



Offset Strategy

MANILDRA SOLAR FARM



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1 INTRODUCTION

1.1 BACKGROUND

The Manildra Solar Farm was approved under Part 3A of the *Environmental Planning and Assessment Act* 1979. It is located in Manildra, central western New South Wales. The proponent is Manildra Solar Farm Pty Ltd ('Proponent'). The location of the site is shown in Figure 1-1.

The project includes the construction and operation of an up to 50 megawatt capacity photovoltaic solar farm over an area of up to 180 hectares, with associated electrical infrastructure, maintenance facilities, site office, access tracks, minor upgrades to adjacent roads, fencing and landscaping.

1.2 AIM OF THIS STRATEGY

The aim of this document is to set out a strategy to satisfy Condition of Approval C.2: the preparation of an offset strategy. This condition forms part of the project's conditions of approval (set out in Section 1.3, below).

As required by the Manildra Solar Farm NSW project approval, this draft strategy has been prepared by an ecologist and requires input from the NSW Office of Environment and Heritage (OEH, formerly Department of Environment Climate Change and Water DECCW) prior to finalisation and submission to the NSW Department of Planning and Infrastructure.

Consultation with OEH (David Geering, October 2015) determined that the Biobanking Calculator could be used with benchmark data to confirm the suitability of the offset site. This has been undertaken in Appendix A.

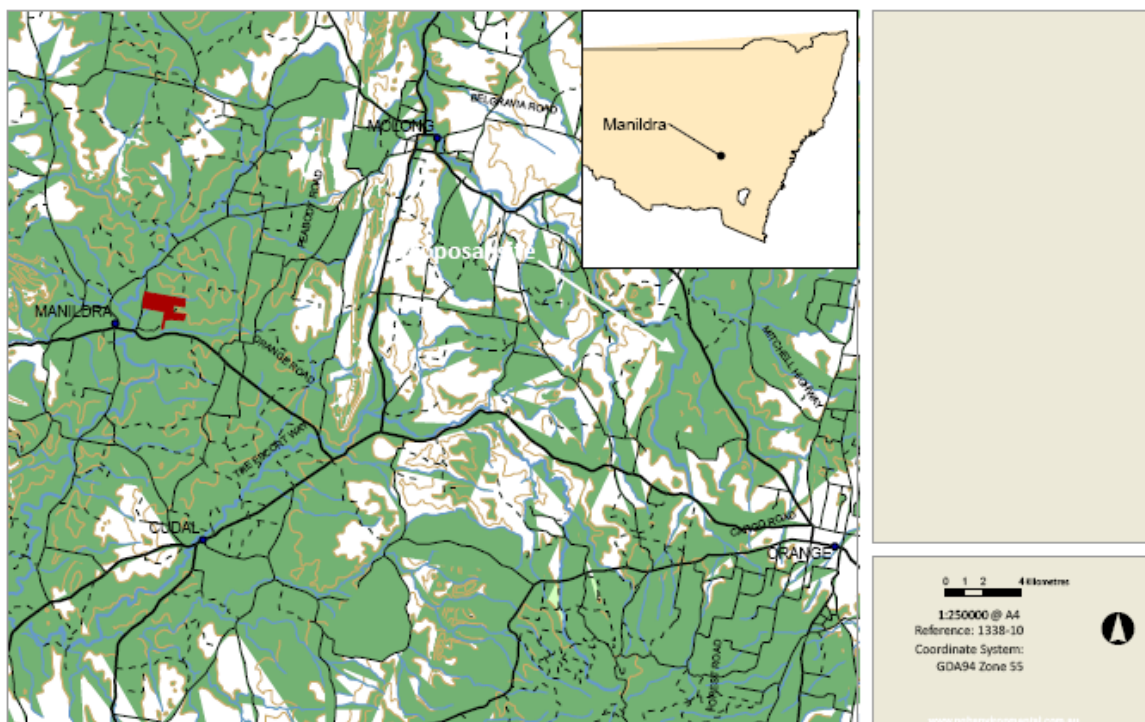


Figure 1-1. Location of the Manildra solar farm (source: nghenvironmental 2010a)

1.3 LEGISLATIVE CONTEXT

The Manildra Solar Farm was approved by the NSW Department of Planning as a Major Project under Part 3A of the *Environmental Planning and Assessment Act 1979*. Major Projects must achieve a ‘maintain or improve’ environmental outcome to be approved. Central to the project therefore, is the requirement to offset biodiversity impacts that have not been able to be avoided or sufficiently minimised.

Generally, the approval contains two requirements regarding offsetting:

1. The preparation of an *offset strategy* (as set out in Condition of Approval C.2) comprising a framework document to set out the means to calculate, secure and manage the required offsets – this document
2. The preparation of an *offset plan* (as set out in Condition of Approval E.3) required prior to operation, to verify that appropriate offsets have been secured and will be managed in perpetuity

Specific to the offset strategy, Condition of Approval C.2 states:

The proponent shall prepare a biodiversity offset strategy, in consultation with DECCW and the landholder to the satisfaction of the Director-General, to guide the development of the offset package required in condition E3. The offset strategy is to be prepared by an ecologist and submitted for the approval prior to commencement of construction and include:

- a) *consideration of all native vegetation losses and the adequacy of the proposed offset*

- b) *demonstration of how the offset will 'improve or maintain' biodiversity values;*
- c) *the proposed offset ratios and connectivity improvements;*
- d) *proposed management actions;*
- e) *demonstrations of how the strategy was prepared in accordance with DECCW's Principles of the Use of Biodiversity Offset in NSW; and*
- f) *measures to ensure in-perpetuity the conservation commitment.*

This report is structured to address these specific areas in Sections 2 – 7.

