Nyngan Solar Plant Biodiversity Offset Site

Annual Ecological Monitoring Report Year 3 – 2019/20

1 | Final

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PARF Company 6 Pty Limited

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Contents

Executive Summary

Background

In 2014, AGL Energy Limited (AGL) constructed a solar photovoltaic (PV) plant with a nominal capacity of up to 106 megawatts (MW) at Nyngan in Central West New South Wales (NSW). The project was approved by the then Department of Planning and Infrastructure (DP&I) on the 15 July 2013. The approval included the Ministers Conditions of Approval (MCoA) of which included that an Offset Management Package be developed to offset the ecological values lost as a result of the project (MCoA C5). Additionally, the biodiversity offset site is required to be monitored for a period of up to 30 years to ensure that ecological values are maintained or improved, and the results reported annually to the Department of Planning, Industry and Environment (DPIE). Condition C5(b) specifically states that the biodiversity outcome to be achieved must 'improve or maintain' the biodiversity values of the site.

Jacobs has now performed three monitoring surveys January 2018 (Year 1), January 2019 (Year 2), December 2019 (Year 3) at the Nyngan Solar Plant Biodiversity Offset Site (the offset site). This report outlines the results of the third annual monitoring survey of the offset site (conducted by Jacobs in December 2019). The first annual monitoring survey was conducted by Jacobs in January 2018, while the baseline study was recorded in the Biodiversity Offset Management Plan (BOMP) by NGH in 2014.

In addition, this report provides a condition assessment for the revegetation area at the Nyngan Solar Plant site, which was required by the condition of approval B18 (October 2011). The revegetation area was to provide both visual screening along the southern boundary of the Solar Plant as well as future compensatory habitat for the Grey-crowned Babbler in the immediate area where habitat has been removed and where the species is known to occur and breed.

Offset site condition

Overall the recent monitoring results demonstrate that biodiversity values across the site have generally decreased with regards to floristic diversity, and in some measures of cover and condition when compared to the vegetation community benchmarks and have mostly declined when compared to the baseline survey results recorded by NGH (2014). Groundcover – grass and groundcover – other are the cover categories that have experienced the biggest decline. The reductions in vegetation cover observed are likely to be due to natural environmental variation (primarily due to drought conditions) and temporary as to be reversed after a return to average or higher rainfall conditions.

Prolonged dry conditions appear to have naturally inhibited the growth and recovery of many grass and forb species and several species were not able to be identified due to their poor condition. It is likely that seed stock lay dormant within the ground. Adequate rainfall would further increase the species diversity at the site and likely show closer consistency with the baseline data. The management actions outlined in this report will further assist the natural regeneration of the site over the next twelve months, an overview of these management actions is provided below.

Stock proof fencing around the offset site was installed in early 2018, approximately two years prior to the recent survey, and is still in good condition. Several diggings under the fence suggest access to the site by feral herbivores and recommendations have been made to remedy this. It is likely that with fencing in place that the biodiversity values of the site will improve through the exclusion of some feral pests and grazing livestock, allowing opportunities for natural regeneration to occur once dry conditions subside.

Fauna habitats across the site are diverse and include; fallen logs, standing dead trees (stags), hollow bearing trees and grass/forb groundcover. These habitats have generally been maintained in similar condition, except for the grass/forb groundcover habitat, that has declined since the NGH (2014) baseline survey and the first and second monitoring surveys.

Weed infestations across the site are generally low and can be maintained by spot treatment as outlined in the management actions (Table 5.1). None of the weeds identified within the site are declared as state or regional priority weeds under the *Biosecurity Act 2015* or the Western Regional Strategic Weed Management Plan 2017-2022 (LLS 2017). One species present on site, Saffron thistle (*Carthamus lanatus*), is recorded on the Office of Environment and Heritage (OEH) 'High Threat' weeds list.

Solar plant revegetation area

The estimated survival rate of the planted tubestock has declined since last year and survival rate is thought to be less than 10%. Plants that have survived appear to be the hardier *Eucalyptus* species and shrub species such as *Acacia* species and *Bursaria spinosa.* The soil was very dry and the prolonged dry weather conditions of the past twelve months have not been conducive to replacement plantings. Jute-matting and tree guards were no longer present around surviving trees and shrubs on the site and may have disintegrated due to the combination of sun, heat, and wind. This may have contributed to mortality of tubestock over the past 12 months. Additional planting may be necessary but should not be conducted until rainfall returns to average or above average conditions.

The diversity of natural regeneration of native grasses and forbs observed in Year 3 has declined since Year 2, likely in response to dry conditions, but remains at a moderate level. The high diversity of native species previously recorded in the groundcover is likely to return with once dry conditions subside.

Fencing around the site is in good condition and will assist in excluding any wandering livestock and some feral pests and as such further support the natural regeneration process.

It is recommended that replacement planting be undertaken after several months of average or higher rainfall have occurred within the revegetation area, in autumn, late winter or early spring. It is recommended that only a small number of plants, approximately 200, be planted in clusters across each revegetation area using a mix of those species that have survived since the last planting. Smaller numbers of tubestock planted in clusters will allow for concentrated watering and improve survivals rates. Further clusters may be added over time. Tree guards are required for all tubestock to protect plants against grazing and create a microclimate around the plant that assists in moisture retention and cooling. Carton guards are recommended over plastic guards because of their ability to more readily breakdown if lost in the surrounding environment and their ease of installation. Intensive watering is required at the time of planting and follow up watering at a rate inversely proportional to rainfall until plants to become established.

Further to supplementary planting it is recommended that brush matting be used with the revegetation areas to assist the natural regeneration of native vegetation. Collection of native seed is to be undertaken by a qualified Bush Regeneration contractor and placed within the site on branches scattered along and around the original planting rip lines. Branches should be left with seed in-situ, allowing seeds to disperse naturally and lay dormant within the ground layer until favourable weather conditions activate germination. This process is to be undertaken in early spring after suitable withholding periods post targeted weed spraying.

Targeted weed spraying is required throughout the revegetation areas in early spring to further assist in the regeneration of native vegetation and growth of planted tubestock.

No Grey-crowned Babblers were observed within the revegetation areas or surrounds. The revegetation areas currently do not provide suitable habitat for this target species. As the ground layer cover improves and planted shrub species and overstorey Eucalypts grow habitat values may improve, however it is likely to take at least 10 years before the overstorey is a suitable height for nesting habitat.

1. Introduction

1.1 Background and study area

In 2014, AGL Energy Limited (AGL) constructed a solar photovoltaic (PV) plant (the Nyngan Solar Plant) with a nominal capacity of up to 106 megawatts (MW) at Nyngan in Central West New South Wales (NSW). The solar plant is located approximately 10 kilometres (km) to the west of the Nyngan township. The site is approximately 300 hectares (ha) in area with additional areas of land for linear easements for the connection of the project's electrical infrastructure to the Nyngan – Cobar 132 kilovolt (kV) transmission line. The location of the solar plant, access and transmission easements and offset site are shown in (Figure 1.1).

The project was approved by the then Department of Planning and Infrastructure (DP&I) on the 15 July 2013. The Ministers Condition of Approval (MCoA) prescribed that an Offset Management Package be developed to offset the ecological values lost as a result of the project (MCoA C5 detailed in Appendix B).

In addition to this condition of consent, the proponent also committed to the following mitigation measures relating to offsets within the Nyngan Solar Plant Submissions Report (NGH Environmental June 2013):

> *An Offset Plan would be developed with input from OEH and the CMA and according to the strategy provided in Appendix G of the Biodiversity Assessment (which included a proposed 1:5 offset ratio). It would be finalised prior to any construction impacts, as outlined in the Biodiversity Assessment. The objective of offsetting is to ensure that an overall 'maintain or improve' outcome is met for the project; where impacts cannot be avoided, or sufficiently minimised, the residual impact would be offset in perpetuity.*
>
> *Prior to finalising the Offset Site boundaries, the proponent would validate the area impacted by construction to ensure that the actual, not estimated, impacted area is offset.*

The offset site management actions and their outcomes would be reported annually to the NSW DPIE for the duration of the project (up to 30 years) to demonstrate that a 'maintain or improve' outcome has been met. This monitoring period may vary, depending on the outcomes recorded across the site at each monitoring event, at the discretion of DPIE.

AGL secured an offset site approximately 10 km southwest of the solar plant site. The site is in the north-western corner of Lot 30 DP 752879 and is approximately 50 ha in area (see Figure 1.1). As an additional compensatory measure, AGL also created a five-hectare revegetation area within the solar plant site to further mitigate the loss of habitat for the Grey-crowned Babbler.

Ownership of the plant and associated biodiversity offset was transferred from AGL PV Solar Developments Pty to PARF Company 6 Pty Limited as trustee of the Project Trust and PARF Company 4 Pty Limited as trustee of the Subhold Trust in November 2016. AGL Hydro Partnership are responsible for the ongoing operation of the plant and maintenance of the offset site, with First Solar (Australia) Pty Ltd providing maintenance services for the first five years of the plant's commercial operation.

1.2 Monitoring objectives

This report documents the results of the third annual ecological monitoring events for the offset site as required under Condition of Approval (CoA) C5. The objective of the monitoring is to demonstrate an 'improve or maintain' outcome for the identified biodiversity offset values at the offset site and to identify any management/remedial actions required to achieve these outcomes.

Monitoring requires the collection of ecological data, consistent with the methodology described in the Biodiversity Offset Management Plan (BOMP) prepared by NGH Environmental (2014). The results are described and analysed with comparison to the baseline data from the BOMP (NGH 2014) to determine if there have been

any significant changes in the vegetation and habitat conditions that are not consistent with improving or maintaining the biodiversity values on the site.

