woodland low 0.03 ha	Disturbances to native fauna through excessive

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Indirect impacts (those listed below are included in the BAM)					
				Zone 3 PCT 266 woodland low 0.06 ha Zone 4 PCT 266 woodland mod-good 0.01 ha Zone 5 PCT 266 derived grassland mod-good 0.05 ha Zone 6 PCT 266 derived grassland low 4.12 ha	dust, noise and light during construction.
Transport of weeds and pathogens from the site to adjacent vegetation	Unknown	Ongoing	Construction and operation: long-term	Zone 1 PCT 277 woodland low 0.03 ha Zone 3 PCT 266 woodland low 0.06 ha Zone 4 PCT 266 woodland mod-good 0.01 ha Zone 5 PCT 266 derived grassland mod-good 0.05 ha Zone 6 PCT 266 derived grassland low 4.12 ha	Introduction of new weed outbreaks on airport land and surrounding habitat.
Increased risk of starvation, exposure and loss of shade or shelter	Unknown	Permanent impact (operation)	Construction Phase: Short-term.	Zone 1 PCT 277 woodland low 0.03 ha Zone 3 PCT 266 woodland low 0.06 ha Zone 4 PCT 266 woodland mod-good 0.01 ha	Loss of woodland habitat.

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Indirect impacts (those listed below are included in the BAM)					
				Zone 5 PCT 266 derived grassland mod-good 0.05 ha Zone 6 PCT 266 derived grassland low 4.12 ha	
Rubbish dumping	Unknown	Ongoing	Construction and operation long-term	Zone 1 PCT 277 woodland low 0.03 ha Zone 3 PCT 266 woodland low 0.06 ha Zone 4 PCT 266 woodland mod-good 0.01 ha Zone 5 PCT 266 derived grassland mod-good 0.05 ha Zone 6 PCT 266 derived grassland low 4.12 ha	Contamination of surrounding habitat with rubbish associated with construction.

7.3 PRESCRIBED IMPACTS

The prescribed biodiversity impacts identified in the BC Regulation (clause 6.1) relevant to the proposal are:

- Impact of development on the habitat for threatened species or ecological communities associated with rocks.
- Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.
- Impacts of development on movement of threatened species that maintains their lifecycle.
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including from subsidence or upsidence resulting from underground mining or other development).
- Impacts of vehicle strikes on threatened species of animals or on animals that are part of a threatened ecological community.

Each of these prescribed impacts to biodiversity has been addressed in the following sections.

7.3.1 Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

The surrounding areas of habitat to development site includes:

- The linear tree line of Goolma Road which contains trees with hollows.
- The Woodland areas and derived grasslands and paddock trees to the south and north of the development.
- Wuuluman Creek to the north within the Wellington Solar Farm.
- A larger patch of vegetation is Mount Arthur north of Wellington township.

The closest area of habitat connectivity for threatened species is linear tree line along Goolma Road which is rather isolated. Adjoining patches of planted vegetation or paddock trees are within 50-100 metres with no connection to larger patches of native vegetation. These small linear patches are foraging and refuge areas for birds and bats as these species move through the landscape, but these areas would not be considered adequate habitat connectivity for threatened species.

The development footprint has been reduced as practical as possible to avoid any unnecessary impacts. All impacted areas are included the BAM calculation.

7.3.2 Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities (including subsidence or upsidence resulting from underground mining or other development)

There is one water body, a small farm dam, to the south of the current substation. There is potential for indirect impacts to this small farm dam during construction, but this can be prevented by mitigation measures. It is anticipated there are no direct impacts on waterbodies or water quality from the development that will impact upon threatened species.

7.3.3 Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC

It is possible threatened species that utilise the Box Gum Woodland (TEC) may be impacted by vehicle strike particularly during construction but this will be avoided as much as possible through mitigation measures such as reduced speed limits and fauna management. This potential impact has been managed in mitigation measures in the Submissions Report (NGH 2018).

7.4 IMPACTS TO BIODIVERSITY VALUES THAT ARE UNCERTAIN

Due to the changes proposed to the development footprint resulting in less impact that the approved development footprint it is unlikely that any uncertain impacts apply.

7.5 IMPACTS TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

The following species listed under the EPBC could possibly be impacted by the proposed development:

- Corben's Long-eared Bat (*Nyctophilus corbeni*),

Further details on the assessment of these species is provided in section 10.1.3. An EPBC referral is not considered necessary.

8 MITIGATING AND MANAGING IMPACTS

8.1 MITIGATION MEASURES

Mitigation measures are required to minimise direct and indirect impacts to threatened communities and species. Mitigation measures have been approved through the Development Consent Conditions and the previous Biodiversity Assessment Report. Table 8-1 proposes the mitigation measure to minimise impact on native vegetation and habitat.

8.1.1 Impacts from the clearing of vegetation and habitats

Direct impacts attributable to the construction, operational and decommissioning phases include:

- Loss of vegetation and fauna habitat
- Loss of threatened species habitat
- Loss of endangered ecological community Box Gum Woodland
- Loss of hollow bearing trees

8.1.2 Indirect impacts

Indirect impacts include:

- Impacts of habitat loss on adjacent habitat values
- Edge effects of habitat that has reduced in size
- Changes in habitat value due to noise, light, dust.
- Transport of weeds

8.1.3 Prescribed impacts

Prescribed impacts include:

- Impacts on habitat of threatened species and endangered ecological communities.
- Impacts on vegetation connectivity for threatened species movement
- Impacts of vehicle strike on threatened species.

Table 8-1 Mitigation measures proposed to avoid and minimise impacts on native vegetation and habitat

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Displacement of resident fauna through vegetation clearing and habitat removal						
timing works to avoid critical life cycle events such as breeding or nursing	• Hollow-bearing trees within the development site would not be cleared between June and February, to avoid the breeding season of Corben's Long-eared Bat and the core hibernation period for Corben's Long-eared Bat. • If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure these species do not occur.	Tree clearing to be undertaken between February and June Pre construction phase	Once off	Lightsource BP	Low	There is still a chance these species will be impacted upon due to out of season breeding, however the risk is low and if the species is detected they will be relocated or referred to a wildlife rescue group if dependent young are detected.
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecologist during clearing events	• Update the Biodiversity Management Plan (BMP) to incorporate protocols for: ○ Protection of native vegetation to be retained ○ Best practice removal and disposal of vegetation ○ Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist ○ Weed management ○ Unexpected threatened species finds ○ Rehabilitation of disturbed areas	Pre-construction phase Construction phase	Regular	Lightsource BP	Low	There is s still a risk that fauna may be impacted upon due to construction, however this will minimise the impacts.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	• The BMP would form part of the Wellington Solar Farm Construction Environmental Management Plan (CEMP).					
relocation of habitat features (fallen timber, hollow logs) from within the development site.	• Hollow logs and significant surface rock will be relocated from the development footprint into areas that are not being impacted upon. Works will be supervised by an ecologist.	Pre construction	Regular	Lightsource BP	Low	This is a low risk activity, it will not make up for the loss of habitat but it will enable the retention of more habitat onsite than if no relocation and retention occurred.
Indirect impacts on native vegetation and habitat						
clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	• The BMP will incorporate details of marking up of vegetation that is to be retained. This could include the development of a marking and communication protocol to ensure that ensures appropriate retention and minimal damage to surrounding vegetation	Pre construction	One off	Lightsource BP	Low	If this activity is carried out as per protocols there is very low risk and there will be little to no residual impacts
noise barriers or daily/seasonal timing of construction and	• As detailed above, activities such as HBT removal will be timed to avoid critical breeding periods for	Construction	Regular	Lightsource BP	Low	If this activity is carried out as per protocols then the risk of noise impacts to fauna during construction are minimal

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
operational activities to reduce impacts of noise	threatened species. This will be detailed in the BMP					
light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	• Avoid night works ie works after sunset or before sunrise. • Direct operation lights away from vegetated areas particularly woodlands	Construction Operation	Regular	Lightsource BP	Low	If protocols are followed, minimal impacts will result. If protocols fail consequences could be moderate due to the presence of threatened species.
adaptive dust monitoring programs to control air quality	• Details of dust management will be in the Construction Environmental Management Plan	Construction	Regular	Lightsource BP	Low	If protocols are followed minimal impacts will result. If protocols fail the consequences are minimal.
temporary fencing to protect significant environmental features such as riparian zones	• Details of riparian zone protection will be in the Biodiversity Management Plan (BMP) and Construction Environmental Management Plan (CEMP)	Construction	Ongoing	Lightsource BP	Low	If protocols are followed failure is unlikely. If protocols fail the consequences are minimal due to the distance from sensitive receptors and the lack of aquatic habitat for threatened species.
hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	• Weed, hygiene and pest management protocols will be prepared and implemented as part of the Biodiversity Management Plan for the development.	Pre construction, Construction and Operation	Ongoing	Lightsource BP	Low	If protocols are followed failure is still possible. If failure does occur consequences could be moderate due to the adjacent farming lands and waterway that has the potential to transport weed seed.
staff training and site briefing to	• Details of staff briefing, toolbox talks and post incident protocols will be in	All stages	Regular	Lightsource BP	Low	If protocols are followed residual impacts are minimal.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
communicate environmental features to be protected and measures to be implemented	the CEMP to ensure that all staff onsite are aware of the biodiversity constraints throughout the Pre Construction, Construction and Operation phases					If protocols fail then there is a moderate risk of impacts occurring.
making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development site.	• Details of site rehabilitation will be provided in the BMP. This includes replanting of indigenous species, ongoing maintenance of plantings and measures of success	All stages	Regular	Lightsource BP	Low	If the protocols are followed there will be no residual impacts only benefits to the surrounding environment. If protocols fail then there will be no improvement to biodiversity following construction.
Prescribed biodiversity impacts						
programming construction activities to avoid critical life cycle events; for example, timing construction activities for when migratory species are absent from the site, or when particular species known to or likely to use the habitat on	• Hollow-bearing trees within the development site would not be cleared between June and February, to avoid the breeding season of Corben's Long-eared Bat and the core hibernation period for Corben's Long-eared Bat. • If clearing outside of this period cannot be achieved, pre-clearing surveys would be undertaken to ensure these species do not occur.	Pre construction	One off	Lightsource BP	Low	There is still a chance these species will be impacted upon due to out of season breeding, however the risk is low and if the species is detected they will be relocated or referred to a wildlife rescue group if dependent young are detected.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
the site are not breeding or nesting						
instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events for rocks, human made structures and non-native vegetation	• Update the Biodiversity Management Plan (BMP) to incorporate protocols for: ○ Protection of native vegetation to be retained ○ Best practice removal and disposal of vegetation ○ Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by an ecologist ○ Weed management ○ Unexpected threatened species finds ○ Rehabilitation of disturbed areas • The BMP would form part of the Wellington Solar Farm Construction Environmental Management Plan (CEMP).	Pre-construction phase Construction phase	Regular	Lightsource BP	Low	There is s still a risk that fauna may be impacted upon due to construction, however protocols will minimise the impacts.
retention of habitat features (fallen timber, hollow logs, rocks) within the development site	• Hollow logs and significant surface rock will be relocated from the development footprint into areas that are not being impacted upon. Works will be supervised by an ecologist.	Pre construction	Regular	Lightsource BP	Low	This is a low risk activity, it will not make up for the loss of habitat but it will enable the retention of more habitat onsite than if no relocation and retention occurred.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	• The CEMP will detail protocols installed to control sediment during construction	Pre construction and Construction	Regular	Lightsource BP	Low	If protocols are followed there is a low risk of impact. If protocols fail there is a low level of consequences due to limited creek and the distance from sensitive receptors.
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	• Details of staff briefing, toolbox talks and post incident protocols will be in the CEMP to ensure that all staff onsite are aware of the biodiversity constraints throughout the Pre Construction, Construction and Operation phases	All stages	Regular	Lightsource BP	Low	If protocols are followed residual impacts are minimal. If protocols fail then there is a moderate risk of impacts occurring.
making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development site	• Details of site rehabilitation will be provided in the BMP. This includes replanting of indigenous species, ongoing maintenance of plantings, monitoring and measures of success	All stages	Regular	Lightsource BP	Low	If the protocols are followed there will be no residual impacts only benefits to the surrounding environment. If protocols fail then there will be no improvement to biodiversity following construction.