Regarding the offset plan, Condition of Approval E.3, referred to above, includes the following requirements:

Details of the offset strategy [package] shall be submitted for the approval of the Director-General prior to the commencement of operation or as agreed by the Director-General. The package shall:

- a) *describe how the offset shall be guaranteed, managed and monitored in perpetuity;*
- b) *ensure all impacted vegetation communities and threatened species habitat has been offset as per the ratios/amounts calculated through the outcomes of the assessment carried out under Condition C2;*
- c) *demonstrate how the offset ratio is consistent with the principles of "improve or maintain" for biodiversity values; and*
- d) *include requirements for a post construction review to confirm the extent of clearing was commensurate with and not greater than that predicted. If clearing is greater, then the package shall demonstrate how the offset was modified and increased to the value of the actual biodiversity loss.*

The Submissions Report (**ngh**environmental 2010b) and Biodiversity Assessment (**ngh**environmental 2010a) completed for the project provide several additional comments relevant to offsetting the impacts of the project:

- *An offset plan ... would be developed in consultation with the landowner and would offset the impact of the development for the period that the impact occurs.*
- *The western paddock [noted to be in better condition than other areas onsite] may provide an appropriate offset site.*
- *Offsetting native pasture would only be undertaken where it is in moderate-good condition as defined by the biometric guidelines and considered to provide quality habitat.*
- *The final infrastructure layout will determine the precise amount of clearing required. At that time, and prior to construction commencing, formal agreements would be sought with the affected land owners to secure offsetting for areas of habitat permanently removed by the proposal.*

2 NATIVE VEGETATION LOSSES AND THE ADEQUACY OF THE PROPOSED OFFSET

2.1 AREAS TO BE IMPACTED

The development will require temporary and permanent infrastructure components. Temporary components include stock pile areas, construction compounds and access tracks. Permanent components include the site office and facilities, solar array mounted on concrete footings or pylons, and transmission infrastructure.

The final infrastructure layout and location of temporary components has not yet been finalised. Estimated impact area footprints for each infrastructure component are shown in Table 2.1.

Table 2-1 Estimated impact areas of each proposal component

Source: Table 7-1 Manildra Solar Farm Biodiversity Assessment, nghenvironmental 2010a

Component	Quantity	Length (m)	Width (m)	Area (m ²)
Site office and facilities	1	20	20	400
Underground electricity transmission (control room to substation)	1	500	0.5	250
Solar Panels	180,000	2	1	360,000 (panel surface) 306,000 (ground coverage assuming 30 degree tilt of panels)
Concrete footing or Pile driven posts	30,000 or 50,000	3.05 or 0.1	0.19 or 0.1	17,385 or 500
Underground cabling (2 circuits)	2	1,250	0.5	1,250
Inverters	72	4.3	2.2	681
Pad-mount transformers	36	4.3	2.2	681
Site access track	1	500	8	4,000 of which 2,000 is already cleared (an existing track)
Internal access tracks	1	5,000	8	40,000
Perimeter tracks	1	7,000	8	56,000
Perimeter fencing	1	7,000	1	7,000
Temporary laydown area	1			20,000
Parking	1			750
Operations and maintenance building (operational stage)	1	12	9	108

2.2 NATIVE VEGETATION WITHIN THE SITE BOUNDARIES

The Biodiversity Assessment (nghenvironmental 2010) discusses the important habitat elements onsite. These include Box-Gum Woodland and Derived Native Grasslands, an Endangered Ecological Community under the NSW *Threatened Species Conservation Act 1995* (White Box-Yellow Box-Blakely's Red Gum Woodland Endangered Ecological Community). Large areas of vegetation are non-native, dominated by exotic species (refer to Figure 3.1.2). Potential for an east west wildlife corridor is provided by overstorey vegetation to the south of the development envelope.

Impacts on native vegetation are shown in Table 2.2 and Figure 2.1. It is noted that this is an upper limit and that the final footprint is likely to impact less native vegetation. The calculations are also precautionary in that they include remnants less than 0.25ha in area. At the time of approval of this project, the Biobanking methodology would not have required offsets for these areas of vegetation (pers. Comm. D. Geering OEH 2015). These native vegetation remnants less than 0.25ha total 0.93 ha.

Table 2-2 Estimated impact areas of final layout (provided September 2015).

Total area of impact	Stage one (ha)	Stage two (ha)	Total (ha)
Native vegetation	6.34	0.92	7.26
Box Gum Woodland Derived Grassland (EEC, TSC)	2.92	0.00	2.92
Box-Gum Woodland (EEC, TSC)	3.42	0.92	4.34
Crop or exotic pasture	105.97	23.53	129.50
Total:	112.31	24.44	136.76

Table 2-3 Calculated area of impact excluding native vegetation remnants <0.25 ha

Area of impact excluding native vegetation remnants <0.25ha	Stage one (ha)	Stage two (ha)	Total (ha)
Native vegetation	5.50	0.83	6.33
<i>Box Gum Woodland Derived Grassland (EEC, TSC)</i>	2.92	0	2.92
<i>Box-Gum Woodland (EEC, TSC)</i>	2.58	0.83	3.41
Crop or exotic pasture	105.97	23.53	129.50
Total:	111.47	24.35	135.83