In addition, an evaluation was undertaken of any required management actions and their effectiveness, as outlined in the BOMP (NGH 2014). BioBanking Assessment Methodology (BBAM 2009) also lists the standard management actions required to be undertaken at offset sites. These are:

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

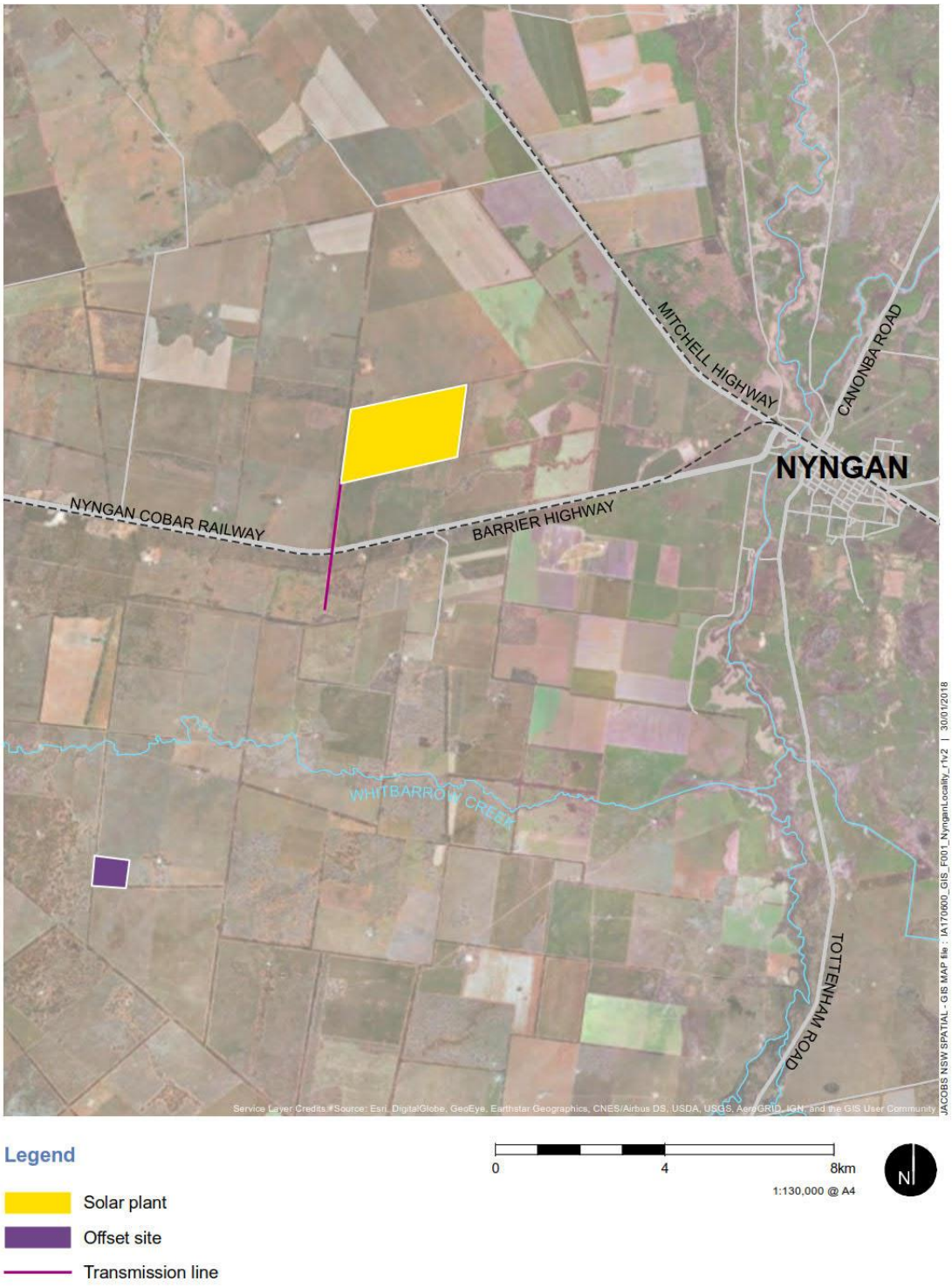

Figure 1.1 | Nyngan solar plant and offset site location

2. Monitoring method

2.1 Requirements

The monitoring is consistent with the methodologies outlined in the BOMP (NGH 2014) and meets the requirements of the CoA C5, outlined in Appendix B. CoA C5(b) stipulates the requirement of the offset site to achieve an 'improved or maintained' outcome for the biodiversity values of the site. Improved or maintained outcomes for the biodiversity values of the offset site have been evaluated through the comparison of monitoring data against the benchmark and baseline data for each surveyed vegetation community as well as the evaluation of weed infestation and fauna habitat. An overview of the monitoring methods used include:

- Vegetation condition assessment. Following the methodology used in the BOMP (NGH 2014), assessment was undertaken using the BioBanking Assessment Methodology (DECC 2009) to collect data on vegetation structure, cover and quality across transects and within plots. This data was then compared with the NGH (2014) baseline data and the benchmark data for each vegetation community type using the OEH Vegetation Benchmarks Database (DECC 2008).
- Habitat evaluation. Notes on fauna habitat were taken across the broader site while traversing the site to reach the monitoring plots. At each monitoring plot detailed notes were also taken to report on habitat condition.
- Fencing evaluation. Fences were assessed through observation by driving and walking around the perimeter of the site, to assess general condition and identify any areas requiring maintenance.

2.2 Field survey

A field survey was undertaken by two Jacobs Ecologists, Matt Consterdine and Timothy Maher on the19th of December 2019 across the two vegetation types identified within the offset site (listed in Table 2.1 below and shown on Figure 2.2) by NGH (2014).

The predominant vegetation within the site was described by NGH (2014) as Poplar Box – Gum-barked Coolabah-White Cypress Pine shrubby woodland (Veg ID 103) (Benson *et al.* 2006). NGH (2014) also notes some characteristics of White Cypress Pine – Polar Box woodland on footslopes and peneplains (ID 72), particularly regarding the dominance of White Cypress Pine (*Callitris glaucophylla*) and the presence of groundcover species. The Biometric benchmarks for these vegetation types are the same (DECC 2008). Difference in structure and species composition occur across the site, most likely due to past disturbance and land management, which have resulted in two main forms of the community being present (NGH 2014):

1) Open White Cypress Pine Woodland
2) White Cypress Pine Polar Box Woodland

Table 2.1 shows the area occupied by these vegetation types within the offset site and the monitoring plots sampled in each.

In addition, NGH (2014) describes a small area (0.66 ha) of vegetation dominated by Budda (*Eremophila mitchellii*), see Figure 2.2. The dominance of Budda in this area is considered most likely due to the removal of overstorey and mid-storey species by past landholders, thus eliminating competition, or other past disturbance such as a localised fire (NGH 2014). This area was described qualitatively and mapped by NGH (2014) but not surveyed in detail by NGH. This area is considered part of the Open White Cypress Pine Woodland. It does not constitute a different vegetation type and does not contain any annual monitoring sites.

Table 2.1: Vegetation types monitored within the offset site

Vegetation Type (DECC 2008)	**Area in offset site (ha)**	Monitoring plots sampled by NGH (2014)	Monitoring plots sampled by Jacobs (2017-2019)
Open White Cypress Pine Woodland	41.55	M01 & M02 (2 plots)	M01 & M02 (2 plots)
White Cypress Pine – Poplar Box Woodland	8.5	M03 & M04 (2 plots)	M03 & M04 (2 plots)

2.2.1 Vegetation condition assessment and establishment of monitoring plots

BioBanking plots were surveyed according to the BioBanking Assessment Methodology (BBAM) (DECC 2009), as outlined in COA C5 (Appendix B) and in the BOMP (NGH 2014). Baseline surveys undertaken by NGH (2014) set up two monitoring plots per vegetation community. Jacobs (2018) have replicated their approach, see Table 2.1.

Floristic data was collected to enable comparison between baseline data and benchmarks recorded in the BOMP (NGH 2014). The four monitoring plots established by NGH (2014), were located at the site using recorded GPS coordinates. These plots were previously marked in the field using star pickets driven into the ground to facilitate future replication. Pickets were placed at the start and end of a 50 metre transect and their coordinates recorded. Start points were delineated with white spray paint sprayed on the top of the picket. A 20 x 20 metre quadrat required by the BBAM (DECC 2009) was conducted within an area bounded by the first 20 metres of the transect and extending 10 metres either side as shown in Figure 2.1. Photographs were taken at the start and end of each monitoring plot.

All vegetation types and monitoring plots are shown in Figure 2.2.

