



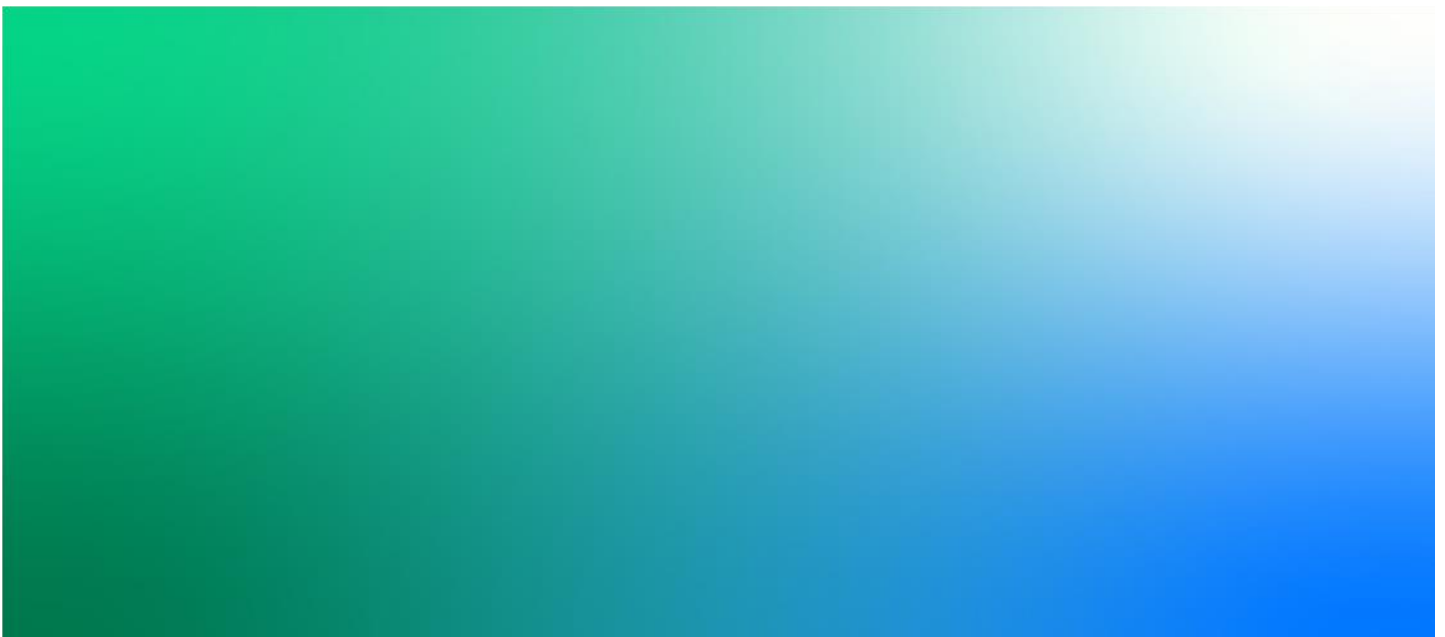
Broken Hill Solar Plant Biodiversity Offset Site

Annual Ecological Monitoring Report Year 4 – 2020/2021

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AGL



Broken Hill Solar Plant Biodiversity Offset Site

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Appendix B. Condition of Approval (COA) C5

Executive Summary

As per the requirements of the Conditions of Approval (COA) the Broken Hill biodiversity offset site is required to be monitored and the results reported annually to the NSW 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 offset site. This report outlines the results of the Year 4 monitoring survey, which is the fourth survey for the offset site since the baseline study recorded in the Biodiversity Offset Management Plan (BOMP) by NGH (2013).

The Year 4 monitoring results demonstrate that biodiversity values across the offset site have improved with regards to floristic diversity, vegetation cover and vegetation quality when compared to the vegetation community benchmarks (as published by DECC 2008), baseline survey results recorded by NGH (2013), and the Year 2 and Year 3 monitoring results. The improvement in condition is likely to be the result of recent favourable rainfall conditions. This rainfall after a period of prolonged dryness (Year 2 and Year 3), has stimulated the growth of many plant species, a number of which were not present during the last two years of monitoring. A prolonged return to average or higher rainfall conditions will likely see the recovery of further floristic diversity, vegetation cover and vegetation quality scores in the future.

The management actions proposed will further assist the natural regeneration with the recent increase in rainfall conditions.

Stock proof fencing around the offset site is in good condition, though there are two places where the fence has been pushed down by surface water run-off and debris at the intersection with an unnamed tributary of Stirling Vale Creek. Maintenance is required to prevent potential access by goats or other pests. It is likely that with the fencing in place the biodiversity values of the offset site will continue to improve through the exclusion of feral goats and any livestock.

Fauna habitats across the offset site are somewhat diverse and include chenopods, rocky patches, tussock grasses, clay crevices and some taller shrubs. These habitats have been maintained, and the groundcover and vegetative cover has increased due to higher rainfall in 2020-21

Weed infestations across the offset site are still generally low but have increased substantially in a few plots sampled as a result of the increased rainfall. This can be managed by spot treatment as outlined in the management actions.

Weeds of concern include the state and regional priority weeds (LLS 2017) Velvet Mesquite and African Boxthorn, which are required to be eradicated from the offset site to prevent further spread to surrounding lands. These species showed further decline since last year and no signs of major regrowth despite improved rainfall conditions. This suggests that weed management on site is working.

Peppercorn Tree (exotic) infestations within the centre of the offset site have showed significant dieback since last year. However, these still appear to be partially alive and may need further treatment. The recommendation remains to control emerging saplings. Replacement planting with native trees and tall shrubs would allow for the maintenance of fauna habitat while gradually removing the Peppercorn Trees.

1. Introduction

1.1 Background and study area

In 2014, AGL Energy Limited (AGL) constructed the Broken Hill Solar Plant (the solar plant), a solar photovoltaic (PV) plant with a nominal capacity of 50 MW, at Broken Hill in western NSW as part of the Commonwealth Solar Flagships Program. The solar plant is located on a property to the west of the Broken Hill township at Lot 6806 DP 823918 and is approximately 200 hectares (ha) in area. 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 NSW Department of Planning and Infrastructure (DP&I) on the 27 March 2013. It is a condition of approval (COA) that an Offset Management Package be developed to offset the ecological values lost as a result of the project (COA C5 is provided in Appendix B). AGL engaged the existing lessee of the solar plant site to include a suitable area of land for offsetting within the scope of the project.

The offset site is located 1.5 km west of the solar plant site, comprising the western portion of the same lot, Lot 6806 DP 823918, covering approximately 162 ha (see Figure 1.1).

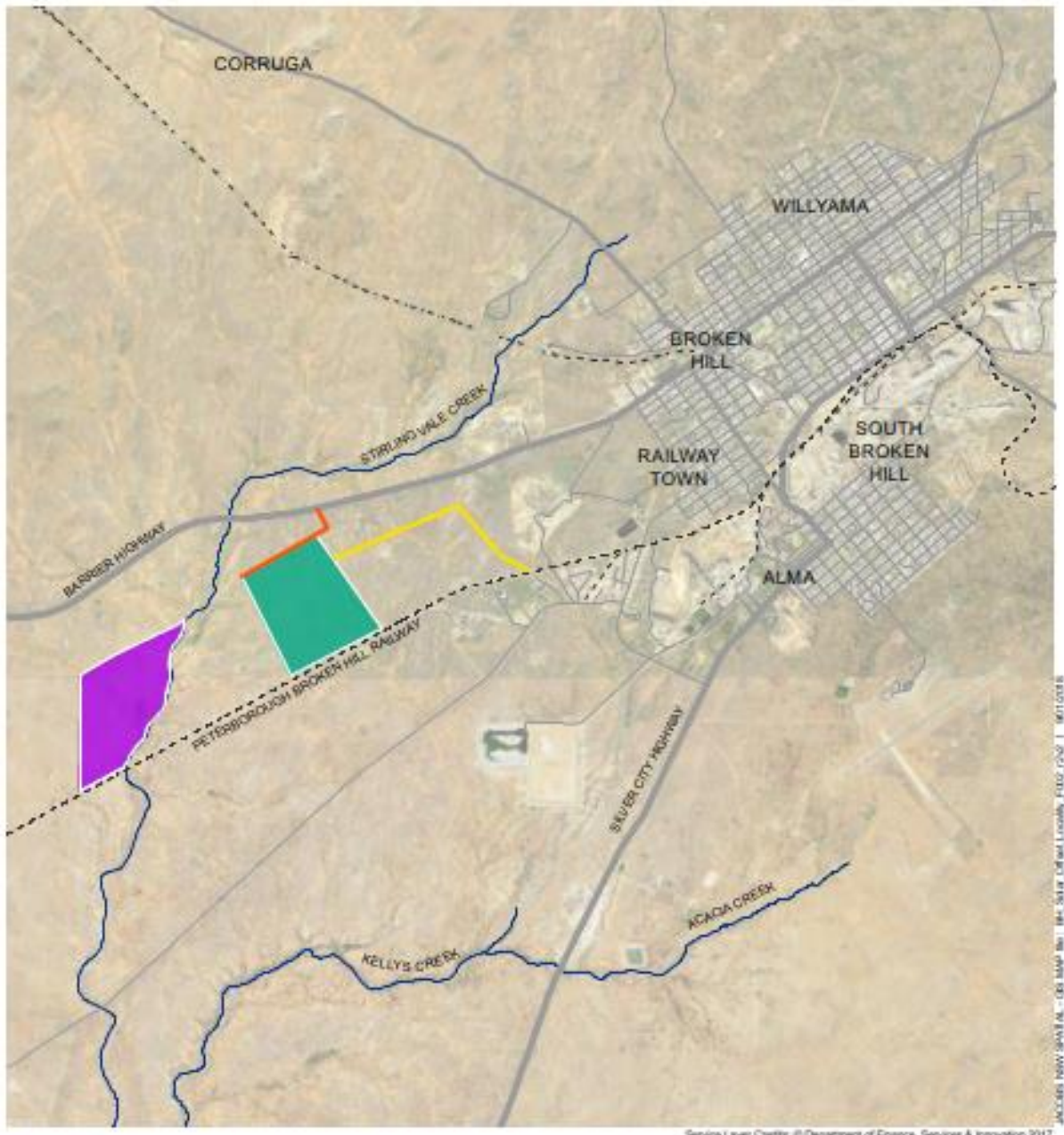
AGL are responsible for the ongoing maintenance of the offset site.