8.2 ADAPTIVE MANAGEMENT STRATEGY

For major projects: details of the adaptive management strategy proposed to monitor and respond to impacts on biodiversity values that are uncertain). The Biodiversity Management Plan (BMP) developed for Wellington Solar Farm will incorporate any adaptive management required for the larger development footprint.

9 SERIOUS AND IRREVERSIBLE IMPACTS (SAII)

9.1 POTENTIAL SERIOUS AND IRREVERSIBLE IMPACT ENTITIES

The principles used to determine if a development will have serious and irreversible impacts, include impacts that:

1. Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline, or
2. Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size, or
3. Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution, or
4. Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

9.1.1 Threatened ecological communities

The following relevant TEC has SAII potential:

- White Box Yellow Box Blakely's Red Gum Woodland.

Areas that comprise White Box Yellow Box Blakely's Red Gum Woodland EEC, have been excluded from the development footprint as much as possible. Specifically, all White Box Yellow Box Blakely's Red Gum Woodland listed as Critically Endangered Ecological Community (CEEC) under the EPBC Act, has been excluded from the development footprint. However, there is a small area of White Box Yellow Box Blakely's Red Gum Woodland EEC listed under the BC Act present within the benching and cabling for the substation see *Figure 3-3*.

The impacted area around the substation comprises:

- 0.39 ha of BC Act listed EEC that was assessed under the SSD/MOD 1 approvals and is considered an impact consistent with the existing approval.
- 0.03 ha of BC Act listed EEC that is additional to that assessed under the SSD/MOD 1 approvals.
- 0.29 ha of BC Act listed EEC that is to be excised from that assessed under SSD/MOD 1 approvals and will no longer be impacted.

In summary the impacts to EEC of the proposed development (MOD 2) are less than that originally approved under SSD/MOD1 approvals as a larger area would be excised than would be added in this MOD 2 layout.

Principle 1 (above) is the reason that White Box Yellow Box Blakely's Red Gum Woodland has been listed as Endangered under NSW BC Act and as a SAII. It has had a drastic reduction in area across its range and therefore has become highly fragmented. It is estimated that less than 4% is remaining in the NSW South Western Slopes and Southern Tablelands (OEH 2011). The following addresses that required under the BAM section 10.2.3 for impacts to an SAII entity:

a) the action and measures taken to avoid the direct and indirect impact on the potential entity for an SAII

Management actions have been put in place to avoid and minimise impacts to White Box Yellow Box Blakely's Red Gum Woodland. These include:

- Clearing protocols, which involve clear marking of impact areas to avoid unintended impacts to White Box Yellow Box Blakely's Red Gum Woodland.
- Temporary fencing to prevent impacts to riparian zones.
- Staged clearing to minimise impacts to EEC to be retained.
- Hygiene protocols to avoid introduction or spread of weeds within EEC/CEEC to be retained.

b) the area (ha) and condition of the TEC to be impacted directly and indirectly impacted by the proposed development. The condition of the TEC is to be represented by the vegetation integrity score for each vegetation zone.

A total of 0.42 ha of White Box Yellow Box Blakely's Red Gum Woodland is to be impacted on the site (this includes 0.03 ha of additional impact, from MOD 1 and 0.39 ha of consistent impact already approved SSD/MOD1). The 0.42 ha of White Box Yellow Box Blakely's Red Gum Woodland is composed of:

- 0.4 ha of Zone 5 PCT 266 Box Gum Woodland derived grassland (moderate to good) with a current vegetation integrity score of 30.
- 0.02 ha of Zone 2 PCT 266 Box Gum Woodland planted (moderate to good) with a current vegetation integrity score of 12.3.

This 0.42 ha area of impact is less than what was approved under SSD/MOD1 approval.

c) the extent to which the impact exceeds any threshold for the potential entity that is specified in the Guidance to assist a decision-maker to determine a serious and irreversible impact.

No thresholds are currently specified for this EEC.

d) The extent and overall condition of the TEC within an area of 1000 ha, and then 10,000 ha, surrounding the development footprint.

Within a 1,000 ha area of the site and surrounds there are two PCTs present that are associated with Box Gum Woodland:

- White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion PCT 266
- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 277

A total of 219 ha of Box Gum Woodland exists within 1,000 ha radius from the centre of the site[1]. This equates to 22% of the 1000 ha area, of this 0.42 ha will be removed which is 0.19%.

Within a 10,000 ha area of the site and surrounds there are six PCTs present that are associated with Box Gum Woodland:

- Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion PCT 74
- White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion PCT 266
- White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion PCT 267
- White Box – Blakely's Red Gum - Long-leaved Box - Nortons Box - Red Stringybark grass-shrub woodland on shallow soils on hills in the NSW South Western Slopes Bioregion PCT 268
- Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion PCT 277
- Derived grassland of the NSW South Western Slopes PCT 796

A total of 1,393 ha of Box Gum Woodland exists within 10,000 ha radius from the centre of the site (refer Footnote 1). This equates to 14% of the total area, of this 0.42 ha will be removed which is 0.03%.

e) An estimate of the extant area and overall condition of the potential TEC remaining in the IBRA subregion before and after the impact of the proposed development has been taken into consideration.

As the reduction in Box Gum Woodland is 0.42 ha which is 0.19% loss over 1000 ha it is unlikely to be a significant impact over the IBRA sub region which is 4.6 million hectares and is likely to be a smaller area of Box Gum Woodland than what was identified within 1000 or 10000 ha.

f) An estimate of the area of the candidate TEC that is in the reserve system within the IBRA region and IBRA subregion.

It is unclear how much Box Gum Woodland is preserved in the reserve system, it is considered that is poorly preserved. However, this project will fund or create preservation of Box Gum Woodland following approval and retirement of PCT 266 credits.

g) The development's proposed impacts on:

    i. Abiotic factors critical to the long-term survival of the potential TEC

The development is considered to have negligible impacts on abiotic factors. The Solar Farm has minimal soil disturbance and low levels of indirect impacts on soil, air and water. In addition, the proposed development is not going to impact upon abiotic processes outside of the development that could impact upon existing Box Gum Woodland either nearby or downstream or in groundwater connected areas.

[1] This assumes that all vegetation mapped as Box Gum Woodland (PCT 74, 266, 267, 268, 277 and 796) all meet the criteria for EEC and/or CEEC Box Gum Woodland which is a highly precautionary approach and considered unlikely.

ii. Characteristic and functionally important species through impacts such as, but not limited to, inappropriate fire/flooding regimes, removal of understorey species or harvesting of plants

This is not applicable. All potential impacts have been considered through the SSD approval process.

iii. The quality and integrity of an occurrence of the potential TEC through threats and indirect impacts

The Box Gum Woodland that remains onsite will be mostly undisturbed through direct impacts. Measures will be undertaken to ensure indirect impacts are minimised. These include weed management, vegetation clearance protocols, avoidance of fertiliser and herbicide drift. The Biodiversity Management Plan, Vegetation Management Plan will ensure management and monitoring of the existing Box Gum Woodland to ensure it is protected and improved.

h) Direct or indirect fragmentation and isolation of an important area of the potential TEC

The area is already highly fragmented, the development is not causing further fragmentation that will significantly impact upon the Box Gum Woodland.

i) The measures proposed to contribute to the recovery of the potential TEC in the IBRA subregion.

A Vegetation Management Plan has been developed to direct and support replanting of Box Gum Woodland species and manage existing Box Gum Woodland within the development site.

The affect of MOD 2 is to reduce the amount of clearing of this TEC. As such, following the above assessment against SAII criteria, it is believed that the Wellington Solar Farm development, will not have a risk of Serious and Irreversible Impact for White Box Yellow Box Blakely's Red Gum Woodland.

9.1.2 Threatened species

No species established as having potential habitat onsite or likely to be impacted by the proposed development has SAII potential.

10 REQUIREMENT TO OFFSET

10.1 IMPACTS REQUIRING AN OFFSET

10.1.1 Ecosystem credits

An offset is required for all impacts of development on PCTs that are associated with:

a) a vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or

b) a vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or

c) a vegetation zone that has a vegetation integrity score ≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.

