9 Ecology

9.1 Terrestrial ecology assessment of project changes

9.1.1 Relevant project changes

Project changes relevant to terrestrial ecology are:

- adjustments in the size and location of the main infrastructure areas;
- relocation and reduction in area of the raw water dam;
- adjustments to the water pipeline route;
- refinement of the rail spur;
- realignment of the Castlereagh Highway for the rail spur construction;
- adjustments to local roads; and
- adjustments to haul roads between the mining areas.

In addition, an assessment of rail noise from trains on the spur line is now available and it has been used to determine relevant indirect ecological impacts.

The proposed changes have decreased the mining area by about 180 ha but have an increased impact on 93 ha of woodland and 234 ha of native grasslands. Some of the grasslands have been further surveyed and reclassified from introduced and disturbed grasslands, thus no greater area of native grasslands is affected.

9.1.2 Assessment method

The new disturbance footprint was superimposed on the sensitive ecological features map in the Project Geographic Information System (GIS), allowing comparison and identification of potential impacts to vegetation types, habitats, threatened species and threatened ecological. Changes to habitat connectivity, indirect impacts and the location of proposed offset areas were also determined.

Where it was considered the Project changes resulted in a potentially significant increase in the impacts on threatened species and ecological communities, impacts were reassessed. Outcomes from this assessment and other proposed amendments to the vegetation and threatened species impacted were then incorporated into an updated offset strategy, which provides additional information on the areas required and values of the offset areas.

While ERM made previous plot surveys in native pasture areas, EMM did additional grassland rapid assessment surveys in January 2013 to determine and map the occurrence of Box Gum or Grey Box Derived Native Grasslands (DNG), listed as part of the respective threatened ecological communities under both the *Threatened Species Conservation Act 1995* (TSC Act) and *Environment Protection Biodiversity Act 1999* (EPBC Act). Rapid assessments were undertaken in areas considered likely to have once supported yellow box, Blakely's red gum, white box or grey box, which were identified from previous mapping and aerial photographs.

Rapid assessment areas were examined in the field, using a technique which involved confirming the site was grassy (or otherwise), determining the diagnostic tree species would have once occurred, identifying the dominant ground cover species and their relative cover, estimating the cover of native versus exotic species and identifying any native forb species, within an area of about 400 m^2. The distribution of any identified DNG was then mapped using knowledge of the general distribution of Box Gum and Grey Box Woodlands within the PAA, grassland rapid assessment results, topographic interpretation and occurrence of the determining tree species in adjacent areas.

9.1.3 Environmental management

Most of the environmental management measures recommended in the EA remain applicable with the Project changes. However, some can be improved as a result of additional information now available about measures to decrease barrier effects from the rail spur. Also, further surveys have been undertaken in some offset sites and the strategy has been updated. The updated strategy is given as Appendix F.

Improved measures will be taken so fauna can move across mine-related infrastructure in wildlife corridors, including those in offset sites. Three drains are being designed to incorporate measures to allow for dry fauna passage near the Goodiman SCA and the offset areas along the rail spur. In addition, a dedicated fauna crossing will be provided in the corridor to the north of the Goodiman SCA to minimise the barrier effect of the rail spur.

