



Tharbogang Quarry and Landfill Offset Monitoring

Annual Monitoring Report 2016

Prepared for
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Abbreviations

Abbreviation	Description
DNG	Derived Native Grassland
ELA	Eco Logical Australia Pty Ltd
HBT	Hollow Bearing Tree
LLS	Local Land Services
MZ	Management zone
OEH	Office of Environment and Heritage

1 Introduction

1.1 Background

Eco Logical Australia Pty Ltd (ELA) was commissioned to prepare Annual Monitoring Report 2016 to comply with the Conservation Agreement between the Minister Administering the *National Parks and Wildlife Act 1974* and Griffith City Council for Tharbogang Quarry and Landfill (2015). This report complies with Annexure D of the Conservation Agreement, to satisfy a commitment made to secure a biodiversity offset relating to the expansion of the existing landfill and quarry. The subject site is located at Lots 181 and 182 in Deposited Plan 756035 (known as Tharbogang Quarry and Landfill), approximately 10 kilometres (km) northwest of Griffith.

Monitoring of the offset site is undertaken annually, with this report documenting year 1 of monitoring under the Conservation Agreement.

The Conservation Agreement requires that the annual monitoring report is to include:

- a description of all completed management actions undertaken in the previous 12 month period
- copies of all receipts from third party contractors engaged by the Owner to undertake management actions listed in items 1 and 2 of Annexure C to the Conservation Agreement
- completed monitoring data sheets (including photographs) using the template provided in Table 4 of Annexure D to the Conservation Agreement (below) and also including quarterly inspection data and stock impact data collected by the Owner
- a discussion of the changes recorded at photo monitoring points and quadrats
- a discussion of the condition of Conservation Values
- a discussion of effectiveness of any management actions implemented
- recommendations and proposed management actions to be performed in following year.

2 Monitoring methodology

In accordance with Annexure D of the Conservation Agreement, each monitoring event includes:

- Photos points
- Biometric data
- Fauna monitoring
- Walk through assessment.

Four photos (one in each cardinal direction) were taken at each of the eight monitoring photo points and six Biobanking monitoring points. Notes are taken on matters that will inform ongoing management (such as vegetation condition, evidence of erosion, weeds). Photographs are compared to 2015 data.

Floristic data was collected at each of the six BioBanking monitoring sites in accordance with the Biobanking Assessment Methodology (2014). These results were compared with baseline and benchmark data provided in Tables 2 and 3 of Annexure D of the Conservation Agreement.

Fauna monitoring included microchiropteran bat (microbat) and diurnal bird surveys. Microbat echolocation recordings were collected from one site within each of the three management zone (MZ), over two nights for a minimum of four hours each night. Bird surveys were undertaken at one site in DNG

(MZ1), two in open woodland (MZ2) and two in woodland (MZ3) and one in *Callitris* Woodland. At each 2 ha site, a 20 minute survey was conducted in the morning and at dusk over two consecutive days.

An additional walk through assessment was conducted to record opportunistic sightings within the Conservation Area. The current survey recorded weed species, evidence of pest animals, natural regeneration of previously disturbed areas and sightings of threatened species.

3 Completed management actions

Table 1: Management actions for Year 1, 2016 monitoring period

Management Action	Timing	Status
Monitoring Biobanking monitoring plots and photo points	Year 1	Complete - results of monitoring are provided.
Recommend weed management thresholds and commence weed management actions in the Conservation Area in Year 1	Years 1 - 3	No weed management actions were undertaken.
Pest animal control (local co-ordination with LLS and OEH).	Year 1 – 10.	No pest animal control actions were undertaken.
	Year 1 – 3 Initial Rabbit Control	No pest animal control actions were undertaken.
	Year 1 – 10 Feral Goat Control	No pest animal control actions were undertaken. No Feral Goats, or evidence of Feral Goats were seen during monitoring
	Year 1 – 10 Feral Cat Control	No pest animal control actions were undertaken.
Fire management hazard reduction burn	Year 1 – 10.	No fire management actions were undertaken.
Maintain vehicle access to Conservation Area for fire management, weed and fencing management.	Year 1	No maintenance to vehicle access tracks was undertaken. No maintenance required
Fencing, gates and signage	Year 1	No fencing, gates or signage were installed during year 1.
Quarterly inspections and stock management data	Year 1	None provided No grazing during year 1.
Annual Reports for Monitoring Program	Years 1 - 10	Complete – year 1.

4 Photo monitoring points and quadrats

Photo points have been created at six Biobanking plots and eight additional points, highlighting management issues, with each point marked with a star picket. Four photographs were taken at each point. Photographs were oriented north, east, south and west. Photos were taken from the top of the star picket.

Photo point 1 (PP1) (from top left bearing N, E, S, W).

Photo point monitors an eroded channel and pasture weeds. During baseline survey erosion of the channel appeared stable and weeds were primarily *Echium plantagineum*, *Arctotheca calendula*, *Hordeum leporinum*, *Lolium rigidum*, and *Bromus* sp. There was no evidence of regeneration of the native canopy. The ground layer included scattered natives such as *Vittadinia cuneata*, *Maireana* sp. and *Erodium crinitum*. Minor dieback was evident in canopy trees to the south.

Monitoring in 2016 did not observe active erosion. The types and abundance of weed species remains similar to the baseline survey, however, there was a higher grass cover in 2016. Dieback of tree canopy in the south is present but has not increased. The current survey found no evidence of regeneration of the native canopy at the photo point, however, low levels of regeneration (*Callitris* and *Allocasuarina luehmannii*) were recorded in the background.



Photo point 2 (PP2) (W, N, E, S)

Photo point monitors an eroded channel, pasture weeds and woodland heath. During baseline survey weeds were primarily *Arctotheca calendula*, *Sisymbrium erysimoides*, *Hordeum leporinum* and *Bromus* sp. The canopy was in a relatively good condition with scattered regeneration of *Callitris glaucophylla* but no visible regeneration of eucalypts. Erosion appeared inactive along the drainage line and stabilised by vegetation cover.

