



Manildra Solar Farm Flora and Fauna Management Plan



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ACRONYMS AND ABBREVIATIONS

BA	Biodiversity Assessment
BoP	Balance of Plant
MSFPL	Manildra Solar Farm Pty Ltd
CEMP	Construction Environmental Management Plan
DoPE	(NSW) Department of Planning and Environment
EA	Environmental Assessment
EEC	Endangered Ecological Community
EPC	Engineering, Procurement and Construction
ER	Environmental Representative
EWMS	Environmental Work Method Statement
FFMP	Flora and Fauna Management Plan
GCMP	Groundcover Management Plan
LLS	Local Land Services
MW	Megawatt
NSW	New South Wales
OEH	(NSW) Office of Environment and Heritage
OP	Offset Plan
PV	Photovoltaic
SCECO	Site Construction and Environmental Compliance Officers
SoC	Statement of Commitment
sp/spp	Species/multiple species
WIRES	NSW Wildlife Information, Rescue and Education Service

1 INTRODUCTION

1.1 THE PROJECT

The approved Manildra Solar Farm will be constructed in the central western area of NSW, on farmland adjacent to an existing substation, approximately 2 kilometres north-east of Manildra and 30 kilometres east of Parkes. The project encompasses the construction and operation of approximately 50MWac of photovoltaic (PV) arrays over an area of approximately 180 hectares. It includes associated electrical infrastructure, maintenance facilities, access tracks and minor upgrades to adjacent roads.

1.2 LEGISLATIVE CONTEXT AND SCOPE OF THIS PLAN

The Manildra Solar Farm project was approved by the NSW Department of Planning in March 2011, under Part 3A (Major Projects) of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). In October 2014, a modification application was submitted to the NSW Department of Planning and Environment under Section 75W of the EP&A Act. The Modification 1 application sought to include the use of tracking panels that would have a 5 metre maximum height. This Modification was approved on 25 March 2015 by the delegate of the Minister for Planning, subject to conditions.

In July 2015, a second Modification application was submitted to the NSW Department of Planning and Environment under Section 75W of the EP&A Act. The modification 2 application sought to modify the Project's Approval, including: extending the lapse date of the approval by 3 years (i.e. to March 2019); allowing string inverters to be installed at the project; changing the noise monitoring requirements; and, updating the schedule of land for the project. The Modification 2 application was approved on 28 August 2015 by the Minister for Planning, subject to conditions.

The consolidated Conditions of Consent (August 2015) for the project (including the Conditions from the approved Project Modifications 1 and 2) outline specific requirements for flora and fauna management during construction and operation.

In addition, requirements have also been taken from the:

- Environmental Assessment, prepared by NGH Environmental October 2010
- Submissions Report, prepared by NGH Environmental December 2010

Items that must be addressed in this plan are identified in Appendix B. The key requirement is outlined in Condition of Consent 14:

As part of the Construction Environmental Management Plan required under condition C13 of this approval, the proponent shall prepare and implement the following:

a) a **Flora and Fauna Management Plan**, developed in consultation with OEH, to outline measures to protect and minimise loss of native vegetation and native fauna habitat as a result of construction of the project. The Plan shall include, but not necessarily limited to:

- (i) plans showing terrestrial vegetation communities; important flora and fauna habitat areas; location where EECs, native pasture; and areas to be cleared. The plans shall also identify vegetation adjoining the site where this contains important habitat areas and /or threatened species, populations or ecological communities;
- (ii) methods to manage impacts on flora and fauna species and their habitat which may be directly or indirectly affected by the project, such as location of fencing, procedures for vegetation clearing or soil removal/stockpiling and procedures for re-locating hollows or installing nesting boxes and managing weeds;
- (iii) procedures to accurately determine the total area, type, and condition of vegetation community to be cleared;
- (iv) reference to the Ground Cover Management Plan required in condition C14(b); and
- (v) a procedure to review management methods where they are found to be ineffective.

1.3 RELATIONSHIP TO OTHER ASSESSMENTS AND PLANS

1.3.1 Source documents

Specific to this project,

1. A Biodiversity Assessment (BA) (NGH Environmental 2010a) was completed in November 2010 as part of an Environmental Assessment for the project (NGH Environmental 2010b).

Supplementary surveys were also documented and summarised within the:

2. Biodiversity Addendum (NGH Environmental 2010c) and
3. Submissions Report (NGH Environmental 2010d)

Surveys associated with these assessments targeted:

- Reptiles (Pink-tailed Worm-lizard, Little Whip Snake) and associated habitat
- Threatened flora species (Spring survey and Winter surveys)
- Box-Woodland EEC (condition assessment)
- Hollow-bearing trees (Superb Parrot and other hollow-dependent fauna habitat)

These documents form source documents for the development of this Flora and Fauna Management Plan (FFMP).

1.3.2 Associated environmental management plans

Associated environmental management plans of relevance to this FFMP include:

Construction Environmental Management Plan	<p>An overarching Construction Environmental Management Plan (CEMP) applies to this project.</p> <p>This FFMP is a sub-plan of the CEMP.</p>
Offset Strategy	<p>An Offset Strategy. The management of an offset site for biodiversity improvement ensures an overall ‘maintain or improve’ environmental outcome, as required for Major Projects.</p> <p>An Offset Plan would be developed to verify the impacted areas have been appropriately offset and would contain any management measures required for any offset lands.</p>
Groundcover Management Plan	<p>A Ground Cover Management Plan to monitor and manage:</p> <ul style="list-style-type: none"> • Weeds • Site rehabilitation • Maintenance of ground cover (particularly beneath panels)

1.4 HOW TO USE THIS DOCUMENT

This document includes the following information:

Section 2	<p>Sets out the environmental context of the project as it relates to flora and fauna impact management.</p> <p>Provides the ‘limit of clearing’ or estimated impact areas for the development.</p>
Section 3	<p>Sets out the management framework, roles and responsibilities, consultation requirements and monitoring, auditing and reporting requirements of the project.</p>
Section 4	<p>Identifies the key flora and fauna risks from the construction activities.</p> <p>Sets out management protocols to address these.</p>
APPENDIX A	<p>Provides annotated site plans locating areas of constraint and identifying where protocols apply on the ground.</p>
APPENDIX B	<p>Provides a reference table to verify all required conditions of consent are addressed by this plan.</p>

2 EXISTING ENVIRONMENT

2.1 GENERAL

Land at the proposal site is gently undulating with rocky patches throughout. Elevation ranges from 450 m to 490 m. The site is at a higher elevation than the majority of the Manildra township which lies roughly 1.5 km to the south west. A small drainage line runs through a short section of the most western paddock. Mandagery Creek lies 1.5 km west of the site.

The proposal site is largely cleared of tree and shrub cover. The understorey is entirely exotic in cropped areas, and in grazed areas is dominated by exotic grasses or native grasses with exotic forbs. Native species diversity is generally low. Native vegetation at the site is likely to be derived from Box-Gum Woodland. Overstorey species are predominantly White Box and Yellow Box eucalypts. Most trees are mature although very few have formed hollows.

The site is privately owned grazing and cropping land carrying largely exotic pasture species which was originally derived from grasslands and woodland. Areas where infrastructure will be located are almost entirely cleared of trees. Figures 2-1 to 2-6 illustrate the general site features. The vegetation communities occurring onsite are listed below and mapped on Figure 2-7.

In summary, three vegetation communities were identified:

- Box-Gum Woodland remnants, mostly small remnant of tree cover, with exotic groundcover
- Box-Gum Woodland derived native grassland
- Exotic crop or pasture, making up the vast majority of the site

All native vegetation onsite would meet the Biometric definition of 'moderate to good' condition in accordance with this two class condition system. However, it is highly degraded and has been considered poor and poor to moderate, according to a more detailed five class condition system used by NGH Environmental.



Figure 2-1 Cultivated paddocks to be occupied by the Solar Farm



Figure 2-2 Exotic dominated pasture to be occupied by the Solar Farm



Figure 2-3 Remnant White Box stand in cultivated paddock



Figure 2-4 Remnant Yellow Box stand in cultivated paddock



Figure 2-5 Native grassland and exotic patches under trees in the western paddock



Figure 2-6 Isolated White Box tree on thin outcrop of rock within a cultivated paddock