1.2 Objectives

This report documents the results of the annual (Year 4) ecological monitoring event for the offset site as required under COA C5. Monitoring of the offset site is required to demonstrate an 'improve or maintain' outcome for the identified biodiversity offset values at the offset site and to identify any management or 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 (2013). The results are described and analysed with comparison to the baseline data from the BOMP (NGH 2013), and those of the first, second and third year monitoring events to determine if there have been any significant changes in the vegetation and habitat conditions and the consistency of these with the objective of improving or maintaining the biodiversity values on the offset site.

In addition, an evaluation was undertaken of any required management actions and their effectiveness, as outlined in the BOMP (NGH 2013), and the standard management actions required to be undertaken at offset sites outlined in the BioBanking Assessment Methodology (BBAM 2009). This includes 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 sufficient, retention of dead timber, erosion control and retention of rocks.



Legend

- Offset site
- Solar plant site
- Access easement
- 22kV aboveground easement

Figure 1.1 Broken Hill Solar Plant and offset site location

2. Monitoring method

2.1 Requirements

The monitoring method is consistent with the methodologies outlined in the BOMP (NGH 2013) and meets the requirements of the COA C5. In particular, COA C5(b) stipulates the requirement of the offset site to achieve an 'improved or maintained' outcome for the biodiversity values of the offset 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 data, baseline data and the results of the first, second and third monitoring events 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 2013), an assessment was undertaken using the BioBanking Assessment Methodology (BBAM) (DECC 2009) to collect data on vegetation structure, cover and quality across transects and within monitoring plots. This data was then compared with the NGH (2013) baseline data, where available, and the benchmark data for each vegetation community type using the Vegetation Benchmarks Database (DECC 2008). The BBAM has now been replaced with the Biodiversity Assessment Methodology 2020 (BAM) which no longer uses the Modified Braun Blanquet method to assess floristic cover and abundance. Given that this study originally used the BBAM (with Modified Braun Blanquet cover/abundance data), this method has been continued in order to enable comparison of vegetation condition between previous years. The vegetation condition for November 2020 (Year 4, this report) is compared with:
 - Benchmark data
 - Baseline study (included in the BOMP, NGH 2014)
 - Year 1 monitoring (Jacobs 2018)
 - Year 2 monitoring (Jacobs 2019)
 - Year 3 monitoring (Jacobs 2020)
- Habitat evaluation. Notes on fauna habitat were taken across the broader site while traversing the offset site to reach the monitoring plots. At each monitoring plot detailed notes were taken.
- Fencing evaluation. Fences were assessed through observation by driving and walking around the perimeter of the offset site, looking for any areas requiring maintenance.

2.2 Field survey

The field survey was undertaken by two Jacobs Ecologists, Matt Consterdine and Tim Maher, on 23 November 2020 across the five vegetation types identified within the offset site (listed in Table 2.1 below and shown on Figure 2.2) by NGH (2013). Details on the vegetation types and number of plots sampled is outlined in Table 2-1.

Table 2.1 Vegetation types within the offset site and plots sampled

Vegetation Type (DECC 2008)	PCT ID	Area in offset site (ha)	Monitoring plots sampled by NGH (2013)	Monitoring sampled by Jacobs (2017-2020)	BBAM (DECC 2009) No. of plots required	Threat category (Benson, 2006)*
Black Bluebush low open shrubland of the alluvial plains and sandplains of the arid and semi-arid zones	221	141.8	M03 (1 plot)	M03 & M07 (2 plots)	4-6 plots	Near threatened
Prickly Wattle open shrubland of drainage lines on stony rises and plains of the arid climate zone	136	8.5	M01 (1 plot)	M01 (1 plot)	2-3 plots	Least concern
Narrow-leaved Hopbush - Scrub Turpentine - Senna shrubland of semi-arid and arid sandplains and dunes	143	1.9	M04 (1 plot)	M04 (1 plot)	1 plot	Least concern
Mulga - Dead Finish on stony hills mainly of the Channel Country and Broken Hill Complex Bioregions	123	1.5	M02 (1 plot)	M02 (1 plot)	1 plot	Near threatened
Old Man Saltbush shrubland mainly of the semi-arid (warm) climate zone (south western NSW)	159	3.2	Not surveyed by NGH (2013)	M05 & M06 (2 plots)	2 plots	Critically Endangered*

* This category is according to Benson (2006); none of these communities are listed under State or Commonwealth legislation

2.2.1 Vegetation condition assessment and establishment of monitoring plots

BioBanking plots were to be surveyed according to the BioBanking Assessment Methodology (BBAM) (DECC 2009), as outlined in COA C5 (Appendix B) and in the BOMP (NGH 2013).

Floristic data was collected to enable comparison between baseline data and benchmarks recorded in the BOMP (NGH 2013). The four monitoring plots established by NGH (2013), were located at the offset site using recorded GPS coordinates. The three additional plots (M05, M06, M07) were installed during the 2017 monitoring by Jacobs to cover additional vegetation areas and types. All plots were previously marked in the field using wooden stakes driven into the ground to facilitate future replication. Stakes were placed at the start and end of a 50 metre transect and their coordinates recorded. Start points were delineated with a silver pin hammered into the top of the stake. 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 (see Figure 2.1). Where required, stakes that had deteriorated in the field over time were replaced with new, thicker stakes and pins.

Photographs were taken at the start and end of each monitoring plot. The location of all vegetation types and monitoring plots are shown in Figure 2.2.

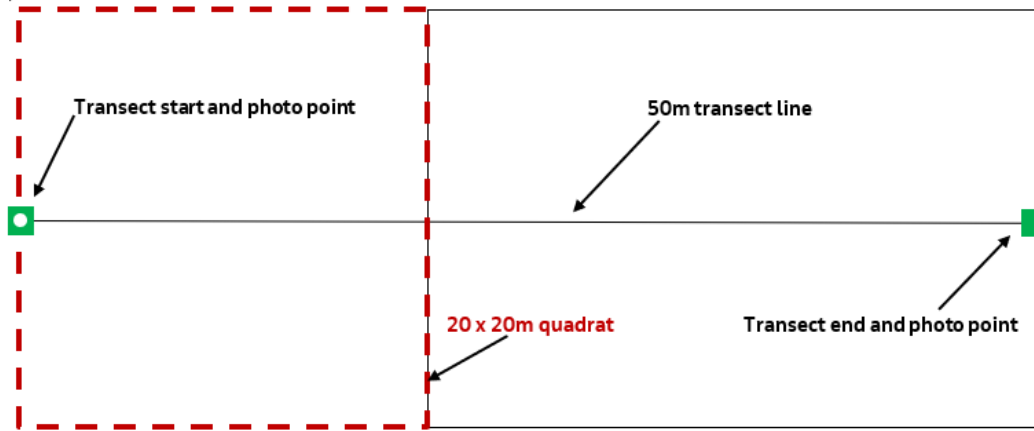
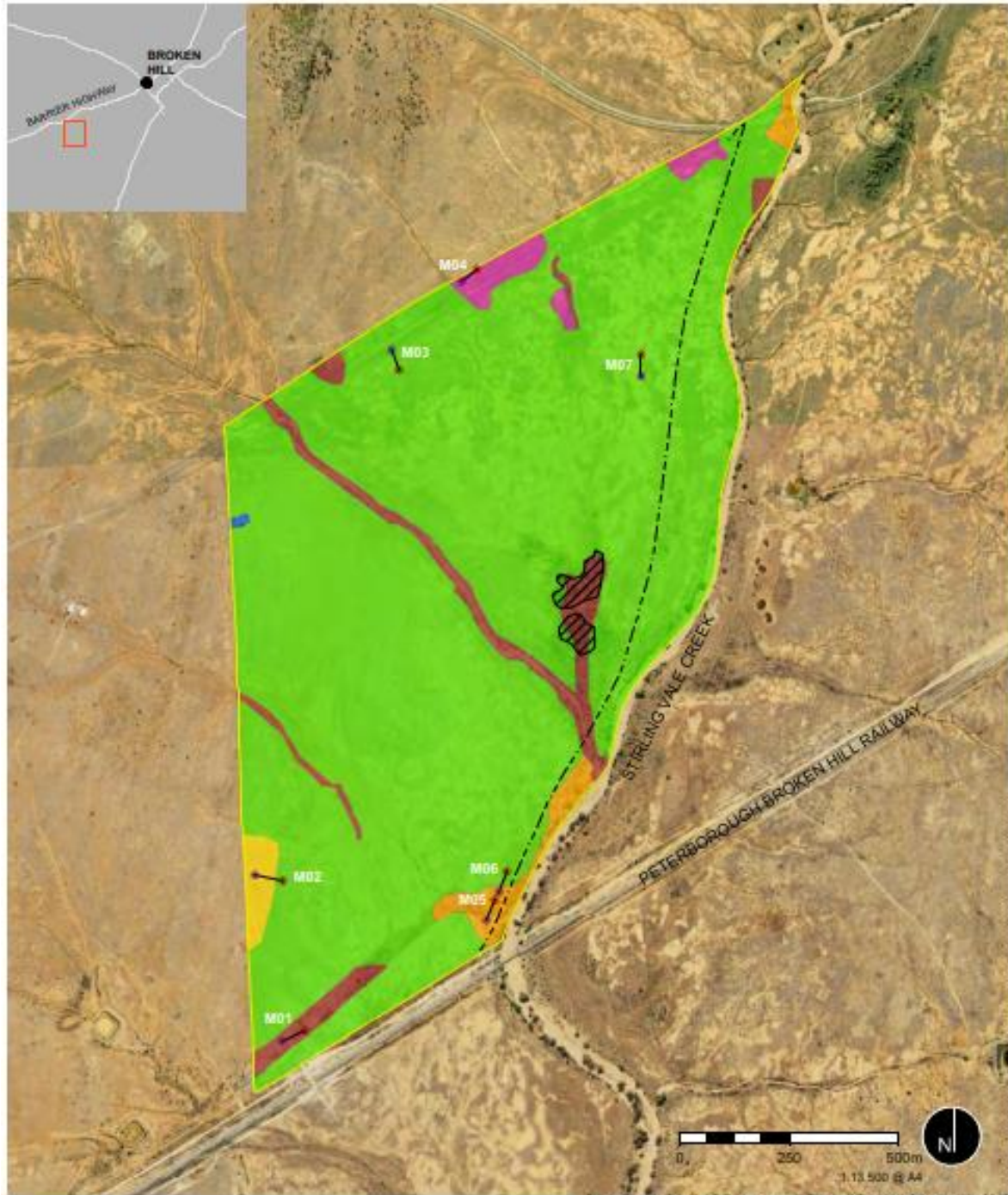