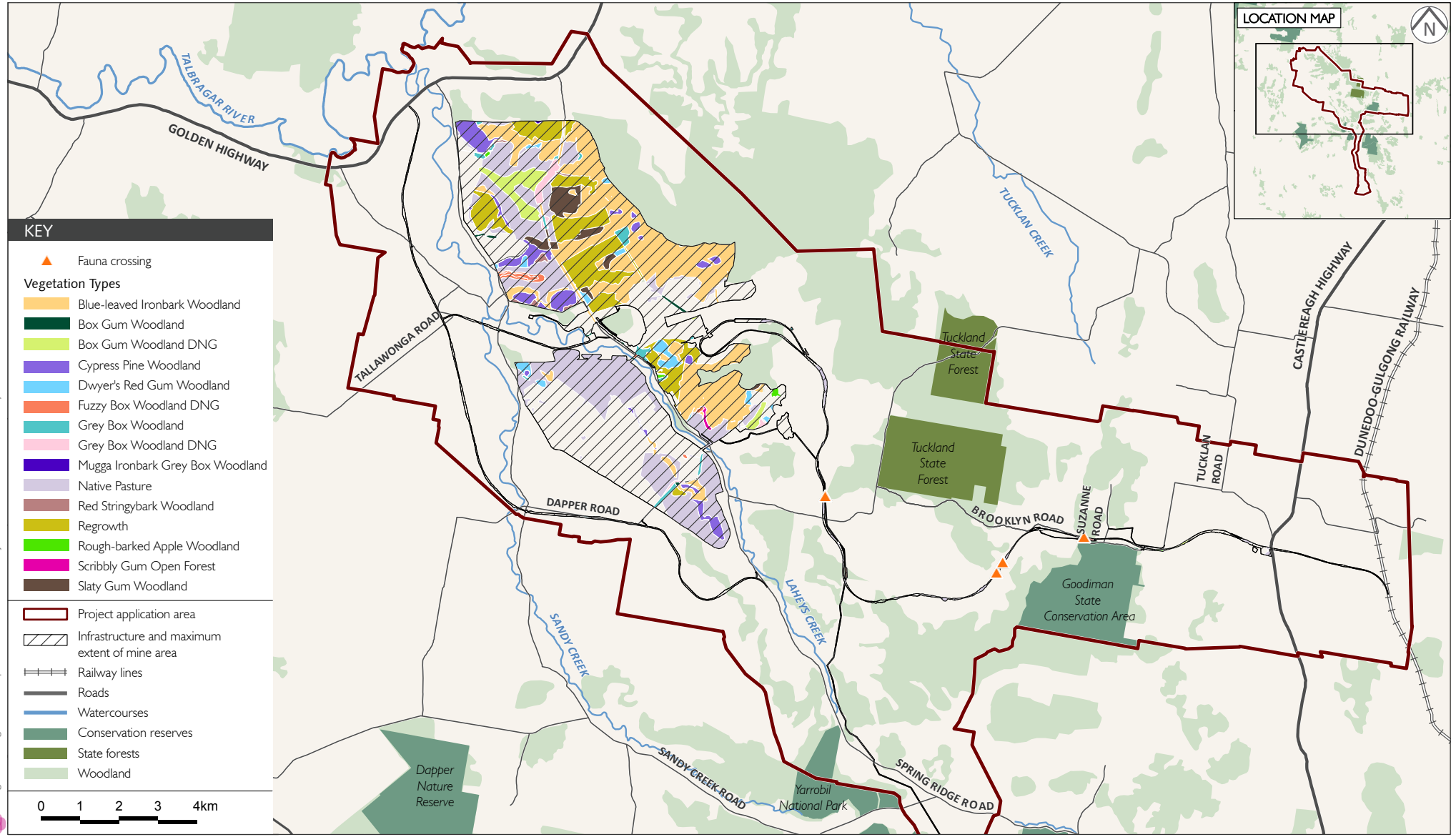
Fauna crossings have been shown to be effective for a range of species (Bond and Jones 2008; Hays and Goldingay 2009). The underpasses will be designed to allow large macropods to move through, but will also accommodate the movement of a range of other species. The proposed overpass near Goodiman SCA will be vegetated to promote the movement of small woodland birds and other fauna (Figure 9.1).

9.1.4 Impacts

The main impacts resulting from the Project changes are the amount and location of vegetation and habitat affected.

i Woodland

The proposed changes result in an increase of 92 ha of woodland (and regrowth) impacted by the Project, to a total of 1,960 ha woodland (and regrowth) impacted (Table 9.1 and Figure 9.2). The additional areas mainly comprise Blue-leaved Ironbark Woodland and Regrowth vegetation. There is also a decrease in the affected area of Dwyer's Red Gum Woodland, Cypress Pine Woodland, Red Stringybark Woodland and Slaty Gum Woodland and reduction of 6 ha of Grey Box Woodland TEC. The Project changes also increase the impacts to 11 ha of TECs, comprising 1 ha of Fuzzy Box Woodland and 10 ha of Box Gum Woodland.