The PCTs and vegetation zones requiring offset (in addition to the current approval) and the ecosystem credits required are documented in Table 10-1and shown on Figure 10-1. Ecosystem credits that will be excised from the credit requirement are shown in Table 10-2 and mapped on Figure 10-1.

Table 10-1 PCTs and vegetation zones that are additional to approved development and require offsets

Zone ID	PCT ID	PCT name	Zone area (ha) additional	Vegetation integrity score	Ecosystem credits required
3	266	Woodland low	0.06	21.4	1
4	266	Woodland moderate to good	0.01	26.5	1
5	266	Derived grassland moderate to good	0.05	30	1
6	266	Derived grassland low	4.12	31.3	64

Table 10-2 PCTs and vegetation zones that are excised from the approved development and require removal from offset requirements

Zone ID	PCT ID	PCT name	Zone area (ha) excised	Vegetation integrity score	Ecosystem credits required
3	266	Woodland low	0.22	21.4	2
5	266	Derived grassland moderate to good	0.34	30	5
6	266	Derived grassland low	10.55	24.4	129

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix D.

10.1.2 Species credits

An offset is required for the threatened species impacted by the development that require species credits. These species and the species credits required are documented in Table 10-3.

Table 10-3 Species credit species that require offsets additional to approved footprint

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost	Species credits required
Bush Stone-curlew (*Bruhinus grallarius)*	2	0.01	0
White-bellied Sea-Eagle (*Haliaeetus leucogaster)*	2	0.10	1

Little Eagle (*Hieraaetus morphnoides)*	1.5	0.10	0
Square-tailed Kite (*Lophoictinia isura)*	1.5	0.10	0

Table 10-4 Species credit species that require removal from offset requirements

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost	Species credits required
White-bellied Sea-Eagle (*Haliaeetus leucogaster)*	2	0.26	2
Little Eagle (*Hieraaetus morphnoides)*	1.5	0.26	2
Square-tailed Kite (*Lophoictinia isura)*	1.5	0.26	2

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix C.

10.1.3 Offsets required under the EPBC Act

Assessment was conducted in relation to Box Gum Woodland, Corben's Long-eared Batand Superb Parrot to determine whether a referral to the Commonwealth was necessary, as documented in APPENDIX B. As such, the proposal is not considered to require offsets in accordance with the EPBC Offsets Policy.

10.2 IMPACTS NOT REQUIRING AN OFFSET

Impacts to PCTs that do not meet the thresholds identified in Section 10.1.1 do not require offsets. These PCTs and vegetation zones are identified in Table 10 3 and mapped on Figure 10 1.

Table 10-5 PCTs and vegetation zones that do not require additional offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score
1	277	Woodland low	0.03	6.1

Table 10-6 PCTs and vegetation that do not require excised offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score
1	277	Woodland low	0.01	6.1
2	266	Planted Woodland moderate to good	0.03	12.3

10.3 AREAS NOT REQUIRING ASSESSMENT

Areas not requiring assessment in accordance with BAM Section 10.4 i.e. land without native vegetation, as shown in Figure 10-1(exotic areas are in grey; not part of this assessment).

Impacts Requiring Offset, Not Requiring Offset and Not Requiring Assessment

Wellington Solar Farm BDAR

Legend

- Development Site
- Additional Vegetation Impacts Requiring Offsets
- Excised Vegetation Impacts Requring Removal From Offsets
- Vegetation not Requiring Offsets
- Impacts Previously Assessed
- Areas not Requiring Assessment

0 200 400 m

Ref: 19-134 Wellington Solar Farm Modification_qfield
Author: Beth.N
Date created: 05.12.2019
Datum GDA94 / MGA zone 55
A3 @ 1:11546

ngh environmental

Figure 10-1 Impacts requiring offset, not requiring offset and not requiring assessment

11 CONCLUSION

Specifically, pursuant to the BC Act, the aim of this BDAR is to:

- identify, assess and derive the credit number for the additional areas now being impacted by the solar farm footprint, that were not impacted by the approved footprint.
- identify, assess and derive the credit number for the areas that will now be removed from the approved solar farm footprint (areas that *were* impacted but are now excised from the approved footprint).
- Reconcile the credit requirement of the original SSD approvals, MOD 1 and this proposed MOD 2 to give one updated credit requirement for the Wellington Solar Farm project.

This BDAR has been prepared to support the MOD 2 submission to Department of Planning Infrastructure and Environment.

Key results

Ecosystem credits

In terms of the impacts on vegetation and the generation of ecosystem credits, the changes proposed in MOD 2 compared with the approved footprint are summarised as follows:

- An overall additional impact of 0.02 ha of PCT 277 White Box Yellow Box Blakely's Red Gum woodland. Zone 1, this generates no credits;
- An overall reduced impact of 6.90 ha of PCT 266 – White Box grassy woodland in the upper slopes sub-region of NSW South Western Slopes. Zones 2 and 4, together now generate 3 credits for the project. For Zones 3, 5 and 6, the net effect is zero credits;
- An overall additional impact of 15.43 ha of exotic vegetation. This generates no credits.

The changes to the development footprint have resulted in an overall reduction in native vegetation being impacted and therefore a reduced credit requirement. Even though there is an overall increase in clearing, the impacts to exotic/planted areas did not generate credits. This has resulted in the footprint increasing in size but the biodiversity impacts and offset requirement being reduced.

The following details the ecosystem credits generated for the additional and excised areas for each vegetation zone for MOD 2. The net credit requirement that now applies to the project is summarised in the righthand column. Note: as the areas that are now being excised in Zones 3, 5 and 6 represent more credits than the areas now being added, the net result is that there will be no ecosystem credits required to be retired in these zones.

Zone	PCT and structure	Condition	Approved Credit Requirements		Credits Requirements Mod 2 (this report)		Updated credit requirement
			Original Approval SSD8573 (converted via reasonable equivalence)	Mod 1	Additional area credits	Excised area credits	(Net)
PCT 277							
Zone 1	PCT 277 woodland	low condition	0	0	0	0	0
PCT 266							
Zone 2	PCT 266 planted woodland	moderate to good condition	0	1	0	0	1
Zone 3	PCT 266 woodland	low condition	1	0	+1	-2	0
Zone 4	PCT 266 woodland	moderate to good condition (hollow bearing trees present)	1	0	+1	0	2
Zone 5	PCT 266 derived grassland	moderate to good condition	0	0	+1	-5	0 (-4)
Zone 6	PCT 266 derived grassland	low condition	0	0	+64	-129	0 (-65)

Species credits

In completing the site assessment for MOD 2, only the additional and excised areas were assessed on site. Targeted surveys were undertaken for candidate flora species where habitat elements were known to exist onsite. Of the flora species surveyed, none were found during targeted surveys. The majority of fauna candidate species identified in the BAM calculator were excluded from further assessment due to a lack of suitable habitat available onsite. For the remainder, due to time constraints, fauna surveys were not conducted for species that had not been previously assessed such as the Bush Stone-curlew, White-bellied Sea-eagle, Square-tailed Kite and Little Eagle. These were all assumed to be present and appropriate credits generated. Other fauna surveyed in 2016 and 2017 had sufficient data to exclude them.

In regard to Species Credit Species for MOD 2 there are no additional credits required Note: as the areas that are now being excised represent more species credits than the areas now being added for the White-bellied Sea-Eagle, Square-tailed Kite and Little Eagle, the net result is that there will be no credits required to be retired for these species.

The net credit requirement for the Wellington Solar Farm is:

- 1 ecosystem credit for PCT 266 planted woodland

- 2 ecosystem credits for PCT 266 woodland moderate to good (with hollow bearing trees)
- 2 species credit for Pink-tailed Legless Lizard

Mitigation and management measures are proposed to adequately address impacts associated with the proposal, both directly and indirectly. The retirement of the updated credit requirement is proposed to be carried out in accordance with the NSW Biodiversity Offsets Scheme and will be achieved by either:

a) Retiring credits under the Biodiversity Offsets Scheme, or

b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or

c) Funding a biodiversity action that benefits the threatened entity impacted by the development.

12 REFERENCES

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APPENDIX A PLOT FIELD DATA

BAM Site Field Survey								
Project:	Wellington Solar Farm	**Plot Identifier**	W-1	**Pic 20x20**		**Pic 20x50**	yes	
Survey date:	8/11/2019		**Compass Orientation (head of 20x20 plot)**			East		
Recorders	Lesley Peden		**PCT:**	277	Box Gum Woodland Derived Native Grassland			
GPS Easting	32.513141	**GPS Northing**	148.946634		**Datum**		**Zone**	
Landform			**Soils**			**Drainage & Slope**		
Morphology		Cowra Trough Red Soils - Wellington	**Soil Texture**	Heavy		**Slope**	Flat	
LandF Element			**Soil Colour**	Red		**Aspect**	West	
LandF Pattern			**Soil Depth**	Shallow		**Drainage**	Good	
Microrelief			**Geology**			**Watercourses**	100 m to trough	

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing	3	NR	
Cultivation	3	R	
Soil erosion	2	R	
Firewood	3	NR	
Grazing	3	R	Sheep, macropods
Fire Damage	0		
Storm Damage	0		
Weediness	3	NR	
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

Agriculture. Grazing and cropping

Age class of trees (DBH range) , Condition of Vegetation, Hollows

N/A

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Grazing, weeds

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Adjacent to Box Gum Woodland with exotic understorey

Dominant Species outside Plot

Eucalyptus albens, Eucalyptus melliodora
Bothriochloa macra
Hordeum leporinum

FUNCTION

Function attributes for	W-1
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**1**
Forb (FG)	**8**
Grass & grasslike (GG)	**2**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL	**11**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**0.1**
Forb (FG)	**0.08**
Grass & grasslike (GG)	**2.1**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL Native	**2.28**
TOTAL 'HTE'	**0.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	90%		
	15m	35%		
	25m	20%	**46.00%**	
	35m	60%		
	45m	25%		
Bare ground cover	5m	7%		
	15m	55%		
	25m	70%	**38%**	
	35m	30%		
	45m	30%		
Cryptogam cover	5m	0%		
	15m	0%		
	25m	0%	**0%**	
	35m	0%		
	45m	0%		
Rock Cover	5m	0%		
	15m	0%		
	25m	0%	**0%**	
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for W-1