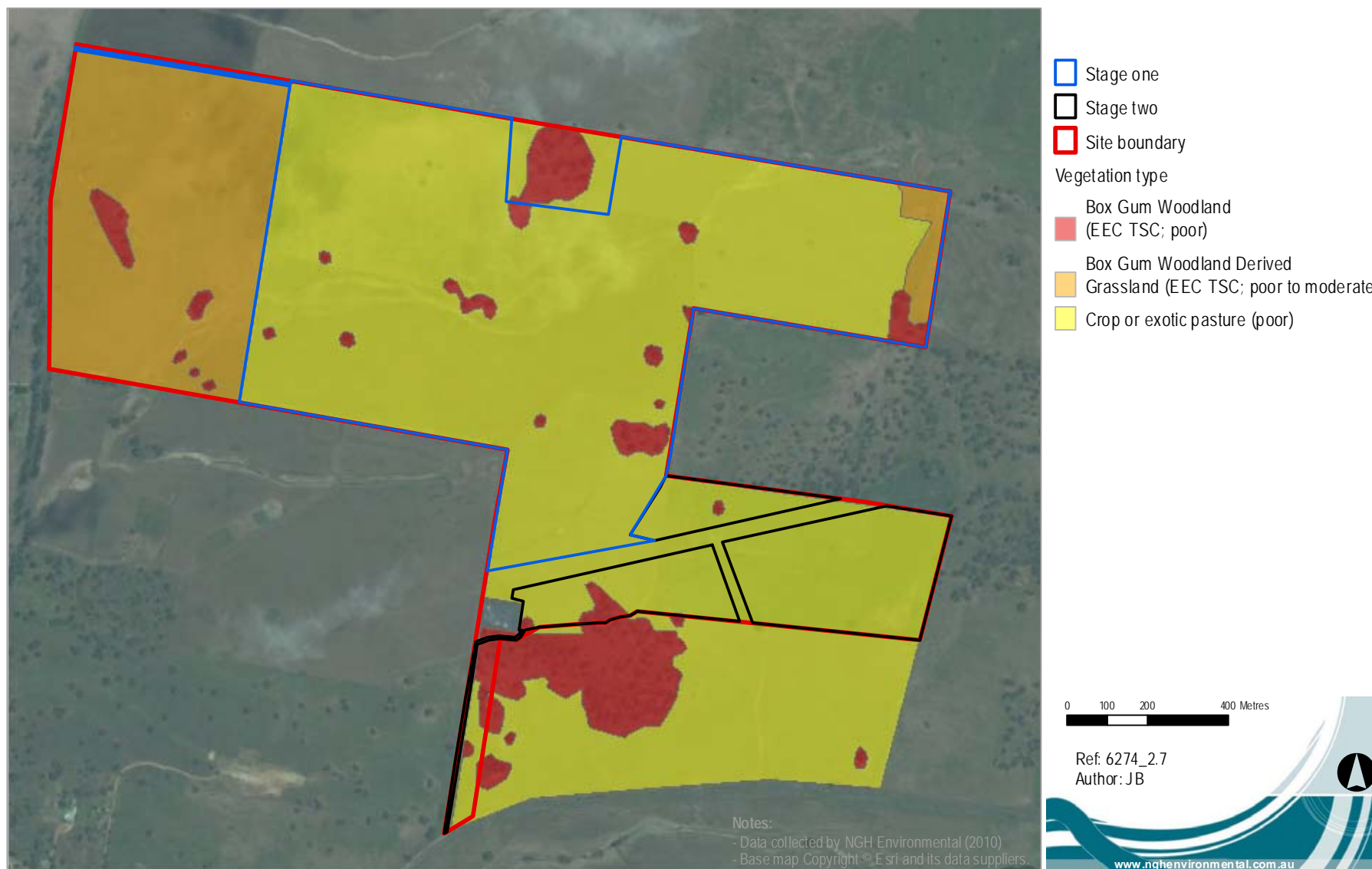


Figure 2-7 Vegetation communities at the Proposed Manildra Solar Farm site

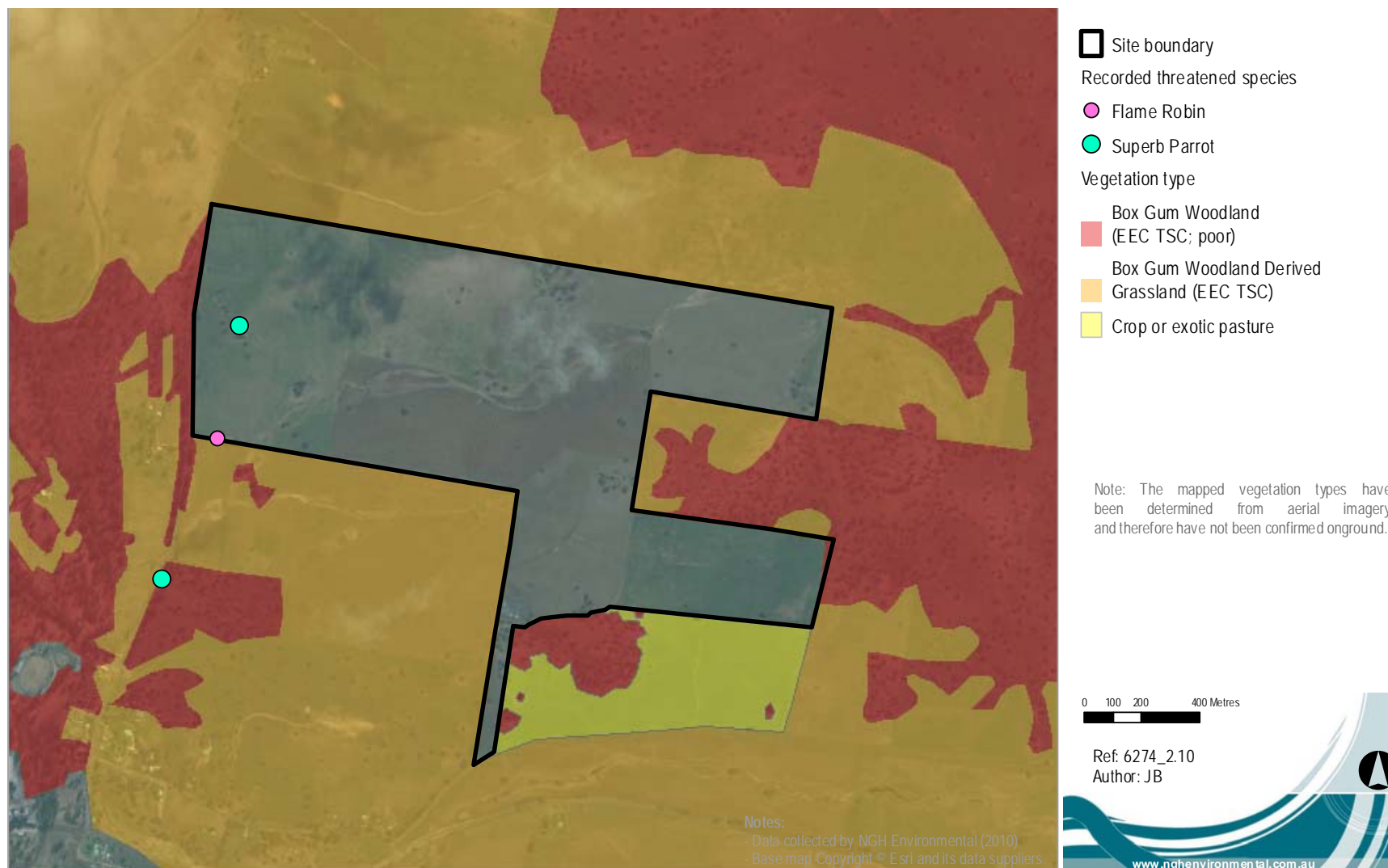


Figure 2-8 Extrapolated vegetation communities surrounding the site and recorded threatened species within the locality.

Notes, Figure 2-8 identifies the potential vegetation types that are surrounding the site. The vegetation mapping was extrapolated from onsite data, using aerial imagery and undertaken on a precautionary basis. Tree cover was assumed to be Box Gum Woodland ECC and cleared areas with sparse tree coverage were mapped as Box Gum Woodland Derived Grassland ECC. A search of the OEH Wildlife Atlas Database identified three recorded threatened species within the locality of the site. A Flame Robin and Superb Parrot were recorded within the site by NGH Environmental during previous assessments for the proposal. A Superb Parrot has been recorded south of the proposal site. The potential for EEC and habitat for threatened species such as the Flame Robin and Superb Parrot nearby underscores the importance of defining constraint areas (Protocol 2, Section 4.2).

2.2 THREATENED SPECIES AND COMMUNITIES

2.2.1 Survey methods and survey effort

Ecological surveys were completed as part of the Biodiversity Assessment (NGH Environmental 2010a) and Biodiversity Addendum (NGH Environmental 2010c), as summarised below:

Table 2-1 Survey effort

Source	Survey type	Survey effort
Biodiversity Assessment NGH Environmental 2010a	Habitat assessment	16 assessments
	Diurnal bird survey	5 surveys, 120 minutes in total
	Camera traps	3 camera nights
	Spotlight	1 foot transect, 1 vehicle transect
	Call playback	1 survey 35 minutes total
	Reptile search	3 surveys, 50 minutes total
Biodiversity Addendum NGH Environmental 2010c	Threatened flora linear transect surveys – foot based	5 hrs
	Additional habitat assessment	6 assessments