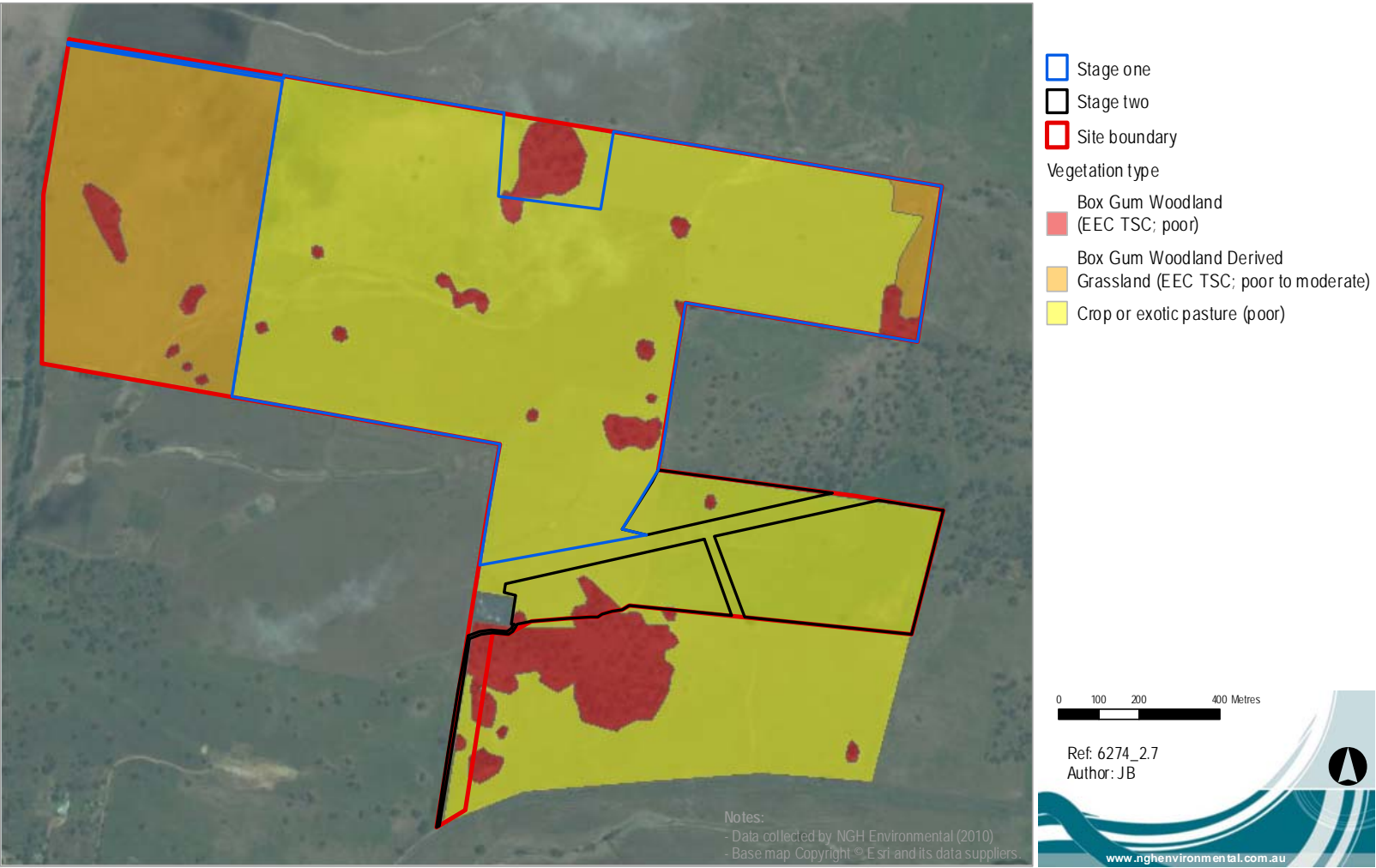


Figure 2-1 Distribution of vegetation types within the project area

2.3 WHAT WILL BE OFFSET?

2.3.1 *Permanent impacts*

It is proposed that only native-dominated vegetation to be permanently removed by the development will be offset.

The exact area to be offset will be calculated by overlaying the final permanent infrastructure footprint over a validated vegetation map, prior to construction. This will ensure that the final offset area will:

- Reflect the final infrastructure layout. The developer has the opportunity to reduce offset requirements in the detailed design of the site, by maximising the development within exotic areas and minimising development within native areas. With regard to this development, using pylons rather than concrete footings and minimising access track widths provide opportunities to reduce vegetation impacts and therefore offset requirements.
- Take into account any changes in native vegetation condition and extent prior to the development commencing. For example, increased rainfall may result in larger native species dominated areas within the development footprint and these are required to be offset. The vegetation mapping should be validated by an ecologist in an appropriate survey window (to maximise native species detection) prior to construction.

The array will be mounted approximately 3m above the ground. Where it occurs over native vegetation, it is proposed that 100% of the array area be considered a permanent habitat loss and offset accordingly.

2.3.2 *Temporary impacts*

As temporary impacts occurring in native dominated vegetation have potential to be rehabilitated, these areas would not be included in the offset plan (i.e. they would not be permanent impacts). The requirement for effective rehabilitation however assumes:

- No trees would be cleared (this would be considered a permanent impact to be offset)
- Native ground cover (of suitable species endorsed by an ecologist) is effectively re-established in these areas in the short term

Where these conditions cannot be met, the areas in question would be included in the offset calculations and permanently offset.