Figure 2-1: Monitoring plot method

Baseline data collected by NGH (2013) at the offset site was limited to a simple presence absence record of plants within monitoring plots. As such, this does not allow for a more detailed analysis to be undertaken to compare data. Therefore the Modified Braun Blanquet method (see Table 2.2) was used for recording floristic cover/abundance data within each monitoring plot, which allowed for more detailed analysis.

Table 2-2: Modified Braun Blanquet method used for the monitoring survey

Modified Bruna Blanquet	
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



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Legend

Site boundary	Transects	Vegetation	
Fence line	Start	Pepper tree infestation	Old man saltbush shrubland
	Finish	Vegetation communities	Prickly wattle open shrubland
	Monitoring transect	Black bluebush low open shrubland	Sandhill wattle tall open shrubland
		Mulga - dead finish	Senna shrubland

Figure 2.2 Vegetation types and monitoring plots within the Broken Hill Offset Site

2.2.2 Habitat evaluation

Detailed habitat notes were taken at each of the monitoring plot locations and included the percentage cover of the following habitat features within the entire 50 x 20 metre plot:

- Tussock grasses
- Chenopod shrubs
- Mulga (or other overstorey species)
- Bare ground
- Cracking clay
- Rocks and logs.

2.2.3 Fencing evaluation

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

2.2.4 Data collection and analysis

Data collected during each monitoring year has been collated into one electronic database using Microsoft Excel, along with NGH (2013) baseline data and the benchmark data for each vegetation community to enable future analysis of data. Photographs of each monitoring plot are captured annually using regular photo points.

2.3 Limitations

2.3.1 Climatic conditions

Broken Hill is a typically dry, semi-arid area that experiences low rainfall. Average rainfall was exceeded in four months during 2020, as seen in Figure 2.3. This is in contrast to both 2018 and 2019 where below average rainfall was received over 24 months. This increase in rainfall preceding the survey caused the occurrence and abundance of many plant species not seen in previous years.

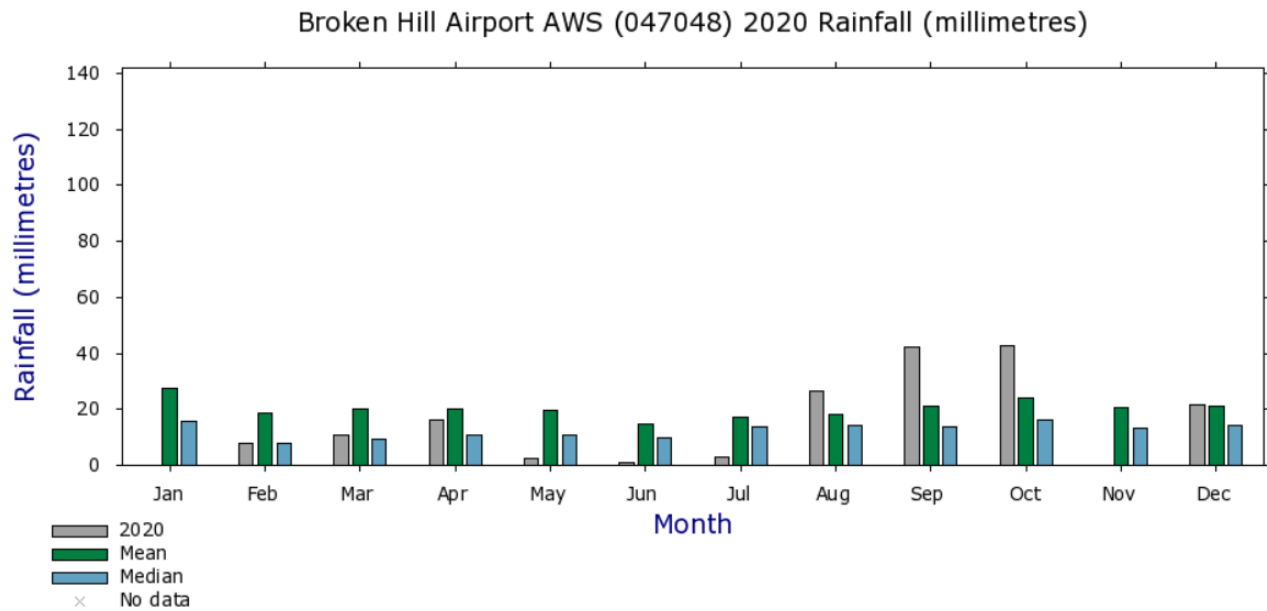


Figure 2.3: Rainfall in Broken Hill in 2020 (source: Australian Bureau of Meteorology)

2.3.2 Grazing pressure

Kangaroos were observed to be common within the offset site. Grazing pressure is considered to be moderate, however is notably lower than 2019 (Year 3) due to apparent absence of goats and sheep in 2020 (Year 4).

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. Photographs taken at the start and end of each monitoring plot are also provided. A species list specific to the 20m x 20m monitoring plot within the larger transect area is provided in Appendix A.

Table 3.1 Coordinates for each of the monitoring plots

Plot name	Transect start		Transect end	
	Latitude*	Longitude*	Latitude*	Longitude*
M01	533641.52	6458408.77	533693.98	6458429.85
M02	533599.64	6458791.57	533663.43	6458774.15
M03	533978.53	6459970.07	533992.65	6459922.92
M04	534146.70	6460116.23	534183.12	6460141.86
M05	534122.66	6458659.4	534144.39	6458705.5
M06	534154.88	6458721	534175.37	6458766.9
M07	534543.53	6459880.4	534546.53	6459929.4

* Co-ordinates are in MGA zone 54 relative to the WGS84 datum

3.1.1 Black Bluebush low open shrubland

The Black Bluebush low open shrubland community is the dominant vegetation type within the offset site. It is dominated by Black Bluebush (*Maireana pyramidata*) with other chenopod shrubs as sub-dominants including, Saltbushes (*Atriplex* spp.) and Copperburrs (*Sclerolaena* spp.). Grasses were non-existent in Year 3 due to lack of rainfall. Favourable conditions this year saw a number of native grass species recorded in this community (see Plates 1 to 4), in particular *Austrostipa scabra* subsp *scabra* and *Enneapogon avenaceus*. Weed species were not extensive in this community. However, *Carrichtera annua* was present in low abundance in M03.

The monitoring plot data along with the benchmarks for this vegetation type (DECC 2008) are shown in Table 3.2 and Table 3.3. Species richness (the number of native species, shown in table 3.2 as 'Native Spp. #') was higher than the baseline for one of the plots, and greater than the Year 1 survey for the other. No over-storey vegetation was present, which is consistent with the baseline of each plot. Cover of most vegetation types was higher than the last two years. The largest increases were in the shrub-layer vegetation cover.

The other native groundcovers (excluding grasses) category has remained similar to the last two years of monitoring and is still well below the baseline for each plot. This is despite above monthly rainfall over the preceding months. This may suggest that this component of the vegetation may require increased rainfall over a longer period to recover.

Grass cover in both plots exceed the two previous years but was still less than Year 1 monitoring and has not reached the minimum benchmark cover in one of the plots. As per previous surveys, Hollow Bearing Tree (HBTs) and logs were absent from this community.

Overall, this community is visibly recovering from the below average rainfall of the last two years and grazing pressure, exhibiting increased species richness and native vegetation cover since the Year 2 and Year 3 surveys. This increase in vegetation cover is visible in the Year 4 monitoring photographs for plot M07 and M03 shown in Plates 1 to 4. The health and condition of native plants has also visibly improved since last year and can be seen in photo 2 and 8. This is likely a result of the above average rainfall of the preceding few months and possibly reduced grazing pressure.