Monitoring in 2016 recorded similar types of weed species to the baseline survey, with an apparent increase of *Echium plantagineum*. The cover and height of the ground layer has increased compared to 2015. The canopy remains in relatively good condition, with continued regeneration of *Callitris* and new growth of eucalypts. Water appears to be diverting along the road rather than through the channel, with the channel 5 – 10 m west of the site dry. No evidence of erosion was observed.



Photo point 3 (PP3) (E, S, W, N)

Photo point monitors a weed infested area, which during baseline survey included noxious weeds *Lycium ferocissimum*, *Marrubium vulgare* and *Opuntia* sp. and other weeds such as *Hordeum leporinum*, *Echium plantagineum* and *Arctotheca calendula*. The eucalypt canopy was in good condition but no regeneration was observed.

As in the baseline survey, the 2016 survey found high levels of weed cover at this site. The noxious weeds *Lycium ferocissimum* and *Opuntia* sp. were present, with other weeds including *Hordeum leporinum* and *Lolium rigidum*. The eucalyptus canopy remains in good condition, however, regeneration of the native canopy was not observed.



Photo point 4 (E, S, W, N)

Photo point monitors noxious weeds and eucalypt health. Noxious weeds observed in the baseline survey included *Lycium ferocissimum*, *Marrubium vulgare* and *Opuntia* sp. Other weeds at the site included *Echium plantagineum* and *Hordeum leporinum*. Some minor dieback of eucalypts was observed in the south, with scattered regrowth of *Callitris* observed in the west. ELA notes a discrepancy in the orientation of the photo point images between 2015 and 2016, which is likely attributed to the effect of the steel star picket on the compass.

The abundance and diversity of weed species observed in the current 2016 survey was similar to the baseline survey, however, *sisymbrium erysimoides*, which was dominant in 2015, was virtually absent. The noxious weeds *Lycium ferocissimum*, *Marrubium vulgare* and *Opuntia* sp. remain on site. The presence of *Arctotheca calendula* appears to have increased. Regrowth of *Callitris* in the west continues, with no new areas of dieback observed.



Photo point 5 (N, E, S, W)

Photo point monitors noxious weeds and eucalyptus health. During baseline survey the noxious weed *Marrubium vulgare* was recorded, with a high cover of other weeds (*Hordeum leporinum*) around the base of the eucalypts. Beyond this, vegetation was dominated by areas of low growing, native dominated ground covers. Canopy was in good condition with no evidence of dieback and eucalypt recruitment observed in the south.

The diversity and abundance of weeds observed during the 2016 survey was similar to those recorded during baseline monitoring. In addition to *Marrubium vulgare*, the noxious weed *Lycium ferocissimum* was recorded on site. Other weed species include *Hordeum leporinum*, *Echium plantagineum* and *Malva parviflora*. Weeds were particularly dense at the base of the eucalypts, as previously observed. The canopy remains in good condition with low levels of eucalypt and *Geijera parviflora* recruitment in the area around the photo point.



Photo point 6 (N, E, S, W)

Photo point monitors noxious weeds and eucalyptus health. During baseline survey dense infestations of the noxious weed *Opuntia* sp. were recorded. Other weeds at the site included *Sisymbrium erysimoides* and *Echium plantagineum*. This community was generally in good condition with some *Callitris* regrowth and the natives *Erodium crinitum* and *Maireana* sp. were common in the ground layer.

The current 2016 survey found the level of *Opuntia* sp. infestation similar to the baseline monitoring. In addition to previously specified weed species, high levels of *Echium plantagineum* and *Arctotheca calendula*, and lower levels of *Sisymbrium erysimoides* occur at the site. Despite this, the community remains in good condition with continued regeneration of *Callitris*.