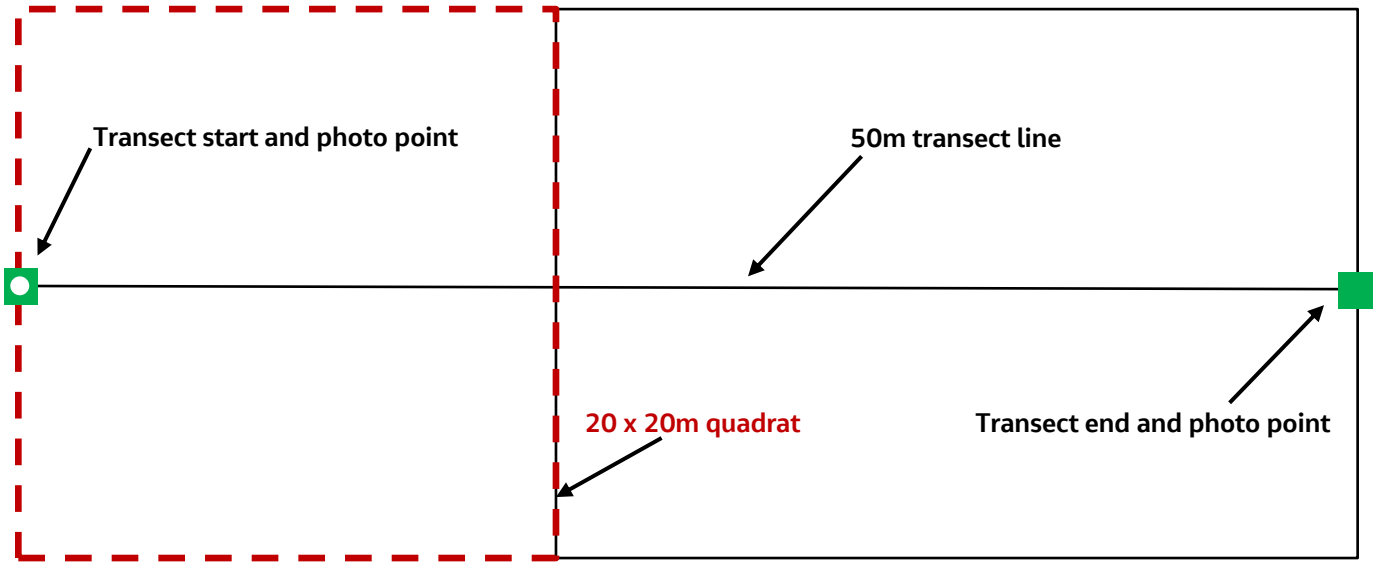

Figure 2.1: Monitoring plot layout

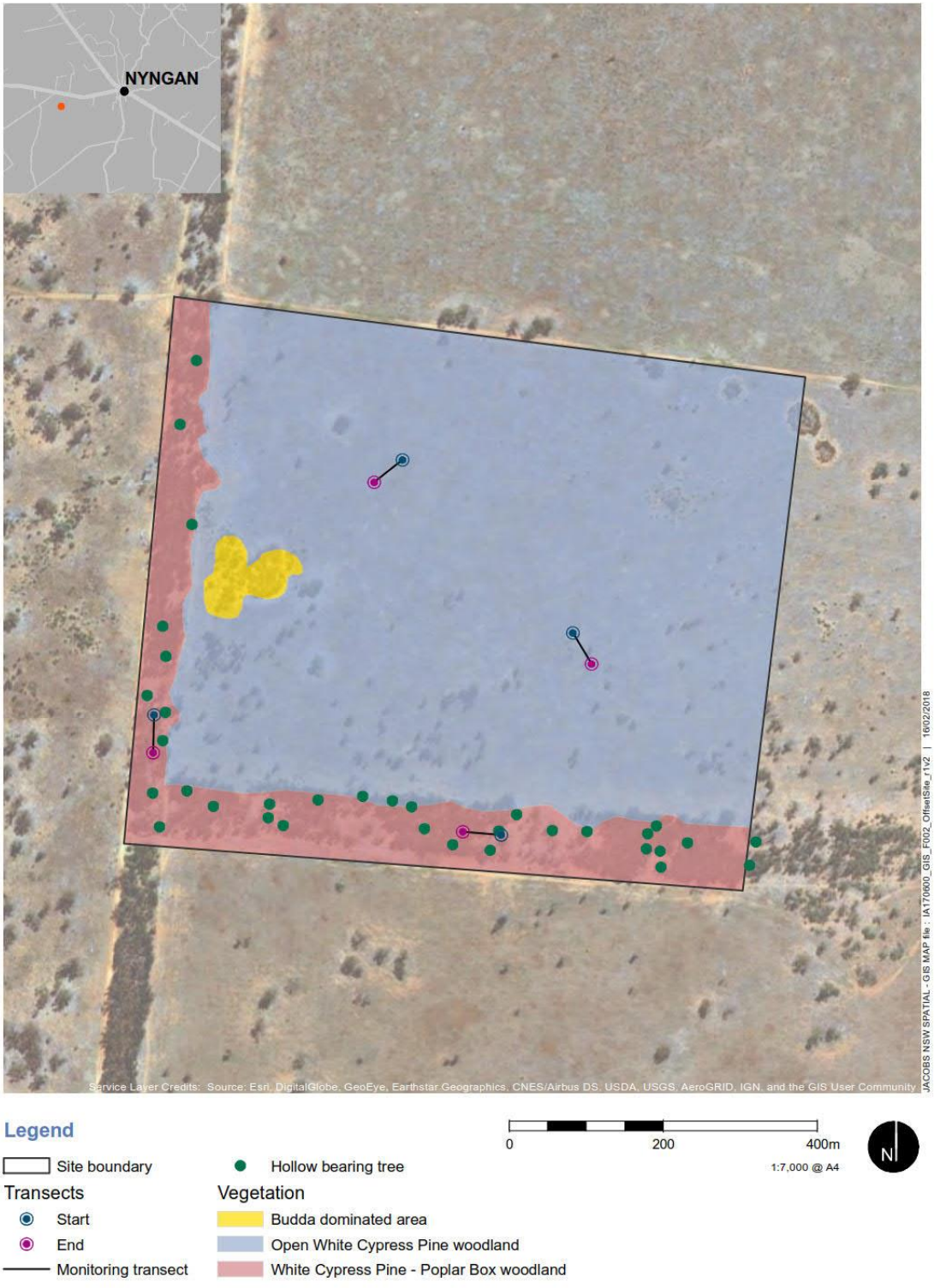

Figure 2.2 | Vegetation types, hollow bearing trees and monitoring plots within the Nyngan offset site

2.2.2 Habitat evaluation

General habitat notes were made for the entire site whilst detailed habitat notes were taken at each of the monitoring plot locations and included the presence of habitat trees, logs and opportunistic fauna observations.

2.2.3 Fencing evaluation

Fences were inspected for any required maintenance issues whilst driving around the perimeter of the site and whilst traversing the site by foot during monitoring plot surveys.

2.2.4 Solar plant revegetation area - assessment

The revegetation area within the solar plant site was assessed by a count of planted species to determine approximate percentage survival rates and for weed infestation. A general plant species list was created for the area and any management actions listed. Section 4 describes the assessment results for the revegetation area and provides recommendations for future management actions. Management actions for the revegetation area are also included in Section 5.

2.3 Limitations

2.3.1 Climatic conditions

Nyngan is a typically dry, semi-arid area that experiences low annual rainfall. While the area received above average rainfall in March, Nyngan experienced much lower rainfall than average for the remainder of 2019. The low yearly rainfall, minimal rainfall between April and December is likely to have resulted in poor conditions for plant growth identified during the survey. It is likely that several species are present in the seed bank that were not evident during the survey. The results of this round of monitoring survey, and the previous rounds of monitoring surveys need to be interpreted against the background of below average rainfall. Meteorological conditions from January 2019 to December 2019 are shown in Figure 2.3.

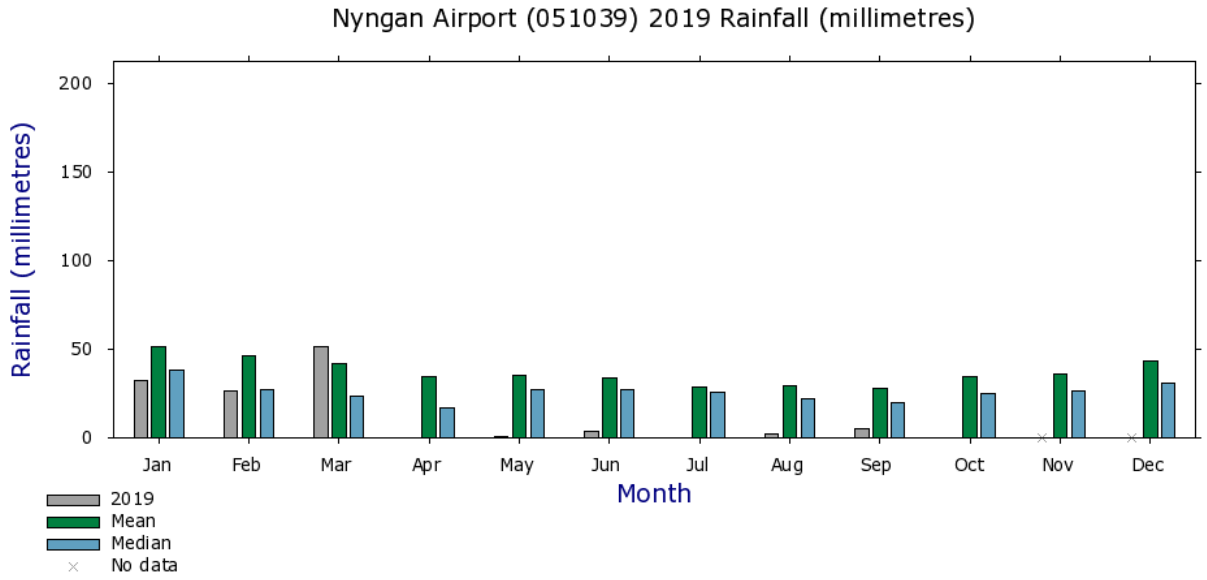

Figure 2.3: Rainfall in Nyngan preceding the surveys (source: Australian Bureau of Meteorology)

2.3.2 Grazing pressure

The offset site has been fenced for approximately two years by the time of this survey. Kangaroos were observed within the site indicating a level of grazing pressure.

2.3.3 Data collection and analysis

Floristic and habitat data collected within each monitoring plot were compared with the vegetation types benchmark data (DECC 2008) and baseline data collected by NGH (2014). The results of these comparisons, along with the habitat data collected for each plot were evaluated to determine whether an 'improve or maintain' outcome is being achieved at the site.

Data collected during each monitoring year will be collated into one electronic database using Microsoft Excel, along with the NGH (2014) baseline data and the benchmark data for each vegetation community to enable future analysis of data. Jacobs has used the Modified Braun Blanquet method (see Table 2.2) for recording floristic abundance data within each monitoring plot.

Table 2.2: Modified Braun Blanquet scale

Modified Braun Blanquet (plant cover abundance scale)	
1	1 to a few individuals present, less than 5% cover
2	Many individuals present, but still less than 5% cover
3	5-<20% cover
4	20-<50% cover
5	50-<75% cover
6	75-100% cover

3. Monitoring results

3.1 Plot data descriptions and benchmark comparisons

The data and description of the results for each surveyed vegetation community are listed below. The coordinates for each monitoring plot are provided in Table 3.1 to enable repeat and consistent monitoring in the future.

Table 3.1: Coordinates for each of the monitoring plots

Plot Name	Transect start		Transect end	
	Easting*	**Northing***	**Easting***	**Northing***
M01	501365.4948	6498409.989	501388.4344	6498371.304
M02	501144.511	6498635.457	501106.7714	6498605.313
M03	500822.2086	6498302.868	500820.4033	6498254.1
M04	501271.0288	6498145.767	501221.3488	6498151.204

* Co-ordinates are in MGA zone 54 relative to the GDA94 datum

3.1.1 Open White Cypress Pine Woodland

This community is the dominant vegetation type within the offset site (approximately 41.55 hectares). The overstorey is sparse and comprised of scattered patches of White Cypress Pine (*Callitris glaucophylla*) with the occasional mature Poplar Box (*Eucalyptus populnea* subsp. *bimbil*). The mid-storey is also very sparse and mostly comprised of regenerating White Cypress Pine. Isolated Wilga (*Geijera parvifolia*) and Budda (*Eremophila mitchellii*) individuals also occur.

The ground cover comprises of a high diversity of forbs and grasses. Dominant species include: Purple Wiregrass (*Aristida ramosa*), Mulga Mitchell Grass (*Thyridolepis mitchelliana*), Longtails (*Ptilotus polystachyus*) and Yellow-bur daisy (*Calotis lappulacea*). The most abundant species during the Year 3 survey were *Convolvulus recurvatus* subsp. *recurvatus* and *Sida cunninghamii*. The seed of the exotic species Cut - leaf Medic (**Medicago laciniata*) was common in the ground layer. No other exotic species were present.