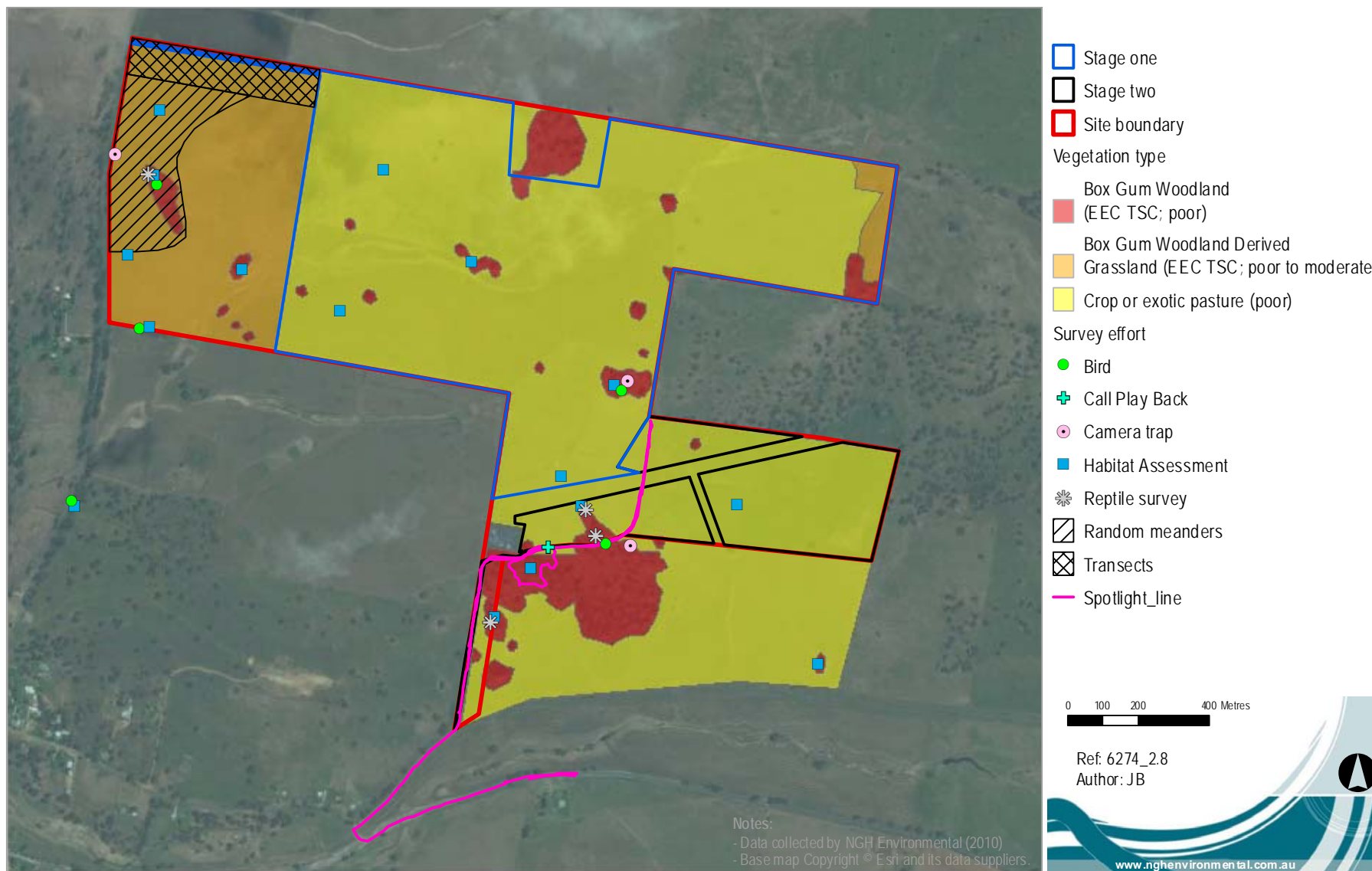


Figure 2-9 Survey effort

2.2.2 Survey results

Endangered Ecological Communities

The native vegetation onsite is derived from an endangered Ecological Community (EEC):

Box-Gum Woodland (Yellow Box – Blakely’s Red Gum Grassy Woodland)

Listed as White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland Endangered Ecological Community (EEC) under the Commonwealth EPBC Act and NSW TSC Act.

Grassland derived from this community also meets the EEC definition. Such areas are mapped in the western paddock and will not be affected by proposed works.

The vegetation type and condition is mapped on the preceding figures.

Flora

No threatened flora species were recorded onsite during surveys for the Biodiversity Assessment or supplementary spring surveys. Low potential for impact to any threatened flora was concluded, a result of the poor condition of the vegetation onsite.

Fauna

Two threatened fauna species listed under the TSC Act were recorded onsite:

- Flame Robin (*Petroica phoenicea*)
- Superb Parrot (*Polytelis swainsonii*)

Flame Robins

Each year the Flame Robin migrates up to the highlands of south-eastern Australia to breed in alpine and subalpine woodlands and scrubby forest. In winter it moves to more open lowland habitats such as grassland with scattered trees and open woodland on the inland slopes and plains (Higgins and Peter 2002). Flame Robins are capable of foraging in modified farmland and the loss of foraging habitat is the major potential impact to these species from the Proposal.

Flame Robins were recorded along the southern boundary of the western paddock in the vicinity of the regeneration seeding trial plots. Seven birds were seen foraging within the site and adjacent sown field. Open areas within the development envelope are used for foraging by this species however Flame Robins are unlikely to breed on site.

Superb Parrots

The district forms part of the South-West Slopes Important Bird Area (IBA), which protects the core breeding area for the Superb Parrot. The Superb Parrot occurs in Box-Gum grassy woodland and open forest, and also on the edges of these habitats. The Superb Parrot forages on the ground or in trees, feeding on lerp, mistletoe berries, eucalypt flowers and grass seed. This species is long lived with low fecundity and requires tree hollows for nesting. Superb Parrots utilise Box-Gum Woodland for foraging and breeding (summer), mostly nesting in dead trees, particularly Blakely’s Red Gum. Even isolated paddock trees are important nesting habitat for this species.

Two pairs of Superb Parrots were seen on site; one in the remnant Box-Gum Woodland near the substation and another (possibly the same pair) flying over the site from south to north. Avoiding clearing during the breeding period for this species is an important protocol within this plan.

Habitat resources

Habitat resources occurring onsite include:

- Hollow bearing trees (eight trees inside the development area that are likely to be impacted)
- Mature eucalypts and isolated shade trees ¹
- Native grassland and associated rock outcrops in the western paddock
- Rock outcrops and log habitat

The location of the threatened fauna records and the habitat features, as mapped in the Biodiversity Assessment and Addendum (NGH Environmental 2010a and c) are mapped below.

¹ Shade trees were not mapped as part of the BA 2010a or c. Only hollow bearing trees are mapped.

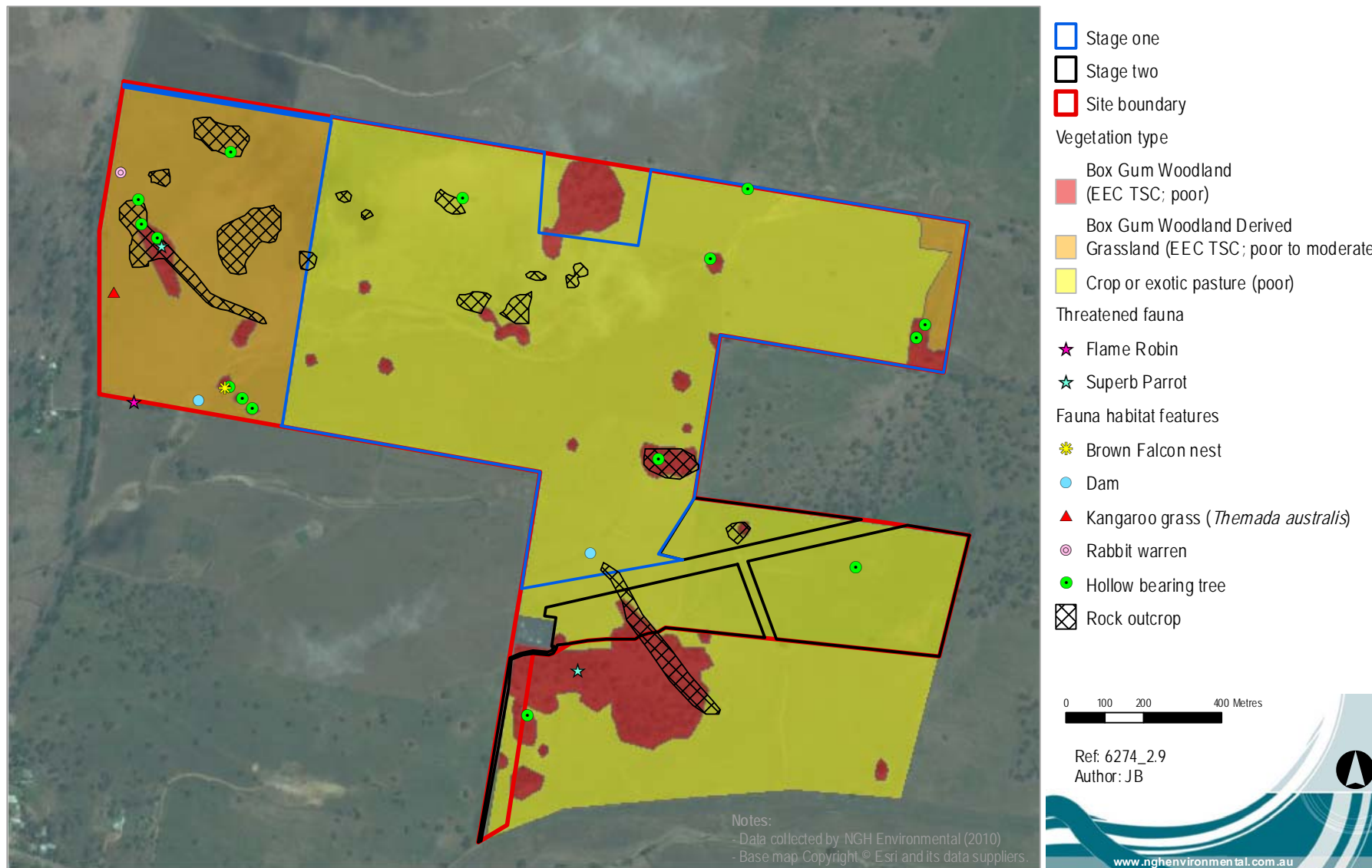


Figure 2-10 Survey results

2.3 DISTURBANCE AND WEEDS

The majority of the woodland vegetation at the site has been historically cleared and thinned to provide areas for cropping and pasture. Past clearing and agriculture has produced a range of direct and indirect impacts to flora habitats, including altered microclimate, loss of pollinator and dispersal fauna, erosion of soils, altered hydrological regimes and elevated soil nutrients. Minor gully erosion was evident in the drainage line in the south west of the western section of the site.

Agricultural activities have resulted in the majority of the site being planted with introduced crop species such as Wheat and Canola. The disturbance has led to the colonisation of a range of other introduced plant species. In areas not utilised for cropping, grazing is likely to have reduced or eliminated selectively grazed or grazing sensitive species, such as Kangaroo Grass (*Themeda australis*), terrestrial orchids, wattles and pea shrubs.

Minor pasture weed species were common across the majority of the study area. Three noxious weeds declared for the Cabonne Shire Council Area under the *Noxious Weeds Act 1993* were recorded at the subject site. The status and distribution of these weeds at the site are summarised in Table 2-1.

All of the recorded noxious weeds are listed as Class 4 weeds, meaning that the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.