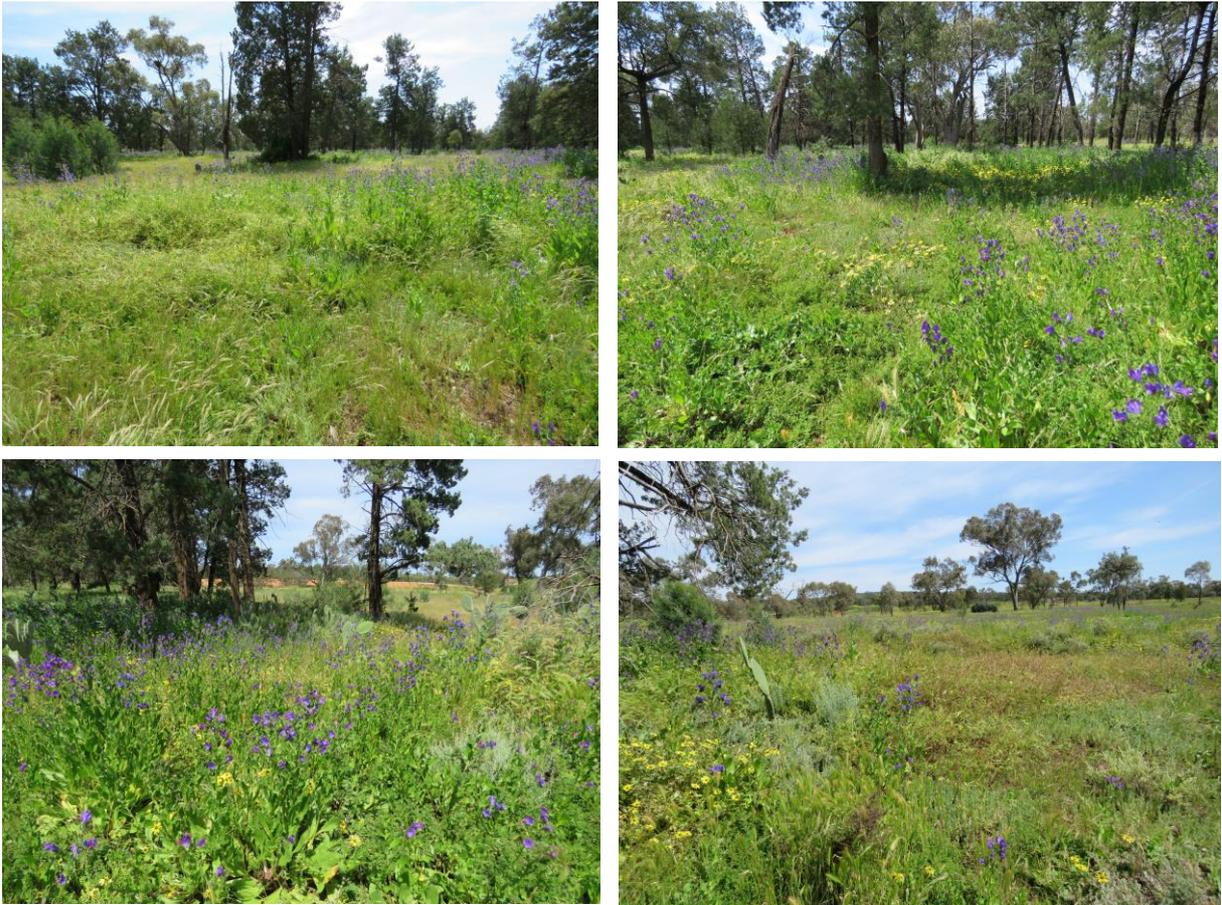


Photo point 7 (N, E, S, W)

Photo point monitors eucalyptus health and regrowth, and general woodland health. During baseline monitoring, regrowth of *Callitris* was observed but did not form a thicket, with stags present. Eucalypt regrowth was also present with minor dieback in the canopy. Foreground groundcover was predominantly native (including *Hyalosperma glutinosum*, *Triptilodiscus pygmaea*, *Maireana* sp. and *Goodenia* sp.). Few weeds were recorded but became more abundant beneath the denser stands of *Callitris* in the background.

As in the base line monitoring, the current 2016 survey found the foreground of this site to be predominantly native with weed species increasing towards the background *Callitris*. Weed species include *Echium plantagineum*, *Arctotheca calendula*, *Vulpia* sp. and *Medicago* sp. Low levels of eucalypt and *Callitris* regrowth continue to be observed. The cover of bare ground has decreased between 2015 and 2016



Photo point 8 (N, E, S, W)

Photo point monitors noxious weeds, perimeter track, pasture weeds and eucalypt health. During baseline survey the noxious weed *Lycium ferocissimum* was recorded, with a high abundance of other weeds (*Arctotheca calendula*, *Hordeum leporinum* and *Sisymbrium erysimoides*) in the area. Eucalypts were generally healthy with no sign of dieback, except for minor dieback in advanced regrowth in the south.

The current 2016 survey found that weed growth was not as tall as in the base line monitoring. *Sisymbrium erysimoides* was virtually absent and the cover of *Echium plantagineum* increased. The diversity and abundance of other weeds was similar, including the noxious weed *Lycium ferocissimum*. Low levels of eucalypt regeneration were observed in the background.

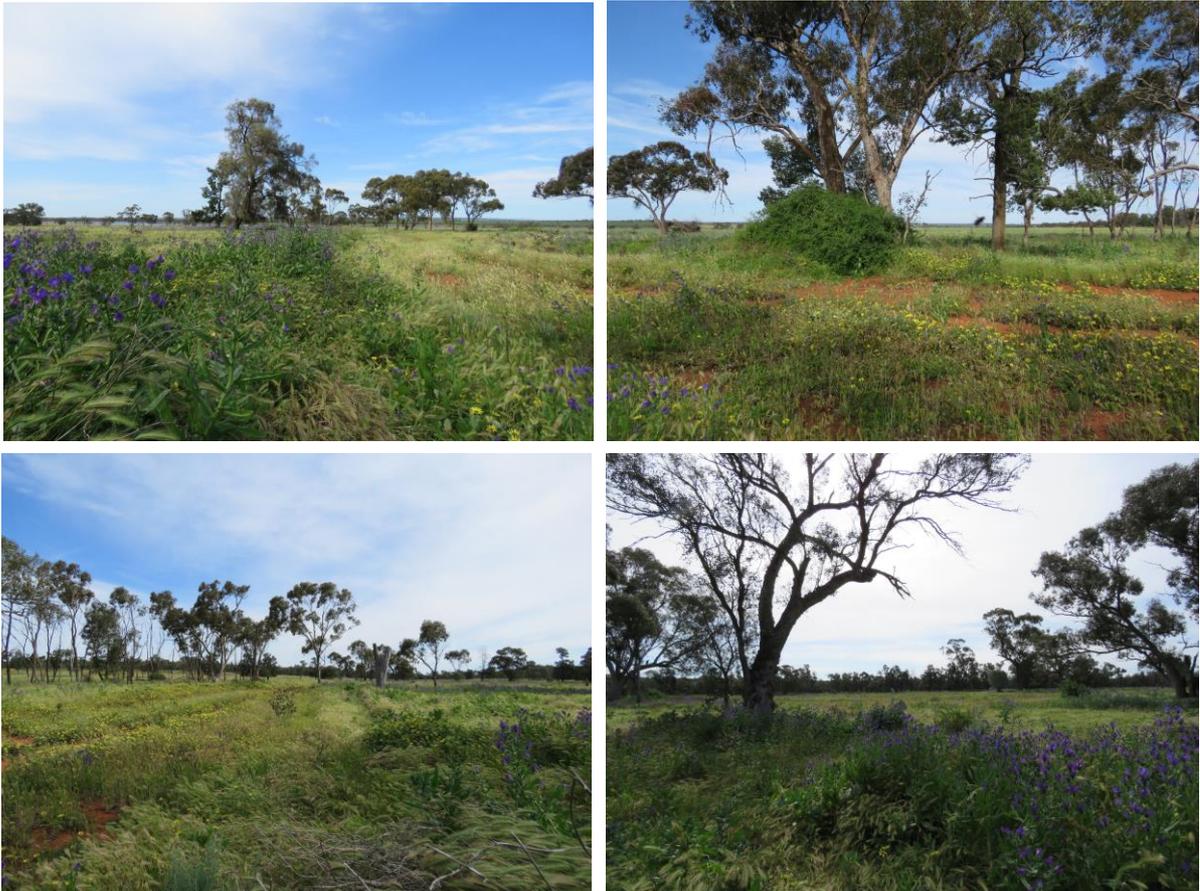


Photo point 9 (BOA1) (N, E, S, W)