Table 3.2 Benchmark and monitoring plot data comparison for Black Bluebush low open shrubland M03 – Broken Hill 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	13	4%	20%	0%	0%	5%	20%	2%	15%	5%	20%	0	0
Baseline (NGH 2013)	10	0%		0%		52%		24%		0%		0	0
Year 1 Plot M03	13	0%		0%		16%		20%		34%		0	0
Year 2 Plot M03	8	0%		0%		0%		14%		2%		0	0
Year 3 Plot M03	6	0%		0%		0%		14%		0%		0	0
Year 4 Plot M03	12	0%		10%		9%		16%		0%		0	0

Table 3.3 Benchmark and monitoring plot data comparison for Black Bluebush low open shrubland M07 – Broken Hill 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	13	4%	20%	0%	0%	5%	20%	2%	15%	5%	20%	0	0
Baseline (NGH 2013)	n/a	n/a		n/a		n/a		n/a		n/a		0	0
Year 1 Plot M07	8	0%		0%		4%		12%		58%		0	0
Year 2 Plot M07	7	0%		0%		0%		6%		0%		0	0

	Native Spp. #	Native Cover				Native Groundcover						HBTs	Logs
		Overstorey		Mid-storey		Grasses		Shrubs		Other			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Year 3 Plot M07	6	0%		0%		0%		5%		0%		0	0
Year 4 Plot M07	9	0%		10%		3%		10%		5%		0	0

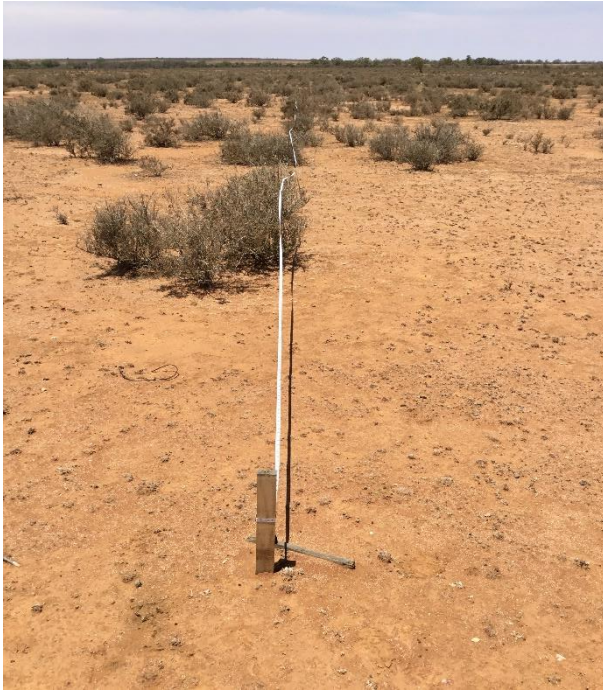


Plate 1 Black Bluebush low open shrubland M03 Year 3



Plate 2 Black Bluebush low open shrubland M03 Year 4



Plate 3 Black Bluebush low open shrubland M07 Year 3

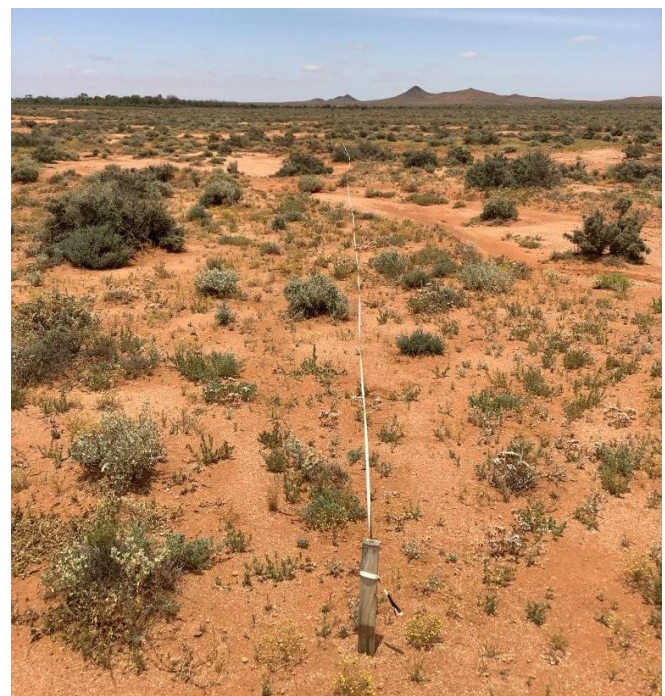


Plate 4 Black Bluebush low open shrubland M07 Year 4

3.1.2 Mulga-Dead Finish on stony hills

The Mulga-Dead Finish on stony hills community is restricted to a small area on a rise in the west of the offset site where the soils are characteristically shallow and stony. Mulga (*Acacia aneura*) is absent within the offset site; however, it occurs on the property to the west. Dominant shrubs include Dead Finish (*Acacia tetragonophylla*), *Senna artemisioides* subsp. *filifolia* and *Senna phyllodinea*. The ground cover consists of a patchy distribution of grasses, forbs, bare earth and scattered rock. Vegetation is visibly recovering after recent above average rainfall. Weed species *Asphodelus fistulosus* and *Carrichtera annua* are present in low abundance. It is in moderate condition (See Plates 5 and 6).

The monitoring plot data along with the benchmarks for this vegetation type (DECC 2008) are shown in Table 3.4. Species richness was the highest ever recorded for this plot, above both the baseline and benchmark for this community. No overstorey cover was recorded in this community due to the absence of Mulga within the offset site, which based on the benchmark range, can be typical of the community.

Mid-storey cover and groundcover-shrub covers exceed the benchmarks. Mid-storey cover was the highest recorded since monitoring began. Groundcover-shrub cover has increased on last year's cover score.

Grass cover increased on the previous two years and was higher than the benchmark for this community. Other native groundcovers also increased on the previous two years and reached the maximum benchmark percentage for this community.

Hollow Bearing Trees (HBTs) and fallen logs were absent from this community.

Overall, this community is in moderate condition, which has improved on the previous two years, with increased species richness and native vegetation cover. Weed cover has increased slightly but is not notable. The increased vegetation cover is visible in comparing the Year 3 and Year 4 monitoring photographs for plot M07 shown in Plate 5 and 6. This is likely a result of the above average rainfall of the preceding few months and possibly reduced grazing pressure from herbivores.



Plate 5 Mulga - Dead Finish on stony hills M02 Year 3



Plate 6 Mulga - Dead Finish on stony hills M02 Year 4

Table 3.4 Benchmark and monitoring plot data comparison for Mulga-Dead Finish on stony hills M01 – Broken Hill 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	17	0%	3%	1%	3%	1%	5%	1%	5%	1%	5%	0	3
Baseline (NGH 2013)	15	0%		8%		52%		14%		2%		0	0
Year 1 Plot M02	18	0%		6%		24%		32%		38%		0	0
Year 2 Plot M02	12	0%		4%		0%		10%		0%		0	0
Year 3 Plot M02	9	0%		4%		0%		8%		0%		0	0
Year 4 Plot M02	24	0%		10%		8%		10%		5%		0	0

3.1.3 Prickly Wattle open shrubland

The Prickly Wattle open shrubland community typically occurs in drainage lines and depressions across the offset site. Prickly Wattle (*Acacia victoriae*) dominated the mid-storey of this community with no overstorey recorded. Dominant shrubs included; Bladder Saltbush (*Atriplex vesicaria*), Black Bluebush (*Maireana pyramidata*) and Spiny saltbush (*Rhagodia spinescens*). Groundcover is consistent and comprises of shrubs and forbs. Weed cover has increased on the last two years, likely a result of the above average rainfall of the preceding few months. Weed species included: *Asphodelus fistulosus*, *Carrichtera annua*, *Carthamus lanatus*, *Chloris truncata*, *Prosopis velutina* and *Rumex crispus*, among others (see plates 7 and 8).

The monitoring plot data along with the benchmarks for this vegetation type (DECC 2008) is shown in Table 3.5. The number of native species recorded is much higher than the benchmark and baseline and previous monitoring years. Overstorey cover was absent from this community which is consistent with the benchmark and considered typical for this community. Mid-storey cover remains above that of the baseline survey and benchmark and is higher than that of the Year 3 survey. Groundcover-shrub cover is significantly greater than the benchmark for this community and has increased since last year's monitoring. The cover of grasses other native ground covers was minimal, but within benchmark values and slightly higher than that recorded the past two years. Hollow Bearing Trees (HBTs) and fallen logs were absent from this community.

Overall, the condition of this community has increased from low to moderate since last year. Species richness has increased by over 300% and cover of native grasses and groundcover 'other' are back within the benchmark levels. This is likely a result of the above average rainfall of the preceding few months and possibly reduced grazing pressure from herbivores. The health and condition of native plants has visibly improved since last year and can be seen in photo 8.



Plate 7 Prickly Wattle low open shrubland M01 in Year 3



Plate 8 Prickly Wattle low open shrubland M01 in Year 4

Table 3.5 Benchmark and monitoring plot data comparison for Prickly Wattle open shrubland – Broken Hill 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	11	0%	0.1%	0%	0%	2%	20%	1%	10%	1%	20%	0	0
Baseline (NGH 2013)	12	7%		5%		14%		38%		2%		0	1.5
Year 1 Plot M01	12	10%		16%		8%		32%		28%		0	0
Year 2 Plot M01	11	0%		21%		0%		22%		0%		0	0
Year 3 Plot M01	5	0%		15%		0%		18%		0%		0	0

	Native Spp. #	Native Cover				Native Groundcover						HBTs	Logs
		Overstorey		Mid-storey		Grasses		Shrubs		Other			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		
Year 4 Plot M01	18	0%		20%		5%		20%		5%		0	0

3.1.4 Narrow-leaved Hopbush – Scrub Turpentine – Senna shrubland

This vegetation type occurs as discrete patches along the northern boundary of the offset site. The mid-storey is dominated by *Senna phyllodinea* and *Senna artemisioides* subsp. *filifolia*. Groundcover is dominated by a range of shrubs including; Black Bluebush (*Maireana pyramidata*), Low Bluebush (*Maireana astrotricha*), Mallee Saltbush (*Atriplex stipitata*) and Spiny saltbush (*Rhagodia spinescens*).

Weed cover increased compared to last year in this community, likely a result of the above average rainfall of the preceding few months, with weeds including: Onion weed (*Asphodelus fistulosus*), *Carrichtera annua*, Paterson's Curse (*Echium plantagineum*), Winged Sea Lavender (*Limonium lobatum*) and Maltese Star-thistle (*Centaurea melitensis*). Species richness of weeds was greatest in this community. The proximity to the access road along the northern boundary may explain the greater infestation of weeds compared to other communities (see plates 9 and 10).