Table 2-2 Noxious weeds at the subject site

Weed species	Status	Abundance and distribution
African boxthorn * <i>Lycium ferocissimum</i>	Class 4	Few individuals in patch of White Box in southern section of the site (survey point 2)
Bathurst burr * <i>Xanthium spinosum</i>	Class 4	One dead individual in the patch of White Box in the central northern section of the site (inspection point). Scattered individuals in B5 and the western paddock.
Scotch thistle * <i>Onopordum acanthium</i>	Class 4	One individual detected in B3 (survey point 4) and removed by NGH Environmental.

Weeds have not been mapped due to the low number and expected changes in weed distribution over time.

2.4 CLEARING REQUIREMENTS FOR CONSTRUCTION

Ensuring that impacts on native vegetation are minimised is important to meet the consent conditions for this project.

2.4.1 Impact area assumed by the environmental assessment

In the Biodiversity Addendum (2010d) provided within the Submissions Report, 13.5 hectares of native vegetation was estimated to be impacted. This was assessed to be in poor condition and would qualify as EEC.

2.4.2 Impact area required by the final construction footprint

The final construction footprint was provided in September 2015 (BD-100-T-ALT 2 Rev A2 9-4-15). Using the outer envelope, not broken down into infrastructure components, this was overlaid on vegetation mapping for the site, to determine the amount of impact on native vegetation. Using the outer envelope is considered to provide the 'upper limit' / 'worst case' area of impact. The results are presented below and indicate less than 7.5 ha of native vegetation would now be impacted.

Table 2-3 Calculated total area of impact for the development according to Biometric vegetation types

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

It is noted that units smaller than 0.25ha are not required to be offset as they are not considered viable (in accordance with the Biobanking assessment methodology that applied at the time of project approval). As such, for the purposes of determining the offset requirement, the clearing estimate will be slightly smaller, as shown in Table 2-4.

Table 2-4 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

These areas are mapped on Figure 2-7, by vegetation type and condition.

Note, all areas of native vegetation would qualify as 'moderate to good' condition under the Biometric definition.

2.4.3 Impact on habitat resources

In addition to the native vegetation area impact, the final construction footprint would also impact:

- Eight hollow bearing trees.
- Rock outcrops and log habitat.

These areas are mapped on Figure 2-9.

3 MANAGEMENT FRAMEWORK

3.1 RESPONSIBILITIES

Responsibilities specific to flora and fauna management are detailed below in Table 3-1.

Table 3-1: Personnel with specific flora and fauna responsibilities

Name	Organisation	Role	Responsibility	Authority
TBA	Manildra Solar Farm Pty Ltd (MSFPL)	Senior management and strategic control	<p>Responsible for providing the required resources to complete the required tasks and to facilitate company corporate support.</p> <p>Responsible for ensuring the project complies with the Conditions of Approval and all statutory and other obligations.</p>	Authority to limit or stop works.
TBA	Contractor	EPC Construction Manager	<p>Determining sequence and interaction of processes.</p> <p>Ensure communications and reporting framework in place.</p> <p>Ensure the goals of the CEMP and sub-plans are achieved.</p> <p>Report incidents to ER and agencies as required.</p> <p>Ensure environmental management is appropriate and resourced.</p> <p>Review CEMP and sub-plans.</p> <p>Ensure timely delivery of corrective actions.</p> <p>Ensure requirements of the CEMP and sub-plans are communicated and implemented.</p> <p>Implement and comply with communications and reporting framework.</p> <p>Responsible for compliance with all applicable environmental legislation and contract obligations.</p> <p>Responsible for the implementation and maintenance of CEMP</p> <p>Implement and monitor corrective actions</p> <p>Comply with regulations within CEMP.</p> <p>Ensure training is delivered and appropriate</p>	<p>All aspects of the environmental performance of the project during construction.</p> <p>Authority to update and implement CEMP, upon ER endorsement and agency approval, where required.</p> <p>Authority to limit or stop works.</p> <p>Authority to require environmental actions to be undertaken.</p> <p>Reports to the Proponent.</p>
TBA	TBA	Environmental Representative	<p>The principal point of advice in relation to the environmental performance of the project.</p> <p>Oversee the implementation of all environmental management plans and monitoring programs required under the planning approval, and advise the Proponent upon the achievement of these plans/programs.</p> <p>Consider and advise the Proponent on its compliance obligations against all matters specified in the conditions of the planning approval and the Statement of Commitments and all other licences and approvals related to the environmental performance and impacts of the project.</p>	Authority to require environmental actions to be undertaken.

Name	Organisation	Role	Responsibility	Authority
			<p>Ensure environmental auditing is undertaken in accordance with all relevant project Environmental Management Systems.</p> <p>Be given the authority and independence to require reasonable steps be taken to avoid or minimise unintended or adverse environmental impacts, and failing the effectiveness of such steps, to direct that relevant actions be ceased immediately should an adverse impact on the environment be likely to occur.</p>	
TBA	TBA	Site Construction and Environmental Compliance Officer (SCECO)	<p>SCEOs are responsible for the day-to-day management of all on-site environmental aspects including field testing, site inspections and any monitoring requirements within their designated area(s). SCEOs play a key role as part of the construction team, and play a practical role in maintaining on-site environmental controls (e.g. erosion and sedimentation controls, incident response) and environmental data collection (e.g. waste tracking, auditing).</p> <p>This role can be performed a construction staff member or construction manager, if they are trained and experienced in the relevant subject areas (Sediment and erosion control).</p>	<p>Implementation of stop work orders.</p> <p>Reports to EPC manager.</p>
All site personnel		Contractors and their staff	<p>Ensure goals of CEMP and sub-plans are implemented upon instruction.</p> <p>Identify and proactively report incidents.</p> <p>Receive training.</p>	<p>Suggest Stop Work orders (<i>stop work permitted if action deemed unsafe</i>).</p>
TBA	TBA	Ecologist (suitably qualified for the task)	<p>Input from the ecologist will be sought at a minimum of once per month following monthly compliance meetings (or as required). The ecologist will be updated as to the on ground results of the protocols within this FFMP and will evaluate the need for onsite inspection and change to any protocols to improve the on ground results.</p> <p>The ecologist is responsible for providing on-site ecological services, where required by this plan e.g. pre-clearance surveys of hollow bearing trees.</p> <p>This role may be undertaken by suitably qualified MSFPL environmental staff or an external party.</p>	<p>Authority to require actions to be undertaken in relation to ecological issues.</p>

3.2 SUBCONTRACTOR MANAGEMENT

Subcontractors are required to adopt this CEMP specific to their detailed activities. They are required to prepare activity related **Environmental Work Method Statements (EWMS)**. They may elect to prepare their own CEMP framework document but if so it must comply with the requirements stipulated in this sub-plan, the CEMP and any other sub-plans.

CEMP and EWMS documentation is to be supplied to the EPC Contractor prior to works being undertaken. The EPC Contractor will be responsible for verifying whether the subcontractor documents:

1. Are consistent with the CEMP framework and sub-plans
2. Adequately address the environmental risks of the activity

Formal advice in this respect will be provided to the subcontractor before works can commence.

3.3 CONSULTATION REQUIREMENTS

This FFMP has been developed in consultation with OEH.

The draft document was forwarded to OEH for comment and now includes changes to address OEH comments regarding the risk matrix definitions in Section 4.1 and additional hollow-bearing tree offset requirements.

3.4 ENVIRONMENTAL MONITORING, REPORTING AND COMPLIANCE

The CEMP and all associated sub-plans (including this Flora and Fauna Management Sub-plan) will be implemented on site during the entire construction period. The implementation will be monitored, reviewed and audited throughout the construction phase as described in the CEMP and summarised below.

3.4.1 *Environmental monitoring*

Environmental inspections will be on going at regular intervals during the construction phase of the project. The proposed inspection schedule, including responsible personnel, reporting requirements and frequency, is detailed in the CEMP. It includes:

- Weekly inspections by the EPC Construction Manager / Environmental Site Officer
- Periodic inspections by the Environmental Representative, depending on works progress
- Monthly compliance meetings by the EPC Construction Manager, MSFPL Construction Manager, Environmental Site Officer and Environmental Representative
- Management reviews, as required

3.4.2 *Environmental auditing*

The project will be subject to ongoing auditing during the construction phase. The auditing will involve both internal and external audits. Internal audits would be undertaken over regular intervals throughout construction. A single external (third party e.g. the Environmental Representative) audit is proposed during construction. The proposed internal auditing regime is detailed in the CEMP.

Audits will be conducted in accordance with ISO 19011:2003 - Guidelines for Quality and/ or Environmental Management Systems.

Audits will focus on:

- Application of procedures and practices
- The CEMP
- Field inspection of environmental controls
- Review of critical controls, including contractor management, emergency response, hazardous substances, incident management and investigation
- Methods for hazard identification and risk control

- Document control and review
- Incident reporting and closure
- Management of contractors and subcontractors
- Preparedness of critical emergency response equipment

3.4.3 Environmental reporting

Environmental issues will be reported in a number of ways:

1. Recorded on the Environmental Actions Register
2. Identified during Audits as Corrective Action Requests, Observations of Concern or Opportunities
3. Identified during toolbox talks or routine observations

These are detailed in the CEMP.

3.4.4 Adaptation of protocols in response to on-ground results

The monthly compliance meetings between the EPC Construction Manager, MSFPL Construction Manager, Environmental Site Officer and Environmental Representative may identify a need to adapt the protocols to improve on-ground results. Input from the ecologist will be sought at a minimum of once per month immediately before and during clearing, following the monthly compliance meetings (or as required). The ecologist will be updated as to the on-ground results of protocols. The need for on-site inspection and change to any protocols will be determined by the ecologist and the site environment officer. The advice will be documented and provided to the MSFPL Project Manager.

Additionally, the site environment officer may request input from the ecologist at other times, depending on the works progress.

