First Solar

Biodiversity Offset Strategy

BERYL SOLAR FARM

JUNE 2017

ngh environmental

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BIODIVERSITY OFFSET STRATEGY

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ACRONYMS AND ABBREVIATIONS

BAR	Biodiversity Assessment Report
BCC	BioBanking Credit Calculator
BOS	Biodiversity Offset Strategy
CEEC	Critically Endangered Ecological Community
DP&E	NSW Department of Planning and Environment
EEC	Endangered Ecological Community
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
FBA	Framework for Biodiversity Assessment
ha	Hectares
km	Kilometres
m	Metres
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage (formerly DECCW)
PCTs	Plant Community Types
TSC Act	*Threatened Species Conservation Act 1995* (NSW)

1 INTRODUCTION

1.1 PURPOSE OF THIS REPORT

This Biodiversity Offset Strategy (BOS) outlines a broad approach for meeting the offset requirements for the Beryl Solar Farm proposal in accordance with the NSW Framework for Biodiversity Assessment FBA. The offset requirements for the proposal have been determined according to the FBA through the preparation of a Biodiversity Assessment Report (BAR) (NGH Environmental 2017). These requirements are summarised in Section 2 below.

Under Section 11.2 of the FBA, ecosystem and species credit requirements identified for the project can be offset in a number of ways, including:

a) Retirement of biodiversity credits from the biodiversity register established under Part 7A of the TSC Act (which would include retiring credits via a BioBanking agreement)
b) Ecological rehabilitation of previously mined land in accordance with Section 12.2 of the FBA
c) Supplementary measures as determined in accordance with the NSW Biodiversity Offsets Policy for Major Projects (If appropriate offsets are not feasible, proponents can provide funds equivalent to those required to purchase biodiversity credits)
d) A combination of the above.

Option a) Retiring credits via a BioBanking agreement is the preferred approach to retire the required credits. This BOS aims to demonstrate that the vegetation retained within the proposal area is of a suitable quantum to provide an adequate offset for the unavoidable impacts to native vegetation generated by the proposal. Where possible, the BOS will aim to match ecosystem and species credits on a 'like for like' basis through the retirement of biodiversity credits, in accordance with the credit profiles provided in the project's credit report. Where this is not possible, supplementary measures may be investigated in consultation with the consent authority.

This BOS documents the following key components required by the FBA:

- Offset site identification — Section 3
- Improvement in biodiversity values at the offset site — Section 4
- Rehabilitation Site identification and supplementary measures — Section 0
- A summary of biodiversity offset measures — Section 6

In addition, a summary of the offset requirements determined in the BAR is provided in Section 2.

1.2 PROJECT BACKGROUND

First Solar Pty Ltd proposes to develop approximately 200 ha of the 300 ha proposal site for the purpose of a solar farm within the Beryl locality. The Beryl Solar Farm would include the following elements:

- PV modules mounted on a fixed or tracking structure.
- 22-40 inverter stations with associated transformer.
- An onsite substation containing one transformer and associated switchgear.
- A 66kV transmission line to the adjacent existing Beryl Substation (300m).
- Underground electrical conduits and cabling to connect the inverters to the onsite substation

- Underground and aboveground (mounted to module structure) DC cabling to connect the modules to the inverter stations.
- An access track off Beryl Road.
- Permanent Site office and maintenance building with associated vehicle parking.
- Internal access tracks to allow for site maintenance.
- Perimeter security fencing up to 2.3m high.
- Native vegetation screening, where required to break up views of infrastructure to specific receivers.

An Environmental Impact Statement (EIS) was prepared to assess the impacts of the proposal, which included the preparation of a Biodiversity Assessment Report (BAR) in accordance with the NSW Framework for Biodiversity Assessment (FBA) (NSW Office of Environment and Heritage, 2014a).

The EIS was submitted in April 2017, and a review was undertaken by relevant approval bodies, including the NSW Department of Planning and Environment (DP&E), and the NSW Office of Environment and Heritage (OEH). A response to the EIS submission was provided by OEH on the 3rd of March, 2017, which assessed the EIS as not meeting the environmental assessment requirements with respect to biodiversity, as the BAR did not contain a BOS to account for impacts to native vegetation.

The BAR identified the proposal would impact on native vegetation, including removal of approximately 17 ha of vegetation that meets the definition of the White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland Endangered Ecological Community (EEC) listed under the NSW Threatened Species Conservation Act 1995 (TSC Act). Under the FBA, the removal of this native vegetation generates 684 ecosystem credits that are required to be offset by the project/proponent.

This BOS has been prepared to account for impacts to native vegetation and to detail how the ecosystem credit points generated by the Beryl SF will be offset. It is intended to be submitted as part of the Submissions Report for the project.

2 OFFSET REQUIREMENTS

2.1 ECOSYSTEM CREDITS

The BAR (Section 7.5) determined that a total of 684 ecosystem credits were required to be offset for the development (BioBanking Credit Calculator (BCC) Major Project 0035/2017/4165MP Version 1). The BCC full credit report for the development site is provided in **Error! Reference source not found.**.

The credits required are comprised of a single Plant Community Type (PCT) across two identified vegetation zones (based on biometric condition) as detailed in Table 2-1.

Table 2-1 Impact and Offset Credit Summary

Plant Community Type		Biometric Vegetation Condition	Impact area / Credits generated by clearing	
Number	Name		Area (Ha)	Credits
281	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (CW111)	Moderate -Good	0.99	54
281	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (CW111)	Low	16.14	630
Total			**17.13**	**684**

2.2 SPECIES CREDITS

No species credits are required to be offset for the project.