Photo point monitors Biobanking plot (BOA1) located in open woodland. During baseline survey the plot was in good condition with a high abundance and diversity of native flora (*Austrostipa scabra*, *Goodenia pusilliflora* and *Hyalosperma glutinosum*) with a low cover of weeds. Low levels of dieback in eucalypt were recorded within the area not but within the plot. Regrowth of *Callitris* was scattered.

The current 2016 photo point monitoring found similar results to the baseline monitoring period. Native flora remain in high abundance, however weed species such as *Vulpia* sp. and *Hypochaeris radicata* have increased slightly. Low levels of eucalypt and *Pittosporum phylliraeoides* regrowth were recorded, with *Callitris* regeneration less apparent.

Biobank plot survey found similar results to the 2015 baseline data, however, exotic species cover has increased from 24% to 52% (**Table 2**). Five new weed species (all annual species) were recorded within the plot (*Bromus* sp., *Lactuca serriola*, *Medicago truncatula*, *Trifolium arvensis* and *Pentstemon airoides*) with the same number of exotic species from the baseline survey not recorded in the current monitoring.

Native species richness remained high at BOA1 in the 2016 survey. Eight native species were recorded in the current survey that were not observed in 2015 baseline monitoring (*Arthropodium minus*, *Atriplex semibaccata*, *Crassula colorata*, *Dichopogon fimbriatus*, *Goodenia cycloptera*, *Hyalosperma glutinosum* subsp. *glutinosum*, *Vittadinia cuneata* and *Xerochrysum bracteatum*). Full species list is provided in **Appendix A**.



Photo point 10 (BOA2) (N, E, S, W)

Photo point monitors Biobanking plot (BOA2) located in woodland. During baseline survey the plot had a high cover of weeds (*Bromus* sp., *Vulpia* sp., *Echium plantagineum*, and *Hypochaeris radicata*), but high diversity of native flora (*Austrostipa scabra* and *Rytidosperma* sp.). The areas was generally in good health with no signs of dieback.

As in the base line monitoring period, the current 2016 photo point monitoring found this site to be in general good condition with no signs of dieback. The site has high weed coverage but maintains a high diversity of native flora. Regeneration of the native canopy can be observed in both *Callitris* and eucalypt species. Above average rainfall resulted in increased height and cover of the ground layer.

Biobank plot survey found similar results to the 2015 baseline data (**Table 2**). Overall there was a small decrease in native groundcover (grasses, shrubs and other) with an increase of exotic species. Three previously unrecorded weed species (all annuals) were observed within the plot (*Lolium rigidum*, *Medicago truncatula*, *Trifolium* sp., and *Pentstemon* sp.) with five exotic species in the baseline survey not recorded in the current monitoring

Native species richness remained high at BOA2 in the 2016 survey. Fourteen native species were recorded in the current survey that were not observed in 2015 baseline monitoring (*Aphanes australiana*, *Aristida behriana*, *Arthropodium minus*, *Atriplex semibaccata*, *Austrostipa* sp., *Cassinia* sp., *Chamaesyce drummondii*, *Crassula colorata*, *Einadia nutans*, *Euphorbia* sp., *Hyalosperma glutinosum* subsp. *glutinosum*, *Hyalosperma* sp., *Ophioglossum lusitanicum* and *Tricoryne elatior*). Full species list is provided in **Appendix A**.



Photo point 11 (BOA3) (N, E, S, W)

Photo point monitors Biobanking plot (BOA3) located in open woodland. During baseline survey the plot was in good condition with a high abundance and diversity of native flora (*Austrostipa scabra* and *Goodenia pusilliflora*) with a moderate cover of weeds (*Vulpia* sp. and *Arctotheca calendula*). Low levels of dieback in eucalypt and *Callitris* were recorded within the photo point and broader area.

As in the base line monitoring period, the current 2016 photo point monitoring found this site to be in general good condition with a high diversity of native species. Weed species have increased in abundance and include *Vulpia* sp., *Arctotheca calendula* and *Echium plantagineum*. Regeneration of the native canopy was observed in both *Callitris* and eucalypt species.

Biobank plot survey found that native groundcover remains similar to 2015 results, with a shift in the proportion of native grasses and native other. However, exotic cover and height of the ground layer has increased greatly since the baseline survey (**Table 2**). Seven new weed species (all annuals) were recorded within the plot (*Centaurea* sp., *Lactuca serriola*, *Lepidium* sp., *Lolium rigidum*, *Rostraria pumila*, *Polygonum aviculare* and *Trifolium* sp.) with three exotic species in the baseline survey not recorded in the current monitoring.

Native species richness remained high at BOA3 in the 2016 survey. Eight native species were recorded in the current survey that were not observed in 2015 baseline monitoring (*Arthropodium minus*, *Crassula colorata*, *Dichopogon fimbriatus*, *Eucalyptus populnea*, *Euphorbia* sp., *Hyalosperma glutinosum* subsp. *glutinosum*, *Hyalosperma* sp. and *Rytidosperma* sp.). Full species list is provided in **Appendix A**.



Photo point 12 (BOA4) (N, E, S, W)

Photo point monitors Biobanking plot (BOA4) located in derived native grassland (DNG) and was a former gravel extraction pit. During baseline survey both native and exotic vegetation had re-established within the photo monitoring point (*Austrostipa scabra* and *Rytidosperma* sp. dominant), including canopy species. Noxious weeds were recorded in the area, including *Opuntia* sp.