The monitoring plot data along with the benchmarks for this vegetation type (DECC 2008) are shown in Table 3.2 and 3.3. Photos 1 to 4 show the photo assessment points. Species richness (the number of native species, shown in the table below as 'Native Spp. #') was above the benchmark for the community across both plots but much lower than the baseline recorded by NGH (2014) and Year 1 and Year 2 survey results. Overstorey and mid-storey are slightly higher than the NGH (2014) baseline data and year 1 monitoring data. Overstorey cover is lower than benchmark and mid-storey cover is within but at the lower end of the benchmark for the community. Grass and other groundcover vegetation cover is substantially lower than in previous surveys and below benchmark ranges. The reduction of grass and other groundcover is also evident when comparing the photo monitoring points between Year 1and Year 2 surveys (see Photos 1 to 4). The reduction in groundcover vegetation is most likely due to the prolonged dry conditions experienced over the last twelve months and is considered part of the natural variation in this community in response to climate variability. Groundcover shrub cover was below the benchmark and baseline (NGH 2014) survey for M02 and similar to the benchmark and baseline (NGH 2014) for M01. Groundcover shrub cover was similar compared to 2017 and 2018 surveys. No Hollow Bearing Trees (HBTs) were recorded in the plot which is unsurprising given the history of clearing in this vegetation. Fallen timber remained below benchmark levels.

The community remains in moderate condition. The increased regeneration of overstorey species such as White Cypress Pine was evident since the Year 1 survey is and likely to continue over time. Continued improvement in this community is likely, with the offset site now fenced, particularly once drought conditions abate.

Photo 1 Open White Cypress Pine Woodland - Plot M01 Year 2

Photo 2 Open White Cypress Pine Woodland - Plot M01 Year 3

Photo 3 Open White Cypress Pine Woodland - Plot M02 year 2

Photo 4 Open White Cypress Pine Woodland - Plot M02 Year 3

Table 3.2: Benchmark and monitoring plot data comparison for Open White Cypress Pine Woodland Plot M01

	Native Spp. #	Native Cover				Native Groundcover						HBTs	Logs
		Overstorey		Mid-storey		Grasses		Shrubs		Other			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Benchmark	15	3%	22%	0%	30%	5%	30%	2%	10%	2%	30%	0.1	20
Baseline (NGH 2014)	28	0%		0%		58%		4%		24%		0	5
Yr 1 M01	30	0%		0%		44%		0%		34%		0	1
Yr 2 M01	26	1%		1%		22%		0%		16%		0	15
Yr 3 M01	17	1%		1%		2%		1%		5%		0	10

Table 3.3: Benchmark and monitoring plot data comparison for Open White Cypress Pine Woodland M02 – Nyngan Offset site

	Native Spp. #	Native Cover				Native Groundcover						HBTs	Logs
		Overstorey		Mid-storey		Grasses		Shrubs		Other			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Benchmark	15	3%	22%	0%	30%	5%	30%	2%	10%	2%	30%	0.1	20
Baseline (NGH 2014)	29	0%		0%		50%		2%		30%		0	17
Yr 1 M02	30	3%		0%		44%		0%		46%		0	1
Yr 2 M02	23	3%		<1%		22%		0%		10%		0	14
Yr 3 M02	16	3%%		1%		3%		2%		3%		0	15

3.1.2 White Cypress Pine – Poplar Box Woodland

This community is restricted to linear strips approximately 45 to 75 metres wide along the western and southern boundaries of the site and occupies approximately 8.5 hectares (Figure 1.2). The overstorey is dominated by White Cypress Pine with mature Poplar Box scattered throughout. In more open areas, Poplar Box is dominant. Gum - barked Coolabah (*Eucalyptus intertexta*) is also present to a lesser extent occurring as occasional individuals. Dense White Cypress Pine recruits form a distinct small tree layer across much of the area. The mid-storey shrub layer is generally sparse and restricted to occasional individuals of Budda, Berrigan (*Eremophila longifolia*) and Sticky Hopbush (*Dodonaea viscosa* subsp. *mucronata*). Climbing saltbush (*Einadia nutans* subsp. *nutans*) is a common low shrub along with Galvanised Burr (*Sclerolaena birchii*) and Eastern Cottonbush (*Maireana microphylla*). The ground cover is patchy and dominated by species such as, Mulga Mitchell Grass, Curly Windmill Grass (*Enteropogon acicularis*), Blue Trumpet (*Brunoniella australis*) and Ridged Sida (*Sida cunninghamiana*). There were no exotic species present in this community during the survey.

The monitoring plot data along with the benchmarks for this vegetation type (DECC 2008) are shown in Table 3.4 and 3.5. Photos 5 to 8 show the photo assessment points during Year 2 and Year 3 surveys. Species richness (which is the number of native species, shown in the table below as 'Native Spp. #') is on average below the

benchmark, the baseline (NGH 2014), and Year 1 and 2 results. Overstorey cover is above the benchmark and like that of previous years. A low mid-storey cover percentage was recorded, which is at the low end of the benchmark range. Grass cover was roughly the same as last year's survey and outside of the benchmark range. Very low groundcover shrub cover was recorded, which was on average below the benchmark and baseline values for the community. Other native ground cover such as forbs was reduced compared to last year while remaining higher than the benchmark range but lower than the baseline values. Groundcover reduction is evident when comparing the photo monitoring points from the Year 2 survey with the current survey (Photos 5 to 8). The reduction in groundcover vegetation is most likely due to the prolonged dry conditions experienced over the last twelve months and is considered part of the natural variation in this community in response to climate variability. Whilst HBTs occur within the wider area of this community none were recorded in the monitoring plot, which is below the benchmark and baseline (NGH 2014) for this community. The values for fallen timber in the monitoring plot were like last year, higher than the benchmark and similar to the baseline (NGH 2014). Overall this community is in moderate condition as while it has maintained most values within benchmarks, and it has experienced a substantial decrease in native species diversity and a reduction in grass and other groundcover.

Table 3.4 Benchmark and monitoring plot data comparison for White Cypress Pine – Poplar Box Woodland – plot M03

	Native Spp. #	Native Cover				Native Groundcover						HBTs	Logs
		Overstorey		Mid-storey		Grasses		Shrubs		Other			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Benchmark	15	3%	22%	0%	30%	5%	30%	2%	10%	2%	30%	0.1	20
Baseline (NGH 2014)	24	29%		0%		32%		6%		10%		2	35
Yr 1 M03	31	39%		0%		18%		0%		56%		0	7
Yr 2 M03	12	32%		2%		0%		2%		18%		0	36
Yr 3 M03	4	30%		2%		0%		2%		7%		0	35

Table 3.5 Benchmark and monitoring plot data comparison for White Cypress Pine – Poplar Box Woodland – plot M04

	Native Spp. #	Native Cover				Native Groundcover						HBTs	Logs
		Overstorey		Mid-storey		Grasses		Shrubs		Other			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Benchmark	15	3%	22%	0%	30%	5%	30%	2%	10%	2%	30%	0.1	20
Baseline (NGH 2014)	21	22%		0%		18%		10%		6%		1	36
Yr 1 M04	36	28%		0%		8%		0%		28%		0	2
Yr 2 M04	19	25%		0%		2%		0%		8%		0	38
Yr 3 M04	7	25%		0%		0%		3%		5%		0	38

Photo 5 White Cypress Pine – Poplar Box Woodland - plot M03 in Year 2

Photo 6 White Cypress Pine – Poplar Box Woodland - plot M03 in Year 3

Photo 7 White Cypress Pine – Poplar Box Woodland plot M04 in Year 2

Photo 8 White Cypress Pine – Poplar Box Woodland plot M04 in Year 3

3.2 Results summary and discussion

The observed changes in the vegetation of the site are summarised and discussed below.

3.2.1 Species richness

Species richness was below benchmark levels for three of the five plots but in all cases was below baseline and year 1 results, except for the revegetation plot (refer Figure 3.1). The groundcover grass and forb component of the vegetation seems to have been the most reduced with many previously recorded annual and short-lived perennial species no longer apparent.

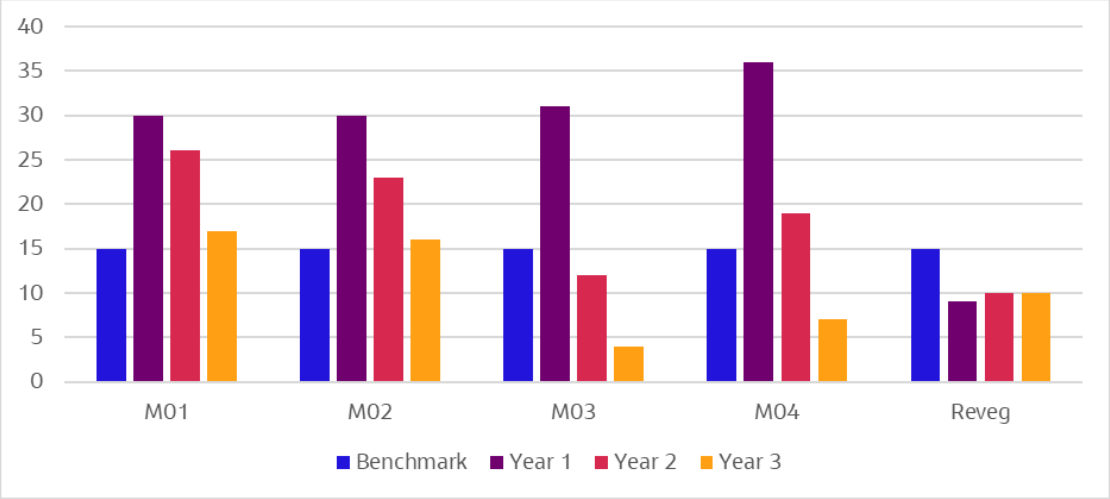

Figure 3.1: Changes in Species Richness

3.2.2 Cover of native and exotic vegetation

The cover scores for native vegetation have remained quite consistent for mid-storey groundcover shrub cover in comparison with year 2 levels. Groundcover grasses and other groundcovers showed the most pronounced reduction in comparison with year 2 levels. There has been a small increase in native mid-storey and canopy cover in comparison with year 2 levels (See Figure 3.2).