3 IDENTIFICATION OF SUITABLE OFFSETS

A search of the Biobanking Credit Register was undertaken on 23/06/2017. No biobanking credits were available for Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (CW111). A preliminary BioBanking Assessment has been undertaken to provide certainty to consent authorities that a suitable quantum of ecosystem credits to form an appropriate offset to unavoidable impacts are available within the patches of vegetation outside of the development envelope within the proposal area.

3.1 OFFSET SITE IDENTIFICATION

Field survey of the Beryl Solar Farm site was conducted in November 2016. As part of this survey, vegetation mapping was conducted within both the impact footprint and adjacent areas of the proposal site. PCTs were identified with reference to the NSW Vegetation Information System Database (OEH, 2016).

Vegetation plots, in accordance with the FBA methodology, were undertaken within all homogenous vegetation zones across the site. This included plots within the impact area as well as the proposed offset areas. Aerial photographic imagery was also used to interpret to assess boundaries of vegetation communities and community extents.

The vegetation mapping across the proposal area resulted in the identification of approximately 100 ha of vegetation communities outside the development envelope. This area is available to be secured as an *in-perpetuity* biodiversity offset for the project and contains the PCT required for offsets as documented in Section 2. The area to be offset is comprised of two components; a western and eastern area, within the broader proposal area. The areas of the PCT to be dedicated for offset are summarised in Table 3-1 below and are shown in Figure 3-1.

Table 3-1 Areas of vegetation communities mapped outside the development envelope during field survey to be included in the offset site.

Plant Community Type	Community	Condition/ description	Vegetation Zone	Area (ha)
281	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (CW111)	Moderate to good (woodland in good condition)	1	4.43
281	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (CW111)	Moderate to good (woodland in moderate condition)	2	4.21
281	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western	Low (woodland in poor condition	3	0.68

Plant Community Type	Community	Condition/ description	Vegetation Zone	Area (ha)
	Slopes Bioregion and Brigalow Belt South Bioregion (CW111)			
281	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (CW111)	Low (derived grassland in poor condition)	4	66.47
400	Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion (CW248)	Moderate to good (ephemeral wetland vegetation in mixed condition)	5	1.69
Total				**77.48**

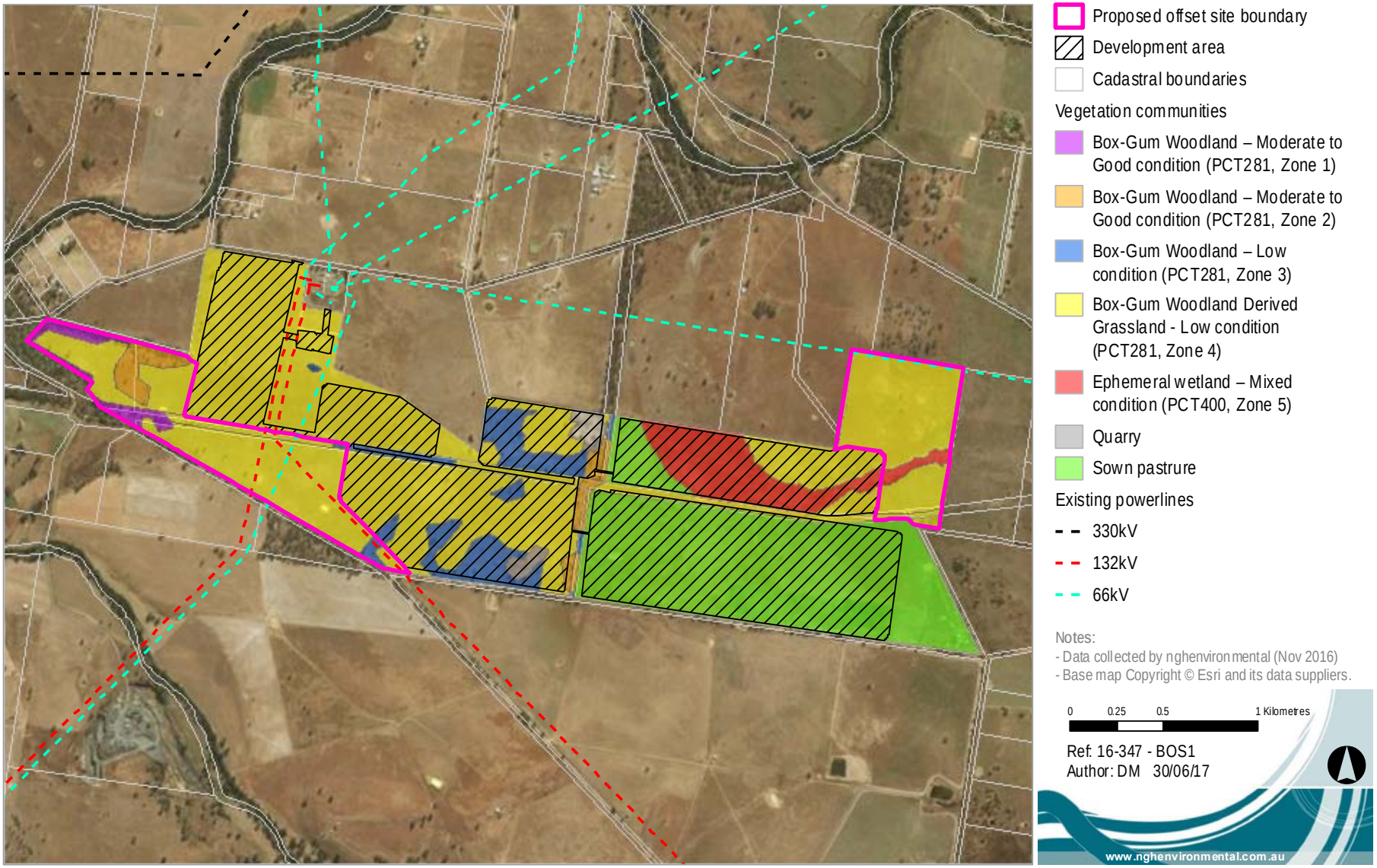

Figure 3-1 Proposed Offset Areas

3.2 GENERAL DESCRIPTION OF OFFSET AREAS

3.2.1 Plant Community Types

As mapped on Figure 3-2, two PCTs occur in the proposed offset areas:

- Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (PCT 281)
- Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion (PCT400)

Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (PCT 281)

Within the offset areas, PCT281 *Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion* occurs as patches of moderate to good condition woodland in the western offset area (Figure 3-2), and areas of low condition derived grasslands across the remainder of the western offset area and the majority of the eastern offset area (Figure 3-3). The low condition areas represent highly degraded pasture, and it is considered likely that most of these areas have been cultivated and possibly cropped in the past.