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Hirs inca	*Hirschfeldia incana*	Buchan Weed	Brassicaceae	0.1	50	*		No		
Hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	1	300	*		No		
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fab	1	500	*		No		
medi sati	*Medicago sativa*	Lucerne	Fabaceae (Fab	0.3	30	*		No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.01	10		Forb (FG)	No		
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.01	5	*		No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.01	4		Forb (FG)	No		
chen mela	*Chenopodium melanocarpum*	Black Crumbweed	Chenopodiace	0.01	50		Forb (FG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.1	2	*		HTE		
sola opac	*Solanum opacum*	Green-berry Nightshade	Solanaceae	0.01	1		Forb (FG)	No		
evol alsi	*Evolvulus alsinoides*	Bindweed	Convolvulacea	0.01	1		Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	0.1	1		Shrub (SG)	No		
poly avic	*Polygonum aviculare*	Wireweed	Polygonaceae	0.5	15	*		No		
malv negl	*Malva neglecta*	Dwarf Mallow	Malvaceae	0.01	8	*		No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.01	1		Forb (FG)	No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	2	50		Grass & grasslike (GG)	No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.01	10	*		No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	2		Grass & grasslike (GG)	No		
cham drum	*Chamaesyce drummondii*	Caustic Weed	Euphorbiacea	0.01	2		Forb (FG)	No		
dysp pumi	*Dysphania pumilio*	Small Crumbweed	Chenopodiace	0.01	1		Forb (FG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllaceae			*		No		

BAM Site Field Survey								
Project:	Wellington Solar	**Plot Identifier**	W-2	**Pic 20x20**		**Pic 20x50**		
Survey date:	9/11/2019		**Compass Orientation (head of 20x20 plot)**					
Recorders	Lesley Peden		**PCT:**	266	Box Gum Woodland Derived Native Grassland			
GPS Easting	-32.52531007	**GPS Northing**	148.96131		**Datum**		**Zone**	
Landform			**Soils**			**Drainage & Slope**		
Morphology			**Soil Texture**	Heavy		**Slope**	Flat	
LandF Element			**Soil Colour**	Red Chromosil		**Aspect**	South East	
LandF Pattern			**Soil Depth**	Shallow		**Drainage**	Good	
Microrelief			**Geology**			**Watercourses**	800 m to dam	

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing	3	NR	
Cultivation	3	NR	
Soil erosion	2	NR	
Firewood	3	NR	
Grazing	3	R	Macropods, sheep
Fire Damage			
Storm Damage			
Weediness	2	R	
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

Agriculture/Grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

N/A

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Grazing, weeds

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Box Gum Woodland Derived Native Grassland

Dominant Species outside Plot

FUNCTION

Function attributes for	W-2
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**0**
Forb (FG)	**4**
Grass & grasslike (GG)	**6**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL	**11**

Count of Native Richness

BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**0**
Forb (FG)	**0.4**
Grass & grasslike (GG)	**5.61**
Fern (EG)	**0**
Other (OG)	**0.1**
TOTAL Native	**6.11**
TOTAL 'HTE'	**0.11**

Count of cover abundance (native vascular plants)

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	20%	**29.00%**	
	15m	50%		
	25m	40%		
	35m	10%		
	45m	25%		
Bare ground cover	5m	70%	**50%**	
	15m	10%		
	25m	25%		
	35m	80%		
	45m	65%		
Cryptogam cover	5m	0%	**0%**	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	1%	**1%**	
	15m	0%		
	25m	0%		
	35m	1%		
	45m	1%		

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

COMPOSITION & STRUCTURE

Species recorded for W-2

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
aust aris	*Austrostipa aristiglumis*	Plains Grass	Poaceae	3	40		Grass & grasslike (GG)	No		
Eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.1	30		Forb (FG)	No		
alte pung	*Alternanthera pungens*	Khaki Weed	Amaranthace	0.01	1	*		HTE		
dysp pumi	*Dysphania pumilio*	Small Crumbweed	Chenopodiace	0.01	1			No		
ryti	*Rytidosperma spp.*		Poaceae	1	50		Grass & grasslike (GG)	No		
ryti caes	*Rytidosperma caespitosu*	Ringed Wallaby Grass	Poaceae	1	20		Grass & grasslike (GG)	No		
them tria	*Themeda triandra*		Poaceae	0.1	5		Grass & grasslike (GG)	No		
Hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	0.1	30	*		No		
trif dubi	*Trifolium dubium*	Yellow Suckling Clove	Fabaceae (Fat	0.1	2	*		No		
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.5	20		Grass & grasslike (GG)	No		
enne nigr	*Enneapogon nigricans*	Niggerheads	Poaceae	0.01	1		Grass & grasslike (GG)	No		
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.01	2	*		No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	5		Forb (FG)	No		
rume brow	*Rumex brownii*	Swamp Dock	Polygonaceae	0.1	5		Forb (FG)	No		
malv negl	*Malva neglecta*	Dwarf Mallow	Malvaceae	0.1	2	*		No		
dich repe	*Dichondra repens*	Kidney Weed	Convolvulace	0.1	10		Forb (FG)	No		
glyc taba	*Glycine tabacina*	Variable Glycine	Fabaceae (Fat	0.1	3		Other (OG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllacea	0.1	5	*		No		
cart lana	*Carthamus lanatus*	Saffron Thistle	Asteraceae	0.1	2	*		HTE		
salv verb	*Salvia verbenaca*	Vervain	Lamiaceae	0.1	15	*		No		

BAM Site Field Survey									
Project:	Wellington Solar	**Plot Identifier**	W-3	**Pic 20x20**		**Pic 20x50**	Yes		
Survey date:	8/11/2019		**Compass Orientation (head of 20x20 plot)**			North			
Recorders			**PCT:**	266					
GPS Easting	-32.511365	**GPS Northing**	148.95503		**Datum**		**Zone**		
Landform			**Soils**			**Drainage & Slope**			
Morphology			**Soil Texture**	Heavy		**Slope**	4 degrees		
LandF Element			**Soil Colour**	Red		**Aspect**	North		
LandF Pattern			**Soil Depth**	Shallow		**Drainage**	Good		
Microrelief			**Geology**			**Watercourses**	Troughs within 500 m		

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing	3	NR	Cleared farmland
Cultivation	3	NR	
Soil erosion	2	NR	
Firewood	3	NR	
Grazing	3	R	Rabbits, sheep and macropods
Fire Damage			
Storm Damage			
Weediness	2	R	
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

Agricultural, grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

N/A

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Grazing, weeds

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Box Gum Woodland Derived Native Grassland

Dominant Species outside Plot

Eucalyptus albens, E. melliodora

FUNCTION

Function attributes for W-3

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	7
	Grass & grasslike (GG)	9
	Fern (EG)	1
	Other (OG)	2
	TOTAL	19

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0.9
	Grass & grasslike (GG)	7.8
	Fern (EG)	0.1
	Other (OG)	0.2
	TOTAL Native	9
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	60%	66.00%	
	15m	60%		
	25m	85%		
	35m	45%		
	45m	80%		
Bare ground cover	5m	15%	12%	
	15m	20%		
	25m	5%		
	35m	15%		
	45m	7%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	10%	7%	
	15m	3%		
	25m	2%		
	35m	10%		
	45m	12%		

COMPOSITION & STRUCTURE

Species recorded for W-3

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Them tria	*Themeda triandra*		Poaceae	5	200		Grass & grasslike (GG)	No		
Both macr	*Bothriochloa macra*	Red Grass	Poaceae	0.3	30		Grass & grasslike (GG)	No		
Eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.3	200		Forb (FG)	No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	20		Forb (FG)	No		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	0.1	1	*		No		
conv angu	*Convolvulus angustissim*		Convolvulacea	0.1	8		Other (OG)	No		
trif subt	*Trifolium subterraneum*	Subterranean Clover	Fabaceae (Fab	0.1	4	*		No		
micr stip	*Microlaena stipoides*	Weeping Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
trag porr porr	*Tragopogon porrifolius s*	Salsify	Asteraceae	0.1	5	*		No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	0.1	5		Grass & grasslike (GG)	No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	30		Grass & grasslike (GG)	No		
aust bige	*Austrostipa bigeniculata*	Yanganbil	Poaceae	1	50		Grass & grasslike (GG)	No		
glyc taba	*Glycine tabacina*	Variable Glycine	Fabaceae (Fab	0.1	1		Other (OG)	No		
pani effu	*Panicum effusum*	Hairy Panic	Poaceae	0.1	6		Grass & grasslike (GG)	No		
aven	*Avena spp.*	Oats	Poaceae	0.1	4	*		No		
dich repe	*Dichondra repens*	Kidney Weed	Convolvulacea	0.1	30		Forb (FG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	0.1	1	*		No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	10		Forb (FG)	No		
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fab	0.1	5	*		No		
vitt grac	*Vittadinia gracilis*	Woolly New Holland I	Asteraceae	0.1	1		Forb (FG)	No		
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	1	40		Grass & grasslike (GG)	No		
chon junc	*Chondrilla juncea*	Skeleton Weed	Asteraceae	0.1	5	*		No		
trif dubi	*Trifolium dubium*	Yellow Suckling Clove	Fabaceae (Fab	0.1	4	*		No		
chei	*Cheilanthes spp.*	Cloak Fern, Mulga Fer	Pteridaceae	0.1	1		Fern (EG)	No		
erod	*Erodium*	Crowfoot	Geraniaceae	0.1	3	*		No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.1	3	*		No		
erag brow	*Eragrostis brownii*	Brown's Lovegrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
cham drum	*Chamaesyce drummondi*	Caustic Weed	Euphorbiacea	0.1	1		Forb (FG)	No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	3		Forb (FG)	No		