The monitoring plot data along with the benchmarks for this vegetation type (DECC 2008) are shown in Table 3.6. The number of species recorded was much higher than benchmark levels, higher than the baseline and more than double the species from last year's monitoring. Overstorey cover was absent from this community which is below the benchmark and baseline data (NGH 2013). The mid-storey cover for this community was above the benchmark range, equalling the highest mid-storey cover score for this community and more than double last year's mid-storey cover. Groundcover-shrub cover was within the benchmark range but still much lower than that recorded during the baseline and Year 1 surveys. However, groundcover-shrub cover increased slightly compared to last year. The cover of grasses was minimal, but within benchmark values and higher than the baseline and last year's cover. Similarly, cover of other native groundcover was within benchmark values, and increased slightly since last year, but is still well below baseline levels. Hollow Bearing Trees (HBTs) and fallen logs were absent from this community.

Overall, this community is still in moderate condition, but the condition has increased since last year (see photo 10). This is likely a result of the above average rainfall of the preceding few months and possibly reduced grazing pressure from herbivores.

Species richness is near baseline levels, but native vegetation cover is still substantially lower, particularly in the groundcover layer, which is likely a result of prolonged dryness from years 2 and 3.

Table 3.6 Benchmark and monitoring plot data comparison for Senna shrubland M04 – Broken Hill 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	12	1%	14%	1%	8%	5%	25%	2%	15%	2%	25%	0	2
Baseline (NGH 2013)	23	3%		0%		48%		24%		2%		0	0
Year 1 Plot M04	20	0%		10%		0%		34%		24%		0	0
Year 2 Plot M04	19	0%		4%		0%		6%		0%		0	0
Year 3 Plot M04	11	0%		4%		0%		5%		0%		0	0
Year 4 Plot M04	24	0%		10%		8%		10%		5%		0	0



Plate 9 Narrow-leaved Hopbush – Scrub Turpentine – Senna Shrubland M04 in Year 3



Plate 10 Narrow-leaved Hopbush – Scrub Turpentine – Senna Shrubland M04 in Year 4

3.1.5 Old Man Saltbush shrubland

Natural occurrences of the Old Man Saltbush shrubland community are rare within the landscape and due to its reduction in extent and poor representation within the reserve system, it is of conservation concern (Benson 2006) (see plates 11 to 14).

This community occurs adjacent to the drainage line along the eastern side of the offset site and has spread to the man-made drainage line in the south of the offset site following disturbance.

The mid-storey of this community is dominated by Old Man Saltbush (*Atriplex nummularia*) and Black Bluebush (*Maireana pyramidata*). Bladder Saltbush (*Atriplex vesicaria*), Ruby Saltbush (*Enchylaena tomentosa*) and Spiny Saltbush (*Rhagodia spinescens*) make up the shrub component of the ground layer. Weed cover has increased in this vegetation community since last year, likely a result of the above average rainfall of the preceding few months, and includes Ward's Weed (*Carrichtera annua*), Paterson's Curse (*Echium plantagineum*), Winged Sea Lavender (*Limonium lobatum*), Onion weed (*Asphodelus fistulosus*), Saffron thistle (*Carthamus lanatus*), among others.

The monitoring plot data along with the benchmarks for this vegetation type (DECC 2008) are shown in Table 3.7 and Table 3.8. This community was not surveyed by NGH (2013) so no baseline data has been collected and as such, the Jacobs (2017) survey data will form the baseline for this community. Species richness increased in this community compared to last year and now exceeds baseline levels, also reaching the benchmark in one of the plots.

Overstorey cover was absent from this community which is below the benchmark data and equal to last year's value. Mid-storey cover was significantly greater than the benchmark and has increased slightly since last year's monitoring. Native grass cover was minimal but increased since last year and is also the baseline level and within the benchmark range for this community. Groundcover-shrub cover increased slightly compared to the last two years of monitoring. It is above the benchmark range, but still well below the baseline cover score for this community. The native groundcover - other category was within the benchmarks but not much different from last year and still well below the baseline cover score for this community. Overall, this vegetation community is in moderate condition and very similar to last year. There has been a slight increase in species richness and cover scores. This is likely a result of the above average rainfall of the preceding few months and possibly reduced grazing pressure from herbivores. Whilst vegetation cover may have only increased slightly, the health and condition of native plants has visibly improved since last year and can be seen in photos 12 and 14.



Plate 11 Old Man Saltbush shrubland M05 in Year 3



Plate 12 Old Man Saltbush shrubland M05 in Year 4



Plate 13 Old Man Saltbush shrubland M06 in Year 3



Plate 14 Old Man Saltbush shrubland M06 in Year 4

Table 3.7 Benchmark and monitoring plot data comparison for Old Man Saltbush shrubland at M05 – Broken Hill 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	2%	20%	0%	3%	0%	10%	1%	20%	0%	5%	0	0
Baseline (NGH 2013)	n/a	n/a		n/a		n/a		n/a		n/a		n/a	n/a
Year 1 Plot M05	9	0%		64%		0%		34%		16%		0	0
Year 2 Plot M05	10	0%		39%		0%		20%		2%		0	0
Year 3 Plot M05	4	0%		30%		0%		20%		0%		0	0
Year 4 Plot M05	12	0%		35%		5%		25%		2%		0	0

Table 3.8 Benchmark and monitoring plot data comparison for Old Man Saltbush shrubland at M06 – Broken Hill 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	2%	20%	0%	3%	0%	10%	1%	20%	0%	5%	0	0
Baseline (NGH 2013)	n/a	n/a		n/a		n/a		n/a		n/a		n/a	n/a
Year 1 Plot M06	11	0%		3%		0%		74%		16%		0	0
Year 2 Plot M06	13	0%		10%		0%		22%		0%		0	0
Year 3 Plot M06	11	0%		8%		0%		18%		0%		0	0
Year 4 Plot M06	15	0%		10%		5%		25%		0%		0	0

3.2 Weeds and disturbance

Weed infestation across the offset site was low to moderate. Monitoring plots M01, M05 and M06, recorded the greatest coverage of weeds, while M04 and M05 had the greatest diversity of weeds.

The centre of the offset site (see Figure 2.2) still contained the exotic species Peppercorn Tree (*Schinus molle* var. *areira*); however, these showed signs of significant dieback compared to last year, possibly from chemical treatment. The Peppercorn trees, being the only overstorey vegetation (>3m) within the offset site and providing shelter from predators and the harsh climatic conditions, particularly for native bird species. Gradual removal of this infestation (mature trees and emerging saplings) may require replacement planting with taller native species to allow shelter habitats to persist (e.g. *Casuarina pauper*, *Alectryon oleifolius* subsp. *canescens*, *Acacia victoriae*, *Acacia aneura* and *Acacia tetragonophylla*).

Two of the weeds recorded within the offset site, Velvet Mesquite (*Prosopis velutina*) and African Boxthorn (*Lycium ferocissimum*) are declared as state and regional priority weeds under the *Biosecurity Act 2015*, as listed in Appendix 1.1 and 1.2 of the Western Regional Strategic Weed Management Plan 2017-2022 (LLS 2017). Both weeds are also listed as Weeds of National Significance and are required to be eradicated from the land and the land is to be kept free of the plant to mitigate the risk of the plant spreading. These weed species are also recorded on the Biodiversity Assessment Method (BAM) 'High Threat' weeds list. Despite recent favourable rainfall conditions these species have declined across the offset site, with only one specimen of Velvet Mesquite (*Prosopis velutina*) present in a single plot (M01) and no sign of new African Boxthorn (*Lycium ferocissimum*). This indicates that management of these species has been effective. Management of these weeds needs to continue to achieve eradication and prevention of re-establishment, especially given the return of favourable rainfall in recent months.

In general, spot herbicide-treatment is required for weed species across the offset site (see Appendix A), concentrating on perennial weeds and those areas identified as having the greatest need, i.e. around disturbance areas such as the man-made drainage line to the south of the offset site, along site boundaries adjacent to access roads and other areas disturbed by the formation of tracks.

A complete list of weeds that may be targeted for management, including, spot spraying are listed in Appendix A.

3.3 Fauna Habitats

Table 3.9 shows the percentage habitat cover at each of the monitoring plots surveyed and compares these to the baseline data recorded in the BOMP (NGH 2013) and other monitoring surveys. Throughout the offset site chenopods and bare ground provide the greatest habitat, which is comparable to the baseline survey results recorded by NGH (2013). Tussock grass habitat has increased slightly across the offset site in general which may be a result of improved rainfall in recent months. However, these levels are still well below the baseline survey (NGH 2013), and it is expected that a longer period of favourable rainfall will be required for baseline levels to begin to return. Rocky habitat occurs towards the southern end of the offset site. Numerous skinks were observed using the various habitats across the offset site during the survey.

Overall habitat appears to have been maintained since the baseline surveys undertaken by NGH (2013), with recent increases in vegetative cover of shrubs and groundcover across the offset site. The fencing will assist in excluding goats and any livestock from the offset site, which may assist in the natural regeneration of the offset site.

Table 3.9 Habitat cover assessment – Broken Hill offset site

	Plot	Year	Habitat component					
			Tussock grasses	Chenopods	Trees/ tall shrubs	Bare ground	Cracking clay	Rocks/ logs
Cover estimates to nearest 5%	M01	BL	5%	40%	15%	60%	0%	5%
		Year 1	0%	50%	15%	45%	0%	10%
		Year 2	0%	25%	10%	50%	0%	10%
		Year 3	0%	20%	10%	60%	0%	10%
		Year 4	2%	40%	15%	40%	0%	10%
	M02	BL	70%	5%	0%	30%	0%	10%
		Year 1	0%	20%	5%	25%	0%	10%
		Year 2	0%	15%	5%	65%	0%	10%
		Year 3	0%	15%	5%	70%	0%	10%
		Year 4	2%	20%	5%	60%	0%	10%
	M03	BL	50%	20%	0%	50%	0%	10%
		Year 1	5%	50%	0%	50%	0%	5%
		Year 2	0%	15%	0%	75%	0%	5%
		Year 3	0%	15%	0%	80%	0%	5%
		Year 4	6%	20%	0%	70%	0%	5%
	M04	BL	60%	20%	0%	40%	0%	0%
		Year 1	0%	25%	5%	40%	0%	0%
		Year 2	0%	10%	5%	70%	0%	0%
		Year 3	0%	10%	5%	80%	0%	0%
		Year 4	4%	15%	8%	70%	0%	2%
	M05	Year 1	0%	10%	5%	10%	0%	0%
		Year 2	0%	10%	5%	30%	0%	0%
		Year 3	0%	10%	5%	60%	0%	0%
		Year 4	0%	15%	8%	40%	10%	4%
	M06	Year 1	0%	10%	5%	10%	0%	0%
		Year 2	0%	5%	5%	40%	0%	0%
		Year 3	0%	10%	5%	70%	0%	0%
		Year 4	0%	20%	5%	60%	0%	5%
	M07	Year 1	0%	10%	0%	45%	0%	0%
		Year 2	0%	5%	0%	75%	0%	0%
		Year 3	0%	10%	0%	75%	0%	0%
		Year 4	0%	10%	0%	80%	0%	8%

*BL = baseline

3.4 Results summary and discussion

The observed changes in the vegetation of the offset site are summarised and discussed below. The summary focuses on the change in species richness and cover of native and weed species. The photo monitoring shows a general increase in the health, vitality and vigour of the existing mature plants in the plots particularly compared with 2019 and is consistent with the improve and maintain objective.