The dominant tree species in the community where it occurs within the development site consisted of the Rough-barked Apple (*Angophora floribunda*), although this species is mixed/co-dominant with Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum *(E. blakelyi*) in woodland patches immediately surrounding the site. This suggests the Yellow Box and Blakely's Red Gum have historically been selectively removed (for the timber/firewood) from the offset areas.

The understorey vegetation included a relatively sparse midstorey vegetation layer comprised primarily of younger/regrowth Rough-barked Apple, Yellow Box and Blakely's Red Gum, with very few native shrubs. The groundcover vegetation characteristics included patches of native perennial grasses, particularly across the western offset area, whilst the eastern offset area is largely dominated by exotic pasture species.

Patches of moderate – good and low condition structural woodland (vegetation zones 1, 2 and 3), meet the criteria for the NSW TSC Act listed EEC *White Box Yellow Box Blakely's Red Gum Woodland; Box Gum Woodland*.

Additionally, the 4.43 ha of vegetation within Zone 1 also meets the criteria of the Critically Endangered Ecological Community (CEEC) *White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland* listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion (PCT400)

The proposed eastern offset area contains a small area somewhat representative of 'riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion (CW248)'. This vegetation was previously included as a zone of the Rough-Barked Apple – Red Gum – Yellow Box woodland community (PCT281) within the BAR. It did not generate credits in the BAR as it was not considered to comprise an EEC (based on species composition and structure) and did not provide threatened species

habitat. Further investigation, has determined that this vegetation would be more appropriately assigned to the riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion (CW248) community (PCT400). This is discussed further in the submission report for the proposal (NGH Environmental, Beryl Solar Farm Submission Report 2017).

This ephemeral wetland community is not considered to comprise an EEC listed under the TSC Act or EPBC Act. It is also highly degraded, having been subject to past pasture improvement practices and is largely dominated by exotic grasses. The native component is dominated by wet area species such as *Eleocharis, Juncus, Isolepis* and *Carex.*

Figure 3-2 Moderate to good woodland vegetation (PCT281) in the western offset area

Figure 3-3 Low condition derived grassland in the western offset area (left) and an example from the adjacent development site (right)

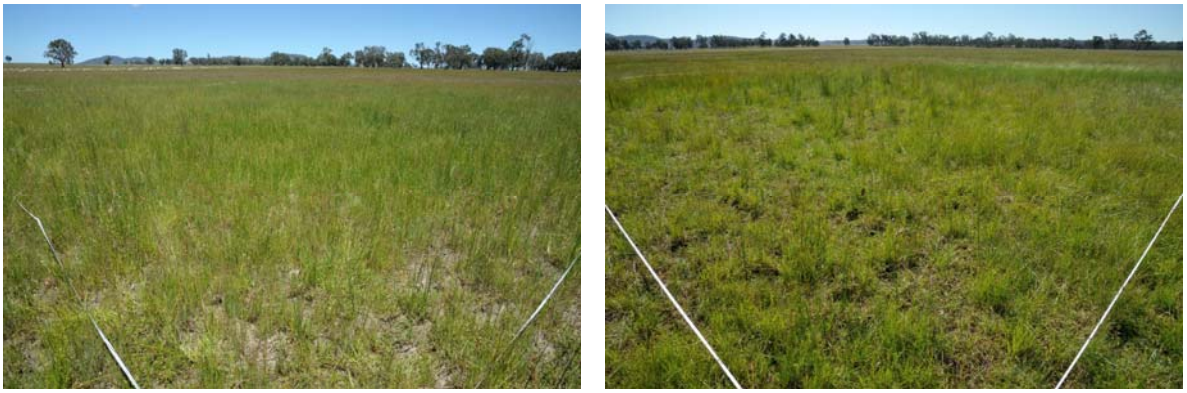

Figure 3-4 Ephemeral wetland vegetation just to the west of the eastern offset area

3.2.2 Threatened species

Two threatened flora species are present within the western offset area; the Pine Donkey Orchid (*Diuris tricolor*) and Silky Swainson-pea (*Swainsona sericea*) (Figure 3-5). A total of four Pine Donkey Orchid individuals were recorded and 38 Silky Swainson-pea. The locations of these threatened flora species are shown on Figure 3-6.

No species credits are required to be offset as part of the project. As such, these species credits generated by the offset site could be retired to offset the impacts of other local developments, in accordance with the FBA and Biobanking market system.