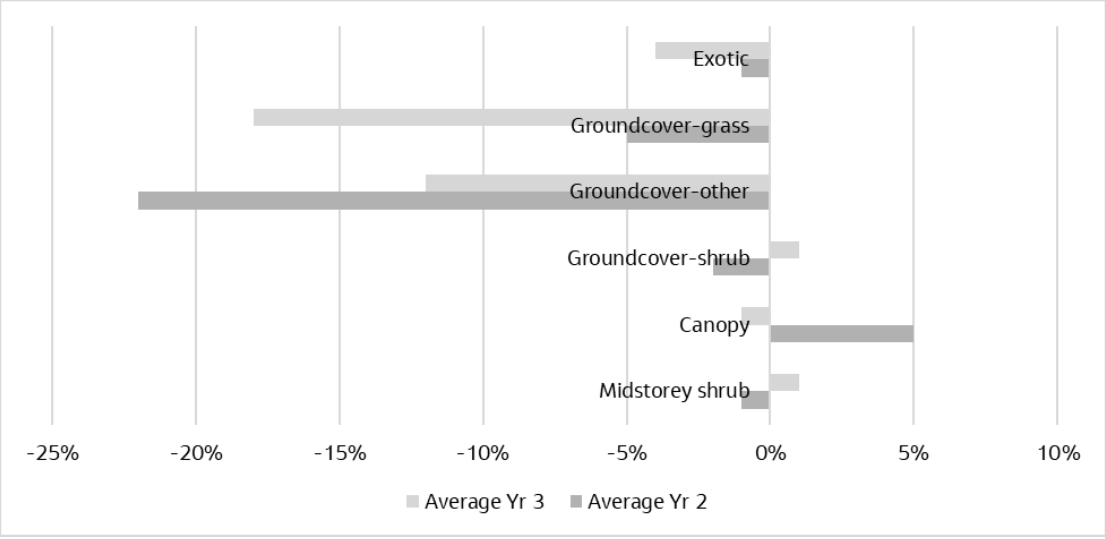

Figure 3.2: Changes in the cover of native and exotic vegetation

Although, the ground cover other layer has declined substantially since Year 2 (refer Figure 3.2), it was still within benchmark levels as the relevant community can naturally occur with minimal forbs (refer to Figure 3.3). The covers of grasses were lower than year 2 levels and have dropped below benchmark levels for each community (refer to Figure 3.4). Native groundcover – shrubs met benchmark levels apart from M01 and M04.

There has been a small reduction in the abundance of exotic species. This change is likely to be attributable to a combination of drought conditions and weed management on the site.

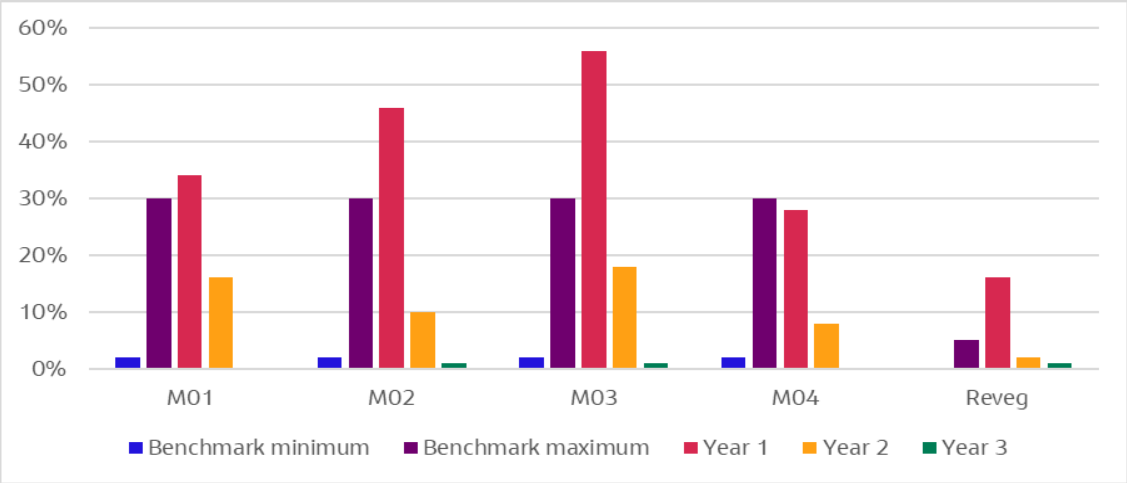

Figure 3.3: Native groundcover – other (percentage cover)

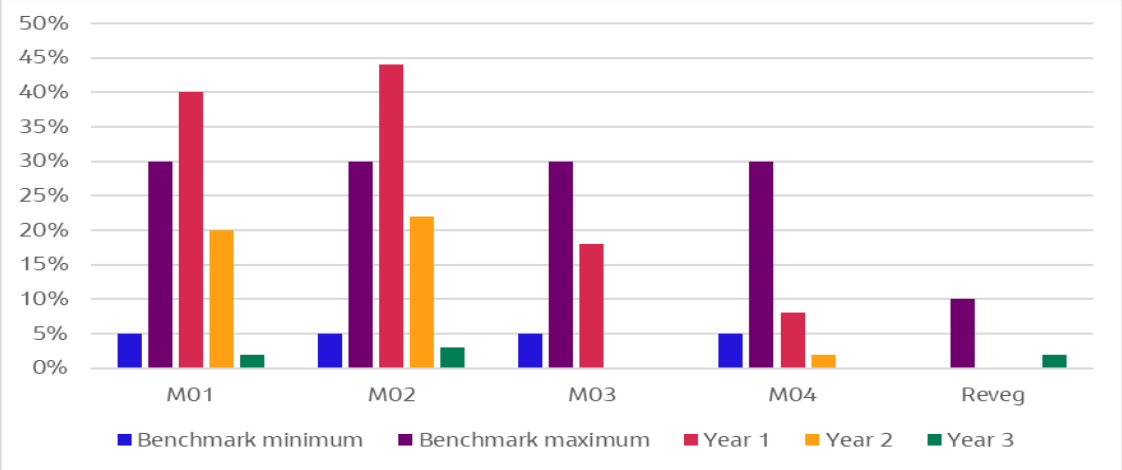

Figure 3.4: Native groundcover - grass (percentage cover)

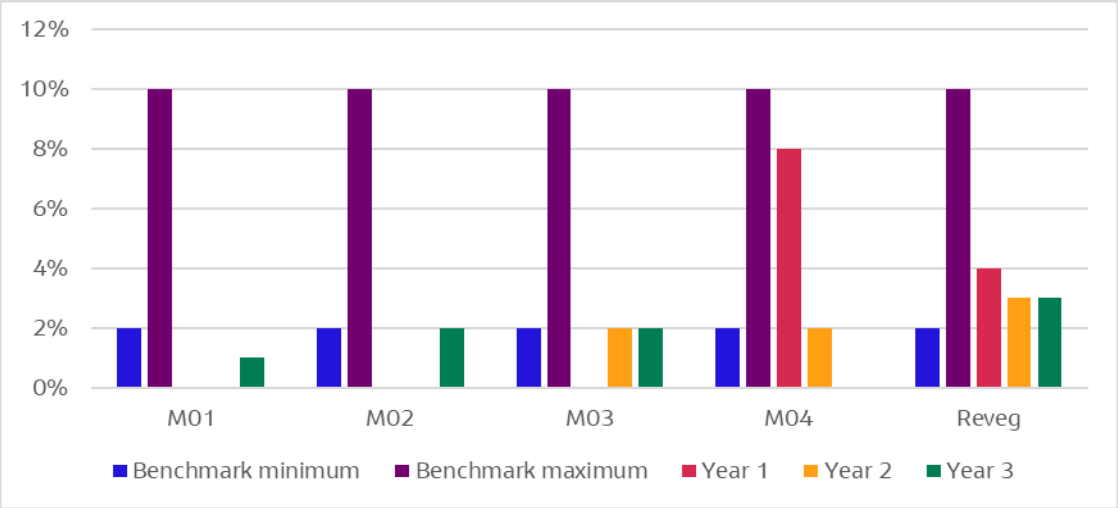

Figure 3.5: Figure Native Groundcover – shrubs (percentage cover)

3.2.3 Discussion

The observed reduction in species richness and native vegetation cover is most likely a result of prolonged below average rainfall at the site. These annual and short-lived perennial groundcover species are likely to naturally fluctuate in abundance in response to rainfall and are likely to persist on the site in the form of a soil-stored seedbank during unfavourable conditions. Grasses seem to have been affected by kangaroo grazing in addition to drought and were generally reduced to shortly-cropped small clumps. A future return to an extended period of average or higher rainfall will likely see a return of annual and short-lived perennial groundcover species and recovery of the foliage cover of grasses.

The monitoring has shown a reduction in the diversity and abundance of native plants and the overall condition of native vegetation on the site. This change is likely to be caused primarily by the prevailing drought conditions and any effect of site management is difficult to detect under these conditions. Additional monitoring under such drought conditions is unlikely to yield meaningful information regarding the improvement or maintenance of biodiversity values.

3.3 Weeds and disturbance

Overall weed infestation across the site was low. The only weed species identified within monitoring plots was *Medicago laciniata* var. *laciniata* and this was only present as dormant fruiting bodies. Historic clearing across the site was evident with several stumps and stags within the site.

The impact of feral pigs was evident during the Year 1 monitoring, including large areas of bare ground and soil disturbance, but no new damage or other signs of recent pig activity was observed in the Year 3 monitoring. Predation, habitat degradation, competition and diseases transmission by feral pigs is listed as a 'key threatening process' under Schedule 4 of the *Biodiversity Conservation Act 2016* (BC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999). A threat abatement plan exists for this process (DEH 2005) and has two broad goals:

- To protect nationally listed threatened species and ecological communities from predation, habitat degradation, competition and disease transmission by feral pigs; and
- To prevent further species and ecological communities from becoming nationally threatened or extinct due to predation, habitat degradation, competition and disease transmission by feral pigs (DEH 2005).

The plan outlines the environmental impacts caused by feral pigs, control techniques and the roles and responsibilities of landowners, communities and authorities in managing the pest. Table 5.1 Offset Site Management measures in the BOMP (NGH 2014) list the exclusion of feral pigs as a management action. If pigs

are found on the site in future, they should be managed through trapping in the first instance, as recommended by the Central West Local Land Services (Mr G Grahame 2018, pers. comm., 30 January). Further details for this management action have been included in Table 5.1 of this report.

None of the weeds identified within the site are declared as state or regional priority weeds under the *Biosecurity Act 2015* or the Western Regional Strategic Weed Management Plan 2017-2022 (LLS 2017).

3.4 Fauna Habitats

Habitat within the offset site comprises of fallen logs, standing dead trees (stags), hollow bearing trees and grassy/forb groundcover (see Photos 9 to12). The higher density woodland areas along the southern and western boundaries of the site are abundant in fallen timber and the overstorey provides nesting and roosting habitat for a range of woodland birds. Mature Poplar Box and Gum-barked Coolabah trees provide hollows of various sizes as mapped by NGH (2014). Tree hollows provide potential habitat for a wide range of bats, woodland birds, owls and arboreal mammals such as gliders. Searches were undertaken for babbler nests whilst undertaking monitoring of plots M03 and M04 within the White Cypress Pine – Polar Box Woodland and whilst traversing the site. No nests were observed. No Grey-crowned Babblers were observed within the offset site. As described by NGH (2014) the presence of the aggressive Noisy Miner within the White Cypress Pine – Polar Box Woodland areas and less commonly in the Open White Cypress Pine woodland may be a significant factor in the absence of this species.