3.4.1 Species richness

Species richness was higher than Year 3, and higher or approaching benchmark levels for all plots (see Figure 3.1). The groundcover grass and forb component of the vegetation has increased with many previously recorded annual and short-lived perennial species recorded that were not present last year.

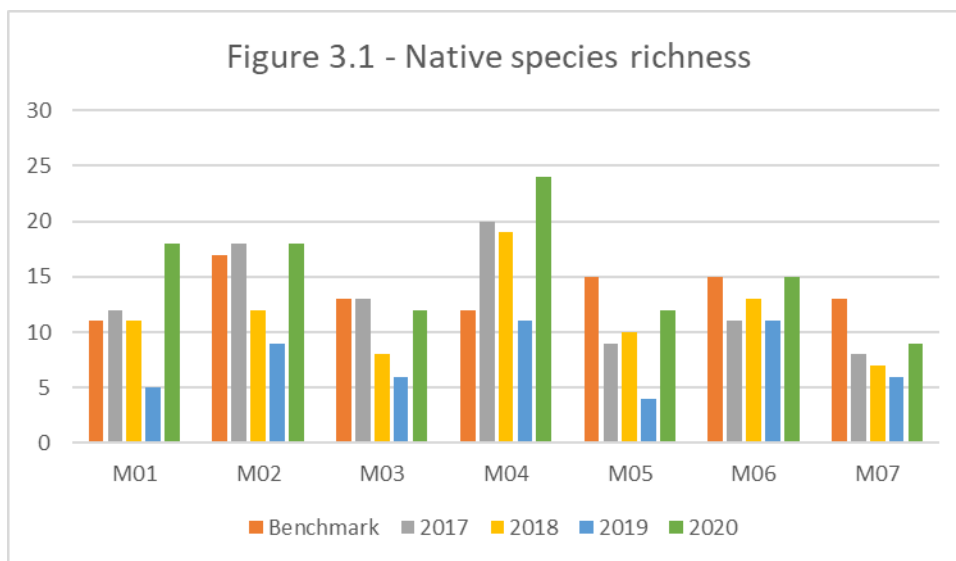


Figure 3-1 Native species richness

3.4.2 Cover of native and exotic vegetation

The cover of native vegetation has increased in comparison with 2018 and 2019 levels for all structural layers with the most pronounced increase observed in the cover of groundcover grasses and other groundcover plants (see Figure 3.2).

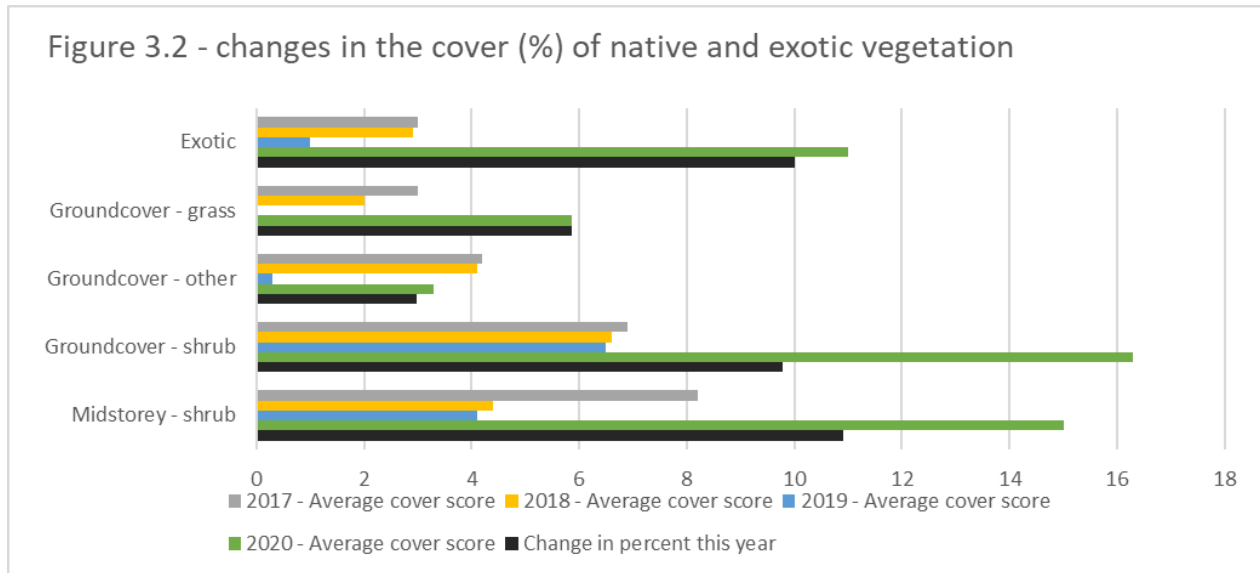


Figure 3-2 Changes in the cover (Braun Blanquet scores) of native and exotic vegetation

Mid-storey and groundcover shrub cover values increased substantially from the Year 3 values and were within the benchmark levels for each plant community.

There has been a substantial increase in the abundance of exotic species. This change is likely to be attributable to the combination of previous site disturbance and the favourable rainfall conditions in recent months.

The covers of grasses and other groundcovers also increased substantially from the Year 3 levels and fell within benchmark levels for most plots, except for M07, which did not meet the minimum benchmark for grass cover, and M04, which did not meet the minimum benchmark for other native groundcover (see Figure 3.3 and Figure 3.4).

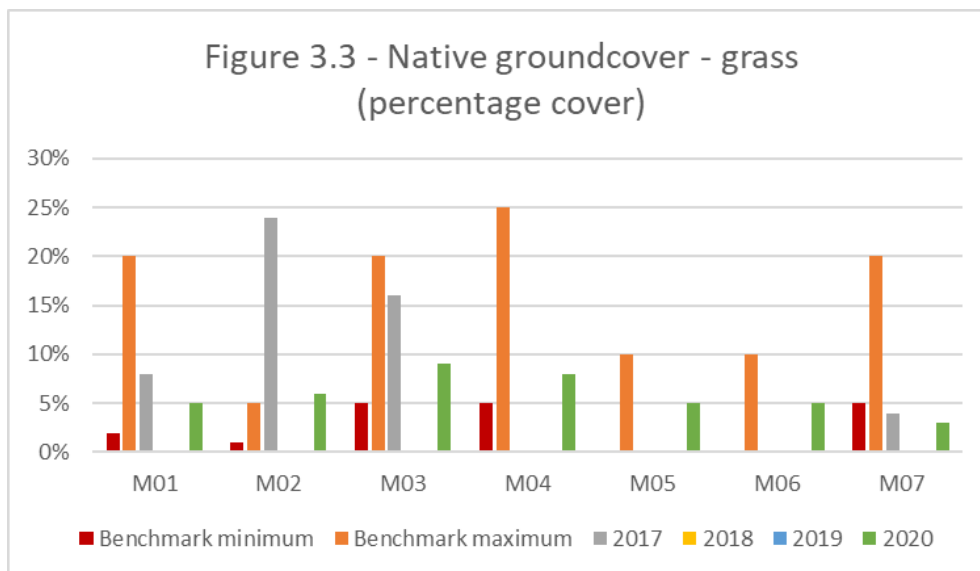


Figure 3-3 Native groundcover - grass (percentage cover)

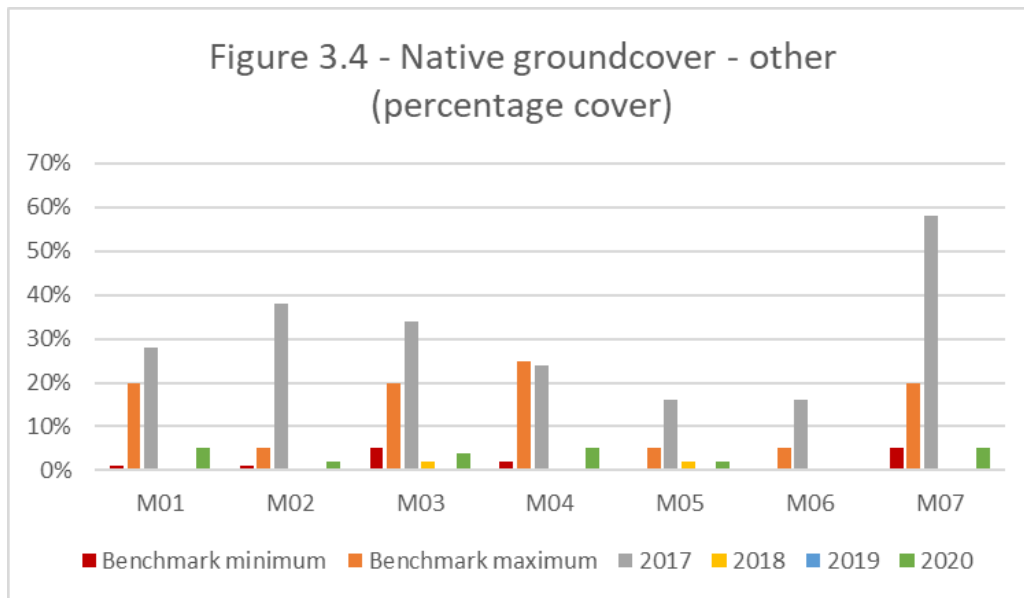


Figure 3-4 Native groundcover - other (percentage cover)