Figure 3-5 Examples of threatened flora species that occur within the western offset area. *Diuris tricolor* (left) and *Swainsona sericea* (right)

3.2.3 Existing infrastructure

Three existing power lines cross the western offset site comprising of two 132kV and one 66kV lines and one 66kV line crosses the northern boundary of the eastern offset site (refer Figure 3-1). These power lines have associated easements which for the purposes of this assessment, have been assumed to be 45m which is a general standard for 132kV overhead lines (TransGrid 2017). Theses easements would need to be maintained free of overstorey vegetation and this has been considered in the credit calculations for the offset site (refer Section 4.1)

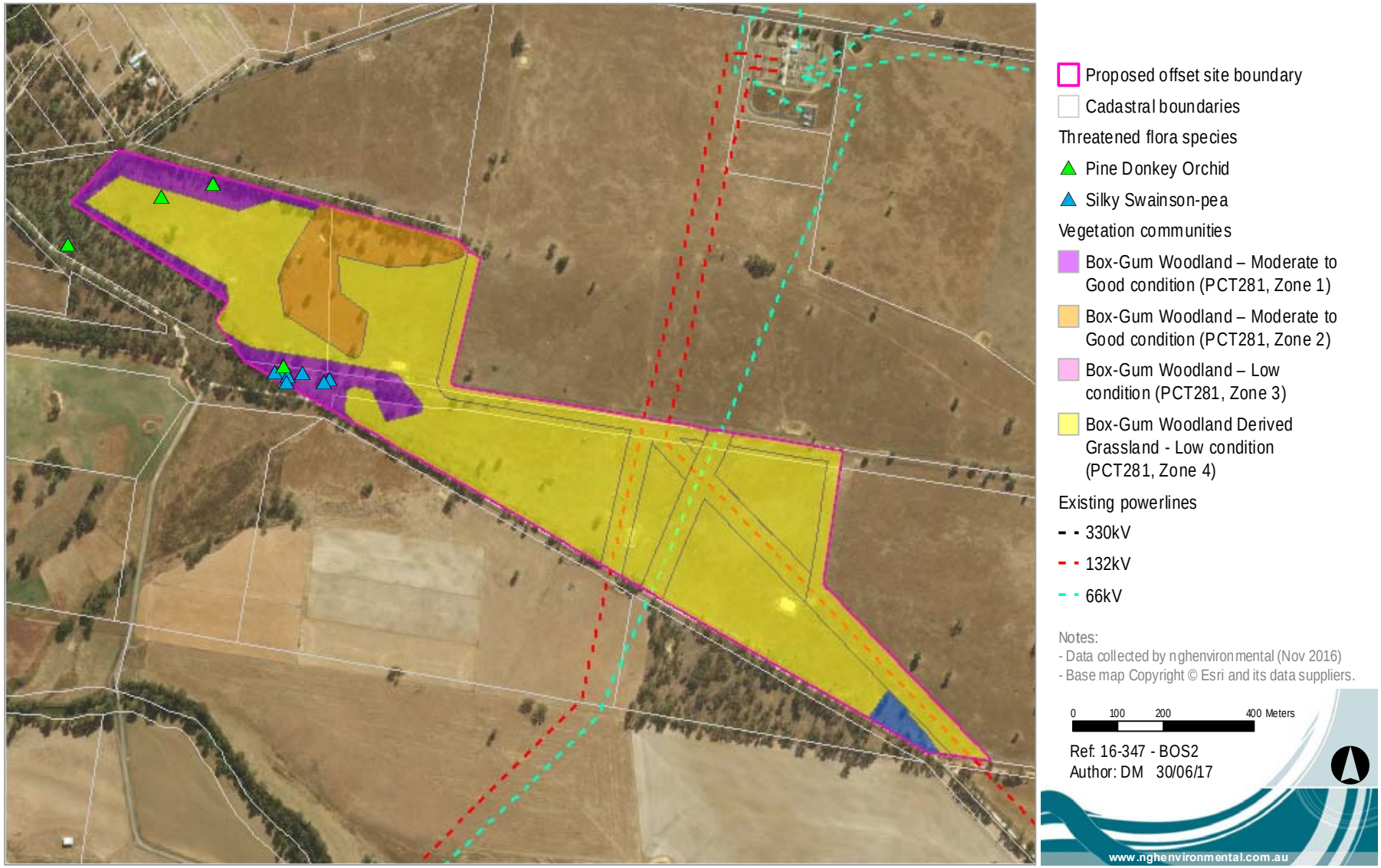

Figure 3-6 Locations of threatened flora within the western offset area

4 IMPROVEMENT IN BIODIVERSITY VALUES AT THE OFFSET SITE

4.1 CREDIT CALCULATOR RESULTS

Preliminary BioBanking credit calculations according to the BioBanking Assessment Methodology (OEH 2014b) have been completed to determine the quantum of ecosystem credits potentially available within the proposed offset areas. Vegetation plots were undertaken within the Rough-Barked Apple – Red Gum – Yellow Box woodland and derived grassland (PCT281) within the proposed western offset area. However, to meet the minimum plot requirements for the Zone 2 and 4 areas, it was necessary to also utilise some of the plot data from the adjacent development area. This is considered appropriate given the general homogenous nature of the zones across both the development and offset areas. No Vegetation plots have been undertaken within the proposed eastern offset area. In order to provide data, plot and transect data from the impact area were used to estimate the credit value within the eastern offset area. As above, this is considered appropriate given the homogenous nature of the zones.

As the BBC cannot accept two zones of the same PCT in the same broad condition class (i.e. PCT281 woodland in low condition and PCT281 derived grassland in low condition). It was necessary to enter in the low condition derived grassland as a moderate to good zone. Hence, the minimum number of plots required were reflective of a moderate to good zone. Even though the minimum plot number was met for the low condition zone, it was necessary to create a 'dummy plot' based on the average of the other plots in the zone to meet the moderate to good requirement (four plots required for the low condition zone but five required as it had to be entered as moderate to good). The use of dummy plots for this low condition area was considered acceptable by OEH in this instance (Ziggy Andersons, OEH, pers. com. 14/02/17).