Integrated Design Solutions | 030518 Cobbora Coal Project - RTS F9-1 Rev B - 04 Febuary 2013

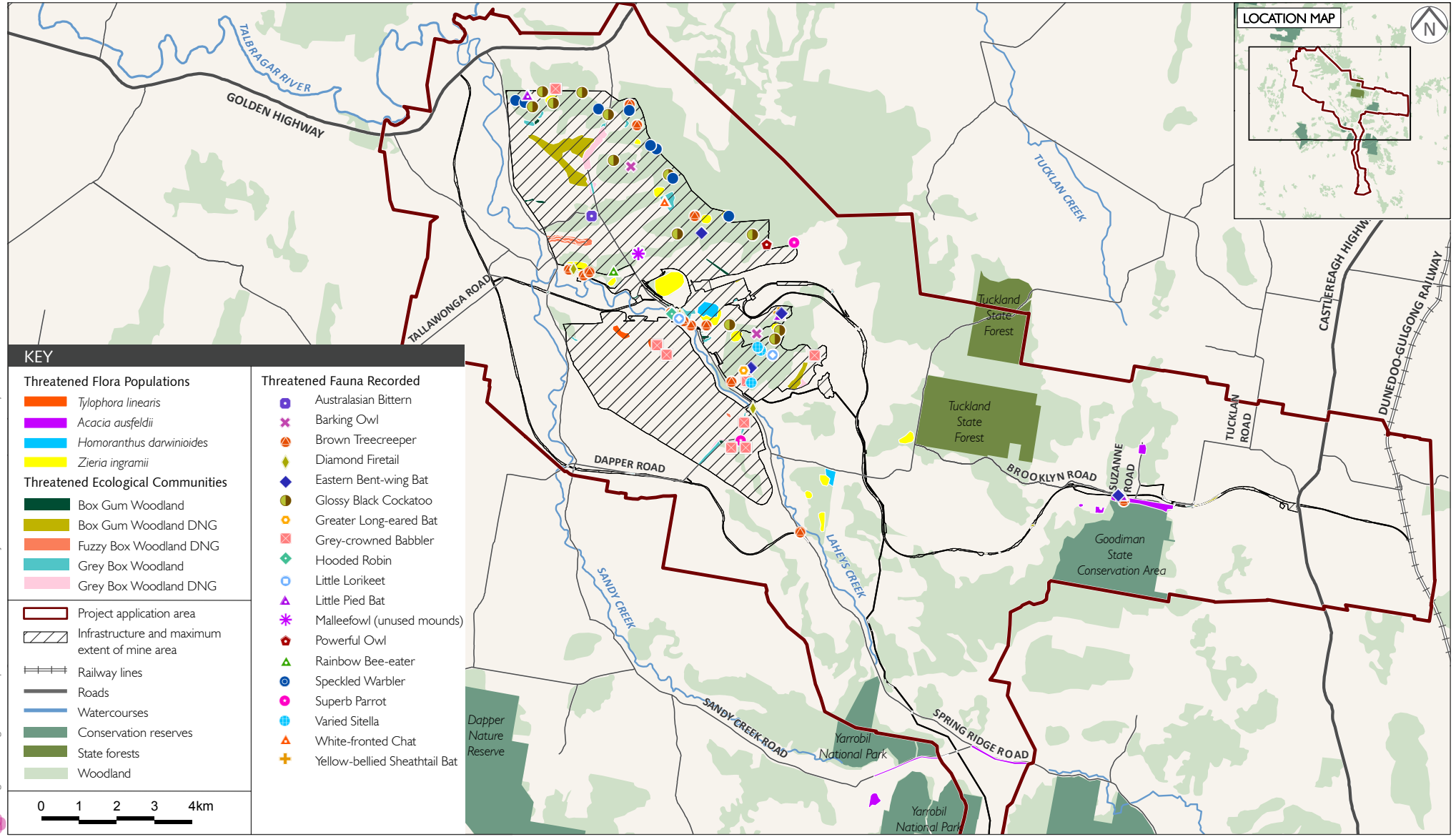
EMM

Cobbora Holding Company Pty Limited

Refined Project Impact Areas and Vegetation

Cobbora Coal Project - Preferred Project Report and Response to Submissions

Figure 9.1



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EMM

Cobbora Holding Company Pty Limited

Significant Ecological Features

Cobbora Coal Project - Preferred Project Report and Response to Submissions

Figure 9.2

Table 9.1 Vegetation impacts from Project changes

Vegetation type	Biometric vegetation type	TEC	Area within PAA (ha)[1]	Area to be removed (ha)	Percent of vegetation type in the PAA to be removed	Comparison with EA footprint (ha)
Cypress Pine Woodland	CW107 Black Cypress Pine – Narrow-leaved Stringybark heathy woodland of the southern Brigalow Belt South Bioregion		488	188	39%	-3
Narrow-leaved Stringybark Woodland	CW107 Black Cypress Pine – Narrow-leaved Stringybark heathy woodland of the southern Brigalow Belt South Bioregion		22	0	0%	0
Blakely's Red Gum Woodland	CW111 Blakely's Red Gum Rough-barked Apple Flats Woodland	Box Gum Woodland	62	0	0%	0
Rough-barked Apple Woodland	CW111 Blakely's Red Gum Rough-barked Apple Flats Woodland	Box Gum Woodland	226	9	4%	+4
Box Gum Grassy Woodland	CW112 Blakely's Red Gum – Yellow Box grassy woodland of the NSW South Western Slopes Bioregion	Box Gum Woodland	815	13	2%	+6
Blue-leaved Ironbark Woodland	CW115 Blue-leaved Ironbark woodland on sandy uplands and slopes of the Darling Riverine Plains Bioregion		5,230	1,043	20%	+25
Regrowth	CW115 Blue-leaved Ironbark woodland on sandy uplands and slopes of the Darling Riverine Plains Bioregion		813	450	55%	+85
Dwyer's Red Gum Woodland	CW133 Dwyer's Red Gum – Currawang grassy mid-high woodland of central NSW		129	67	52%	-16
Fuzzy Box Woodland	CW138 Fuzzy Box on loams in the Nandewar Bioregion and northern Brigalow Belt South Bioregion	Fuzzy Box Woodland	129	14	11%	+1