The greater area across the centre of the site comprises of very few scattered trees and is a mix of bare ground and a grassy/forb groundcover. Scattered fallen timber and small stags also provide habitat in this area. White-winged choughs were observed foraging on the ground and in the canopy. Small birds such as the Crimson chat and various wood swallows were observed foraging within the grassy groundcover and perching on small trees and stags. Mobs of Eastern Grey Kangaroos including juveniles were observed within the site. Overall the habitats within the offset site appeared to be consistent with those described by NGH (2014). The installation of fencing approximately two years prior to the current survey is likely to be effective in excluding goats, pigs and any livestock from the site, which may assist in the natural regeneration of the site and hence improve the vegetative habitats.

Photo 9 Open grass habitat with patches of bare ground and the occasional tree or stag.

Photo 10 A large log, one of many providing habitat for reptiles.

Photo 11 Wooded areas along the southern and western boundaries of the offset site provide an abundance of fallen log habitat.

Photo 12 Hollow bearing tree – *Eucalyptus populnea* subsp. *bimbil* (source: NGH 2014)

3.5 Fence maintenance

Stock proof fences, approximately 1200 mm high, have been installed around the entire perimeter of the offset site approximately one month prior to the year 1 survey (January 2018) and as such are in near new condition. Fencing comprises of a ring lock style, (and originally included) a single strand of barbed wire along the top (see Photo 13). Kangaroos were observed within the offset site and exiting the site by jumping the fence.

The top barbed-wire strand has been removed in 2019 as recommended by Jacobs (2019) to minimize the risk of kangaroo entrapment and mortality. No kangaroo carcasses were observed entangled in the boundary fences in the Year 3 survey.

Digging under the fence was observed at multiple places around the fence perimeter. This is likely access to offset the site by wild goats or sheep. See Photo 14-16.

Photo 13 Ring-lock fencing along the southern boundary of the offset site. This style of fencing surrounds the entire perimeter of the offset site

Photo 14 access to site under fence by goats or sheep

Photo 15 access to site under fence by goats or

Photo 16 access to site under fence by goats or sheep

4. Solar Plant Revegetation area

4.1 Overview and monitoring methodology

It was a condition of approval (COA B18, October 2011) for the Nyngan Solar Plant that visual screening be provided along the southern boundary of the site to reduce visual impacts. The provision of visual screening was to be incorporated with habitat restoration of approximately 5 hectares of land at the solar plant site as an additional compensatory environmental measure. In the long-term this will provide additional habitat for the Grey-crowned Babbler in the immediate area where habitat has been removed and where the species is known to occur and breed.

A Landscape Plan was prepared for the revegetation area by First Solar (2013) and planting of the revegetation area was undertaken in accordance with this plan. Measures, additional to the Landscape Plan, that have the objective of enhancing habitat for the Grey-crowned Babbler were outlined in the BOMP (NGH 2014) and include:

- Where possible, tubestock and seed used for revegetation would be of local provenance.
- Stock would be excluded from the revegetation area for the life of the solar plant.
- Groundcover revegetation would be conducted focusing on establishing a grassy understorey suitable for foraging by the Grey-crowned Babbler. It is proposed to utilise grass species that are known to occur on the site and are considered suitable for revegetation as outlined in Table 6-2 of the BOMP (NGH 2014).
- Larger logs that are cleared from other activities within the development site would be placed within the revegetation area to provide additional habitat features.
- Ongoing weed control within the revegetation area would be carried out as described for the development site in the project Operational Environmental Management Plan.

The revegetation area at the solar plant (see Figure 4.1) is divided into two areas, the eastern and western revegetation areas (see Photos 17 and 18), by a patch of remnant vegetation retained within the site. Revegetation occurred approximately 18 months prior to this assessment and each area has been fenced in its entirety. One monitoring transect (50m x 20m) was established within the larger, eastern revegetation area to identify any natural regeneration diversity and cover in the area. A species list specific to the 20m x 20m monitoring plot within the larger transect area is provided in Appendix A. An overall assessment was also undertaken for the two revegetation areas to estimate the survival rate of planted tubestock.

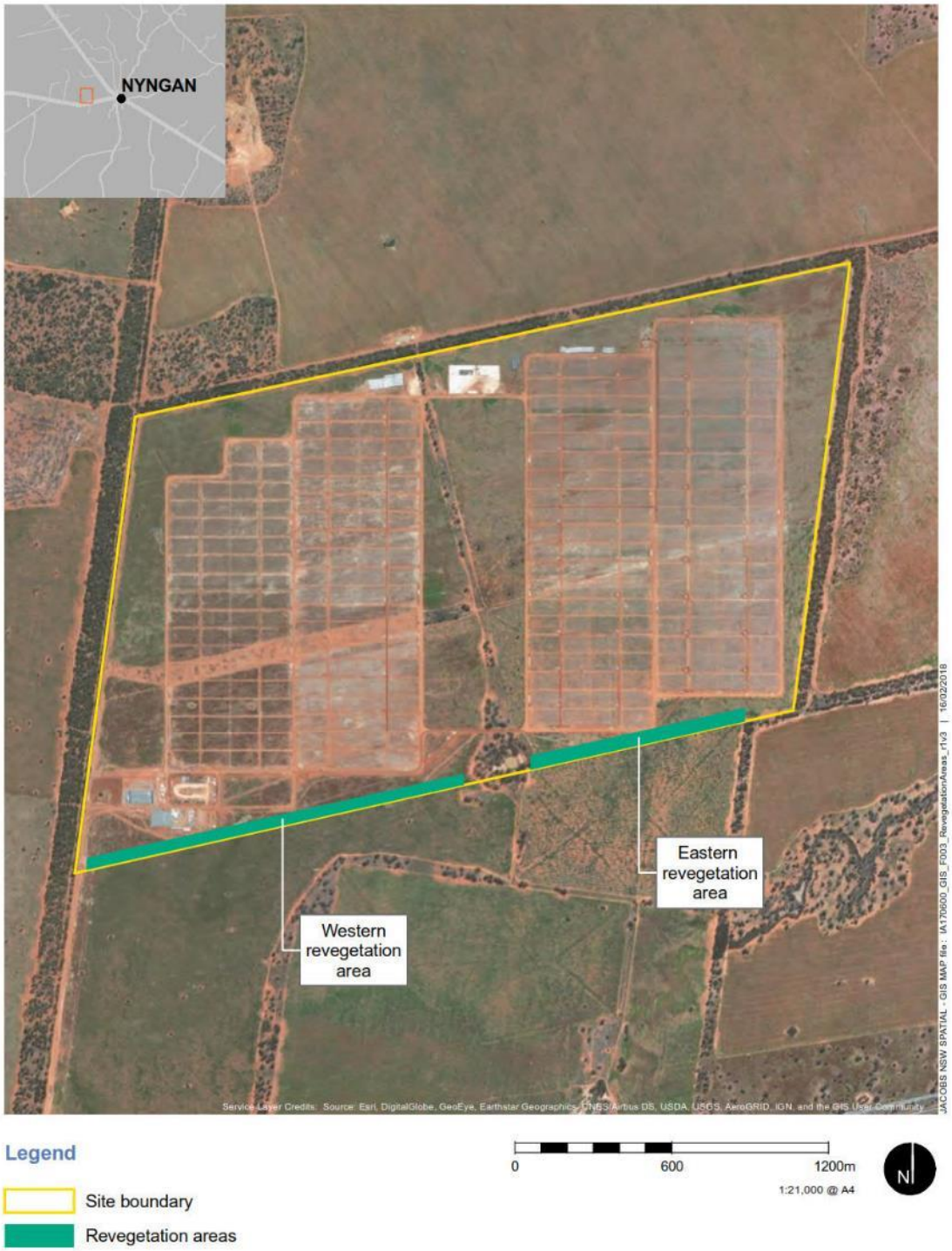

Figure 4.1 | Revegetation areas within the Nyngan solar plant site

Photo 17 Looking west along the western revegetation area (Year 2).

Photo 18 Looking west along the western revegetation area (Year 3)

4.2 Revegetation area condition assessment

Monitoring of the revegetation areas within the solar plant was undertaken on 19 December 2019. The results of the assessment are provided below along with recommended management actions. Management actions are also outlined in, Table 5.1, Section 5.

4.2.1 Tubestock survival rate

Tubestock was planted within the revegetation area in July 2017 (see Figure 4.1). The estimated survival of tubestock in last year's survey was 10%. There has been further losses of tubestock this year with an estimated survival of 5-10% tubestock alive compared to last year's survey. The survivors are predominately *Eucalypt spp.* and some shrub species such as *Acacia spp.* and hardier species such as the shrub *Bursaria spinosa* (see Photos 19 and 20). After the intial watering of newly planted tubestock, approximately eight follow up watering events were undertaken, one per week, for the two months following the planting. No follow up watering of the tubestock has been undertaken since last year's survey.

Jute matting and tree guards were recommended for the planting (First Solar 2013 and NGH 2014) however, were not used at the time of planting. Jute matting and tree guards had been installed around surving plants by the time of last year's survey as reccomended, however, these have since disappeared, likely due to heat, wind and sun on-site and are no longer assisting the survival or growth of the present tubestock.

4.2.2 Fencing

Fences were installed around the entirety of the revegetation areas in March 2017 and appear to be in good condition at the time of this assessment.

Photo 19 Surviving *Acacia sp.* planted within the revegetation area (Year 3).

Photo 20 Surviving *Brachychiton populneus* planted within the revegetation area with recently installed jute matting and plant protector (Year 2)

4.2.3 Natural regeneration

A significant amount of natural regeneration occurring within the ground layer of the revegetation areas was observed in the year 1 monitoring. With the subsequent dry conditions many of the species that were previously apparent were not detected during the year 2 survey. This year's survey found a further decline in species with 10 native species identified within a 20m x 20m plot in the eastern revegetation area, which is considered likely to be representative of the entire revegetation area. A full species list and cover abundance score using the modified Braun Blanquet scale are provided in Appendix A. The reduced diversity and number of native plants naturally regenerating within the ground layer of the revegetation areas since last year can be attributed to the continued dry conditions.