As documented in Section 3.2.3, three existing powerlines and their associated easements traverse the western offset site and one across the northern boundary of the eastern offset site. These easements will need to be maintained free of overstorey vegetation and as such, they have been mapped and included as a separate zone (Zone 6) in the BCC (Figure 4-1 and Figure 4-2). To account for this requirement, the default overstorey increase from 0 to 1 in the BCC was changed to 0 for the future site value. This management strategy has also been applied to areas within 25m of the proposed solar array where overstorey shading is undesirable, mapped as Zone 6 in Box-Gum Woodland low condition derived grassland and Zone 7 in the Ephemeral Wetland vegetation on Figure 4-1 and Figure 4-2.

The key outputs of the BCC credit reports are provided below. The full final credit report is given in **Error! Reference source not found.**.

Date of report: 30/06/2017 Time: 1:37:56PM Calculator version: v4.0

Biobank details

Proposal ID: 0035/2017/4443B

Proposal name: Beryl Solar Farm

Proposal address: Beryl Road Beryl NSW 2852

Proponent name: First Solar (Australia) Pty Ltd

Proponent address: Level 3, 16 Spring street Sydney NSW 2000

Proponent phone: 0290027710

Assessor name: Brooke Marshall

Assessor address: 1/216 Carp St Bega NSW 2250

Assessor phone: 64928333

Assessor accreditation: 0035

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	1.69	12.00
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	75.79	723.00
Total	77.48	735

Credit profiles

1. Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)

Number of ecosystem credits created	87
IBRA sub-region	Upper Slopes - Central West

2. Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)

Number of ecosystem credits created	6
IBRA sub-region	Upper Slopes - Central West

3. Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)

Number of ecosystem credits created	630
IBRA sub-region	Upper Slopes - Central West

4. Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion, (CW248)

Number of ecosystem credits created	12
IBRA sub-region	Upper Slopes - Central West

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Pine Donkey Orchid	Diuris tricolor	4.00	28
Silky Swainson-pea	Swainsona sericea	38.00	270

BioBanking Credit Calculator

Ecosystem credits

NSW GOVERNMENT Office of Environment & Heritage

Proposal ID :	0035/2017/4443B
Proposal name :	Beryl Solar Farm
Assessor name :	Brooke Marshall
Assessor accreditation number :	0035
Tool version :	v4.0
Report created :	30/06/2017 13:36

Assessment circle name	Landscape score	TS subzone number	Vegetation zone name	Vegetation type name	Condition	Management zone name	Management zone area	Current site value	Future site value	Gain in site value	Total credit created for management zone
ONE	14.70	CW111_Moderate/Good_1	CW111_Moderate/Good	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Moderate/Good	1	4.43	71.33	85.33	14.00	45
ONE	14.70	CW111_Moderate/Good_Medium_1	CW111_Moderate/Good_Medium	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Moderate/Good_Medium	2	4.21	67.33	80.67	13.34	42
ONE	14.70	CW111_Low_1	CW111_Low	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Low	3	0.68	28.00	48.78	20.78	6
ONE	14.70	CW111_Moderate/Good_Derived grassland_1	CW111_Moderate/Good_Derived grassland	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Moderate/Good_Derived grassland	6	12.21	17.33	32.11	14.78	99
ONE	14.70	CW111_Moderate/Good_Derived grassland_1	CW111_Moderate/Good_Derived grassland	Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Moderate/Good_Derived grassland	6	12.21	17.33	32.11	14.78	99
ONE	14.70	CW248_Moderate/Good_1	CW248_Moderate/Good	Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Moderate/Good	7	0.18	44.93	53.99	9.06	1
ONE	14.70	CW248_Moderate/Good_1	CW248_Moderate/Good	Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Moderate/Good	7	0.18	44.93	53.99	9.06	1

BioBanking Credit Calculator

Species credits

Office of Environment & Heritage

Proposal ID :	0035/2017/4443B
Proposal name :	Beryl Solar Farm
Assessor name :	Brooke Marshall
Assessor accreditation number :	0035
Tool version :	v4.0
Report created :	30/06/2017 13:36

Scientific name	Common name	Species TG value	Biobank on identified population?	Number found?	Units	Number of credits
Diuris tricolor	Pine Donkey Orchid	1.30	No	4.00	indiv	28
Swainsona sericea	Silky Swainson-pea	1.80	No	38.00	indiv	270