4 ENVIRONMENTAL MANAGEMENT OF ACTIVITIES

4.1 ENVIRONMENTAL ACTIVITIES, IMPACTS AND RISKS

This section identifies environmental risks of the project, to ensure activities with potential to harm the environment are managed commensurate to the risk they pose. Risk is rated low to high, dependent on the likelihood of the activity harming the environment, and the consequence, if the activity should the activity harm the environment. Refer to Table 4-1.

Table 4-1: Risk matrix

		Consequence		
		1 Major	2 Moderate	3 Low
Likelihood	1 Certain	High	High	Moderate
	2 Possible	High	Moderate	Moderate
	3 Remote	Moderate	Moderate	Low

Risk matrix definitions:

Likelihood	Description
Certain	It is very probable that this risk could occur in any year (>95%)
Possible	It is equally probably that this risk could occur in any year (50%)
Remote	It is improbable that this risk could occur in any year (<5%)
Consequence	Description
Major	Major loss in numbers or habitat leading to a substantive adverse impact on local or regional population viability.
Moderate	Moderate loss in numbers or habitat may have a minor adverse impact on local or regional population viability.
Low	Repeated small impacts would not cause a substantive adverse impact on flora and fauna; no impact on local or regional population viability.

Construction activities that may have an adverse impact on flora and fauna and their associated risk ratings are summarised in Table 4-2 (extracted from the Environmental Assessment: Manildra Solar Farm, Final V1, November 2010, NGH Environmental, 2010b). Note, the impacts below do not include the shading from panels, which is an operational impact of the project.

Table 4-2: Risk assessment for Manildra solar farm construction activities

Activity	Potential impact	Likelihood	Consequence	Risk
Clearing and grubbing	Habitat removal (native vegetation and hollow-bearing trees)	Certain	Low	Moderate
	Habitat modification	Certain	Low	Moderate
	Degradation of adjacent areas of habitat	Possible	Low	Moderate
Excavation (of tracks, lay down areas)	Habitat removal (rock outcrops)	Remote	Low	Low
	Habitat modification	Possible	Low	Moderate
	Erosion of disturbed areas and stockpiles	Possible	Low	Moderate

Activity	Potential impact	Likelihood	Consequence	Risk
Install solar array infrastructure	Habitat alienation	Certain	Low	Moderate
Operation of machinery and plant	Collisions with wildlife	Possible	Moderate	Moderate
	Habitat alienation	Certain	Low	Moderate
Pole and overhead transmission line installation	Erosion of disturbed areas	Possible	Low	Moderate
	Erosion of stockpiles	Possible	Low	Moderate
	Reduced air quality (dust)	Possible	Low	Moderate
Trenching for underground transmission line installation	Habitat removal	Certain	Low	Moderate
	Habitat modification	Certain	Low	Moderate
	Erosion of disturbed areas and stockpiles	Possible	Low	Moderate
	Pollution (sedimentation or spill risk) to local waterways	Remote	Low	Low
	Trap hazard to fauna	Possible	Moderate	Moderate

Most activities are considered a moderate risk. Specific protocols have been developed to manage the impacts of these activities in Section 4.2.

PROTOCOL 1: Design measures	OBJECTIVE: Minimise harm to flora and fauna
PROTOCOL 2: Constraints areas	OBJECTIVE: Avoid / minimise impacts in sensitive areas
PROTOCOL 3: Vegetation clearing	OBJECTIVE: Minimise clearing extent
PROTOCOL 4: Trenching	OBJECTIVE: Minimise trap hazard
PROTOCOL 5: Operation of plant and equipment	OBJECTIVE: Minimise noise and other disturbance, minimise harm to resident fauna (including any stock)
PROTOCOL 6: Habitat restoration	OBJECTIVE: Restore habitat
PROTOCOL 7: Hollow-bearing tree removal guidelines	OBJECTIVE: Minimise harm to resident fauna
PROTOCOL 8: Monitor and adapt actions	OBJECTIVE: Improve management of flora and fauna / respond to on ground results

Additionally, the following issues are addressed by other management plans and are not discussed further by this plan:

Weed control and Rehabilitation of disturbed areas	Covered within the Groundcover Management Plan
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4.2 ENVIRONMENTAL PROTOCOLS

The following eight (8) protocols detail the required management actions in specific areas in accordance with the project's conditions of approval.

Site Plans, illustrating where these protocols apply, are provided as Appendix A.

Table 4-3: Flora and fauna management protocols for the Manildra Solar Farm

PROTOCOL 1: Design measures	OBJECTIVE: Minimise harm to flora and fauna	Responsibility
Endangered Ecological Community (EEC) impacts	<ul style="list-style-type: none"> • Within the development envelope, impacts on EEC vegetation will be minimised (where practical). Most significantly, this includes two large remnants on the northern boundary of the development envelope and on the north eastern boundary of the development envelope. If impacted, these areas will require offsets (refer to Offset Strategy for this project). Smaller remnants within the development envelope that cannot be avoided will also be offset where larger than 0.25ha in area. 	EPC Construction Manager
Overhead powerlines	<ul style="list-style-type: none"> • Power poles and overhead powerlines will be bird-safe using flags or marker balls, large wire size and wire and conductor spacing (where practical) 	EPC Construction Manager
Underground power cabling	<ul style="list-style-type: none"> • Underground cable, in preference to an overhead transmission line, will be installed within the existing farm track to the substation, to minimise additional impacts (where practical) 	EPC Construction Manager
Tracks	<ul style="list-style-type: none"> • Use of the existing track (rather than the creation of a new track) will be preferred to allow access to the site from the substation (where practical) • Tracks that will not be used during operation will be rehabilitated from 8m width to 5m width where practical, after works. This reduces the impact to only that required for the operation of the project, after construction is complete. 	EPC Construction Manager
Fences	<ul style="list-style-type: none"> • Where security considerations permit, perimeter fencing will not contain barbed wire, particularly the top strands. • If a cyclone mesh fence is to be used efforts should be made to increase the visibility to fast flying parrots. 	EPC Construction Manager
Ancillary facilities	<ul style="list-style-type: none"> • Construction site office and other ancillary facilities will be located to avoid the constraints areas identified in Appendix A. • Preference will be given to areas that area in poorest condition, such as areas of previous disturbance 	EPC Construction Manager

PROTOCOL 2: Constraints areas	OBJECTIVE: Avoid / minimise impacts in sensitive areas	Responsibility
1. Define constraints area	<p>With reference to the site plans in Appendix A, outside of the development envelope, the following areas will be fenced or otherwise clearly marked on the ground for avoidance:</p> <ul style="list-style-type: none"> • Endangered Ecological Communities (EECs) • Mature trees (over >50cm diameter at breast height). The dripline of trees should be used to demarcate the constraint area • Hollow-bearing trees. The dripline of trees should be used to demarcate the constraint area • Rock outcrops (including a 2.5m buffer) should be fenced for avoidance, wherever possible. • Offset areas <p>With reference to the site plans in Appendix A, inside the development envelope, impacts to the following areas will be minimised, where this is possible:</p> <ul style="list-style-type: none"> ○ Endangered Ecological Community (EEC) understorey, where possible ○ Mature trees that can be retained (over >50cm diameter at breast height). The dripline of trees should be used to demarcate the constraint area ○ Hollow-bearing trees. The dripline of trees should be used to demarcate the constraint area ○ Rock outcrops (including a 2.5m buffer) should be fenced for avoidance, wherever possible. 	EPC Construction Manager
2. Communicate about constraints areas	<ul style="list-style-type: none"> • The locations of all constraints areas will be made known to all on ground staff (annotated site plans to be displayed in lunch room or site office) • Specific management required near constraints areas will be discussed in tool box talks and environmental inductions 	EPC Construction Manager
3. Activities in and near constraints areas	<p>Excluding where works are required:</p> <ul style="list-style-type: none"> • No works, including clearing, traffic, deposition of spoil, rubbish or materials laydown, are to be conducted in constraints areas • Indirect impacts (for example, potential for sediment laden runoff and weed ingress) will be managed by implementation of activity-based protocols (Vegetation Clearing, Trenching, Protocols 3 and 4) 	EPC Construction Manager

PROTOCOL 3: Vegetation clearing	OBJECTIVE: Minimise clearing extent	Responsibility
1. Minimise clearing	<ul style="list-style-type: none"> • Clearing of vegetation (required for tracks, underground power and the array where it affects overstorey vegetation) will be limited to the minimal extent practicably required • Extents of clearing: <ul style="list-style-type: none"> ○ The limits of clearing will be clearly marked on the ground (flagging, stakes, fences etc.) and GPSed. The marked areas to be cleared will be overlaid on the vegetation map (Figure 2-7) to provide an updated impact area table and verify the actual areas of clearing. ○ All areas not marked for clearing will be treated as constraints – no direct impacts. According to Protocol 2 no works are to be conducted in constraint areas. ○ Tree pruning will be undertaken in favour of tree removal, where possible • Hollow bearing trees and mature trees (>50cm DBH) will be avoided to the maximum extent possible 	EPC Construction Manager
2. Clearing dense native pasture	<ul style="list-style-type: none"> • Where practicable, whole sods will be removed with an excavator where these areas are well-vegetated with dense root systems. Sods will be stored in moist, shaded conditions and replaced following the works. Sod storage time will be minimised and sods will be replaced in a manner that maximises the chances of re-establishment. 	EPC Construction Manager
3. Clearing of mature trees	<ul style="list-style-type: none"> • If the removal of mature trees (>50cm diameter at breast height) cannot be avoided: <ul style="list-style-type: none"> ○ Identify whether the trees are hollow-bearing according to the hollow-bearing tree removal guidelines (Protocol 7). If trees are not identified as hollow-bearing: ○ Fell trees into the most disturbed area possible, to avoid damaging adjacent vegetation ○ Do not push felled vegetation into constraints areas features 	EPC Construction Manager
4. Clearing near large mature trees	<ul style="list-style-type: none"> • Where clearing near trees: <ul style="list-style-type: none"> ○ Excavations and vehicle/machinery movements will occur outside the canopy drip line of large eucalypts 	EPC Construction Manager
5. After clearing: rehabilitation	<ul style="list-style-type: none"> • Rehabilitation will be conducted as outlined in the Groundcover Management Plan 	EPC Construction Manager