This stipulation provides the incentive to both:

- Avoid or minimise impacts in areas of intact native vegetation
- Effectively rehabilitate these areas, where avoidance is not feasible

A Flora and Fauna Management Plan and Groundcover Management Plan stipulate management measures required during construction including rehabilitation.

3 'IMPROVE OR MAINTAIN' BIODIVERSITY VALUES

Clearing land or modifying native vegetation results in a biodiversity loss; habitat is removed or degraded. The purpose of an offset site is not just to equal the vegetation to be affected by the development, but to ensure that over time, through dedicated management actions, an improvement in the offset site's biodiversity values will balance out that initial loss. That is why offset ratios are not 1:1 but are usually much higher.

An 'improve or maintain biodiversity value' outcome is proposed to be achieved for this project as follows:

Regarding the development site:

- Permanent infrastructure in native dominated areas will be minimised as much as practical
- Temporary infrastructure will be located in exotic dominated areas as much as practical
- Native dominated areas subject to temporary impacts will be rehabilitated to pre-impact condition and where this is not achievable, the area will be considered a permanent impact to be offset.
- Residual impact to native vegetation (that cannot be avoided or minimised) will be offset.

These stipulations are intended to minimise the impacts on native vegetation, which will in turn reduce the offset requirements for the developer.

Regarding the offset site:

- The offset ratio will be either:
 - 1:10 'like for like' or 'like for better', in terms of vegetation type and condition
 OR
 - Calculated specifically using the OEH endorsed Biobanking methodology

A 1:10 offset ratio is considered appropriate by OEH where endangered ecological communities are being impacted. Using the Biobanking methodology is the preferred option as it is both a tool accepted to provide a 'maintain or improve' outcome as well as being able to precisely reflect the condition of the vegetation in question.

- In the selection of the offset site, the ability to enhance landscape connectivity will be considered.
- The offset site will be managed for biodiversity value improvement. Specific management prescriptions will be developed and implemented. Their success will be monitored and adapted as required. Refer to Section 5 of this strategy for examples.
- The offset site will be established in perpetuity. Refer to Section 7 of this strategy for details.
- Provision will be made to fund the management actions required to be implemented at the offset site. Refer to Section 7 of this strategy.
- The offset site will complement existing biodiversity conservation initiatives. That is, it will not include a site already set aside to be managed for biodiversity conservation, such as under an existing Property Vegetation Plan.

4 OFFSET RATIOS AND CONNECTIVITY IMPROVEMENTS

4.1 LOCATING AN OFFSET SITE

The Proponent is currently considering offset sites, including the ability to locate offsets within the project's site boundary. In particular the following is noted:

- The area to the west of the development envelope, within the site boundary, has higher quality native vegetation than that to be impacted by the development. Securing this area as an offset has the following advantages:
 - It can achieve 'like for like' in terms of native vegetation type and 'like for better' in terms of vegetation condition
 - It will reduce the area required to be offset (as it will achieve a lower ratio due to it being of better condition than the area to be impacted) under a Biobanking survey methodology
- Similarly, the area to the south of the development envelope presents an opportunity to enhance landscape connectivity:
 - Replanting trees in this area could enhance the east west link adjacent to the site
- Both sites present opportunities for efficient management actions by the developer and land owner, in conjunction with onsite construction and operation. For example,
 - Management responsibility can be clearly set out as part of the lease agreement with the landowner
 - More expensive elements such as fencing, weed control and replanting in the offset site could be accomplished efficiently during the construction phase

4.2 OFFSET RATIOS

As discussed in Section 3, the offset ratio will be either:

- 1:10 'like for like' or 'like for better', in terms of vegetation type and condition
- OR
- Calculated specifically using the OEH endorsed Biobanking methodology

To verify that suitable offset areas can be found within the site boundaries, a Biobanking assessment was undertaken. In consultation with OEH, benchmark data rather than field collected data were allowed to be used. The results are presented in Appendix A and demonstrate the western portion of the site is sufficient to meet Biobanking requirements. It contains the correct vegetation types and is of sufficient size to meet the offset requirement. The resulting offset ratio is approximately 1 : 6.

4.3 CONNECTIVITY

Specific to the Manildra site, connectivity improvements have been specified. This will have three important benefits:

- Enhanced functioning of remnant vegetation as a wildlife corridor
- Enhanced viability of previously fragmented remnants
- Reduced 'edge effects' in the offset area, allowing for greater improvements over time

If a biometric (Biobanking) assessment approach is taken, connectivity values would be incorporated into the credit statement. Additionally, however, connectivity should be considered during the selection of the offset site, to maximise these connectivity benefits.

As discussed in Section 4.1, there is an opportunity to enhance connectivity by including the area to the south of the development envelope in the offset plan and undertaking tree planting in this area. An additional advantage is that the offset areas would be under as few landholdings as possible, which should assist the co-ordinated management of the offset sites.

5 MANAGEMENT ACTIONS

A management plan is required to set out how the offset site will be managed. This plan would be completed and signed by the land owner to ensure that all measures are committed to. The plan also includes checklists useful for keeping track of the actions undertaken. The plan is likely to be required by OEH to be submitted as part of the establishment of the offset site. Note, a template plan can be downloaded as a word document from the Biobanking website.