4.2.4 Weed infestation

Weed infestation within the revegetation areas was low to moderate. There were four species present. The more common weeds included, Saffron Thistle, Onion Weed and Medicago. To allow for continued improvement in the natural regeneration of the areas and greater growth in the surviving Tubestock species, targeted spot spraying of weeds is recommended.

4.2.5 Habitat evaluation

The revegetation areas currently do not provide suitable habitat for the target species, Grey-crowned Babbler. As the ground layer cover improves and planted shrub species and overstorey Eucalypts grow this may improve, however it is likely to take at least 10 years before the overstorey is a suitable height for nesting habitat. The bare ground and emerging groundcover may provide some areas of open foraging habitat for birds. The placement of any rock or fallen log debris within the site would enhance habitat for reptile species.

4.3 Recommended future management actions

The following management actions are recommended for the revegetation areas within the solar plant. These actions are also included in Section 5 of this report.

- Replacement planting is recommended at a low rate (approximately 200 plants per revegetation area) and in clusters along the revegetation area using a mixture of *Eucalypt spp., Acacia spp.* and other hardy shrub species that were previously planted and have survived. Clustering of a low number of plants may allow for a concentrated effort in watering and hence a greater likelihood of plant survival. Further clusters may be added in the future should this method prove to be more successful. Tubestock is to be used and tree guards provided around each. Supplementary planting is recommended to be undertaken when weather conditions are still warm but cooler in Autumn but only after a return to average or higher monthly rainfall over several successive months. Intensive watering in of tubestock at the time of planting as well as subsequent watering following planting is paramount. A qualified Bush Regeneration contractor is required to advise on species and watering frequency and as such a degree of flexibility should be allowed for in any quotation for these services.
- Targeted spot spraying of weeds is recommended in late winter or early spring 2020.
- Brush matting – collection of native seed from local provenance placed within the site on branches scattered along the original planting rip lines. Branches should be left with seed *in-situ*, allowing seeds to disperse naturally and lay dormant within the ground layer until favourable weather conditions activate germination. To be undertaken in early spring after suitable withholding periods post targeted weed spraying.

5. Management Actions

The following management measures in Table 5.1 were outlined in the BOMP (NGH 2014) and were to be actioned and adapted based on annual monitoring results. Table 5.1 also provides an evaluation of the need for each management action, based on observation during the monitoring works, the timing, and who is required to undertake the action. Management actions relate to the Nyngan Offset site, Figure 2.2 and the Nyngan Solar Plant site revegetation areas, Figure 4.1

Table 5.1 : Management Actions required at the Nyngan Offset site and Nyngan Solar Plant site revegetation areas

Management measure	Objective	Action	Required / Timing	Location where required	Who	Actions undertaken since previous monitoring session	Adaptive measures if required
Weed control	Weed control to reduce spread and competition with native species	Targeted spot spraying	Yes required Early Spring 2018. In growth season, in suitable low wind conditions so as to prevent spray drift to other native species.	Nyngan Offset site Nyngan Solar Plant site revegetation areas	Professional bush regeneration consultant with appropriate chemical use accreditation.	A weed management contractor inspected the site in November 2019. Due to the severe weather conditions the recommendation was to spray at a later date.	Monitoring and spot-spraying of re-emerging weeds in 2020.
Exclusion of feral pigs	To improve natural regeneration of vegetation, prevent soil disturbance which may lead to erosion and to prevent	Feral pigs may potentially be low numbers in the site and as such the recommended action in the first instance is trapping and use of firearm to kill any caught pigs. The specific process for the trapping procedure, killing of any caught pigs and disposal of carcases are outlined on the NSW Department of Primary Industries (DPI) web page:	Possibly required if any pigs manage to get into the site due to future fence damage.	Nyngan Offset site.	Landowner in consultation with Nyngan LLS – Geoff Grahame 0427 437 488.	No evidence of feral pigs.	Fence monitoring and repair of any damage observed.

Management measure	Objective	Action	Required / Timing	Location where required	Who	Actions undertaken since previous monitoring session	Adaptive measures if required
	potential harm to and competition with native fauna.	https://www.dpi.nsw.gov.au/biosecurity/vertebrate-pests/pest-animals-in-nsw/feral-pigs/feral-pig-control Central West Local Land Services have an office based at Nyngan and a trap readily available for loan to assist in this process. Liaison with the landowner to undertake this process is required.					
Cat and/or fox control	To eliminate feral pests from within the site and improve opportunities for native fauna to inhabit the site	None required at this stage. Allow habitats to regenerate over the next year with new fencing. Re-evaluate in Year 3.	Not required at this stage	Nyngan Offset site and adjoining lands where possible.	-	-	-
Rabbit control	To eliminate feral pests from within the site and reduce grazing on native flora	None required at this stage. Allow native vegetation to regenerate over the next year with new fencing. Re-evaluate in Year 3.	Not required at this stage	Nyngan Offset site and adjoining lands where possible.	-	-	-
Control of Noisy Miners	To reduce Noisy Miners within the site	None required at this stage. Allow natural regeneration to continue to occur now that the site is fenced and re-evaluate in Year 3.	Not required at this stage	Nyngan Offset site and	-	-	-

Management measure	Objective	Action	Required / Timing	Location where required	Who	Actions undertaken since previous monitoring session	Adaptive measures if required
	to decrease competition with other native woodland birds.			adjoining lands where possible.			
Monitoring plot survey	Repeat monitoring plot surveys to evaluate the 'improve or maintain' outcome of biodiversity values at the site	Repeat monitoring of all plots within the offset site.	Yes required / Late spring 2019	Nyngan Offset site Nyngan Solar Plant site revegetation areas	Two qualified Ecologists	-	Where possible time survey events to occur within two weeks of a significant rainfall event so as to better identify the diversity of plant species dormant within the ground layer
Monitoring of revegetation areas	Repeat monitoring plot survey to evaluate the condition of the revegetation areas with regards to planting	Repeat monitoring of single plot within the eastern revegetation area.	Yes, required Late spring 2019	Nyngan Solar Plant site revegetation areas	Two qualified Ecologists	-	Where possible time survey events to occur within two weeks of a significant rainfall event so as to better identify the diversity of plant species dormant

Management measure	Objective	Action	Required / Timing	Location where required	Who	Actions undertaken since previous monitoring session	Adaptive measures if required
	survival rates and natural regeneration diversity and cover						within the ground layer
Supplementary planting of revegetation areas	To enhance the native vegetation, cover in the revegetation areas and replace plants lost.	Supplementary planting of approximately 200 plants per revegetation area, using a mixture of *Eucalypt spp., Acacia spp.* and other hardy shrub species that were previously planted and have survived. Ecologist to work with a qualified bush regeneration contractor. Tubestock is to be used and tree guards provided around each. Guards are also required around the surviving tubestock from the previous planting. Carton guards are recommended over the plastic tree guards for their ability to more readily break down in the environment and their ease of installation. Intensive watering in of tubestock at the time of planting as well as subsequent watering following planting is paramount. A qualified Bush Regeneration contractor is required to advise on watering frequency and as such a degree of flexibility should be allowed for in any quotation for these services.	Yes required, When the weather is warm but not hot and following several months of average or higher rainfall. Subject to suitable weather conditions in the locality.	Nyngan Solar Plant site revegetation areas	Qualified Bush Regeneration contractor.		Planting to be conducted in 2020 when weather conditions are suitable Planting time subject to suitable weather conditions in the locality.
Brush-matting of revegetation areas	To enhance the natural regeneration	Collection of native seed from local provenance placed within the site on branches scattered along the original planting rip lines.	Yes required Early Spring 2019 after	Nyngan Solar Plant site	Qualified Bush		Plan to undertake this action in 2020 if

Management measure	Objective	Action	Required / Timing	Location where required	Who	Actions undertaken since previous monitoring session	Adaptive measures if required
	of the revegetation areas.	Branches should be left with seed in-situ, allowing seeds to disperse naturally and lay dormant within the ground layer until favourable weather conditions activate germination. To be undertaken in early spring after suitable withholding periods post targeted weed spraying.	suitable withholding periods post targeted weed spraying.	revegetation areas	Regeneration consultant		better conditions arise, subject to local seed availability.
Fence modification	To prevent kangaroos and other native wildlife from being injured or killed by fences	It is recommended that the top barbed-wire strand is removed to minimise the risk of kangaroo entrapment and mortality. Monitoring should be undertaken to determine whether kangaroos and other animals continue to become entangled. Monitoring should also determine whether the modified fence continues to be effective in excluding large non-native herbivores.	As soon as possible	Boundaries of the offset site with the exception of any boundaries with neighbouring properties.	Landowner or contractor	The top barbed wire layers were removed in 2019.	Additional measures may be required in 2020 to either further reduce the risk to wildlife and/or to inhibit non-native herbivores from entering the site.

6. Conclusions

As per the requirements of the Ministers Conditions of Approval (MCoA) for the Nyngan Solar Plant the biodiversity offset site is required to be monitored and the results reported annually to the NSW Office of Environment and Heritage (OEH). Condition C5(b) specifically states that the biodiversity outcome to be achieved must 'improve or maintain' the biodiversity values of the site. This report outlines the results of the third monitoring survey for the offset site since the baseline study recorded in the Biodiversity Offset Management Plan (BOMP) by NGH (2014).

In addition, this report provides a condition assessment for the revegetation area at the Nyngan Solar Plant site, which was required by the condition of approval (CoA B18, October 2011). The revegetation area was to provide both visual screening along the southern boundary of the solar plant as well as future compensatory habitat for the Grey-crowned Babbler in the immediate area where habitat has been removed and where the species is known to occur and breed.

6.1 Conditions at the offset site

The recent monitoring results demonstrate that biodiversity values across the site have generally decreased with regards to floristic diversity, and in some measures of cover and condition when compared to the vegetation community benchmarks (DECC 2008) and compared to previous monitoring events.

The notable change in native grass and other groundcover condition, is likely attributed to natural prolonged dry periods which appear to have inhibited the growth of grass and forb species. It is likely that seed stock lay dormant within the ground. Adequate rainfall would further increase the species diversity at the site. The management actions outlined in Table 5.1 will further assist the natural regeneration of the site over the next twelve months, an overview of these is provided below.

Stock proof fencing around the offset site has been installed for approximately two years prior to the recent survey. It is likely that with the fencing in place the biodiversity values of the site will improve through the exclusion of some feral pests and any livestock, allowing further opportunities for natural regeneration to occur once suitable rainfall conditions return. While the fence is in good condition around the perimeter of the site, there is evidence of feral animals breaching the fence by digging underneath and management actions need to be taken to prevent further feral herbivores from accessing the site.