PROTOCOL 3: Vegetation clearing	OBJECTIVE: Minimise clearing extent	Responsibility
6. After clearing: Verify offsets are adequate	After clearing, <ul style="list-style-type: none"> • The boundaries of all cleared areas will be mapped using hand held GPS • An updated vegetation impact table will be produced, with input from an ecologist (as per Table 3-1 of this FFMP) • The actual area of impact will be used to verify that the designated offsets for the project are adequate and in accordance with the Offset Plan for the project • If inadequate, additional offsets will be added in consultation with OEH. 	Site Construction Manager

PROTOCOL 4: Trenching	OBJECTIVE: Minimise trap hazard	Responsibility
1. Trenching	<ul style="list-style-type: none"> • Trenches should be backfilled as soon as possible to minimise the chance of fauna becoming trapped • Trenches left open overnight: <ul style="list-style-type: none"> ○ Will be sealed if possible ○ If they cannot be sealed, check trench at first light and remove trapped fauna - release into nearby vegetation outside of the project site ○ Where required, handle trapped animals safely, minimising stress and injury ○ Where required, frogs will only be handled using gloves • Excavated topsoil and subsoil will be stored separately and replaced in a manner that replicates the original profile as closely as possible, to assist natural revegetation. <p><i>Notes:</i> Small mammals and reptiles are easily trapped by open trenches. Handling animals should be done with care.</p>	EPC Construction Manager

PROTOCOL 5: Operation of plant and equipment	OBJECTIVE: Minimise noise and other disturbance	Responsibility
1. Operation of equipment	<ul style="list-style-type: none"> • All reasonable and feasible noise control measures will be implemented prior to the commencement of construction works. This includes: <ul style="list-style-type: none"> ○ Construction plant will be maintained in good working order to minimise unnecessary emissions ○ Where practical, construction plant will not be left idling when not in use ○ The use of noisy plant / machinery simultaneously will be minimised as far as practicable 	EPC Construction Manager
2. Potential for collisions / other disturbance	<ul style="list-style-type: none"> • Stock will be restricted from construction work areas in consultation with the landowners. • Heavy vehicles will be restricted to existing tracks and designated access ways which will be marked on site plans. Other vehicles (parking and access) will be rationalised to limit areas of impact, in accordance with the Traffic Management Plan. • Vehicle speed will be limited onsite • All staff will be made aware of high risk periods for vehicle collisions with wildlife, which are: <ul style="list-style-type: none"> ○ Early morning ○ Evening 	EPC Construction Manager

PROTOCOL 6: Fauna habitat restoration	OBJECTIVE: Restore fauna habitat	Responsibility
1. Nest boxes:	<ul style="list-style-type: none"> • Nest boxes to offset hollow bearing trees must be installed within 3 months of the removal of the hollow bearing tree. • For each hollow bearing tree to be removed, mount nest boxes (or hollow tree sections) of similar size to the hollows removed (2 nest boxes per hollow bearing tree to be removed) in nearby trees. • The number of nest boxes required and their size would be determined by an ecologist, based on the hollow-bearing trees to be removed. • Trees for mounting the boxes in would be selected by an ecologist. They should not contain hollows. They should be of sufficient size to accommodate the nest box. • Advice on mounting aspect, fixings, height etc. would be detailed by the ecologist • The location of the selected trees would be mapped and retained as part of this FFMP and for ongoing monitoring. • Annual monitoring would be carried out for a period of five years: <ul style="list-style-type: none"> ○ to establish occupancy rates and enable control of feral pest animal species, should these be occupying the boxes. ○ To ensure the boxes remain securely attached and suitable for use. Faulty boxes would be replaced. 	Site Environmental Officer
2. Rocky outcrops:	Any rock habitat (rocks >20cm diameter) removed will be placed nearby immediately, outside the impact area.	Site Environmental Officer
3. Logs:	Any logs removed will be placed nearby immediately, outside the impact area.	Site Environmental Officer
4. Waterbodies/dams:	If dams are to be removed during site development works, alternative watering points should be established to compensate for their loss and maintain similar resources for native fauna. Installation of additional watering points may require approval for agencies.	Site Environmental Officer

PROTOCOL 7: Hollow-bearing tree removal guidelines	OBJECTIVE: Minimise harm to resident fauna	Responsibility
<p>1. Prior to clearing</p>	<ul style="list-style-type: none"> • With input from an ecologist, clearly mark all trees containing hollows which are to be removed. Features that are useful for identifying HBTs include: <ul style="list-style-type: none"> ○ Dead trees ○ Snapped off branches ○ Trunk spouts ○ Damage to trunk such as disease, areas of rot, etc. that have potential to develop into trunk or branch hollows ○ Depressions or cavities where hollows may form such as at trunk/branch joints or at the fork of the trunk above the bole • A pre-clearance check must be undertaken by a qualified ecologist. The pre-clearance check is to include stagwatching for a minimum of 20 minutes in the vicinity of each hollow-bearing tree to be removed to assist the identification of any resident fauna. • If pre-clearance surveys identify hollow bearing trees that are significant to the viability of local threatened species populations (for example a threatened microbat colonial roost tree) a management plan to minimise impacts to breeding and relocate the colony must be prepared and implemented. 	<p>EPC Construction Manager</p>
<p>2. Clearing hollow-bearing trees</p>	<ul style="list-style-type: none"> • Removal of hollow bearing trees should be planned to occur outside of sensitive breeding times for Superb Parrots (September to January). • Clear surrounding native vegetation first and allow hollow-bearing trees to remain standing overnight. After at least 1 night, hollow-bearing trees can be removed in accordance with the steps below • When removing hollow-bearing trees, a spotter should be present at each tree to be removed to look for signs of animal movement in the tree to be cleared. The spotter should be able to communicate directly with plant operators • Prior to clearing hollow-bearing trees, use an excavator or loader to hit the trunk as high up the tree as possible several times. Wait at least 30 seconds. Repeat this process several times • Once the hollow-bearing limbs or hollow-bearing tree are on the ground, the spotter must check each hollow for signs of wildlife before the next limb/tree is removed • If taking the tree down in stages, remove non-hollow-bearing limbs first. Then remove hollow-bearing limbs • Records of any animals removed or injured must be retained • Record the number and size of hollows removed, to inform the placement of nest boxes (Protocol 6). 	<p>EPC Construction Manager</p>

PROTOCOL 7: Hollow-bearing tree removal guidelines	OBJECTIVE: Minimise harm to resident fauna	Responsibility
3. Handling wildlife	<ul style="list-style-type: none"> • Direct contact with any wildlife should be avoided wherever possible • Any uninjured wildlife must be encouraged to leave the site • If wildlife is injured, WIRES or similarly-qualified and licensed personnel should be contacted to collect and treat any injured individuals <p><i>Notes:</i> The local number for WIRES should be retained onsite by the EPC Construction Manager: 13 000 WIRES or 13 00 556 686</p>	EPC Construction Manager

PROTOCOL 8: Monitor and adapt actions	OBJECTIVE: Improve management of flora and fauna / respond to on ground results	Responsibility
<p>Aims:</p> <p>The protocols above will be adapted as required to ensure the following objectives are achieved.</p> <ul style="list-style-type: none"> • Design measures implemented to minimise impacts • No direct or indirect impacts on constraint areas • Clearing restricted to only that required, indirect impacts of clearing managed • Habitat elements (hollows, rocks and logs) replaced • Specific plans implemented where required • No injured fauna • Any fauna trapped, removed at first light • WIRES called immediately, if required for injured animals • Disturbed areas stabilised to prevent weed ingress or soil erosion • Regular tool box talks addressing the above issues <p>Implementation:</p> <ul style="list-style-type: none"> • Ecologist input sought at a minimum of once per month, immediately before and during clearing, at or following monthly compliance meetings by the EPC Construction Manager, MSFPL Construction Manager, Environmental Site Officer and Environmental Representative (or as required). • The ecologist will be updated as to the on ground results of the above protocols and will evaluate the need for onsite inspection and change to any protocols to improve the on ground results. • Documented results of the evaluation will be provided within two weeks of each contact with the ecologist, to the MSFPL Project Manager, Environmental Site Officer and Environmental Representative. • Additionally, the ecologist’s input in evaluating and updating controls may be requested at any additional time, in response to on ground progress. 		<p>EPC Construction Manager</p>

5 REFERENCES

Landcom 2004 Managing Urban Stormwater Construction: Soils and construction Vol 4. Fourth edition, March 2004.

NGH Environmental 2010a. Manildra Solar Farm Biodiversity Assessment. Report prepared November 2010 (provided as an appendix to the Environmental Assessment 2010b).

NGH Environmental 2010b. Manildra Solar Farm Environmental Assessment. Report prepared November 2010.

NGH Environmental 2010c. Manildra Solar Farm Biodiversity Addendum. Report prepared December 2010 (provided as an appendix to the Submissions Report 2010d).