Grey Box Woodland	CW145 Inland Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Grey Box Woodland	660	49	7%	-5
Mugga Ironbark Grey Box Woodland	CW155 Mugga Ironbark – Inland Grey Box – pine tall woodland of the NSW South Western Slopes Bioregion		55	1	2%	0
Mugga Ironbark Woodland	CW156 Mugga Ironbark - Inland Grey Box shrubby woodland of the Brigalow Belt South Bioregion		81	0	0%	0
Scribbly Gum Open Forest	CW176 Red Stringybark – Scribbly Gum - Red Box – Long-leaved Box shrub – tussock grass open forest the NSW South Western Slopes Bioregion		5	5	100%	0
Red Stringybark Woodland	CW177 Red Stringybark woodland of the dry slopes of the South Western Slopes Bioregion		888	20	2%	-2
Slaty Gum Woodland	CW191 Slaty Gum woodland of the slopes of the southern Brigalow Belt South Bioregion		874	101	12%	-2

Table 9.1 Vegetation impacts from Project changes

Vegetation type	Biometric vegetation type	TEC	Area within PAA (ha)[1]	Area to be removed (ha)	Percent of vegetation type in the PAA to be removed	Comparison with EA footprint (ha)
Tumbledown Gum Woodland	CW202 Tumbledown Red Gum – Black Cypress Pine – Red Box low woodland of hills of the South Western Slopes		123	0	0%	0
White Box Woodland	CW213 White Box – White Cypress Pine – Inland Grey Box woodland on the western slopes of NSW	Box Gum Woodland	206	0	0%	0
Total woodland and regrowth in moderate–good condition			**10,804**	**1,960**	**18%**	**+93**
Box Gum Woodland DNG (TSC Act only)				105		
Grey Box Woodland DNG (TSC Act only)				34		
Fuzzy Box DNG				14		
Native Pasture in low condition			3,000	1,048	35%	+81
Total native vegetation			**14,804**	**3,161**	**21%**	**+327[2]**
Total disturbance area			**20,804**	**4,537**	**22%**	**-93**

Notes: 1. Based on available mapping and limited groundtruthing outside the impact area.

2. This increase has resulted from the reclassification of low condition and non-native grasslands to native grasslands and DNG.