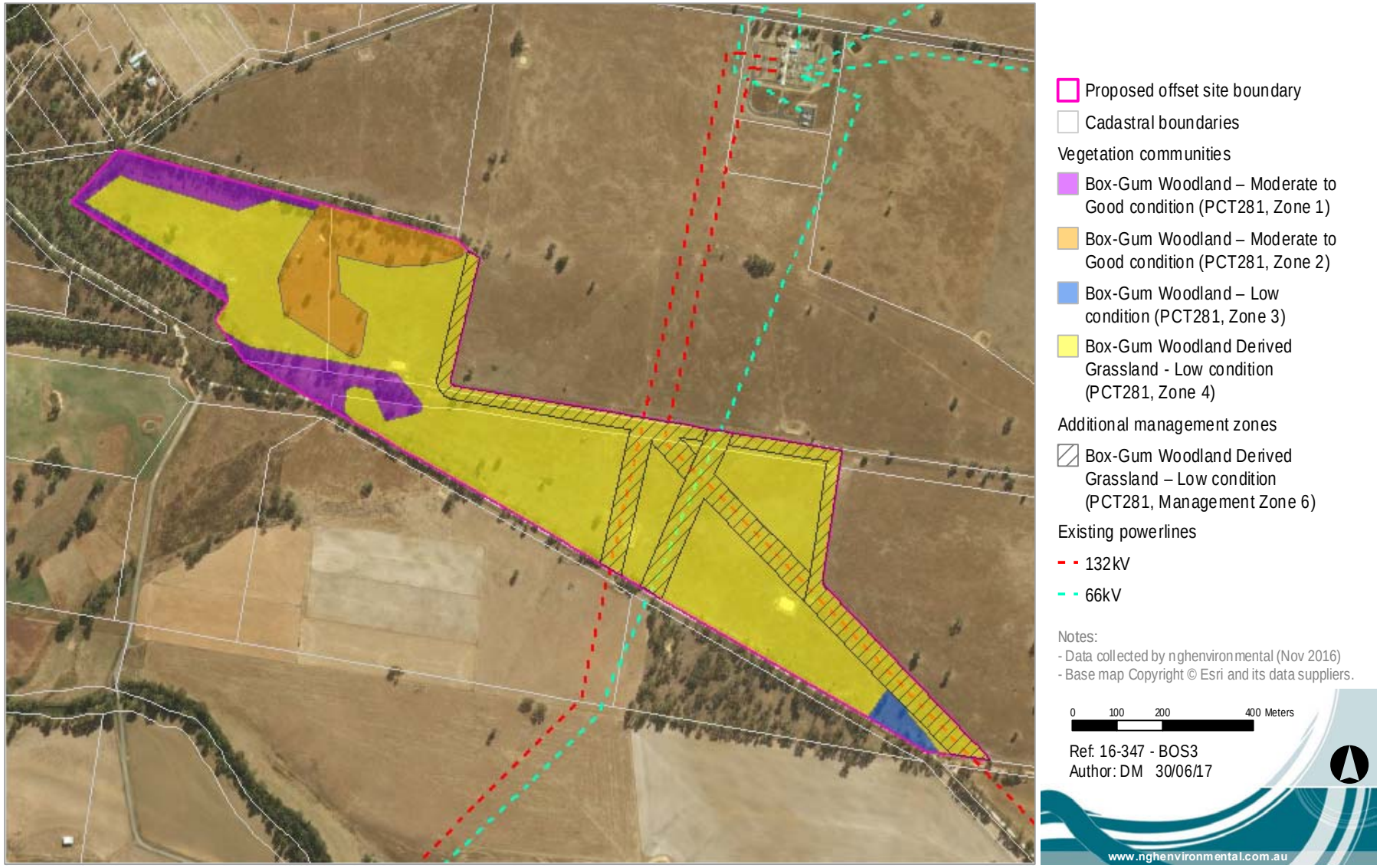

Figure 4-1 Management zones in the western offset site

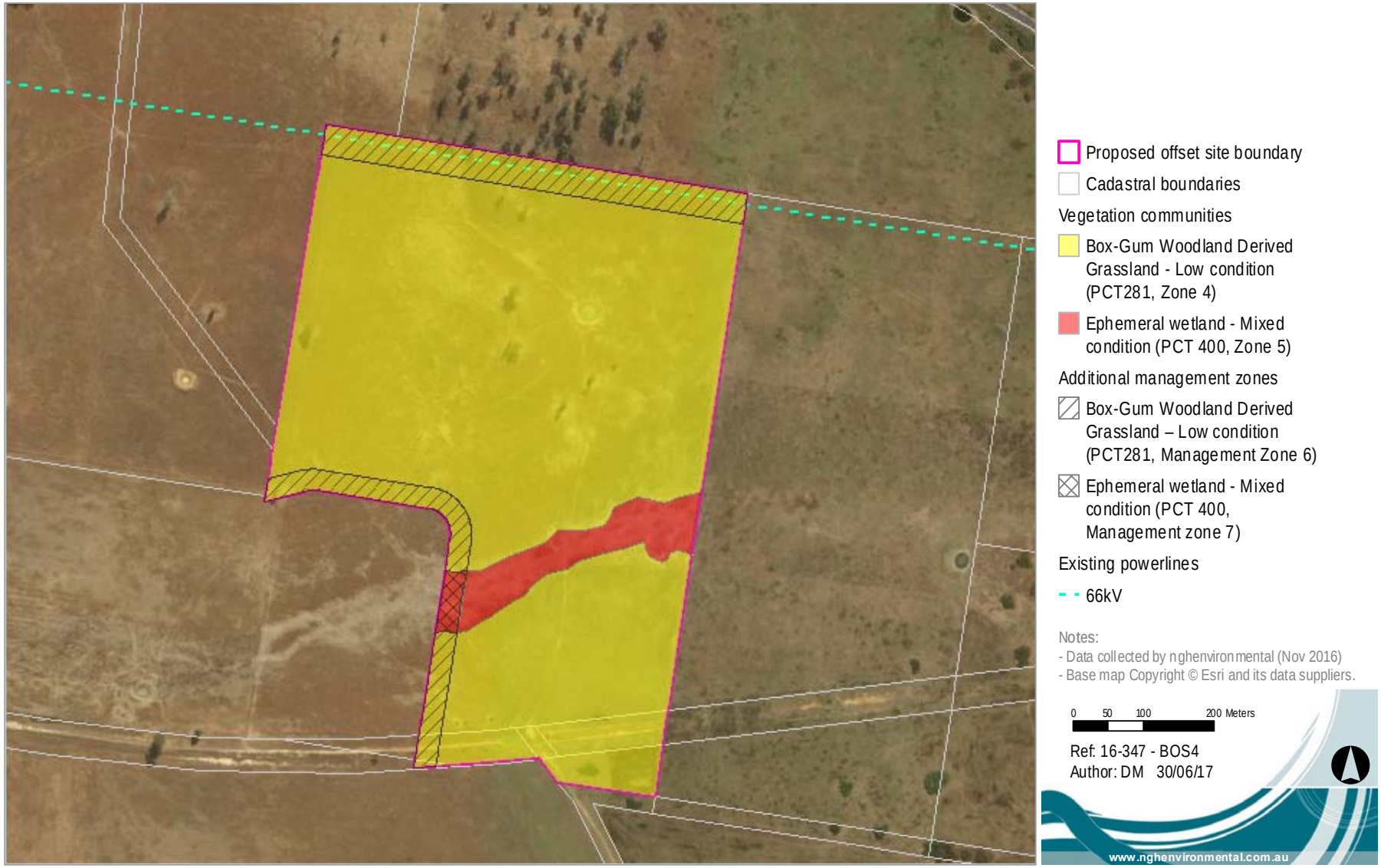

Figure 4-2 Management zones in the eastern offset site

4.2 MANAGEMENT ACTIONS

Appropriate management actions would be discussed with OEH, and be incorporated into the preparation of a detailed management plan for each management zone within the proposed offset.