The current 2016 survey found this photo monitoring point to be in a similar condition to the baseline monitoring period. Weed species include *Arctotheca calendula* and the noxious weed *Opuntia* sp. Regeneration of the native canopy was observed in both *Callitris* and eucalypt species in similar levels to the previous year.

Biobank plot survey found similar results to the 2015 baseline data with the proportion of both native and exotic species remaining largely unchanged (**Table 2**). Nine new weed species were recorded within the plot (*Avena fatua*, *Bromus rubens*, *Hordeum leporinum*, *Lolium rigidum*, *Medicago polymorpha*, *Opuntia stricta*, *Petrorhagia nanteuillii*, *Trifolium arvense* and *Vulpia* sp.) with four exotic species in the baseline survey not recorded in the current monitoring.

Native species richness increased marginally at BOA4 in the 2016 survey. Nine native species were recorded in the current survey that were not observed in 2015 baseline monitoring (*Aristida behriana*, *Calotis hispidula*, *Chamaesyce drummondii*, *Convolvulus erubescens*, *Crassula colorata*, *Einadia nutans*, *Hyalosperma glutinosum* subsp. *glutinosum*, *Maireana excavata* and *Xerochrysum bracteatum*). Full species list is provided in **Appendix A**.

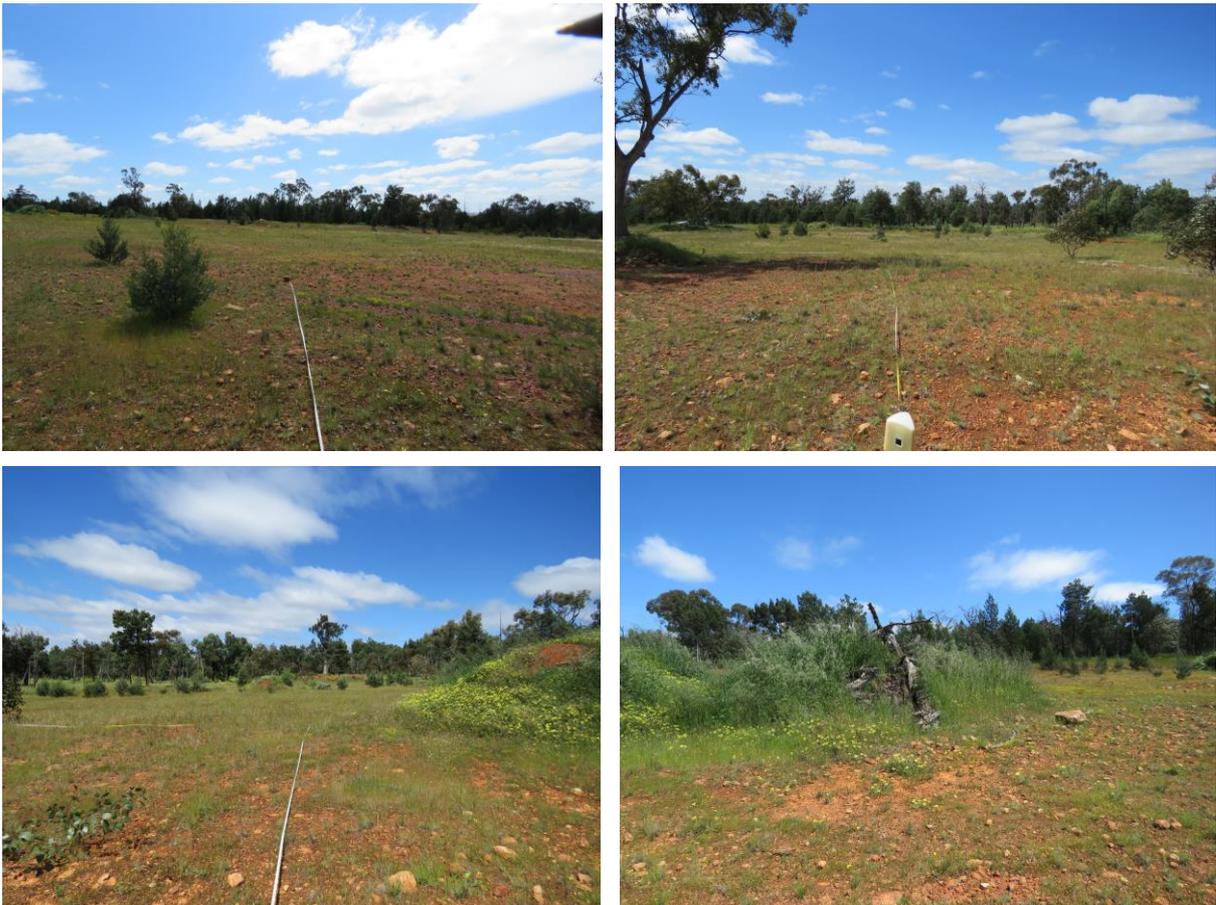


Photo point 13 (BOA5) (N, E, S, W)

Photo point monitors Biobanking plot (BOA5) located in a *Callitris* thicket. The start point is located on the edge of the thicket so that an increase in the size of the thicket to the west can be observed. During baseline survey *Callitris* were mostly low growing resulting in a “lock-up”, composed of dense *Callitris* to 4 m and 40 % cover. The groundcover comprised both native and exotic species (*Austrostipa scabra*, *Cheilanthes sieberi*, *Stuartina muelleri*, *Hordeum leporinum* and *Sisymbrium erysimoides* common).

The current 2016 survey found this photo point to be in a similar condition to the baseline monitoring period. The ground cover continues to be a mix of both native and exotic species, including weed species *Arctotheca calendula*, *Hypochaeris radicata* and *Vulpia* sp. Some dieback of *Callitris* is occurring due to natural thinning as a result of the “lock up”.