BAM Site Field Survey								
Project:	Wellington Solar Farm	**Plot Identifier**	W-4	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	8/11/2019		**Compass Orientation (head of 20x20 plot)**					
Recorders	Lesley Peden		**PCT:**	266	Box Gum			
GPS Easting	32.50492	**GPS Northing**	148.95447		**Datum**		**Zone**	
Landform			**Soils**			**Drainage & Slope**		
Morphology			**Soil Texture**	Heavy		**Slope**	Flat	
LandF Element			**Soil Colour**	Red		**Aspect**	Nth	
LandF Pattern			**Soil Depth**	Shallow		**Drainage**	Good	
Microrelief			**Geology**			**Watercourses**	1 km + to troughs	

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing	2	NR	Sparse upper canopy, no midstorey
Cultivation	0		
Soil erosion	1	NR	Topsoil blown off
Firewood	2	NR	Minimal fallen timber
Grazing	2	R	Rabbits, Macropods, Sheep
Fire Damage	0		
Storm Damage	0		
Weediness	0		
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information
Current land use
Residential/semi rurla
Age class of trees (DBH range) , Condition of Vegetation, Hollows
50- 80cm DBH
Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)
Grazing
Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)
Box Gum Woodland

Dominant Species outside Plot	

Eucalyptus albens,

FUNCTION

Function attributes for	W-4
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**1**
Shrub (SG)	**0**
Forb (FG)	**3**
Grass & grasslike (GG)	**8**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL	**12**

Count of Native Richness

BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**5**
Shrub (SG)	**0**
Forb (FG)	**0.13**
Grass & grasslike (GG)	**4.2**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL Native	**9.33**
TOTAL 'HTE'	**0**

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		14	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	80%		
	15m	20%		
	25m	90%	**39.60%**	
	35m	5%		
	45m	3%		
Bare ground cover	5m	10%		
	15m	70%		
	25m	5%	**54%**	
	35m	90%		
	45m	95%		
Cryptogam cover	5m	0%		
	15m	0%		
	25m	0%	**0%**	
	35m	0%		
	45m	0%		
Rock Cover	5m	1%		
	15m	5%		
	25m	2%	**2%**	
	35m	1%		
	45m	1%		

COMPOSITION & STRUCTURE

Species recorded for	W-4								
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**
Eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.02	50		Forb (FG)	No	
Micr stip	*Microlaena stipoides*	Weeping Grass	Poaceae	0.2	20		Grass & grasslike (GG)	No	
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No	
euca albe	*Eucalyptus albens*	White Box	Myrtaceae	5	1		Tree (TG)	No	
trif arve	*Trifolium arvense*	Haresfoot Clover	Fabaceae (Fat	0.01	3	*		No	
both macr	*Bothriochloa macra*	Red Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No	
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	2	200		Grass & grasslike (GG)	No	
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fat	0.1	10	*		No	
aust bige	*Austrostipa bigeniculata*	Yanganbil	Poaceae	1	50		Grass & grasslike (GG)	No	
dich repe	*Dichondra repens*	Kidney Weed	Convolvulace	0.1	200		Forb (FG)	No	
malv negl	*Malva neglecta*	Dwarf Mallow	Malvaceae	0.01	1	*		No	
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.01	5		Forb (FG)	No	
ryti caes	*Rytidosperma caespitosum*	Ringed Wallaby Grass	Poaceae	0.2	20		Grass & grasslike (GG)	No	
cent eryt	*Centaurium erythraea*	Common Centaury	Gentianaceae	0.01	1	*		No	
aust aris	*Austrostipa aristiglumis*	Plains Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No	
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	0.5	20		Grass & grasslike (GG)	No	
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	0.1	5	*		No	
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	0.01	1	*		No	

BAM Site Field Survey								
Project:	Wellington Solar	**Plot Identifier**	W-5	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	8/11/2019		**Compass Orientation (head of 20x20 plot)**					
Recorders			**PCT:**					
GPS Easting	-4.75398E-05	**GPS Northing**	148.961589/6399330.91	**Datum**		**Zone**		
Landform			**Soils**			**Drainage & Slope**		
Morphology			**Soil Texture**	fine		**Slope**	5 degrees	
LandF Element			**Soil Colour**	orange		**Aspect**	SW	
LandF Pattern			**Soil Depth**	Shallow		**Drainage**	good	
Microrelief			**Geology**			**Watercourses**	dam 10m	

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing	3	NR	
Cultivation	3	NR	
Soil erosion	2	NR	
Firewood	3	NR	
Grazing	3	R	Cows and macropods
Fire Damage	0		
Storm Damage	0		
Weediness	1		
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

Grazing/ transgrid infrastructure nearby

Age class of trees (DBH range) , Condition of Vegetation, Hollows

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Grazing, weeds

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Box Gum Derived Woodland

Dominant Species outside Plot

FUNCTION

Function attributes for W-5

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	8
	Grass & grasslike (GG)	9
	Fern (EG)	0
	Other (OG)	0
	TOTAL	17

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0.8
	Grass & grasslike (GG)	13.5
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	14.3
	TOTAL 'HTE'	0.1

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	60%	63.00%	
	15m	40%		
	25m	70%		
	35m	70%		
	45m	75%		
Bare ground cover	5m	35%	29%	
	15m	50%		
	25m	25%		
	35m	15%		
	45m	20%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	1%	1%	
	15m	0%		
	25m	0%		
	35m	1%		
	45m	1%		

COMPOSITION & STRUCTURE

Species recorded for W-5

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllacea	0.1	1	*		No		
rume brow	*Rumex brownii*	Swamp Dock	Polygonaceae	0.1	5		Forb (FG)	No		
aust aris	*Austrostipa aristiglumis*	Plains Grass	Poaceae	5	15		Grass & grasslike (GG)	No		
both macr	*Bothriochloa macra*	Red Grass	Poaceae	5	80		Grass & grasslike (GG)	No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	30		Grass & grasslike (GG)	No		
unknown creeper	*#N/A*	#N/A	#N/A	0.1	20	#N/A		FALSE	#N/A	#N/A
Ryti caes	*Rytidosperma caespitosu*	Ringed Wallaby Grass	Poaceae	0.1	15		Grass & grasslike (GG)	No		
Aila alti	*Ailanthus altissima*	Tree of Heaven	Simaroubacea	0.1	1	*		HTE		
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	2	50		Grass & grasslike (GG)	No		
chon junc	*Chondrilla juncea*	Skeleton Weed	Asteraceae	0.2	100	*		No		
micr stip	*Microlaena stipoides*	Weeping Grass	Poaceae	0.1	50		Grass & grasslike (GG)	No		
cham drum	*Chamaesyce drummondi*	Caustic Weed	Euphorbiacea	0.1	60		Forb (FG)	No		
malv negl	*Malva neglecta*	Dwarf Mallow	Malvaceae	0.1	8	*		No		
vitt grac	*Vittadinia gracilis*	Woolly New Holland D	Asteraceae	0.1	2		Forb (FG)	No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	6		Forb (FG)	No		
aust bige	*Austrostipa bigeniculata*	Yanganbil	Poaceae	1	40		Grass & grasslike (GG)	No		
trif	*Trifolium spp.*	A Clover	Fabaceae (Fab	0.1	5	*		No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.1	5	*		No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.1	5		Forb (FG)	No		
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	0.1	10	*		No		
aven	*Avena spp.*	Oats	Poaceae	0.1	20	*		No		
Ryti carp	*Rytidosperma carphoide*	Short Wallaby Grass	Poaceae	0.1	15		Grass & grasslike (GG)	No		
trif dubi	*Trifolium dubium*	Yellow Suckling Clove	Fabaceae (Fab	0.1	5	*		No		
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fab	0.1	10	*		No		
brom hord	*Bromus hordeaceus*	Soft Brome	Poaceae	0.1	5	*		No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	3		Forb (FG)	No		
wahl	*Wahlenbergia spp.*	Bluebell	Campanulace	0.1	5		Forb (FG)	No		
elym scab	*Elymus scaber*	Common Wheatgrass	Poaceae	0.1	3		Grass & grasslike (GG)	No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	2		Forb (FG)	No		

BAM Site Field Survey

Project:	Wellington Solar	**Plot Identifier**	W-6-1	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	8/11/2019		**Compass Orientation (head of 20x20 plot)**					
Recorders	LP		**PCT:**	YES				
GPS Easting		**GPS Northing**	266		**Datum**		**Zone**	

Landform			**Soils**			**Drainage & Slope**		
Morphology			**Soil Texture**	Fine		**Slope**	1 degree	
LandF Element			**Soil Colour**	Orange		**Aspect**		
LandF Pattern			**Soil Depth**	Shallow		**Drainage**	Good	
Microrelief			**Geology**			**Watercourses**	100 m to dam	

Plot Disturbance

	Severity	**Age**	**Observational Evidence**
Clearing	3	NR	
Cultivation	3	NR	
Soil erosion	2	NR	
Firewood	3	NR	
Grazing	3	R	Macropods, cows, sheep
Fire Damage	0		
Storm Damage	0		
Weediness	2	NR	
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

Agriculture: grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Grazing, weeds

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Box Gum Woodland Derived Grassland

Dominant Species outside Plot

FUNCTION

Function attributes for W-6-1

BAM Attribute (20x20m plot)

	Stratum	**Sum**
Count of Native Richness	**Tree (TG)**	**0**
	Shrub (SG)	**0**
	Forb (FG)	**4**
	Grass & grasslike (GG)	**6**
	Fern (EG)	**0**
	Other (OG)	**0**
	TOTAL	**10**

BAM Attribute (20x20m plot)

	Stratum	**Sum**
Count of cover abundance (native vascular plants)	**Tree (TG)**	**0**
	Shrub (SG)	**0**
	Forb (FG)	**0.4**
	Grass & grasslike (GG)	**4.4**
	Fern (EG)	**0**
	Other (OG)	**0**
	TOTAL Native	**4.8**
	TOTAL 'HTE'	**0.1**

BAM Attributes (1 x 1m Plots)

	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	70%	**66.00%**	
	15m	70%		
	25m	65%		
	35m	50%		
	45m	75%		
Bare ground cover	5m	10%	**18%**	
	15m	5%		
	25m	20%		
	35m	40%		
	45m	15%		
Cryptogam cover	5m	0%	**0%**	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	3%	**1%**	
	15m	1%		
	25m	1%		
	35m	1%		
	45m	1%		