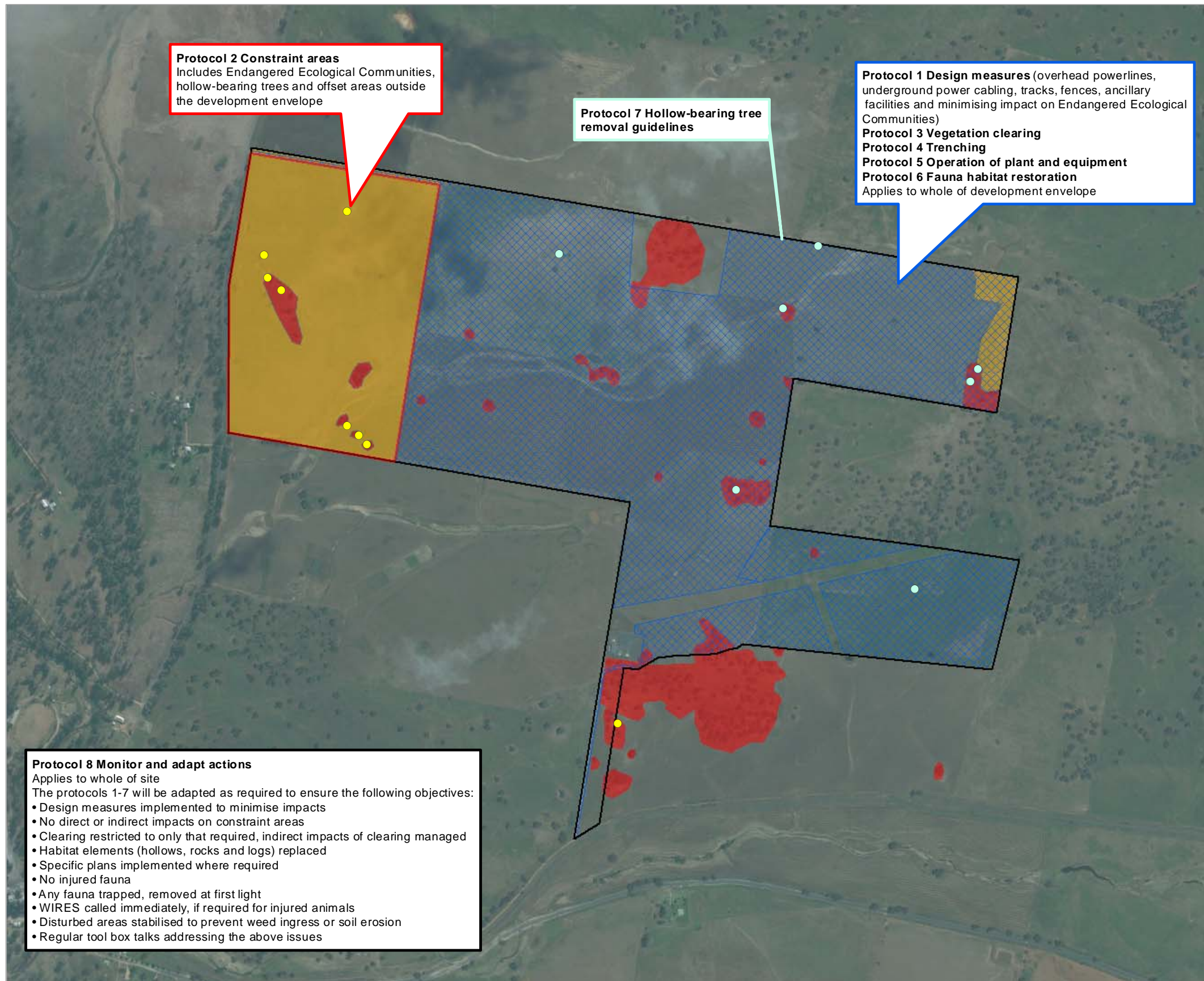
NGH Environmental 2010d. Manildra Solar Farm Submissions Report. Prepared December 2010.

NGH Environmental 2012 Manildra Solar Farm Offset Strategy, Final V2 Report prepared October 2012.

APPENDIX A FLORA AND FAUNA SITE PLAN

This Flora and Fauna Environmental Management Site Plan illustrates where the protocols described in this document apply. Specifically, it identifies:

Areas where design measures apply	<ul style="list-style-type: none">• Perimeter fencing• Power poles and overhead powerlines• Tracks• Ancillary facilities
Areas where all impacts must be avoided:	<ul style="list-style-type: none">• Constraints areas adjoining the development envelope
Areas where impacts must be specifically managed:	<ul style="list-style-type: none">• Constraints areas within the development envelope



Protocol 2 Constraint areas
Includes Endangered Ecological Communities, hollow-bearing trees and offset areas outside the development envelope

Protocol 7 Hollow-bearing tree removal guidelines

Protocol 1 Design measures (overhead powerlines, underground power cabling, tracks, fences, ancillary facilities and minimising impact on Endangered Ecological Communities)
Protocol 3 Vegetation clearing
Protocol 4 Trenching
Protocol 5 Operation of plant and equipment
Protocol 6 Fauna habitat restoration
Applies to whole of development envelope

Protocol 8 Monitor and adapt actions
Applies to whole of site
The protocols 1-7 will be adapted as required to ensure the following objectives:

- Design measures implemented to minimise impacts
- No direct or indirect impacts on constraint areas
- Clearing restricted to only that required, indirect impacts of clearing managed
- Habitat elements (hollows, rocks and logs) replaced
- Specific plans implemented where required
- No injured fauna
- Any fauna trapped, removed at first light
- WIRES called immediately, if required for injured animals
- Disturbed areas stabilised to prevent weed ingress or soil erosion
- Regular tool box talks addressing the above issues

FLORA AND FAUNA MANAGEMENT PLAN

Manildra Solar Farm

- Hollow-bearing trees inside development envelope
- Hollow-bearing trees outside development envelope
- Offset site boundary
- Site boundary
- Development envelope: stage one and
- Endangered Ecological Community
- Box Gum Woodland (poor)
- Box Gum Woodland Derived Grassland (poor-moderate)

Notes:
- Data collected by nghenvironmental (2010)
- Base map Copyright © Esri and its data suppliers.

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Ref: 6274
Author: JB

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APPENDIX B CONDITION CROSS REFERENCE

Project conditions of relevance to the management of flora and fauna impacts are included detailed below. Items addressed in this plan are shaded blue.

Legend:

FFMP	Flora and Fauna Management Plan, this document
CEMP	Construction Environmental Management Plan
OEMP	Operation Environmental Management Plan
GCMP	Groundcover Management Plan
OP	Offset Plan
OS	Offset Strategy

ID	Full text	Timing	Addressed in:
Condition of consent			
C1	The clearing of all native vegetation is to be limited to the minimal extent practicably required. Details regarding the procedures for clearing vegetation and minimising the extent of clearing shall be clearly included in the Flora and Fauna Management Plan required by in condition C14(a).	Pre-construction	FFMP
C2	The Proponent shall prepare a biodiversity offset strategy, in consultation with OEH and the landholder to the satisfaction of the Secretary, 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 approval prior to the commencement of construction and include: <ul style="list-style-type: none"> (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) Demonstration of how the strategy was prepared in accordance with OEH's <i>Principles for the Use of Biodiversity Offsets in NSW</i>; and (f) Measures to ensure in-perpetuity the conservation commitment. 	Pre-Construction	OS
C13	The Proponent shall prepare and implement a Construction Environmental Management Plan (CEMP) to outline environmental management practices and procedures to be followed during construction of the project. The Plan shall be prepared in consultation with NOW and Cabonne Shire Council and be consistent with the Guideline for the Preparation of	Pre-construction	CEMP (k) FFMP

ID	Full text	Timing	Addressed in:
	<p>Environmental Management Plans (DIPNR, 2004 or its latest revision) and shall include, but not necessarily be limited to:</p> <p>(k) Maps or plans clearly indicating where the project area has been reduced to minimise impacts to EEC and native grasses in good condition</p>		
C14	<p>A part of the Construction Environmental Management Plan required under condition C13 of this approval, the proponent shall prepare and implement the following:</p> <p>a) a Flora and Fauna Management Plan, developed in consultation with OEH, to outline measures to protect and minimise loss of native vegetation and native fauna habitat as a result of construction of the project. The Plan shall include, but not necessarily limited to:</p> <p>(i) plans showing terrestrial vegetation communities; important flora and fauna habitat areas; location where EECs, native pasture; and areas to be cleared. The plans shall also identify vegetation adjoining the site where this contains important habitat areas and /or threatened species, populations or ecological communities;</p> <p>(ii) methods to manage impacts on flora and fauna species and their habitat which may be directly or indirectly affected by the project, such as location of fencing, procedures for vegetation clearing or soil removal/stockpiling and procedures for re-locating hollows or installing nesting boxes and managing weeds;</p> <p>(iii) procedures to accurately determine the total area, type, and condition of vegetation community to be cleared;</p> <p>(iv) reference to the Ground Cover Management Plan required in condition C14(b); and</p> <p>(v) a procedure to review management methods where they are found to be ineffective.</p>	Construction	FFMP
C14	<p>b) a Ground Cover Management Plan, developed in consultation with OEH, to outline measures to ensure adequate vegetation cover and composition beneath the solar PV array. The Plan shall include, but not necessarily be limited to:</p> <p>(i) procedures to minimise disturbance to ground cover not impacted by the project particularly in the area of the native pasture in good condition;</p> <p>(ii) procedures for the stabilisation, rehabilitation and revegetation of disturbed ground cover including reference to field trials where required;</p> <p>(iii) weed management measures to control and prevent the spread of noxious weeds;</p> <p>(iv) monitoring methods to assess the impact of the project on the ground cover vegetation; and</p> <p>(v) a procedure to review management methods where they are found to be ineffective.</p>	Construction	GCMP