Fauna habitats across the site are in moderate to good condition and have been maintained, except for the grassy habitat due to dry conditions.

Weed infestations across the site are generally low and can be maintained by spot treatment as outlined in the management actions.

6.2 Solar plant revegetation area

Overall the solar plant revegetation area has not fared well since planting in July 2017 and has further declined in condition since the Year 2 monitoring. The soil was extremely dry and the prolonged dry weather conditions over the past twelve months have not been conducive to establishing tubestock. Jute-mats and tree covers have been removed since the Year 2 monitoring which is likely to have contributed to further losses.

Natural regeneration within the site appears to be good for native grasses and forbs, though diversity and cover have declined since the previous survey, likely as a result of dry conditions.

Fencing around the site is in good condition and will assist in excluding and wandering livestock and some feral pests and as such further support the natural regeneration process.

The Jacobs (2019) report recommended that replacement planting be undertaken within the revegetation area pending suitable weather conditions in the locality. Suitable weather has not come to pass, and replacement planting is recommended in the next year if dry conditions cease.

Targeted weed spraying is required throughout the revegetation areas in early spring to further assist in the regeneration of native vegetation and growth of planted tubestock.

7. References

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Appendix A. Flora species list and opportunistic fauna list

Table A.1 Flora species list and 20m x 20m plot survey Modified Braun Blanquet scores

Family	Genus	Species	N or E	M01	M02	M03	M04	Reveg area
Asteraceae	*Carthamus*	*lanatus**	E					1
Asteraceae	*Conyza*	*bonariensis**	E					1
Asteraceae	*Lactuca*	*serriola f. serriola**	E					
Asteraceae	*Sonchus*	*oleraceus*	E					1
Cucurbitaceae	*Citrullus*	*colocynthis**	E					1
Fabaceae - Faboideae	*Medicago*	*laciniata var. laciniata**	E					
Poaceae	*Avena*	*sp.**	E					
Polygonaceae	*Emex*	*australis**	E					
Verbenaceae	*Glandularia*	*aristigera*	E					
Acanthaceae	*Brunoniella*	*australis*	N					
Acanthaceae	*Rostellularia*	*adscendens var. adscendens*	N					
Amaranthaceae	*Alternanthera*	*sp. A Flora of New South (M.Gray 5187)*	N					
Amaranthaceae	*Ptilotus*	*obovatus*	N					
Amaranthaceae	*Ptilotus*	*polystachyus*	N	2	1			1
Apocynaceae	*Marsdenia*	*australis*	N					
Apocynaceae	*Parsonsia*	*eucalyptophylla*	N					
Apocynaceae	*Rhyncharrhena*	*linearis*	N	1				
Asteraceae	*Calotis*	*cuneifolia*	N					
Asteraceae	*Calotis*	*lappulacea*	N	1				2
Asteraceae	*Chrysocephalum*	*apiculatum*	N	1	1			
Asteraceae	*Glossocardia*	*bidens*	N				1	
Asteraceae	*Stuartina*	*muelleri*	N					
Asteraceae	*Vittadinia*	*dissecta var. hirta*	N					
Asteraceae	*Vittadinia*	*cuneata var. cuneata*	N	1				
Asteraceae	*Vittadinia*	*sulcata*	N					1
Asteraceae	*Vittadinia*	*gracilis*	N		1			
Asteraceae	*Xerochrysum*	*viscosum*	N					
Boraginaceae	*Heliotropium*	*europaeum**	N					

Family	Genus	Species	N or E	M01	M02	M03	M04	Reveg area
Campanulaceae	*Wahlenbergia*	*sp.*	N					
Campanulaceae	*Wahlenbergia*	*gracilis*	N					
Chenopodiaceae	*Dysphania*	*pumilio*	N					1
Chenopodiaceae	*Einadia*	*nutans subsp. nutans*	N		1			
Chenopodiaceae	*Einadia*	*nutans subsp. linifolia*	N	1			1	
Chenopodiaceae	*Enchylaena*	*tomentosa*	N					
Chenopodiaceae	*Maireana*	*villosa*	N					
Chenopodiaceae	*Maireana*	*microphylla*	N					
Chenopodiaceae	*Maireana*	*enchylaenoides*	N	1	1		1	
Chenopodiaceae	*Rhagodia*	*spinescens*	N					
Chenopodiaceae	*Salsola*	*australis*	N					1
Chenopodiaceae	*Sclerolaena*	*birchii*	N					
Chenopodiaceae	*Sclerolaena*	*bicornis var. bicornis*	N					
Convolvulaceae	*Convolvulus*	*recurvatus subsp. recurvatus*	N	1	2			1
Cupressaceae	*Callitris*	*glaucophylla*	N	2	3	4	3	
Euphorbiaceae	*Euphorbia*	*drummondii*	N					1
Fabaceae - Mimosoideae	*Acacia*	*deanei subsp. deanei*	N					1
Geraniaceae	*Erodium*	*crinitum*	N					
Goodeniaceae	*Goodenia*	*cycloptera*	N					
Lamiaceae	*Teucrium*	*racemosum*	N					
Lomandraceae	*Lomandra*	*effusa*	N					
Malvaceae	*Abutilon*	*oxycarpum*	N					1
Malvaceae	*Abutilon*	*halophilum*	N	1	1			
Malvaceae	*Brachychiton*	*populneus subsp. trilobus*	N					
Malvaceae	*Sida*	*cunninghamii*	N	1	2			
Malvaceae	*Sida*	*corrugata*	N		1	1	1	
Myrtaceae	*Eucalyptus*	*populnea subsp. bimbil*	N	1		2	3	
Nyctaginaceae	*Boerhavia*	*dominii*	N		1			
Oxalidaceae	*Oxalis*	*perennans*	N					
Poaceae	*Aristida*	*jerichoensis var. subspinulifera*	N	1	1			
Poaceae	*Austrostipa*	*scabra subsp. scabra*	N					

Family	Genus	Species	N or E	M01	M02	M03	M04	Reveg area
Poaceae	*Dichanthium*	*sericeum*	N					
Poaceae	*Digitaria*	*brownii*	N					
Poaceae	*Digitaria*	*divaricatissima*	N					
Poaceae	*Enneapogon*	*avenaceus*	N					
Poaceae	*Enteropogon*	*acicularis*	N					
Poaceae	*Panicum*	*decompositum*	N		1			
Poaceae	*Panicum*	*effusum*	N					
Poaceae	*Paspalidium*	*constrictum*	N					
Poaceae	*Sporobolus*	*contiguus*	N					
Poaceae	*Thyridolepis*	*mitchelliana*	N	1	1			
Poaceae	*Tragus*	*australianus*	N					
Portulacaceae	*Portulaca*	*oleracea*	N					1
Proteaceae	*Hakea*	*tephrosperma*	N	1				
Pteridaceae	*Cheilanthes*	*sieberi subsp. sieberi*	N		1			
Rutaceae	*Geijera*	*parviflora*	N					
Sapindaceae	*Dodonaea*	*viscosa subsp. mucronata*	N				1	
Scrophulariaceae	*Eremophila*	*longifolia*	N	2				
Scrophulariaceae	*Eremophila*	*mitchellii*	N			1		
Solanaceae	*Solanum*	*ellipticum*	N					
Solanaceae	*Solanum*	*eremophilum#*	N					
Solanaceae	*Solanum*	*esuriale*	N					
Zygophyllaceae	*Tribulus*	*micrococcus*	N					
Zygophyllaceae	*Tribulus*	*minutus*	N	1	1			

* general weed

**state and regional weeds to be targeted (Biosecurity Act 2015)

Table A.2 Opportunistic fauna species list

Class	Species	Common Name	Sighting
Birds	*Corcorax melanorhamphos*	White-winged chough	Observed in the site
	Eolophus roseicapilla	Galah	Observed in the site
	Manorina melanocephala	Noisy miner	Observed in the site
	Struthidea cinerea	Apostlebird	Observed in the site
	Cracticus tibicen	Australian Magpie	Observed in the site
Mammals	*Macropus giganteus*	Eastern Grey Kangaroo	Observed in the site

Appendix B. Condition of Approval (COA) C5

Biodiversity Offset Management Plan

C5. Following final design and prior to the commencement of construction, or as otherwise agreed to by the Director-General, the Proponent shall develop and submit a Biodiversity Offset Management Package for the approval of the Director-General. The package shall detail how the ecological values lost as a result of the Project will be offset. The Biodiversity Offset Management Package shall be developed in consultation with the OEH and shall (unless otherwise agreed by the Director-General) include, but not necessarily be limited to:

(a) an assessment of all native vegetation communities, threatened species habitat and Willyama Common land that will either be directly or indirectly impacted by the proposal;

(b) the objectives and biodiversity outcomes to be achieved (including 'improve or maintain' biodiversity values), and the adequacy of the proposed offset considered;

(c) the final suite of the biodiversity offset measures selected and secured including but not necessarily limited to;

  i) an offset proposal which is supported by a suitable metric method (such as the Biobanking Assessment Methodology);

  ii) details of the relative condition and values of communities on the offset site in comparison to those to be impacted, including all areas of native shrubland in moderate to good condition;

  iii) proposed management actions and expected gains;

(d) the monitoring requirements for compensatory habitat works and other biodiversity offset measures proposed to ensure the outcomes of the package are achieved, including:

  i) the monitoring of the condition of species and ecological communities at offset locations;

  ii) the methodology for the monitoring program(s), including the number and location of offset monitoring sites, and the sampling frequency at these sites;

  iii) provisions for the annual reporting of the monitoring results for a set period of time as determined in consultation with the OEH; and

(e) timing and responsibilities for the implementation of the provisions of the Package.

Land offsets shall be consistent with the *Principles for the use of Biodiversity Offsets in NSW* (NSW Office of Environment and Heritage, June 2011). Any land offset shall be enduring and be secured by a conservation mechanism which protects and manages the land in perpetuity. Where land offsets cannot solely achieve compensation for the loss of habitat, additional measures shall be provided to collectively deliver an improved or maintained biodiversity outcome for the region.

Where monitoring referred to in condition (d) indicates that biodiversity outcomes are not being achieved, remedial actions shall be undertaken to ensure that the objectives of the Biodiversity Offset Package are achieved.

Within one from approval from the Director-General the Proponent shall, in conjunction with the lessee of Western Lands Lease 14240, apply to the Crown Lands Division of the Department of Trade and Investment for a Change of Lease Purpose of Western Land Lease 14240 to appropriately record the biodiversity offset on title and within the lease conditions as a conservation area.