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

COMPOSITION & STRUCTURE

Species recorded for W-6-1

Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fal	0.1	1	*		No		
cham drum	*Chamaesyce drummond*	Caustic Weed	Euphorbiacea	0.1	15		Forb (FG)	No		
chon junc	*Chondrilla juncea*	Skeleton Weed	Asteraceae	0.2	100	*		No		
aust aris	*Austrostipa aristiglumis*	Plains Grass	Poaceae	1	35		Grass & grasslike (GG)	No		
trif	*Trifolium spp.*	A Clover	Fabaceae (Fal	0.1	45	*		No		
lepi afri	*Lepidium africanum*	Common Peppercres	Brassicaceae	0.1	3	*		No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	6		Forb (FG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	0.1	15		Forb (FG)	No		
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	10	500	*		No		
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	2	200		Grass & grasslike (GG)	No		
aust bige	*Austrostipa bigeniculata*	Yanganbil	Poaceae	1	100		Grass & grasslike (GG)	No		
rume brow	*Rumex brownii*	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
trif subt	*Trifolium subterraneum*	Subterranean Clover	Fabaceae (Fal	1	200	*		No		
ryti caes	*Rytidosperma caespitos*	Ringed Wallaby Gras	Poaceae	0.1	10		Grass & grasslike (GG)	No		
ryti carp	*Rytidosperma carphoide*	Short Wallaby Grass	Poaceae	0.2	50		Grass & grasslike (GG)	No		
trag porr porr	*Tragopogon porrifolius*	Salsify	Asteraceae	0.1	5	*		No		
cart lana	*Carthamus lanatus*	Saffron Thistle	Asteraceae	0.1	2	*		HTE		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		

BAM Site Field Survey

Project:	Wellington Solar Farm	**Plot Identifier**	W-6-2	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	7/11/2019	Lesley Peden	**Compass Orientation (head of 20x20 plot)**			East		
Recorders	Lesley Peden		**PCT:**	266	White Box Grassy Woodland- Derived Grassland			
GPS Easting	-32.510832	**GPS Northing**	148.97312		**Datum**		**Zone**	

Landform		**Soils**		**Drainage & Slope**	
Morphology		**Soil Texture**	Fine	**Slope**	
LandF Element		**Soil Colour**	orange/brown	**Aspect**	East
LandF Pattern		**Soil Depth**	shallow	**Drainage**	
Microrelief		**Geology**		**Watercourses**	

Plot Disturbance

	Severity	**Age**	**Observational Evidence**
Clearing	3	NR	
Cultivation	3	NR	
Soil erosion	0	NR	
Firewood	0	NR	
Grazing	2	R	cattle/ macropods/sheep
Fire Damage	0		
Storm Damage	0		
Weediness	2	R	
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

Agriculture: Grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Grazing, weeds

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Box Gum Woodland

Dominant Species outside Plot

Eucalyptus albens

FUNCTION

Function attributes for W-6-2

BAM Attribute (20x20m plot)

	Stratum	**Sum**
Count of Native Richness	**Tree (TG)**	**0**
	Shrub (SG)	**0**
	Forb (FG)	**7**
	Grass & grasslike (GG)	**10**
	Fern (EG)	**0**
	Other (OG)	**0**
	TOTAL	**17**

BAM Attribute (20x20m plot)

	Stratum	**Sum**
Count of cover abundance (native vascular plants)	**Tree (TG)**	**0**
	Shrub (SG)	**0**
	Forb (FG)	**0.7**
	Grass & grasslike (GG)	**26.7**
	Fern (EG)	**0**
	Other (OG)	**0**
	TOTAL Native	**27.4**
	TOTAL 'HTE'	**0.2**

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

BAM Attributes (1 x 1m Plots)

	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	60%		
	15m	50%		
	25m	40%	**40.00%**	
	35m	20%		
	45m	30%		
Bare ground cover	5m	20%		
	15m	15%		
	25m	10%	**22%**	
	35m	40%		
	45m	25%		
Cryptogam cover	5m	0%		
	15m	0%		
	25m	0%	**0%**	
	35m	0%		
	45m	0%		
Rock Cover	5m	2%		
	15m	3%		
	25m	2%	**3%**	
	35m	5%		
	45m	1%		

COMPOSITION & STRUCTURE

Species recorded for W-6-2

Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
vitt grac	*Vittadinia gracilis*	Woolly New Holland D	Asteraceae	0.1	30		Forb (FG)	No		
chon junc	*Chondrilla juncea*	Skeleton Weed	Asteraceae	0.5	200	*		No		
Vulp	*Vulpia spp.*	Rat's-tail Fescue	Poaceae	0.1	10	*		No		
trif	*Trifolium spp.*	A Clover	Fabaceae (Fab	0.1	40	*		No		
Trif subt	*Trifolium subterraneum*	Subterranean Clover	Fabaceae (Fab	0.1	40	*		No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.1	50	*		No		
them tria	*Themeda triandra*		Poaceae	0.2	10		Grass & grasslike (GG)	No		
cham drum	*Chamaesyce drummondi*	Caustic Weed	Euphorbiacea	0.1	2		Forb (FG)	No		
pani effu	*Panicum effusum*	Hairy Panic	Poaceae	0.2	40		Grass & grasslike (GG)	No		
Alte nana	*Alternanthera nana*	Hairy Joyweed	Amaranthace	0.1	1		Forb (FG)	No		
salv verb	*Salvia verbenaca*	Vervain	Lamiaceae	0.1	5	*		No		
hord lepo	*Hordeum leporinum*	Barley Grass	Poaceae	5	10	*		No		
sonc aspe	*Sonchus asper*	Prickly Sowthistle	Asteraceae	0.1	5	*		No		
cart lana	*Carthamus lanatus*	Saffron Thistle	Asteraceae	0.1	5	*		HTE		
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fab	0.2	40	*		No		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	0.1	3	*		No		
ryti caes	*Rytidosperma caespitosu*	Ringed Wallaby Grass	Poaceae	25	500		Grass & grasslike (GG)	No		
ryti carp	*Rytidosperma carphoide*	Short Wallaby Grass	Poaceae	0.2	20		Grass & grasslike (GG)	No		
hypo radi	*Hypochaeris radicata*	Catsear	Asteraceae	0.1	5	*		No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.1	3		Forb (FG)	No		
malv negl	*Malva neglecta*	Dwarf Mallow	Malvaceae	0.1	10	*		No		
trif arve	*Trifolium arvense*	Haresfoot Clover	Fabaceae (Fab	0.1	5	*		No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.5	50		Grass & grasslike (GG)	No		
both macr	*Bothriochloa macra*	Red Grass	Poaceae	0.2	5		Grass & grasslike (GG)	No		
erag brow	*Eragrostis brownii*	Brown's Lovegrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
Sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	4		Forb (FG)	No		
enne nigr	*Enneapogon nigricans*	Niggerheads	Poaceae	0.1	1		Grass & grasslike (GG)	No		
trif dubi	*Trifolium dubium*	Yellow Suckling Clove	Fabaceae (Fab	0.1	10	*		No		
aila alti	*Ailanthus altissima*	Tree of Heaven	Simaroubacea	0.1	2	*		HTE		

BAM Site Field Survey

Project:	Wellington Solar	**Plot Identifier**	W-6-3	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	8/11/2019		**Compass Orientation (head of 20x20 plot)**			East		
Recorders	Lesley Peden		**PCT:**	266	White Box Grassy Woodland- Derived Grassland			
GPS Easting	32.51083	**GPS Northing**	148.97313		**Datum**		**Zone**	

Landform			**Soils**			**Drainage & Slope**		
Morphology			**Soil Texture**	Dry		**Slope**		
LandF Element			**Soil Colour**	Red		**Aspect**	West	
LandF Pattern			**Soil Depth**	Shallow		**Drainage**		
Microrelief			**Geology**			**Watercourses**	1 km to dam	

Plot Disturbance

	Severity	**Age**	**Observational Evidence**
Clearing	3	NR	
Cultivation	3	NR	
Soil erosion	1	NR	Wind blown topsoil
Firewood	3	NR	
Grazing	3	R	Macropods (R), Cattle (NR)
Fire Damage			
Storm Damage			
Weediness	1	R/NR	
Other			

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

Agriculture, grazing

Age class of trees (DBH range) , Condition of Vegetation, Hollows

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Grazing, weeds

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Box Gum Woodland

Dominant Species outside Plot	

Brachychiton populneus near road

FUNCTION

Function attributes for	**W-6-3**

BAM Attribute (20x20m plot)

	Stratum	**Sum**
Count of Native Richness	**Tree (TG)**	**0**
	Shrub (SG)	**0**
	Forb (FG)	**6**
	Grass & grasslike (GG)	**4**
	Fern (EG)	**0**
	Other (OG)	**1**
	TOTAL	**11**

BAM Attribute (20x20m plot)

	Stratum	**Sum**
Count of cover abundance (native vascular plants)	**Tree (TG)**	**0**
	Shrub (SG)	**0**
	Forb (FG)	**0.6**
	Grass & grasslike (GG)	**0.4**
	Fern (EG)	**0**
	Other (OG)	**0.1**
	TOTAL Native	**1.1**
	TOTAL 'HTE'	**0.2**

BAM Attributes (1 x 1m Plots)

	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	15%		
	15m	70%		
	25m	30%	**44.00%**	
	35m	60%		
	45m	45%		
Bare ground cover	5m	75%		
	15m	20%		
	25m	50%	**42%**	
	35m	15%		
	45m	50%		
Cryptogam cover	5m	0%		
	15m	0%		
	25m	0%	**0%**	
	35m	0%		
	45m	0%		
Rock Cover	5m	0%		
	15m	0%		
	25m	0%	**0%**	
	35m	1%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