ID	Full text	Timing	Addressed in:
E3	<p>Details of the offset package shall be submitted for the approval of the Secretary prior to the commencement of operation or as agreed by the Secretary. The package shall:</p> <ul style="list-style-type: none"> (a) describe how the offset shall be guaranteed, managed and monitored in perpetuity; (b) ensure all impacted vegetation communities and threatened species habitat have 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. 	Pre-Construction	OP
F6	<p>The proponent shall implement a revegetation and rehabilitation program for all areas of the development footprint which are disturbed during the construction of the project, but which are not required for the ongoing operation of the project including temporary construction facility sites and sections of construction access roads, The Proponent shall ensure that all revegetation measures are implemented progressively where possible and in all cases within six months of the cessation of construction activities at the relevant area. Unless otherwise agreed to by the Secretary, the Proponent shall monitor and maintain the health of all revegetated areas until such time that the plantings have been verified by an independent and suitably qualified expert (whose appointment has been agreed to by the Secretary) as being established, in good health and self sustaining.</p>	Construction	GCMP
Revised statements of commitment, Submissions report 2010			
1	<p>An Offset Plan will be prepared by an ecologist consistent with the ‘Principles for the use of biodiversity offsets in NSW’, as outlined in the Biodiversity Assessment, and submitted for approval prior to the commencement of works. The plan would be developed in consultation with the landowner and would offset the impact of the development for the period that the impact occurs.</p>	Pre-construction	OP
2	<p>The PV array, site access tracks and other infrastructure should be sited to avoid constraints identified within the Biodiversity Assessment constraints mapping. These include:</p> <ul style="list-style-type: none"> • The larger stands of Box-Gum Woodland across the site 	Design Phase	FFMP

ID	Full text	Timing	Addressed in:
	<ul style="list-style-type: none"> Hollow bearing trees² Isolated shade trees where possible Native grassland and associated rock outcrops in the Western Paddock As far as possible rock outcrops across the proposal site together with a minimum 2.5 metre buffer to avoid shading. 		
3	Areas of high biodiversity value would be clearly identified throughout construction and protected from the direct and indirect impacts of the Proposal. Contractors and staff would be made aware of the significance and sensitivity of these areas.	Design phase	FFMP
4	The western paddock of the proposed solar farm site should be avoided if possible to minimise impacts to grassy groundcover flora comprising the Box-Gum Woodland EEC.	Design phase	FFMP
5	Where security concerns permit perimeter fences should not contain barbed wire, particularly the top strands. If a cycisolated mesh fence is to be used efforts should be made to increase the visibility to fast flying parrots.	Design Construction	FFMP
6	If used, and where practicable, power poles and overhead powerlines will be bird-safe using flags or marker balls, large wire size and wire and conductor spacing.	Design Construction	FFMP
7	If the removal of any hollow bearing trees was required this activity would be proceeded by a pre clearance check by a qualified ecologist including anabat survey and stagwatching.	Pre- Construction	FFMP
8	Works will avoid impacts to mature eucalypts wherever possible. Tree protection standards should comply with Australian standard AS4970-2009 Protection of trees on development sites (Standards Australia, 2009). Wherever practicable, excavations and vehicle/machinery movements will occur outside the canopy dripline of large eucalypts.	Design Construction	FFMP
9	Existing farm tracks should be used wherever possible to minimise the number of new roads.	Construction	CEMP
10	Where cement is included in cable trench backfill, at least 20 centimetres of cement-free topsoil will be replaced as the top layer in the backfill.	Construction	CEMP

² The planned layout of the PV arrays, site access tracks and other infrastructure will require the removal of up to 8 hollow-bearing trees from the development area. The Biodiversity Assessment (nghenvironmental, 2010a) and Biodiversity Assessment Addendum (nghenvironmental, 2010c) assumed that the removal of hollow-bearing trees from the works footprint would be necessary and potential impacts were therefore assessed accordingly. A new measure was recommended by the Biodiversity Addendum to ensure impacts to significant hollow-bearing trees and therefore hollow dependent fauna, are minimised: *If pre-clearance surveys identify hollow bearing trees that are significant to the viability of local threatened species populations (for example a threatened microbat roost tree) these trees would be retained and infrastructure would be designed to accommodate them.* This was not carried over into the Submissions Report and therefore does not form a commitment of the project. Nonetheless a protocol has been developed to address as much as possible this measure.

ID	Full text	Timing	Addressed in:
11	Where practicable, whole sods will be removed with an excavator where these areas are well-vegetated with dense root systems. Sods will be stored in moist, shaded conditions and replaced following the works. Sod storage time will be minimised and sods will be replaced in a manner that maximises the chances of re-establishment.	Construction	CEMP
12	Where possible, as a precaution, works should be planned to avoid sensitive times for Superb Parrots - September to January.	Construction	FFMP
13	Excavated topsoil, subsoil will be stored separately and replaced in a manner that replicates the original profile as closely as possible.	Construction	CEMP
14	Where practicable, grass surfaces and shrubs will be retained or restored on infrequently used vehicle routes.	Construction	CEMP
15	Site stabilisation, rehabilitation and revegetation of all disturbed areas would be undertaken without delay.	Construction	GCMP
16	As a general rule, disturbed areas will be used preferentially for vehicle and machinery access, materials laydown, stockpiling of cleared vegetation and the deposition and retrieval of spoil whenever practicable.	Construction	CEMP
17	Works will be avoided during, and immediately following heavy rainfall events to protect soils and vegetation at the site.	Construction	CEMP
18	<p>Weed / pathogen controls will be implemented, including:</p> <ul style="list-style-type: none"> ○ Machinery and vehicles used in construction works will be washed before and after site access to reduce the introduction and spread of weeds and pathogens. ○ Laydown sites for excavated spoil, equipment and construction materials will be weed-free or treated for weeds wherever practicable. ○ Weed monitoring will be carried out at all sites after the completion of construction works and ongoing weed control will occur where noxious or invasive species are recorded. In particular, monitoring will be undertaken during the following late spring/early summer, and remedial action taken as required. ○ Sediment control materials should be weed free (straw bales, geotextiles). ○ Imported materials such as sand and gravel will be sourced from sites which do not show evidence of noxious weeds or Phytophthora infection. 	Construction	GCMP
19	If dams are removed during site development works, alternative watering points should be established to compensate for their loss and maintain similar habitat resources for native fauna.	Construction	FFMP
20	Any trench sections left open for greater than a day would be inspected daily, early in the morning and any trapped fauna removed. The use of ramps or ladders to facilitate trapped fauna escape is recommended.	Construction	FFMP
21	Rock and log habitat removed during the construction phase will be reinstated following the works.	Construction	FFMP

ID	Full text	Timing	Addressed in:
22	Where tree hollows are required to be removed, these should be replaced by nest boxes of similar size in nearby trees.	Construction	FFMP
23	Wherever possible small rock outcrops at the site should be excluded from the array, together with a minimum 2.5 metre buffer to avoid shading.	Construction	CEMP
24	<p>A groundcover management plan would be developed that would include regular monitoring of vegetation cover and composition and allow for adaptive management. This would include:</p> <ul style="list-style-type: none"> Establishment of a shade tolerant perennial groundcover across the cropping and exotic dominated grazing paddocks prior to the installation of the PV arrays Advice from an agronomist in relation to preferred species/varieties, establishment methods of alternative pastures and best practice management. <p>Where information is lacking, trials may be required onsite</p>	Pre-Construction Construction Operation	GCMP
25	If localised erosion is detected, effective treatments would be applied without delay, such as hardening with mulch, reseeding and covering with an open weave jute matting, gypsum application to improve structure and infiltration, protection with geotextile fabric or localised flow dispersal and diversion structures.	Operation	OEMP
26	The space between the PV array rows should be maintained and kept clear to enable access by vehicles for ongoing weed control, and pasture renovation if required.	Operation	OEMP
27	Efforts should be made to minimise disturbance to the existing groundcover during construction. Construction and maintenance vehicles should not access the site when soils are very wet to minimise soil compaction and disturbance.	Construction Operation	CEMP OEMP
28	Fencing along Molong Manildra Road should be maintained so as macropods and other large native fauna are not funnelled along the perimeter fence and onto the road creating a traffic hazard and collision risk to the animal.	Operation	OEMP
29	Monitoring of fauna site habitat usage pre and post construction is recommended but not considered essential.	Operation	OEMP
Text from Environmental assessment (page numbers provided as ID)			
P13	The identified environmental risks and impacts would be managed in accordance with the Statement of Commitments, and implemented via a Construction Environmental Management Plan (CEMP) during the construction period and an Operation Environmental Management Plan (OEMP) for the operational phase. The EMPs would comply with the environmental management systems (EMS) standard ISO14001:2004.	Construction	CEMP
P35	Trenches would be back-filled with sand to approximately 300 millimetres depth from ground level, then capped with a concrete slab or other protective material, and then top-covered	Construction	GCMP

ID	Full text	Timing	Addressed in:
	with soil. The trenches would be revegetated with pasture species to stabilise disturbed soils.		
P36	The trenches (associated with the connection to Manildra 132kV substation) would be revegetated with pasture species to stabilise disturbed soils.	Construction	GCMP
P37	Once the construction phase has finished, any tracks not used for normal farming practice or PV array maintenance would be rehabilitated. Internal access tracks would be maintained to allow maintenance and repairs to the PV array.	Operation	GCMP
P43	Weed control would be undertaken as required using a spray unit mounted on a quad bike. Groundcover vegetation around the panel rows would be either slashed or grazed by sheep to maintain a safe height below the panels.	Operation	GCMP
Text from Biodiversity Assessment, within the Environmental Assessment (page numbers provided as ID)			
p45	Trenches should be backfilled as soon as possible to minimise the chance of fauna becoming trapped. If trenches are left open for any length of time small ramps or ladders should be installed to allow trapped fauna to escape.	Construction	FFMP
p45	Construction materials should not be stockpiled for extended periods of time as local fauna may take up residence and be injured when the materials are moved.	Construction	FFMP
Text from Biodiversity Assessment Addendum, within Submissions Report (page numbers provided as ID)			
P16	If pre-clearance surveys identify hollow bearing trees that are significant to the viability of local threatened species populations (for example a threatened microbat roost tree) these trees would be retained and infrastructure would be redesigned to accommodate them.	Construction	FFMP