Biobank plot survey found a slight decreased in native mid-storey cover and a large increase in native ground cover species (**Table 2**). Similarly, there has been a large increased in exotic cover, compared with the 2015 baseline survey. Ten new weed species were recorded within the plot (*Aira cupaniana*, *Bromus rubens*, *Hypochaeris glabra*, *Iris* sp., *Opuntia* sp., *Opuntia stricta*, *Petrorhagia nanteuilii*, *Sonchus asper*, *Trifolium arvense* and *Trifolium* sp.) with five exotic species in the baseline survey not recorded in the current monitoring.

Native species richness decreased slightly at BOA5 in the 2016 survey, however, fourteen native species were recorded in the current survey that were not observed in 2015 baseline monitoring (*Aphanes australiana*, *Crassula colorata*, *Crassula decumbens*, *Dichopogon fimbriatus*, *Crassula colorata*, *Enchylaena tomentosa*, *Eucalyptus populnea*, *Hyalosperma glutinosum* subsp. *glutinosum*, *Hypoxis* sp., *Velleia paradoxa* and *Wahlenbergia communis*). Full species list is provided in **Appendix A**.



Photo point 14 (BOA6) (N, E, S, W)

Photo point monitors Biobanking plot (BOA6) located in woodland. During baseline survey the plot had a high cover of weeds (*Arctotheca calendula*, *Bromus* sp., *Echium plantagineum* and *Medicago* sp.), but also had a high diversity of native flora (*Dichopogon fimbriatum*, *Austrostipa scabra*, *Triptilodiscus pygmaea* and *Stuartina muelleri*). The area was generally in good health with some older stags present.

The current 2016 survey found this photo point to be in a similar condition to the baseline monitoring period. The site continues to have a high coverage of weed species, predominantly *Arctotheca calendula*, *Echium plantagineum* and *Vulpia* sp. The site was generally in good health with low levels of *Callitris* regeneration.

Biobank plot survey found a minimal decreased in native canopy, mid-storey and ground cover, with a large increase of exotic cover compared with the 2015 baseline survey (**Table 2**). Four new weed species (all annuals) were recorded within the plot (*Aira cupaniana*, *Rostraria pumila*, *Medicago truncatula* and *Pentstemon airoides*) with eight exotic species in the baseline survey not recorded in the current monitoring.

Native species richness decreased slightly in BOA6 in the 2016 survey, however, seven native species were recorded in the current survey that were not observed in 2015 baseline monitoring (*Chenopodium desertorum*, *Crassula colorata*, *Dichopogon fimbriatus*, *Euphorbia* sp., *Hyalosperma glutinosum* subsp. *glutinosum*, *Ophioglossum lusitanicum* and *Tricoryne elatior*). Full species list is provided in **Appendix A**.



Table 2: Plant community type benchmarks and quadrat scores as at October 2016.

Quadrat number	Native species richness	Overstorey cover %	Mid-storey cover %	Ground cover – grasses %	Ground cover – shrubs %	Ground cover – other %	Exotic cover	Number of trees with hollows	Proportion overstorey regen.	Total length of fallen logs (m)
<i>Benchmark:</i>	≥ 23	14-27	33-38	5-22	0-21	0-20	N/A	≥ 3	1	≥ 33
BOA1	36	0	3	32	0	40	52	0	0.33	0
BOA2	35	0	6.4	0	0	16	52	0	0.67	37
BOA3	32	2.1	5	22	2	24	78	0	1	5
BOA4	25	0	0.5	30	0	20	22	0	1	0
BOA5	34	0	14.5	0	0	68	42	0	0.5	1
BOA6	27	23.7	0	4	0	16	70	1	1	14

5 Condition of conservation values

Conservation values refers to the biodiversity values of the Conservation Area and are specified in Annexure B of the Conservation Agreement.

The Conservation Area contains one biometric vegetation community, Inland Grey Box – Poplar Box – White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Penepplain Bioregion (Poplar Box Woodland). There has not been a considerable change in vegetation condition relative to the BioMetric benchmarks (DECC 2008) since the Conservation Agreement was undertaken.

The woodland areas are in a moderate condition, with native species richness and groundcover above the benchmark. Other measures of vegetation condition remain reduced, although natural regeneration of all canopy species is occurring.

Similarly, the open woodland areas are in a moderate condition, with mid-storey and understorey cover above the benchmark. Natural regeneration of canopy species is occurring, however over-storey and shrub cover remains below the lower benchmark. The number/proportion of Hollow Bearing Trees (HBTs) per hectare is similar between woodland and open woodland areas, both of which are somewhat reduced.

Canopy and mid-storey cover remains absent in Derived Native Grassland (DNG) areas and subsequently there is no coarse woody debris or natural regeneration of canopy species. The ground layer is primarily composed of native grasses and remains intact.

The current 2016 survey recorded 44 species of birds within the Conservation Area. Four of these species are listed under the TSC Act and/or EPBC Act (Major Mitchell's Cockatoo, Rainbow Bee-eater, Superb Parrot and Grey-crowned Babbler), and two species (Chestnut-rumped Thornbill and Red-capped Robin) that are identified as declining woodland species in south-western NSW (Reid 1999). Only one species, Common Starling, is considered a pest species. Full species list in **Appendix A**.

Landscape linkages with the Conservation Area have not significantly changed since the Conservation Agreement was formed.

6 Effectiveness of management actions

The following management actions have been undertaken within the Conservation Area in the past twelve months.

6.1 Monitoring Biobanking monitoring plots and photo points

Monitoring of Biobanking monitoring plots and photo points was successfully undertaken in the 2016 period. Monitoring methodology followed the management action outlined in Table 4 Annexure C Monitoring Program of the Conservation Agreement (2015) and Error! Reference source not found. of this report. No significant deviations from baseline monitoring were observed in the 2016 monitoring period.

6.2 Annual Reports for Monitoring Program

This Annual Monitoring Report meets the specifications in Annexure D Monitoring Program of the Conservation Agreement (2015).