COMPOSITION & STRUCTURE

Species recorded for W-6-3

Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
Chon junc	*Chondrilla juncea*	Skeleton Weed	Asteraceae	1	1	*		No		
Medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fat	0.1	4	*		No		
vitt grac	*Vittadinia gracilis*	Woolly New Holland D	Asteraceae	0.1	10		Forb (FG)	No		
Eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.1	4		Forb (FG)	No		
Sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	30		Forb (FG)	No		
conv angu	*Convolvulus angustissim*		Convolvulace	0.1	20		Other (OG)	No		
Pani effu	*Panicum effusum*	Hairy Panic	Poaceae	0.1	5		Grass & grasslike (GG)	No		
Malv negl	*Malva neglecta*	Dwarf Mallow	Malvaceae	0.1	2	*		No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
Sonc aspe	*Sonchus asper*	Prickly Sowthistle	Asteraceae	0.1	1	*		No		
trif dubi	*Trifolium dubium*	Yellow Suckling Clover	Fabaceae (Fat	0.1	1	*		No		
ryti caes	*Rytidosperma caespitosu*	Ringed Wallaby Grass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
medi sati	*Medicago sativa*	Lucerne	Fabaceae (Fat	0.1	1	*		No		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	0.1	2	*		No		
cart lana	*Carthamus lanatus*	Saffron Thistle	Asteraceae	0.1	5	*		HTE		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	10		Forb (FG)	No		
trif subt	*Trifolium subterraneum*	Subterranean Clover	Fabaceae (Fat	0.1	10	*		No		
salv verb	*Salvia verbenaca*	Vervain	Lamiaceae	0.1	6	*		No		
wahl	*Wahlenbergia spp.*	Bluebell	Campanulace	0.1	1		Forb (FG)	No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.1	3	*		No		
cham drum	*Chamaesyce drummondi*	Caustic Weed	Euphorbiacea	0.1	1		Forb (FG)	No		
both macr	*Bothriochloa macra*	Red Grass	Poaceae	0.1	4		Grass & grasslike (GG)	No		
vulp	*Vulpia spp.*	Rat's-tail Fescue	Poaceae	0.1	50	*		No		
sida	*Sida spp.*		Malvaceae	0.1	3	*		No		
hirs inca	*Hirschfeldia incana*	Buchan Weed	Brassicaceae	0.1	1	*		No		
heli ampl	*Heliotropium amplexicau*	Blue Heliotrope	Boraginaceae	0.1	1	*		HTE		

APPENDIX B EPBC ASSESSMENT OF SIGNIFICANT IMPACT

The *Environment Protection and Biodiversity Conservation Act* 1999 specifies factors to be considered in deciding whether a development is likely to significantly affect Endangered Ecological Communities, threatened species and migratory species, listed at the Commonwealth level. The following assessment assesses the significance of the likely impacts associated with the proposed works on:

- White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands. (Critically Endangered Ecological Community)
- Regent Honeyeater (*Anthochaera phrygia*) – Critically Endangered EPBC Act.
- Swift Parrot (*Lathamus discolor*) – Critically Endangered EPBC Act.
- Koala (*Phascolarctos cinereus*) – Vulnerable EPBC Act.
- Corben's Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable EPBC Act.
- Large-eared Pied Bat (*Chalinolobus dwyeri)* – Vulnerable EPBC Act.
- Small Purple Pea (*Swainsona recta*) – Endangered EPBC Act.
- Euphrasia arguta (*Euphrasia arguta)* - Endangered EPBC Act.
- Painted Honey-eater (*Grantiella picta)* – Vulnerable EPBC Act.
- Spotted-tailed Quail (*Dasyurus maculatus*) – Endangered EPBC Act.
- Brush-tailed Rock-Wallaby(*Petrogale penicillata*)– Vulnerable EPBC Act.
- Grey-headed Flying-fox (*Pteropus poliocephalus)* – Vulnerable EPBC Act.
- Pink-tailed Legless-lizard (*Aprasia parapulchella)* – Vulnerable EPBC Act.
- Striped Legless Lizard (*Delma impar)* – Vulnerable EPBC Act.

Surveys in 2017 and flora surveys and assessment in 2019, (NGH 2017) demonstrate that the Swift Parrot, Regent Honeyeater, Koala, Euphrasia arguta, Painted Honey-eater, Large-eared Pied Bat, Spotted-tailed Quoll, Brush-tailed Rock-wallaby, Grey-headed Flying-fox and Small Purple-pea are unlikely to occur within the development footprint presented in this report. Therefore, the following species and communities will be addressed here:

- White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived native grasslands. (Critically Endangered Ecological Community)
- Corben's Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable EPBC Act.

Different significant impact criteria apply depending on the level at which a species or community is listed (i.e. vulnerable, endangered, critically endangered etc.). The appropriate criteria have been applied to the entities listed above in the assessment below.

WHITE BOX – YELLOW BOX – BLAKELY'S RED GUM GRASSY WOODLAND AND DERIVED NATIVE GRASSLANDS (CRITICALLY ENDANGERED ECOLOGICAL COMMUNITY)

No EPBC listed Box Gum Woodland exists within the current development footprint. Therefore, there is not going to be an impact upon this TEC due to this development.

CORBEN'S LONG-EARED BAT (VULNERABLE)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

lead to a long-term decrease in the size of an important population of a species

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

No known records of this species occur within the locality of the proposal area. A Nyctophilus species was detected through the ANABAT in 2017 however the species could not be identified from calls alone. Suitable habitat for this species occurs within the proposal area. The consented solar farm layout will remove a total of 16 hollow-bearing trees, suitable for roosting for Corben's Long-eared Bat this proposal will not contribute to additional HBTs being removed. The foraging habitat contained within the development site is considered to be sub-optimal, with no shrub or small tree layers present, and would likely only be utilised on occasion. The species is considered likely, were it to occur within the development site not to be reliant on the trees within development footprint but may utilise the larger Solar Farm development site as a roosting resource. The higher quality remnants of vegetation containing similar densities of hollow-bearing trees and higher-quality understory and foraging habitat have been avoided by the larger Solar Farm proposal, thus the species is considered likely to remain viable within the proposal area, were it present. The proposal is not considered likely to lead to a long-term decrease in the size of an important population of the species.

reduce the area of occupancy of an important population,

There will be a reduction of approximately 0.06 ha of moderate to good quality woodland vegetation. The species is highly mobile and is considered likely to use a number of woodland areas surrounding the larger Solar Farm area, including the higher quality habitats within the proposal area, that have been avoided. The proposal area will continue to contain suitable areas of roosting and foraging habitat of a sufficient size and quality to maintain a population of the species within the proposal area and the wider locality.

fragment an existing important population into two or more populations

Vegetative connectivity within the proposal area will be maintained and improved through planting and avoidance of impacts to vegetation. As the species is highly mobile, roosts singly or in pairs and relocates between multiple roost locations over successive nights (TSSC, 2015), the proposal will not impact on its movement within or across the proposal area.

adversely affect habitat critical to the survival of a species

No habitat critical to the survival of the species exists within the development site. Suitable foraging and roosting habitats represented within the proposal area have been avoided by the proposal and will be retained, thus ensuring that these habitats are not adversely affected.

disrupt the breeding cycle of an important population

The species is known to roost in large dead stags in NSW (DoE, 2015). No additional hollow bearing trees are to be removed within the proposed Development Footprint, therefore breeding is unlikely to be disrupted.

modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline

The proposal will remove approximately 0.06 ha of moderate to good quality woodland vegetation containing native canopy and native understorey species. The vegetation to be removed as a result of the proposal is considered to constitute low quality foraging habitat and no potential roosting and breeding habitat. However, the modification and removal of this habitat is not considered likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, as higher quality areas of suitable habitat have been avoided and will be retained within the proposal area, ensuring that areas of suitable habitat remain. As such, the impacts to habitat are not considered likely to be such that the species is likely to decline, were it present within the development site.

result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat

Nyctophilus species are typically impacted by cats due to their slow flight and ground foraging habits. The proposal will modify the current land use, potentially creating additional shelter habitat for predatory invasive species such as foxes and cats, which are considered likely to be locally prevalent regardless of the proposal. A management plan will be prepared and implemented which will monitor and manage these species within the proposal area and offset area.

introduce disease that may cause the species to decline

The proposal is not considered likely to introduce any diseases that would impact the species.

interfere substantially with the recovery of the species

Considering the small areas of potential foraging and minimal potential roosting habitat to be removed, the mitigation measures in place to avoid impacts to individuals and that substantial habitat will remain within the broader proposal area and locality, the proposal is unlikely to interfere with the recovery of Corben's Long-eared Bat.

Conclusion:

The proposal will remove 0.06 ha of moderate to good quality woodland vegetation. The habitat to be impacted is considered to constitute low-quality foraging habitat and would likely only be utilised on occasion. Roosting is unlikely to be impacted as there are no additional hollow bearing trees proposed for removal within the development footprint; however. It is likely that within the larger solar farm this species will utilise multiple roost hollows over successive nights, up to 4km apart (TSSC, 2015). As such, it is likely that any individuals utilising the larger solar farm site would only do so on occasion. Significant areas of better-quality habitat have been avoided by the proposal and will be retained within the larger Solar Farm area. It is considered likely that, were the species present within the development site, the population would remain viable within the broader proposal area. As such, the proposal is unlikely to significantly impact the species, and a referral under the EPBC Act is not required.