Groundcover shrubs also saw a general increase in cover across the offset site compared to years 2 and 3. However, these levels remain well below baseline for all plots (refer to Figure 3.5)

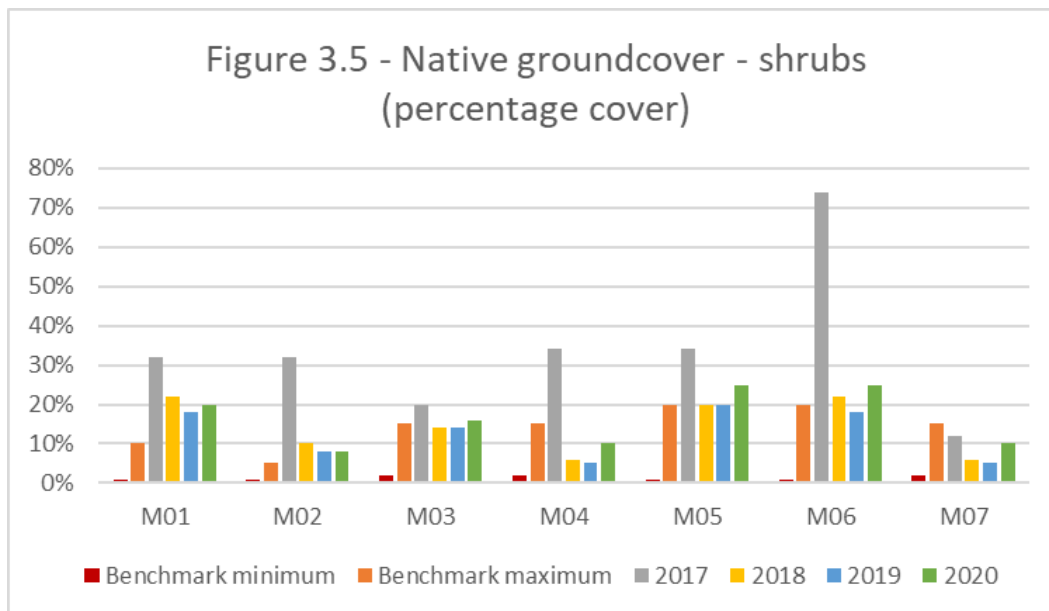


Figure 3-5 Native groundcover - shrubs (percentage cover)

3.4.3 Discussion

The observed increase in species richness and native vegetation cover in the 2020 monitoring data is most likely a result of recent above average rainfall at the offset site in the months preceding the survey, breaking a period of substantially below average rainfall over the past two years. These annual and short-lived perennial groundcover species are likely to naturally fluctuate in abundance in response to rainfall and are likely to emerge on the offset site from the soil-stored seedbank during favourable conditions as were experienced in the last quarter of 2020. Compared to Year 3, mid-storey shrubs have produced substantial new growth due to above average rainfall, resulting increased foliage cover. More extended periods of average or higher rainfall will likely see a complete return of annual and short-lived perennial groundcover species and recovery of the foliage cover of grasses and shrubs. Grazing pressure on grasses and herbs by kangaroos, goats and sheep has decreased since last year due to more plant biomass available to grazers.

The monitoring has shown an increase in the diversity and abundance of native plants and the overall condition of native vegetation on the offset site. This change is likely to be caused primarily by multiple months of favourable rainfall conditions. Continued favourable conditions is likely to yield more meaningful information regarding the improvement or maintenance of biodiversity values as a result of site management.

3.5 Fence maintenance

Stock proof fences were installed around the entire offset site approximately in mid-2017. A combination of ring lock style of fencing and plain and barbed wire strand fencing has been used around the offset site. Fences are generally located on the boundary of the offset site (i.e. the perimeter of the offset site), except for the eastern fence which is between about 50 m and 150 m west of the eastern site boundary as mapped in the Biodiversity Offset Management Plan, Broken Hill Solar Plant (NGH Environmental, 2013). Gaps in the fence previously identified have been sufficiently fixed and livestock and feral goats appeared to be absent from the offset site. However, the fence has since been pushed down in two sections by the flow of water and debris, at the intersection with an unnamed tributary of Stirling Vale Creek (see plates 15 and 16). An action to address this has been included in section 4.

Kangaroos were observed within the offset site and were seen to traverse the fences.



Plate 15: Fence pushed over by water and debris on the northern boundary.



Plate 16: Fence pushed over by water and debris on the eastern boundary.

4. Management Actions

The following management measures in Table 4.1 were outlined in the BOMP (NGH 2013) and were to be actioned and adapted based on annual monitoring results. Table 4.1 provides an evaluation of the need for each management action, the timing, and who is required to undertake the action. Actions undertaken since previous monitoring session and recommended adaptive measures are also described.

Table 4.1 : Management Actions for the Broken Hill offset site

Management measure	Objective	Action	Timing	Actions undertaken by AGL	Actions required in 2021	Adaptive measures / recommended actions for 2021 / Timing
Management Measures of the BOMP (Note: the text in blue is text added to the original BOMP text where required)						
Weed control	To minimise the occurrence of weeds within the offset site particularly Weeds of National Significance (WoNS) and listed noxious weeds. <i>Target state and regional priority weeds (Mesquite and African Boxthorn) to eliminate from site and prevent spread as required under the Biosecurity Act 2015 and the Western Regional Strategic Weed Management Plan 2017 – 2022 (LLS 2017)</i>	Survey to identify target locations for weed control. Weed control using appropriate methodologies considering target species and landscape context. <i>Spot herbicide treatment: foliar spraying or cut/scape and paint methods.</i>	At establishment of the offset site Ongoing as required <i>During active growth season, which is generally in Spring to early Summer, particularly after rainfall. Should be undertaken in suitable low wind conditions to prevent spray drift to other native species.</i>	Initial spraying of Mesquite and African Boxthorn completed across site in 2018. Targeted spraying of weeds conducted in November 2019. Targeted weed spraying in May 2020. Targeted weed spraying in November 2020.	Yes	Monitoring and treatment of re-shooting plants and seedlings required now, since recent favourable rain conditions.

Management measure	Objective	Action	Timing	Actions undertaken by AGL	Actions required in 2021	Adaptive measures / recommended actions for 2021 / Timing
Cat and/or fox control	To minimise the presence of cats and foxes within the offset site.	Conduct baiting or trapping if evidence of cats or foxes is detected within the offset site.	Consideration given to action on the basis of monitoring results. Annual monitoring. Control in response to detection of cats or foxes.	None required at this stage. Re-evaluate during next monitoring event; spotlighting and/or camera trap surveys are recommended to be undertaken during 2021-22 to inform management.	No	n/a
Rabbit control	To minimise the risk of the offset site becoming a refuge for rabbits. To control rabbit numbers within the offset site and thereby prevent rabbits from substantially impacting on native flora and habitat values.	Conduct baiting or controlled grazing to reduce the ability of the site to act as a refuge to rabbits.	Consideration given to action on the basis of monitoring results. Annual monitoring. Control in response to detection of cats or foxes.	None required at this stage. Allow native vegetation to regenerate over the next year. Re-evaluate during next monitoring event.	No	n/a
Exclusion of feral goats and livestock	To minimise the presence of feral goats. To continuously exclude large non-native herbivores from the offset site and reduce grazing on native flora.	Install preventative fencing suitable for the target species. Remove goats (by trapping or other means) if detected within the offset site.	At establishment of the offset site Ongoing as required In response to detection of feral goats or livestock	A fence to exclude goats and livestock is present. Allow native vegetation to regenerate over the next year and then re-evaluate fencing effectiveness during next monitoring event. Gaps under the fence identified in 2019 have since been fixed and these appear to be excluding feral goats and livestock.	Yes	Repair/reinforce fence at two sections where noted in 2020 to be pushed over by water and debris, at the intersection with an unnamed tributary of Stirling Vale Creek. Fence monitoring and repair of any damage observed.

Management measure	Objective	Action	Timing	Actions undertaken by AGL	Actions required in 2021	Adaptive measures / recommended actions for 2021 / Timing
Specialised measures (conducted if required) of the BOMP						
Weed control	To minimise the occurrence of weeds in the creek adjacent to the offset site, particularly Weeds of National Significance (WoNS) and listed noxious weeds.	The creek line adjacent to the site's eastern boundary would be fenced out of the offset site, however weed survey and control would be undertaken along the creek where it adjoins the offset site to ensure weeds do not become established here. Methods would be appropriate to waterways (i.e. control of spray drift).	Ongoing as required	Ongoing weed spraying. Targeted weed spraying completed across site in 2018. Targeted weed spraying conducted in November 2019. Targeted weed spraying in May 2020. Targeted weed spraying in November 2020.	Yes	Monitoring and treatment of re-shooting plants and seedlings required now, since recent favourable rain conditions.
Implementation of controlled burns	To re-introduce a more natural fire regime and assist in the recovery of degraded areas. To improve the natural regeneration of native flora	If degradation is detected from monitoring, consult with OEH to determine if burning may be appropriate. Conduct burns as recommended by OEH.	Ongoing	None required at this stage. Allow native vegetation to regenerate over the next year. Re-evaluate during next monitoring event.	No	n/a
Adapt measures to resident native fauna	To ensure that resident native fauna are not adversely impacted by management actions.	If resident native fauna may be impacted by management actions, adapt actions as	Ongoing as required	n/a	No	n/a

Management measure	Objective	Action	Timing	Actions undertaken by AGL	Actions required in 2021	Adaptive measures / recommended actions for 2021 / Timing
		required to address the risk of impact.				
Additional Management Measures						
Monitoring plot survey	Repeat monitoring plot surveys to evaluate the 'improve or maintain' outcome of biodiversity values at the offset site	Repeat monitoring of all plots within the offset site	Late spring	n/a	Yes	Where possible time survey events to occur within four weeks of a significant rainfall event to better identify the diversity of plant species dormant within the ground layer
Weed control	Target Peppercorn Tree infestation	Thinning of mature trees without active nests and new saplings to be targeted using hand removal and cut and paint techniques. Replacement planting of mature trees removed with native trees and tall shrubs.	During active growth season, which is generally in Spring to early Summer, particularly after rainfall. Planting to be undertaken after drought conditions subside and several successive months of average or above average rainfall.	Contractor treated peppercorn trees in November 2019. Advanced peppercorn trees were drilled and inoculated in May 2020.	Yes	Contractor to discuss further with AGL and, with agreement, undertake treatment in 2021. Removal of mature trees (unless active bird nests are discovered). Target all saplings.
Weed control	Target onion weed and saffron thistle in general weeding across the offset site	Spot spraying	During active growth season, which is generally in Spring to early Summer, particularly after rainfall. Should be undertaken in	Ongoing weed spraying. Targeted weed spraying completed across site in 2018.	Yes	Target these species when they reappear following rain in 2021. Treatment before seeding is recommended (prior to spring).