The plan should include clear targets so that actions can be adapted if required to meet the intent of the management action. The overall objective of the management actions will be to improve the biodiversity value of the offset site. Specific actions will address threats and actions to improve existing values.

Specific management requirements for the offset site will be developed as part of the offset plan . Once a site is determined however, the following actions are likely to be required:

- Fencing and signage to ensure the site is protected from inadvertent impacts of nearby agricultural activities.
- A highly controlled light grazing regime (using biomass indicators to ensure adequate ground cover is maintained in all seasons) may be appropriate, if it can enhance native species diversity.
- Controlled burning may be appropriate as a strategy to enhance native seed germination.
- Weed control and monitoring.
- Feral animal control and monitoring.
- Replanting native trees (species to be determined by an ecologist) to enhance landscape connectivity in specific areas.

6 PRINCIPLES OF THE USE OF BIODIVERSITY OFFSET IN NSW

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

Offsets are then used to address remaining impacts. This may include modifying the proposal to avoid an area of biodiversity value or putting in place measures to prevent offsite impacts.

By way of iterative infrastructure planning including considering refined constraints mapping, the proposal has avoided and mitigated, proposing to offset only residual impacts. This is documented within the Biodiversity Assessment (nghenvironmental 2010a).

The development envelope allows for further micro-siting of infrastructure, and this can also be used as an opportunity to reduce the offset requirement, as discussed in several sections of this strategy.

All regulatory requirements must be met.

Offsets cannot be used to satisfy approvals or assessments under other legislation, e.g. assessment requirements for Aboriginal heritage sites, pollution or other environmental impacts (unless specifically provided for by legislation or additional approvals).

The conditions of approval with regard to offsetting are set out in Section 2 of this strategy. The strategy is structured to address each explicitly. Approvals or assessments under other legislation are not relevant to this proposal.

Offsets must never reward ongoing poor performance.

Offset schemes should not encourage landholders to deliberately degrade or mismanage offset areas in order to increase the value from the offset.

This can be addressed in two ways:

- a) The offset site can be set up in perpetuity – this removes the incentive to degrade the offset site to facilitate development at a later date
- b) The management measures can have clear targets and be set out to push most management to the beginning of the agreement, where successful accomplishment of targets would be rewarded by less intensive management in ongoing years. This suits measures such as weed control which are more easily achieved with intensive efforts than with small ongoing efforts.

This strategy proposes to address both aspects, as discussed in Sections 5 (management) and 7 (in-perpetuity security) of this strategy.

Offsets will complement other government programs.

A range of tools is required to achieve the NSW Government's conservation objectives, including the establishment and management of new national parks, nature reserves, state conservation areas and regional parks and incentives for private landholders.

The offset site has not yet been selected. As discussed in Section 3, it has been established that it cannot be a site already used as a type of biodiversity conservation reserve.

Offsets must be underpinned by sound ecological principles.

They must:

- *include the consideration of structure, function and compositional elements of biodiversity, including threatened species*
- *enhance biodiversity at a range of scales*
- *consider the conservation status of ecological communities*
- *ensure the long-term viability and functionality of biodiversity.*

Biodiversity management actions, such as enhancement of existing habitat and securing and managing land of conservation value for biodiversity, can be suitable offsets. Reconstruction of ecological communities involves high risks and uncertainties for biodiversity outcomes and is generally less preferable than other management strategies, such as enhancing existing habitat.

These are features that need to be considered in the selection of the offset site as well as the management actions for the site. Biobanking credit calculation is the most accurate and demonstrable way to take these issues into account during site selection. As set out in Section 3 of this strategy, the selection of the offset site will consider the ability to enhance landscape connectivity. As set out in Section 5, it will be managed, subject to a management plan prepared for the offset site specifically. The success of management actions will be monitored and adapted as required to achieve their set objectives.

Offsets should aim to result in a net improvement in biodiversity over time.

Enhancement of biodiversity in offset areas should be equal to or greater than the loss in biodiversity from the impact site.

Setting aside areas for biodiversity conservation without additional management or increased security is generally not sufficient to offset against the loss of biodiversity. Factors to consider include protection of existing biodiversity (removal of threats), time-lag effects, and the uncertainties and risks associated with actions such as revegetation.

Offsets may include enhancing habitat, reconstructing habitat in strategic areas to link areas of conservation value, or increasing buffer zones around areas of conservation value and removal of threats by conservation agreements or reservation.

As above, this is incorporated in Section 3 of this strategy.

Offsets must be enduring - they must offset the impact of the development for the period that the impact occurs.

As impacts on biodiversity are likely to be permanent, the offset should also be permanent and secured by a conservation agreement or reservation and management for biodiversity. Where land is donated to a public authority or a private conservation organisation and managed as a biodiversity offset, it should be accompanied by resources for its management. Offsetting should only proceed if an appropriate legal mechanism or instrument is used to secure the required actions.

The offset security for this development is required in perpetuity. This is discussed in Section 7 of this strategy.

Offsets should be agreed prior to the impact occurring.

Offsets should minimise ecological risks from time-lags. The feasibility and in-principle agreements to the necessary offset actions should be demonstrated prior to the approval of the impact. Legal commitments to the offset actions should be entered into prior to the commencement of works under approval.

The strategy sets out a pathway to establish the offset site and its management. This strategy requires input from OEH and landholders prior to any impacts occurring.

It is a requirement that all offset arrangements be in order prior to operation. The offset plan will verify that the objectives set out in this strategy have been achieved.