Mandatory management actions required at a BioBank site include:

- Management of grazing for conservation[1]
- Weed control
- Management of fire for conservation
- Management of human disturbance
- Retention of regrowth and remnant native vegetation
- Replanting or supplementary planting where natural regeneration will not be sufficient
- Retention of dead timber
- Erosion control
- Retention of rocks

Additional management actions which may be required to be undertaken within the proposed offset site were generated by the BCC as follows:

[1] While grazing is not prohibited, it must be managed carefully for the objective of biodiversity improvement. This may affect the timing of grazing and stocking rates. It will require agreed monitoring methods to inform stock management.

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Pine Donkey Orchid	Control of feral pigs
Pine Donkey Orchid	Feral and/or over-abundant native herbivore control
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Control exotic pest fish species (within dams)
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Control of feral pigs
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Exclude miscellaneous feral species
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Feral and/or over-abundant native herbivore control
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Fox control
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Maintain or re-introduce natural flow regimes
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Exclude commercial apiaries
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Exclude miscellaneous feral species
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Feral and/or over-abundant native herbivore control
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Fox control
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Slashing
Silky Swainson-pea	Feral and/or over-abundant native herbivore control

5 REHABILITATION OR SUPPLEMENTARY MEASURES

No Rehabilitation on land identified for rehabilitation or supplementary measures as defined in the NSW Biodiversity Offsets Policy for Major Projects are proposed as part of this BOS.

6 SUMMARY OF BIODIVERSITY OFFSET MEASURES

Based on these preliminary Biobanking calculations, the offset areas investigated meet the ecosystem credits required for the development proposal (**Error! Reference source not found.**). The offset areas also generate ecosystem credits and species credits surplus to the requirements of the proposal that could be used as offsets for other projects or sold through the BioBanking Credit Register.

It is proposed that a Biodiversity Offset Plan be prepared to:

1. Demonstrate the final offset area meets the FBA requirements; and
2. Detail management measures appropriate to the site.

The Biodiversity Offset Plan will be prepared in consultation with relevant consent authorities and detail the extent, preferred layout and management of the proposed offset. The Biodiversity Offset Plan would be prepared and implemented within two years of construction commencing.

Table 6-1 Impact and Offset Credit Summary

Ecosystem credits

Plant Community Type		Impact		Offset	
PCT	Name	Area (Ha)	Credits	Area (Ha)	Credits
281	Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion (CW111)	17.13	684	75.79	723
400	Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion (CW248)	17.89	0	1.69	12
Total		**35.02**	**684**	**77.48**	**735**

Species credits

Species	Impact		Offset	
Name	# individuals	Credits	# individuals	Credits
Pine Donkey Orchid (*Diuris tricolor*)	0	0	4	28
Silky Swainson-pea (*Swainsona sericea*)	0	0	38	270
Total	**0**	**0**	**42**	**298**

7 CONCLUSION

This BOS has been prepared to demonstrate that offsets for the proposed Beryl Solar Farm are available within the proposal area and are adequate to compensate for the impacts of the development.

The proposed offset areas generate a total of 723 ecosystem credits for PCT281 - Rough-Barked Apple – red gum – Yellow Box woodland on alluvial clay to loam soils on valley flats in northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, which meets the required 684 ecosystem credits for this PCT as determined according to the FBA.

In addition, the proposed offset areas also generate 12 ecosystem credits for PCT400 - Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion and 28 and 270 species credits respectively for the Pine Donkey Orchid and Silky Swainson-pea. Surplus credits may be used as offsets for other projects or sold through the BioBanking Credit Register.

A Biodiversity Offset Plan will be prepared in consultation with OEH to define the final offset area. The Biodiversity Offset Plan will include details regarding the management (and any required monitoring) of the offset area, as required by the BioBanking Assessment Methodology.

8 REFERENCES

NGH Environmental (2017) Biodiversity Assessment Report: Beryl Solar Farm. Report prepared for First Solar Australia Pty Ltd, March 2017.

NGH Environmental (2017) Beryl Solar Farm Submission Report. Report prepared for First Solar Australia Pty Ltd, June 2017.

OEH (2016) NSW Vegetation Information System Classification Database. Accessed online via secure login at: http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx.

OEH (2014a). Framework for Biodiversity Assessment: NSW Biodiversity Offsets Policy for Major Proposals. Published by Office of Environment and Heritage for the NSW Government.

OEH (OEH) (2014b). Biobanking Assessment Methodology. Office of Environment and Heritage, NSW.