APPENDIX C BAM CALCULATOR CREDIT REPORTS

C.1 ADDITIONAL AREAS

BAM Credit Summary Report

Proposal Details

Assessment Id
00018234/BAAS19015/19/00018235

Proposal Name
Wellington BDAR - infrastructure movement within proposal area

BAM data last updated *
26/11/2019

Assessor Name

Report Created
10/03/2020

BAM Data version *
22

Assessor Number

BAM Case Status
Open

Date Finalised
To be finalised

Assessment Revision
0

Assessment Type
Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion								
2	277_Zone1_addition	6.1	0.0	0.25	High Sensitivity to Potential Gain	2.00	TRUE	0
							Subtotal	**0**
White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion								
1	266_Zone3_addition	21.4	0.1	0.25	High Sensitivity to Potential Gain	2.00	TRUE	1
3	266_Zone4_addition	26.5	0.0	0.25	High Sensitivity to Potential Gain	2.00	TRUE	1
4	266_Zone5_addition	30.0	0.1	0.25	High Sensitivity to Potential Gain	2.00	TRUE	1
5	266_Zone6_addition	31.3	4.1	0.25	High Sensitivity to Potential Gain	2.00	TRUE	64
							Subtotal	**67**
							Total	**67**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits
Burhinus grallarius / Bush Stone-curlew (Fauna)						
266_Zone3_addition	21.4	0	0.25	2	False	0
277_Zone1_addition	6.1	0	0.25	2	False	0
266_Zone4_addition	26.5	0.01	0.25	2	False	0

266_Zone5_addition	30.0	0	0.25	2	False	0
266_Zone6_addition	31.3	0	0.25	2	False	0
					Subtotal	**0**
Haliaeetus leucogaster / White-bellied Sea-Eagle (Fauna)						
266_Zone3_addition	21.4	0.06	0.25	2	False	1
277_Zone1_addition	6.1	0.03	0.25	2	False	0
266_Zone4_addition	26.5	0.01	0.25	2	False	0
266_Zone5_addition	30.0	0	0.25	2	False	0
266_Zone6_addition	31.3	0	0.25	2	False	0
					Subtotal	**1**
Hieraaetus morphnoides / Little Eagle (Fauna)						
266_Zone3_addition	21.4	0.06	0.25	1.5	False	0
277_Zone1_addition	6.1	0.03	0.25	1.5	False	0
266_Zone4_addition	26.5	0.01	0.25	1.5	False	0
266_Zone5_addition	30.0	0	0.25	1.5	False	0
266_Zone6_addition	31.3	0	0.25	1.5	False	0
					Subtotal	**0**
Lophoictinia isura / Square-tailed Kite (Fauna)						
266_Zone3_addition	21.4	0.06	0.25	1.5	False	0
277_Zone1_addition	6.1	0.03	0.25	1.5	False	0
266_Zone4_addition	26.5	0.01	0.25	1.5	False	0

266_Zone5_addition	30.0	0	0.25	1.5	False	0
266_Zone6_addition	31.3	0	0.25	1.5	False	0
					Subtotal	**0**

C.2 EXCISED AREAS

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00018234/BAAS19015/19/00018235	Wellington BDAR - infrastructure movement within proposal area	26/11/2019
Assessor Name	Report Created	BAM Data version *
	10/03/2020	22
Assessor Number	BAM Case Status	Date Finalised
	Open	To be finalised
Assessment Revision	Assessment Type	
1	Major Projects	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	Vegetation integrity loss / gain	Area (ha)	Constant	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits

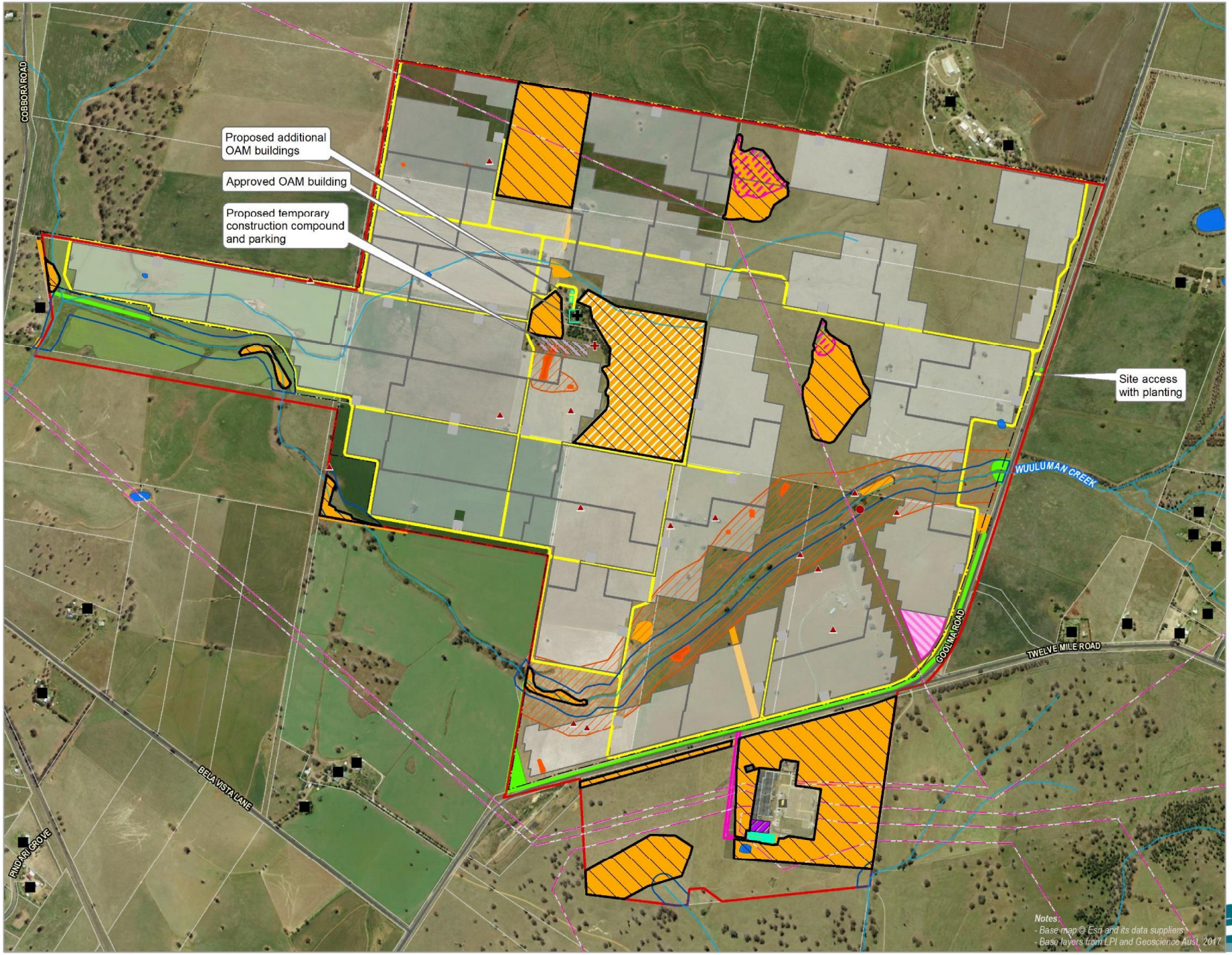
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion								
3	277_Zone1_excised	6.1	0.0	0.25	High Sensitivity to Potential Gain	2.00	TRUE	0
							Subtotal	**0**
White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion								
1	266_Zone2_excised	12.3	0.0	0.25	High Sensitivity to Potential Gain	2.00	TRUE	0
2	266_Zone3_excised	21.4	0.2	0.25	High Sensitivity to Potential Gain	2.00	TRUE	2
4	266_Zone5_excised	29.9	0.3	0.25	High Sensitivity to Potential Gain	2.00	TRUE	5
5	266_Zone6_excised	24.4	10.6	0.25	High Sensitivity to Potential Gain	2.00	TRUE	129
							Subtotal	**136**
							Total	**136**

Species credits for threatened species

Vegetation zone name	Habitat condition (HC)	Area (ha) / individual (HL)	Constant	Biodiversity risk weighting	Potential SAII	Species credits
Burhinus grallarius / Bush Stone-curlew (Fauna)						
266_Zone2_excised	12.3	0	0.25	2	False	0
266_Zone3_excised	21.4	0	0.25	2	False	0
277_Zone1_excised	6.1	0	0.25	2	False	0

266_Zone5_excised	29.9	0	0.25	2	False	0
266_Zone6_excised	24.4	0	0.25	2	False	0
					Subtotal	**0**
Haliaeetus leucogaster / White-bellied Sea-Eagle (Fauna)						
266_Zone2_excised	12.3	0.03	0.25	2	False	0
266_Zone3_excised	21.4	0.22	0.25	2	False	2
277_Zone1_excised	6.1	0.01	0.25	2	False	0
266_Zone5_excised	29.9	0	0.25	2	False	0
266_Zone6_excised	24.4	0	0.25	2	False	0
					Subtotal	**2**
Hieraaetus morphnoides / Little Eagle (Fauna)						
266_Zone2_excised	12.3	0.03	0.25	1.5	False	0
266_Zone3_excised	21.4	0.22	0.25	1.5	False	2
277_Zone1_excised	6.1	0.01	0.25	1.5	False	0
266_Zone5_excised	29.9	0	0.25	1.5	False	0
266_Zone6_excised	24.4	0	0.25	1.5	False	0
					Subtotal	**2**
Lophoictinia isura / Square-tailed Kite (Fauna)						
266_Zone2_excised	12.3	0.03	0.25	1.5	False	0
266_Zone3_excised	21.4	0.22	0.25	1.5	False	2
277_Zone1_excised	6.1	0.01	0.25	1.5	False	0

266_Zone5_excised	29.9	0	0.25	1.5	False	0
266_Zone6_excised	24.4	0	0.25	1.5	False	0
					Subtotal	**2**



GENERAL LAYOUT OF DEVELOPMENT

Wellington Solar Farm

- Project boundary
- Development exclusion zone (excluding rehabilitation undertaken in accordance with the Biodiversity Management Plan)
- Existing substation
- Local road
- Highway
- Existing transmission lines
- Farm dam / other water body
- Drainage line
- Drainage line 40m buffer
- Access gate

Approved infrastructure

- Landscaping (5m wide planting)
- Approved landscaping grove
- Existing homestead/Approved OAM

Proposed infrastructure

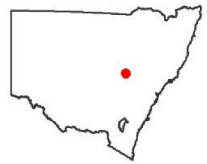
- Proposed battery storage area
- Proposed fence
- Proposed temporary laydown area and parking / turning circle
- Proposed internal road/ underground transmission line
- Proposed array/inverter layout
- Inverter
- Proposed inverter blocks
- Proposed underground transmission line corridor
- Proposed substation bench
- Proposed substation expansion
- Proposed OAM building

Constraints

- Aboriginal heritage item (isolated find)
- Aboriginal heritage item (artefact scatter)
- Hearth site
- Potential archaeological deposit (PAD)
- Scarred tree
- Historic heritage site (OAM building)
- Sensitive receiver
- Potential rocky outcrops

Vegetation exclusion zones

- Vegetation constraint (CEEC)
- Vegetation constraint (EEC moderate to good condition)
- Cadastre



0 50 100 200 m

A3 @ 1:12,500
Ref: 19-134 EIS v251119
Author: TH Date: 4/02/2020

Notes:
- Base map © Esri and its data suppliers
- Base layers from LPI and Geoscience Aust, 2017

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