Offsets must be quantifiable - the impacts and benefits must be reliably estimated.

Offsets should be based on quantitative assessment of the loss in biodiversity from the clearing or other development and the gain in biodiversity from the offset. The methodology must be based on the best available science, be reliable and used for calculating both the loss from the development and the gain from the offset. The methodology should include:

- *the area of impact*
- *the types of ecological communities and habitat/species affected*
- *connectivity with other areas of habitat/corridors*
- *the condition of habitat*
- *the conservation status and/or scarcity/rarity of ecological communities*
- *management actions*
- *level of security afforded to the offset site.*

These points are addressed in this document. As stated, biometric assessment offers the most demonstrable method to undertake the first six points. A PVP is proposed to ensure long term security.

The best available information/data should be used when assessing impacts of biodiversity loss and gains from offsets. Offsets will be of greater value where:

- *they protect land with high conservation significance*
- *management actions have greater benefits for biodiversity*
- *the offset areas are not isolated or fragmented*
- *the management for biodiversity is in perpetuity (e.g. secured through a conservation agreement).*

The validation of the vegetation at the time of offset calculations will ensure that the best available information is used. The definition of the offset site will be done according to Section 3, to ensure like for like (or better) and considering ways to enhance landscape connectivity. Section 7 addresses perpetuity.

Management actions must be deliverable and enforceable.

The management plan for the offset site is discussed in Section 5. This guidance information is intended to ensure that the actions achieve their objectives, to improve biodiversity values at the offset site.

Offsets must be targeted.

They must offset impacts on the basis of like-for-like or better conservation outcome. Offsets should be targeted according to biodiversity priorities in the area, based on the conservation status of the ecological community, the presence of threatened species or their habitat, connectivity and the potential to enhance condition by management actions and the removal of threats. Only ecological communities that are equal or greater in conservation status to the type of ecological community lost can be used for offsets. One type of environmental benefit cannot be traded for another: for example, biodiversity offsets may also result in improvements in water quality or salinity but these benefits do not reduce the biodiversity offset requirements.

Offsets have been proposed based on biodiversity values and achieve a like for like or like for better outcome.

Offsets must be located appropriately.

Wherever possible, offsets should be located in areas that have the same or similar ecological characteristics as the area affected by the development.

Section 3 sets out the rationale for defining the offset site, including like for like (or better). Two areas that would meet this objective are identified. Both land to the west and south of the development envelope have features that would make them highly suitable for offsets.

Offsets must be supplementary.

They must be beyond existing requirements and not already funded under another scheme. Areas that have received incentive funds cannot be used for offsets. Existing protected areas on private land cannot be used for offsets unless additional security or management actions are implemented. Areas already managed by the government, such as national parks, flora reserves and public open space cannot be used as offsets.

This point has been considered in Section 3.

Offsets and their actions must be enforceable through development consent conditions, licence conditions, conservation agreements or a contract.

Offsets must be audited to ensure that the actions have been carried out, and monitored to determine that the actions are leading to positive biodiversity outcomes.

The establishment of a CPVP on the land title ensures in-perpetuity security for the offset site. Management actions would be shared between the developer (for the life of the impact) and the landowner (post development), as discussed in Section 7.

7 IN-PERPETUITY CONSERVATION COMMITMENT

An appropriate management vehicle is required that:

- Secures the site in perpetuity
- Allows for the ongoing management of the site (including how the designated management actions will be funded)

Four options may be considered for securing a long-term management arrangement at the offset site:

- Biobanking agreement (TSC Act , part 7 A)
- Conservation Property Vegetation Plan (CPVP) (Native Vegetation Act)
- Local Environmental Plan: Environmental Zone E2 or E3 (Environmental Planning and Assessment Act)
- Plan of management with S.88b covenant (Environmental Planning and Assessment Act)

It is proposed that a Conservation Property Vegetation Plan (CPVP) be established over the offset area that will be attached to the land title. To ensure that the CPVP is binding on successors in title, an abstract of the CPVP will be registered with the Land and Property Management Authority under the *Real Property Act 1900*.

The CPVP will be a legally binding agreement under both the Native Vegetation Act 2003 and the Threatened Species Conservation Act 1995. The terms of the CPVP will not be affected by any changes to local or state planning rules or new listings of threatened species. A CPVP can be varied at the landholder's request, provided the variation will still improve or maintain environmental outcomes.

The CPVP will include management actions associated with the offset area that will apply in perpetuity. These management actions should be consistent with recommendations specified in this document.

As the CPVP would be attached to the land title, the land owners are ultimately responsible for funding the management actions required at the offset site and monitoring the effectiveness of their implementation. The Proponent, if they do not intend to purchase the offset sites, would ensure the land owners have sufficient resources and information to implement the management actions as this forms a condition of the solar farm's consent. For the duration of the project (up to 50 years), the success of the management actions would be audited and reported as part of the annual environmental report for the project.

8 CONCLUSION

This document is intended to set out the framework for identifying, securing and managing an offset site suitable to achieve a 'maintain or improve' biodiversity outcome for the project, in line with the project's approval requirements.

It has been prepared in consultation with OEH. A draft document was provided to OEH in October 2012. After further consultation, a revised document was prepared including a preliminary Biobanking assessment to confirm the suitability of the proposed offset site.

It is recommended that this document also be forwarded to involved land holders to ensure that the commitments are fully understood and all opportunities to minimise the offset requirement (by minimising clearing of native vegetation) have been explored.