7 Recommendations

Implementation of the *pest animal control* management action in Year 2 of the Conservation Agreement. Although not specified in the Agreement, management of foxes within the Conservation Area may be important for maintaining the biodiversity values of the site. Fox scat was recorded at a number of sites within the Conservation Area during the current 2016 survey.

It is recommended that weed management actions within the Conservation Area commence in Year 2 of the Conservation Agreement. For manageability, rapidly spreading noxious weeds such as *Opuntia* sp. should be the initial focus of weed management action.

Appendix A Species list

BioBanking plot species lists

Species Name	Common Name	BOA1		BOA2		BOA3		BOA4		BOA5		BOA6	
		2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
Exotic species													
<i>Aira cupaniana</i>											x		x
<i>Arctotheca calendula</i>	Capeweed	x	x	x	x	x	x	x	x	x	x	x	
<i>Avena fatua</i>									x				
<i>Bromus rubens</i>									x		x		
<i>Bromus sp.</i>			x	x	x	x	x	x	x	x	x	x	x
<i>Carthamus lanatus</i>	Saffron Thistle							x	x			x	
<i>Centaurea sp.</i>							x						
<i>Cirsium vulgare</i>	Spear Thistle									x			
<i>Echium plantagineum</i>	Patterson's Curse	x	x	x	x	x	x	x	x	x	x	x	x
<i>Erodium cicutarium</i>	Common Crowfoot					x	x						
<i>Hedypnois rhagadioloides</i>		x	x			x	x	x	x				
<i>Hordeum leporinum</i>	Barley Grass	x	x	x	x	x	x		x	x	x	x	x
<i>Hypochaeris glabra</i>		x		x							x	x	
<i>Hypochaeris radicata</i>	Catsear	x		x	x	x	x	x	x	x	x	x	x
<i>Iris sp.</i>											x		
<i>Lactuca serriola</i>	Prickly Lettuce		x	x	x		x			x	x	x	x
<i>Lepidium sp.</i>							x						
<i>Lolium rigidum</i>	Wimmera Ryegrass				x		x		x	x		x	x
<i>Rostraria pumila</i>							x						x
<i>Medicago laciniata</i>	Cut-leaved Medic	x	x			x	x			x		x	
<i>Medicago minima</i>	Woolly Burr Medic			x	x			x	x				
<i>Medicago polymorpha</i>									x				
<i>Medicago truncatula</i>	Barrel Medic		x		x	x		x					x
<i>Medicago sp.</i>				x						x		x	
<i>Opuntia stricta</i>									x				
<i>Opuntia sp.</i>	Prickly Pear							x			x		
<i>Petrorhagia nanteuillii</i>	Proliferous Pink								x		x		
<i>Polygonum aviculare</i>							x						
<i>Raphanus raphanistrum</i>	Wild Radish			x									
<i>Silene tridentata</i>								x				x	

Species Name	Common Name	BOA1		BOA2		BOA3		BOA4		BOA5		BOA6	
		2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
<i>Sisymbrium erysimoides</i>	Smooth Mustard	x		x		x		x		x	x	x	x
<i>Sisymbrium irio</i>		x		x	x							x	
<i>Sonchus asper</i>	Prickly Sowthistle										x		
<i>Sonchus oleraceus</i>	Common Sowthistle	x		x	x	x	x	x	x	x	x	x	x
<i>Trifolium arvense</i>	Haresfoot Clover		x	x	x	x	x		x		x	x	
<i>Trifolium sp.</i>					x		x				x	x	x
<i>Veronica arvensis</i>				x		x				x			
<i>Vulpia myuros</i>	Rat's Tail Fescue												
<i>Vulpia sp.</i>		x	x	x	x	x	x		x	x	x	x	x
False Aira			x		x								x
Unknown grass			x										
Native species													
<i>Actinobole uliginosum</i>	Flannel Cudweed	x	x	x	x	x	x			x	x	x	x
<i>Aphanes australiana</i>					x						x	x	x
<i>Aristida behriana</i>	Bunch Wiregrass	x	x		x	x	x		x				
<i>Arthropodium minus</i>	Small Vanilla Lily		x		x		x			x	x	x	x
<i>Arthropodium sp.</i>				x									
<i>Atriplex semibaccata</i>	Creeping Saltbush		x	x	x	x	x	x					
<i>Austrostipa aristiglumis</i>	Plains Grass												
<i>Austrostipa scabra</i>	Speargrass	x	x	x	x	x	x	x	x	x	x	x	x
<i>Austrostipa bigeniculata</i>		x				x							
<i>Austrostipa sp.</i>					x								
<i>Brachychiton populneus</i>	Kurrajong			x	x								
<i>Brachyscome lineariloba</i>	Hard-headed Daisy	x											
<i>Bulbine bulbosa</i>	Bulbine Lily	x	x	x	x			x		x	x	x	x
<i>Bulbine semibarbata</i>										x			
<i>Calandrinia eremaea</i>				x						x		x	
<i>Callitris glaucophylla</i>	White Cypress Pine	x	x	x	x	x	x	x	x	x	x	x	x
<i>Calotis hispidula</i>	Bogan Flea	x	x	x	x	x	x		x	x	x	x	x
<i>Cassinia artemisioides</i>				x									
<i>Cassinia sp.</i>					x								
<i>Chamaesyce drummondii</i>					x				x				
<i>Cheilanthes sieberi</i>		x	x	x	x	x	x			x	x	x	