Management measure	Objective	Action	Timing	Actions undertaken by AGL	Actions required in 2021	Adaptive measures / recommended actions for 2021 / Timing
			suitable low wind conditions to prevent spray drift to other native species.	<p>Targeted weed spraying conducted in November 2019.</p> <p>Targeted weed spraying in May 2020.</p> <p>Targeted weed spraying in November 2020.</p>		

5. Conclusions and recommendations

The Year 4 monitoring results show an improvement in vegetation and habitat across the offset site with regards to floristic diversity, coverage and quality when compared to the vegetation community benchmarks (DECC 2008), baseline survey and Year 2 and Year 3 results. This increase is likely a result of recent above average rainfall conditions, compared to the previous monitoring years, which have stimulated the growth of many plant species not seen in the previous two monitoring surveys. It is evident that a lot of seed stock lay dormant within the ground for these species. Continued adequate rainfall would further increase the species diversity at the offset site. The management actions outlined in Table 4.1 will further assist the natural regeneration of the offset site over the next 12 months.

Stock proof fencing around the offset site is in generally good condition. However, there are two places where the fence has been pushed down by rainfall and debris, at the intersection with an unnamed tributary of Stirling Vale Creek, allowing access by animal pests. Management actions have been recommended to remedy this. It is likely that with the fencing in place the biodiversity values of the offset site will continue to improve through the exclusion of feral goats and any livestock.

Fauna habitats across the offset site are somewhat diverse and include bare ground, chenopods, rocky patches, tussock grasses and some taller shrubs. These habitats have been maintained, except for an increase in groundcover habitat. Tussock grass habitats will likely improve with the combination of further favourable rainfall conditions and intact fencing excluding grazing by goats.

Weed infestations across the offset site are still generally low but have increased substantially in a few monitoring plots due to increased rainfall. This resurgence can be managed by spot treatment as outlined in the management actions.

Weeds of concern in the offset site include the state and regional priority weeds (LLS 2017) Velvet Mesquite and African Boxthorn, which are required to be eradicated from the offset site to prevent further spread to surrounding lands. These species showed further decline since last year and no signs of regrowth despite improved rainfall conditions. This suggests that weed management on site has been effective.

Peppercorn Tree infestations within the centre of the offset site have showed significant dieback since last year however require further treatment (if no active birds nests are present). The recommendation remains to control of emerging samplings, and replacement planting with native trees and tall shrubs would allow for the maintenance of fauna habitat while gradually removing the Peppercorn Trees.

6. References

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Appendix A. Flora species list and opportunistic fauna list

Table A.6.1 Flora species list and 20m x 20m plot survey Modified Braun Blanquet scores

Family	Scientific Name	Common Name	M 01	M 02	M 03	M 04	M 05	M 06	M 07	Previously recorded on site
Aizoaceae	<i>Sarcozona praecox</i>	Sarcozona	1	1				1	2	x
Amaranthaceae	<i>Alternanthera angustifolia</i>									x
Anacardiaceae	<i>Schinus molle</i> var. <i>areira</i> *	Peppercorn Tree								x
Apocynaceae	<i>Rhyncharhena linearis</i>	Purple Pentatropae		1						x
Asphodelaceae	<i>Asphodelus fistulosus</i> *	Onion weed	1	1		2	1			x
Asphodelaceae	<i>Bulbine</i> sp.	Bulbine lily								x
Asteraceae	<i>Sonchus oleraceus</i> *	Common Sowthistle	1							x
Asteraceae	<i>Brachyscome ciliaris</i> var. <i>lanuginosa</i>		1			2	1			x
Asteraceae	<i>Brachyscome dentata</i>									x
Asteraceae	<i>Leiocarpa semicalva</i>		2							x
Asteraceae	<i>Senecio lanibracteus</i>									x
Asteraceae	<i>Xanthium spinosum</i> *	Bathurst Burr								x
Asteraceae	<i>Carthamus lanatus</i> *	Saffron thistle	1				1			x
Asteraceae	<i>Vittadinia cuneata</i>	Fuzzweed		1	3	1	1			x
Boraginaceae	<i>Heliotropium supinum</i> *	Prostrate Heliotropae								x
Boraginaceae	<i>Echium plantagineum</i> *	Paterson's Curse				1	3			x
Brassicaceae	<i>Arabidella</i> sp.		2				3	3		
Brassicaceae	<i>Carrichtera annua</i> *		3	2	1	3	2	3		
Chenopodiaceae	<i>Atriplex stipitata</i>	Mallee Saltbush	2	1		2		1		
Chenopodiaceae	<i>Atriplex vesicaria</i>	Bladder Saltbush	3					3	2	
Chenopodiaceae	<i>Atriplex nummularia</i>	Old Man Saltbush					4	2	3	
Chenopodiaceae	<i>Dissocarpus paradoxus</i>	Cannonball Burr	1		2	2		2		

Family	Scientific Name	Common Name	M 01	M 02	M 03	M 04	M 05	M 06	M 07	Previously recorded on site
Chenopodiaceae	<i>Enchylaena tomentosa</i>	Ruby Saltbush		1	1	1	2			
Chenopodiaceae	<i>Maireana astrotricha</i>	Low Bluebush				1				x
Chenopodiaceae	<i>Maireana pyramidata</i>	Black Bluebush	3	3	4	3	3	4	3	x
Chenopodiaceae	<i>Maireana lobiflora</i>					1			2	
Chenopodiaceae	<i>Sclerolaena patenticuspis</i>	Copperburr			1	1		2	3	x
Chenopodiaceae	<i>Rhagodia spinescens</i>	Spiny saltbush	3	1		3	1	2		x
Chenopodiaceae	<i>Maireana coronata</i>	Crown Fissure-weed								
Chenopodiaceae	<i>Salsola australis</i>			1		1		1		x
Chenopodiaceae	<i>Sclerolaena divaricata</i>	Tangled Copperburr		3	1	1	2			x
Convolvulaceae	<i>Convolvulus remotus</i>		1							x
Crassulaceae	<i>Crassula tetramera</i>									x
Euphorbiaceae	<i>Euphorbia multifaria</i>									x
Fabaceae	<i>Vicia</i> sp.*									
Fabaceae	<i>Acacia tetragonophylla</i>	Dead finish		2						x
Fabaceae	<i>Acacia victoriae</i>	Prickly wattle	2	1				1		x
Fabaceae	<i>Acacia burkittii</i>	Sand hill wattle								x
Fabaceae	<i>Acacia oswaldii</i>	Umbrella wattle		1						x
Fabaceae	<i>Medicago minima</i> *									x
Fabaceae	<i>Prosopis velutina</i> **	Velvet mesquite	1							x
Fabaceae	<i>Senna phyllodinea</i>			2		3	1			x
Fabaceae	<i>Senna artemisioides</i> subsp. <i>filifolia</i>			3		2		1		x
Lamiaceae	<i>Salvia verbenaca</i> *	Vervain								x
Loranthaceae	<i>Lysiana exocarpi</i>									x
Malvaceae	<i>Sida corrugata</i>	Corrugated sida	1			1				
Malvaceae	<i>Sida</i> sp.		1			1				

Family	Scientific Name	Common Name	M 01	M 02	M 03	M 04	M 05	M 06	M 07	Previously recorded on site
Myrtaceae	<i>Eucalyptus camaldulensis</i>	River Red Gum								x
Pittosporaceae	<i>Pittosporum angustifolium</i>	Weeping pittosporum								x
Poaceae	<i>Chloris truncata</i>	Windmill grass	2							x
Poaceae	<i>Cymbopogon ambiguus</i>	Scent grass								x
Poaceae	<i>Rytidosperma caespitosum</i>	Ringed Wallaby Grass	2							
Poaceae	<i>Tragus australianus</i>	Small Burr grass		1						x
Poaceae	<i>Austrostipa scabra</i> subsp. <i>scabra</i>	Speargrass	2	2	2	2		1		
Poaceae	<i>Enneapogon avenaceus</i>	Bottle Washers	3	2	2	1	2	2	2	
Polygonaceae	<i>Rumex crispus</i> *	Curled dock								x
Portulacaceae	<i>Portulaca oleracea</i>	Pigweed								x
Scrophulariaceae	<i>Eremophila sturtii</i>	Narrow-leaf Emu Bush								x
Scrophulariaceae	<i>Myoporum montanum</i>	Western Boobiella								x
Solanaceae	<i>Lycium ferocissimum</i> **	African boxthorn					1			
Solanaceae	<i>Solanum esuriale</i>	Quena				2				
Solanaceae	<i>Solanum sturtianum</i>									
Zygophyllaceae	<i>Tribulus minutus</i>									x

* general weed

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

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 month of 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.