The offset plan, required to be developed prior to operation, would fully detail:

- The final areas of native vegetation to be impacted and their current condition (including collection of plot data prior to any impacts and in suitable seasonal conditions)
- The final offset areas (including collection of plot data prior to any impacts and in suitable seasonal conditions)
- The ability of the offsets to achieve a 'maintain or improve' biodiversity outcome for the project
- Specific management actions for the offset site
- Demonstration that the site is secured in perpetuity under a suitable instrument.

9 REFERENCES

nghenvironmental 2010a. Manildra Solar Farm Biodiversity Assessment. Report prepared for Infigen Energy, October 2010.

nghenvironmental 2010b. Manildra Solar Farm Submissions Report. Report prepared for Infigen Energy, December 2010.

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APPENDIX A BIOBANKING CALCULATIONS

APPROACH

To inform this offset strategy, preliminary BioBanking calculations were undertaken as follows:

- Framework for Biodiversity Assessment option selected for BioBanking calculations, reflecting that the project is a Major Project
- Impact areas and threatened species values entered, as collected from the 2010 Biodiversity Assessment
- Plot data manufactured from OEH database benchmark data, to estimate the site values of each vegetation type to be impacted
- Resultant credit profile converted to areas, using the OEH credit converter tool.

The key decision points in this process are documented below.

METHOD

Landscape assessment

A site based assessment was undertaken. The landscape is largely cleared and additional clearing of native vegetation on account of the development would be low. The following scores were entered as estimated from aerial imagery;

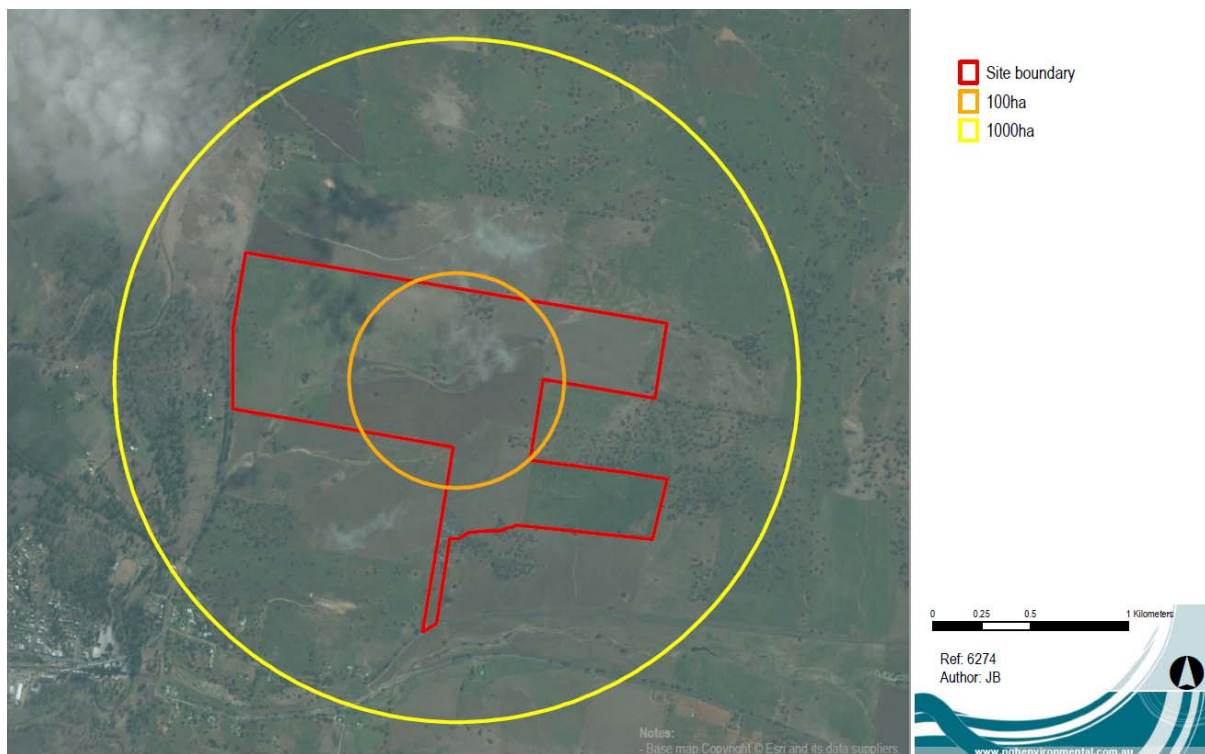
Outer assessment circle before development: <5% after development: <5%

Inner assessment circle before development: <5% after development: <5%

No connecting links are affected by the development.

No biodiversity links including riparian areas are affected.

The resulting landscape score is 12.



Vegetation zones

The native vegetation zones that would be impacted by the project as entered into the BioBanking Credit Calculator (BCC), their condition class and number of biometric plots required for them are provided below. The site score is also provided. This is based on the plot data entered (discussed below).

Table 9-1 Native vegetation zones within the project

Zone	Total (ha)	Condition class	Plots required	Site value score
Box Gum Woodland Derived Grassland (EEC, TSC)	2.92	Moderate to good	2	62
Box-Gum Woodland (EEC, TSC)	4.34	Moderate to good	3	58

Notes:

- No geographic / habitat features were entered, on the basis of the results of the Biodiversity Assessment (2010) that assessed low potential for the returned species to occur.
- Exotic pasture has not been included in the assessment.
- Native remnants less than 0.25ha have been included as a precautionary measure, to provide an upper limit offset requirement to the client.
- As this assessment is preliminary, no additional threatened species polygons / management zones have been added. Management zones are equivalent to the vegetation zones; all site scores have been reduced to zero 'after development'.