TransGrid (2017) TransGrid Easement Guide. Accessed online 30/06/17 at: http://myareesubstation.net/transGrid_%20easement_%20brochure.pdf

APPENDIX A FINAL CREDIT REPORT – DEVELOPMENT SITE

Biodiversity credit report

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

Date of report: 30/06/2017 Time: 1:51:41PM Calculator version: v4.0

Major Project details

Proposal ID:	0035/2017/4165MP
Proposal name:	Beryl Solar Farm
Proposal address:	suite 1, 216 carp st Bega NSW 2550
Proponent name:	First Solar (Australia) Pty Ltd
Proponent address:	Level 3, 16 Spring Street Sydney NSW 2000
Proponent phone:	0290027710
Assessor name:	Brooke Marshall
Assessor address:	1/216 Carp St Bega NSW 2250
Assessor phone:	64928333
Assessor accreditation:	0035

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	147.46	1,761.67
Total	147.46	1,762

Credit profiles

1. Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)

Number of ecosystem credits created	784
IBRA sub-region	Upper Slopes - Central West

Offset options - Plant Community types	Offset options - IBRA sub-regions
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111) Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest of the NSW South Western Slopes Bioregion, (CW103) Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112) Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (CW138) Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion, (CW139) Blakely's Red Gum - White Box - Yellow Box - Black Cypress Pine box grass/shrub woodland on clay loam soils on undulating hills of central NSW South Western Slopes Bioregion, (CW209) White Box - Rough-barked Apple alluvial woodland of the NSW central western slopes including in the Mudgee region, (CW211) White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion, (CW213) White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (CW215) White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216) Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion, (CW225) Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion, (CW226) Apple Box - Rough-barked Apple terrace flats woodland of the southern Brigalow Belt South Bioregion, (CW231) 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, (CW320) Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion, (CW295) Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland of the NSW South Western Slopes Bioregion, (CW285) Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (CW280) Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion, (CW330)	Upper Slopes - Central West and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)

Number of ecosystem credits created	978
IBRA sub-region	Upper Slopes - Central West

Offset options - Plant Community types	Offset options - IBRA sub-regions
Apple Box - Blakely's Red Gum moist valley and footslopes grass-forb open forest of the NSW South Western Slopes Bioregion, (CW103) Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111) Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion, (CW112) Fuzzy Box Woodland on alluvial brown loam soils mainly in the NSW South Western Slopes Bioregion, (CW138) Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion, (CW139) Blakely's Red Gum - White Box - Yellow Box - Black Cypress Pine box grass/shrub woodland on clay loam soils on undulating hills of central NSW South Western Slopes Bioregion, (CW209) White Box - Rough-barked Apple alluvial woodland of the NSW central western slopes including in the Mudgee region, (CW211) White Box - White Cypress Pine - Western Grey Box shrub/grass/forb woodland in the NSW South Western Slopes Bioregion, (CW213) White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (CW215) White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion, (CW216) Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion, (CW225) Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion, (CW226) Apple Box - Rough-barked Apple terrace flats woodland of the southern Brigalow Belt South Bioregion, (CW231) 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, (CW320) Riparian Blakely's Red Gum - box - shrub - sedge - grass tall open forest of the central NSW South Western Slopes Bioregion, (CW295) Red Stringybark - Blakely's Red Gum +/- Long-leaved Box shrub/grass hill woodland of the NSW South Western Slopes Bioregion, (CW285) Red Box - White Box +/- Red Stringybark hill woodland in the NSW South Western Slopes Bioregion, (CW280) Yellow Box grassy woodland on lower hillslopes and valley flats in the southern NSW Brigalow Belt South Bioregion, (CW330)	Upper Slopes - Central West and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required

APPENDIX B FINAL CREDIT REPORT – OFFSET SITE

BioBanking credit report

This report identifies the number and type of credits required at a BIOBANK SITE

Date of report: 30/06/2017 Time: 1:37:56PM Calculator version: v4.0

Biobank details

Proposal ID:	0035/2017/4443B
Proposal name:	Beryl Solar Farm
Proposal address:	Beryl Road Beryl NSW 2852
Proponent name:	First Solar (Australia) Pty Ltd
Proponent address:	Level 3, 16 Spring street Sydney NSW 2000
Proponent phone:	0290027710
Assessor name:	Brooke Marshall
Assessor address:	1/216 Carp St Bega NSW 2250
Assessor phone:	64928333
Assessor accreditation:	0035

Additional information required for approval:

- ☐ Use of local benchmark
- ☐ Expert report...
- ☐ Request for additional gain in site value

Ecosystem credits summary

Plant Community type	Area (ha)	Credits created
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	1.69	12.00
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	75.79	723.00
Total	77.48	735

Credit profiles

1. Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)

Number of ecosystem credits created	87
IBRA sub-region	Upper Slopes - Central West

2. Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)

Number of ecosystem credits created	6
IBRA sub-region	Upper Slopes - Central West

3. Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion, (CW111)

Number of ecosystem credits created	630
IBRA sub-region	Upper Slopes - Central West

4. Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion, (CW248)

Number of ecosystem credits created	12
IBRA sub-region	Upper Slopes - Central West

Species credits summary

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Pine Donkey Orchid	Diuris tricolor	4.00	28
Silky Swainson-pea	Swainsona sericea	38.00	270

Additional management actions

Additional management actions are required for:

Vegetation type or threatened species	Management action details
Pine Donkey Orchid	Control of feral pigs
Pine Donkey Orchid	Feral and/or over-abundant native herbivore control
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Control exotic pest fish species (within dams)
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Control of feral pigs
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Exclude miscellaneous feral species
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Feral and/or over-abundant native herbivore control
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Fox control
Riparian sedgeland rushland wetland of the Pilliga to Goonoo sandstone forests, Brigalow Belt South Bioregion	Maintain or re-introduce natural flow regimes
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Exclude commercial apiaries
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Exclude miscellaneous feral species
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Feral and/or over-abundant native herbivore control
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Fox control
Rough-Barked Apple - red gum - Yellow Box woodland on alluvial clay to loam soils on valley flats in the northern NSW South Western Slopes Bioregion and Brigalow Belt South Bioregion	Slashing
Silky Swainson-pea	Feral and/or over-abundant native herbivore control