Species Name	Common Name	BOA1		BOA2		BOA3		BOA4		BOA5		BOA6	
		2015	2016	2015	2016	2015	2016	2015	2016	2015	2016	2015	2016
<i>Ophioglossum sp.</i>						x							
<i>Ophioglossum lusitanicum</i>				x									
<i>Oxalis perennans</i>		x	x	x	x	x	x			x	x	x	x
<i>Pittosporum phylliraeoides</i> (<i>angustifolium</i>)		x	x										
<i>Pterostylis bicolor</i>	Black-tip Greenhood									x			
<i>Ptilotus spathulatus</i>		x	x					x	x				
<i>Ranunculus sessiliflorus</i>				x	x							x	x
<i>Rhodanthe corymbiflora</i>	Small White Sunray												
<i>Rhodanthe pygmaea</i>		x	x	x		x	x	x					
<i>Rhodanthe diffusa</i>				x		x				x	x	x	
<i>Rytidosperma sp.</i>		x	x	x	x	x	x	x	x	x	x	x	
<i>Rytidosperma sp2</i>							x						
<i>Salsola tragus</i>		x		x				x	x				
<i>Sclerolaena sp.</i>			x										
<i>Sida corrugata</i>		x	x	x	x	x	x	x	x	x		x	
<i>Sida cunninghamii</i>	Ridged Sida	x	x	x	x	x	x	x	x	x	x	x	x
<i>Spergularia sp.</i>										x			
<i>Solanum esuriale</i>	Quena					x							
<i>Stackhousia monogyna</i>	Creamy Stackhousia			x	x	x				x	x		
<i>Stuartina muelleri</i>	Spoon Cudweed			x	x	x	x			x	x	x	x
<i>Thysanotus patersonii</i>										x			
<i>Tricoryne elatior</i>	Yellow Autumn-lily				x	x	x						x
<i>Triptilodiscus pygmaeus</i>	Common sunray	x	x	x		x	x			x	x	x	x
<i>Velleia paradoxa</i>											x		
<i>Vittadinia cuneata</i>	Fuzzweed		x	x	x	x	x	x	x			x	
<i>Wahlenbergia communis</i>	Tufted Bluebell										x		
<i>Wahlenbergia sp.</i>		x	x	x						x		x	
<i>Wahlenbergia (broad leaf)</i>						x							
<i>Wurmbea dioica</i>				x									
<i>Xerochrysum bracteatum</i>	Golden Everlasting		x	x	x	x	x		x	x	x	x	x
Unknown grass										x			x
<i>Millotia myosotidifolia</i>	Broad-leaved Millotia									x			

Bird survey species list 2016

Species Name	Common Name	TSC Act Listing	EPBC Act Listing	BO A1	BO A2	BO A3	BO A4	BO A5	BO A6
<i>Acanthagenys rufogularis</i>	Spiny-cheeked Honeyeater				x			x	x
<i>Acanthiza nana</i>	Yellow Thornbill				x		x	x	
<i>Acanthiza reguloides</i>	Buff-rumped Thornbill				x			x	
<i>Acanthiza uropygialis</i>	Chestnut-rumped Thornbill				x		x	x	
<i>Anas superciliosa</i>	Pacific Black Duck				x				
<i>Barnardius zonarius</i>	Australian Ringneck			x	x	x	x	x	x
<i>Cacatua galerita</i>	Sulphur-crested Cockatoo				x				
<i>Cacatua leadbeateri</i>	Major Mitchell's Cockatoo	V				x			
<i>Chrysococcyx lucidus</i>	Shining Bronze Cuckoo					x		x	
<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike			x	x		x	x	
<i>Corcorax melanorhamphos</i>	White-winged Chough			x	x				
<i>Corvus bennetti</i>	Little Crow			x	x	x			x
<i>Corvus coronoides</i>	Australian Raven			x	x			x	x
<i>Cracticus nigrogularis</i>	Pied Butcherbird			x	x				
<i>Cracticus tibicen</i>	Magpie			x	x	x	x		x
<i>Cracticus torquatus</i>	Grey Butcherbird			x	x	x		x	x
<i>Eolophus roseicapilla</i>	Galah				x	x	x		x
<i>Grallina cyanoleuca</i>	Magpie Lark			x	x	x	x	x	x
<i>Haliastur sphenurus</i>	Whistling Kite			x	x		x	x	
<i>Malurus lamberti</i>	Variegated Fairywren							x	
<i>Manorina flavigula</i>	Yellow-throated Miner			x	x	x			x
<i>Merops ornatus</i>	Rainbow Bee-eater		M		x		x	x	
<i>Milvus migrans</i>	Black Kite			x	x		x	x	x
<i>Northiella haematogaster</i>	Blue Bonnet			x		x	x		x
<i>Nymphicus hollandicus</i>	Cockatiel			x		x			x
<i>Ocyphaps lophotes</i>	Crested Pigeon			x	x	x	x		x
<i>Pachycephala rufiventris</i>	Rufous Whistler			x				x	x
<i>Pardalotus striatus</i>	Striated Pardalote			x	x	x	x	x	x
<i>Petrochelidon nigricans</i>	Tree Martin			x	x			x	
<i>Petroica goodenovii</i>	Red-capped Robin							x	
<i>Phaps chalcoptera</i>	Common Bronzewing				x	x		x	x
<i>Platycercus eximius</i>	Eastern Rosella								x
<i>Polytelis swainsonii</i>	Superb Parrot	V	V			x			
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler	V		x		x	x	x	x

Species Name	Common Name	TSC Act Listing	EPBC Act Listing	BO A1	BO A2	BO A3	BO A4	BO A5	BO A6
<i>Psephotus haematonotus</i>	Red-rumped Parrot			x	x	x	x	x	x
<i>Rhipidura albiscapa</i>	Grey Fantail				x		x	x	
<i>Rhipidura leucophrys</i>	Willie Wagtail			x	x		x		x
<i>Struthidea cinerea</i>	Apostlebird			x		x			x
<i>Sturnus vulgaris</i>	Starling			x	x	x	x		x
<i>Taeniopygia bichenovii</i>	Double-barred Finch						x		
<i>Threskiornis moluccus</i>	White Ibis				x				
<i>Vanellus miles</i>	Masked Lapwing								x
	A Woodswallow				x				

Appendix B Biobank monitoring photos

BOA1



BOA2



BOA3



BOA4



BOA5



BOA6



PLEASE KEEP SECTION BREAK AT THE END OF THIS PAGE TO KEEP BACK PAGE FORMATTING

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