Plot data used in the assessment

The following plot data have been derived from benchmark data on the OEH vegetation data base. Generally, the median range of the lower and upper benchmarks has been used.

For the derived grassland, the overstorey is entered as zero and no fallen logs, regeneration or hollows are assumed to occur. For the woodland, native midstory and groundcover as entered as zero as these areas area comprised of overstorey above exotic pasture.

As the data were not collected in the field and are 'manufactured', not Easting and Northing location apply; '111111, 1111111' has been entered for each plot. The number of plots required, as shown Table 9-1, have been duplicated for each zone.

The management scores *with development* have been entered as zero for each parameter – that is, total removal of habitat would result from the development. Current site value scores are shown in Table 9-1. Future site value scores would all be zero.

Table 9-2 Plot data used in the assessment

Zone 1 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (LA120) Derived grassland

Overstorey removed.

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
1	23	0	10.5	42.5	4	11.5	0	0	0	0	111111	1111111	1

Zone 2 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (LA120)

Native midstorey and understorey removed.

Plot name	Native plant species richness	Native over-storey cover	Native mid-storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overstorey regeneration	Total length of fallen logs	Easting	Northing	Zone
2	23	21.5	0	0	0	0	100	1	1	66	111111	1111111	1

Benchmark data used to derive the plot data are shown below

Table 9-3 Benchmark data (OEH Oct 2008).

Veg Type ID	Native plant species richness		Native over-storey cover		Native mid-storey cover		Native ground cover (grasses)		Native ground cover (shrubs)		Native ground cover (other)		Cover estimates - Source	Number of trees with hollows	Total length of fallen logs	Hollows & logs - Source
	Richness	Source	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper				
LA 120	23	E	8	35	1	20	15	70	3	5	3	20	P	0.8	66	E

Site surveys

Predicted species assumed to occur where returned as:

- Grey-crowned Babbler (eastern subspecies) *Pomatostomus temporalis subsp. temporalis*
- Little Lorikeet *Glossopsitta pusilla*
- Swift Parrot *Lathamus discolor*

Species requiring survey were returned as:

- Brush-tailed Phascogale *Phascogale tapoatafa*
- Koala *Phascolarctos cinereus*
- Regent Honeyeater *Anthochaera phrygia*
- Squirrel Glider *Petaurus norfolcensis*

On the basis of the Biodiversity Assessment (2010), none of these latter species are considered to occur or be impacted.

RESULTS

Offset requirement

The following ecosystem and threatened species credits have been returned by the assessment. The full offset profile generated by the BCC is provided in Appendix B.

- Blakely's Red Gum Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion (derived grassland) 145 credits
- Blakely's Red Gum Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion 202 credits

There are no species credits generated by the assessment.

Credit conversion

The OEH 'credit converter' tool has been used to convert the credit requirements of the development into an estimate of the areas of each vegetation type and threatened species habitat needed to satisfy those credit requirements.

Table 9-4 Credit conversion: area estimated to achieve offset requirement

Entity requiring offsets	Credit requirement	Area of land required, as determined by the credit calculator
Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	347	37.3 hectares

It is noted that there is no requirement to separately offset woodland versus derived grassland. They are different forms of the same community and either or both could be used to satisfy the offset requirement.

Candidate offset site

The paddock to the west of Stage 1 was evaluated to determine its ability to meet the offset requirement for the project. It contains the correct vegetation types and is of sufficient size to meet the offset requirement. The resulting offset ratio is approximately 1 : 6.

Table 9-5 Native vegetation zones within the project's nominated offset site

Zone	Total (ha)	Condition class
Box Gum Woodland Derived Grassland (EEC, TSC)	40.31	Moderate to good
Box-Gum Woodland (EEC, TSC)	1.54	Moderate to good
Total	41.85	

APPENDIX B CREDIT PROFILE

BioBanking Credit Calculator

Ecosystem credits

Proposal ID : 0035/2015/2353MP
 Proposal name : Manildra solar farm
 Assessor name : Brooke Marshall
 Assessor accreditation number : 0035
 Tool version : v4.0
 Report created : 03/02/2016 11:13

Assessment circle name	Landsc ape score	Vegetation zone name	Vegetation type name	Condition	Red flag status	Management zone name	Management zone area	Current site value	Future site value	Loss in site value	Credit required for bio diversity	Credit required for TS	TS with highest credit requirement	Average species loss	Species TG Value	Final credit requirement for management zone
one	12.00	LA120_Moderate/Good_Derived grassland	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate/Good_Derived grassland	Yes	1	2.92	62.00	0.00	62.00	145	90	Little Lorikeet	66.67	1.80	145
one	12.00	LA120_Moderate/Good	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate/Good	Yes	2	4.34	58.00	0.00	58.00	202	126	Little Lorikeet	33.33	1.80	202

BioBanking Credit Calculator

Species credits

Proposal ID :

Proposal name :

Assessor name :

Assessor accreditation number :

Tool version : v4.0

Report created : 03/02/2016 11:13

Scientific name	Common name	Species TG value	Identified population?	Can Id. popn. be offset?	Area / Negligible number of loss	Red flag status	Number of credits
<hr/>							
No							