Key: TEC – threatened ecological community, PAA – Project application area.

ii Grasslands

The area of native pasture in low condition in the Project area has increased by 81 ha to 1,048 ha (Table 9.1 and Figure 9.1). This represents roughly 35% of the native pasture identified in the PAA and is an increase of about 8% from the original Project footprint. In addition to this, 153 ha of native pastures in a moderate condition are considered to represent grasslands derived from Box Gum Woodland, Fuzzy Box Woodland or Grey Box Woodland, which are all listed as threatened ecological communities (see Figure 9.1).

Grasslands are a dominant feature in the PAA and region. However, the condition, and therefore habitat, provided by these areas varies greatly as a result of past agricultural practices. In the Project area, the condition of the grasslands varies from dominance by introduced crops and grasses, to low condition native pastures with low diversity and few forb species. Grassland areas were identified as foraging habitat for raptors, owls and microbat species, mainly due to the presence of introduced small mammals and insects, and habitat for a range of reptile species.

The changes affecting grasslands are unlikely to result in a significant increase in impacts on any ecologically significant features. The mine footprint will be gradually impacted and rehabilitated, with rehabilitated lands containing grassland in similar condition to the pre-mining grassland.

Further grassland surveys were undertaken in January 2013 to better establish the condition of native pasture across most of the site. The condition of these areas were assessed against the Box Gum Woodland and/or Grey Box Woodland guidelines to determine if any areas met the description of derived native grasslands (DNG) under the TSC Act and EPBC Act. An assessment of the potential impact on DNG is provided in the following section.

iii Threatened ecological communities

An additional 11 ha of woodland TECs will be directly impacted because of the Project changes. The area of TECs to be impacted by the Project is now 14 ha for Fuzzy Box Woodland, 22 ha for Box Gum Woodland and 49 ha for Grey Box Woodland (Table 9.2 and Figure 9.2).

In addition 153 ha of native pasture, considered to have been derived from Box Gum Woodland (105 ha), Grey Box Woodland (34 ha) and Fuzzy Box Woodland (14 ha), have been identified in the changed Project area (see Figure 9.2). These additions are based on additional grassland assessments by EMM.

Table 9.2 Summary of impacts to threatened species and communities from Project changes

	Status					
Species or community	**TSC Act**	**EPBC Act**	**Recorded?**	**Impact description**	**Significant increase in impact?**	**Outcome**
Box Gum Woodland	E	CE	Yes	Removal of an additional 6 ha – total of 18 ha	Yes	Significant impact still likely
Derived Native Grasslands (various TECs)[1]	E	-1	Yes	Removal of 153 ha (not previously identified in the EA)	Yes	Significant impact still likely
Fuzzy Box Woodland	E	-	Yes	Removal of an additional 1 ha – total of 14 ha	No	Significant impact still likely
Inland Grey Box Woodland	E	E	Yes	Removal of an additional 3 ha – total of 57 ha	No	Significant impact still likely

Notes: 1.The derived grasslands are not considered to meet the EPBC Act definition of Box Gum Woodland or Grey Box Woodland.

As significant impacts were expected for all TECs identified in the Project area, the assessments of significance have not been updated. But, the proposed offsets for TECs will need to be increased to reflect changes in impact areas.

While the Project changes will increase the impacts on woodland TECs by 11 ha and DNG by 153 ha, it is considered unlikely this will result in the loss of these communities in the locality given CHC's commitment to offset the Project impact. When implemented and finalised, the offset strategy will increase the amount and condition of Box Gum Woodland, Grey Box Woodland and Fuzzy Box Woodland conserved in the locality in the long term.

iv Threatened flora

No additional known populations of threatened flora will be impacted by the Project changes. While the footprint in the area next to Goodiman SCA is slightly different to the original footprint, the number of Ausfeld's wattle to be impacted is still estimated as some 200 individuals, given their density in this area (see Figure 9.2). In addition, impacts are not likely to significantly increase for any threatened flora species that are considered likely to occur, but were not recorded in the Project area (Table 9.3). This is because the changed project areas were surveyed enough for the presence of threatened flora species, and the potential for occurrence of additional flora species in these areas is considered low. The affects of the changes on threatened flora are summarised in Table 9.3.

Table 9.3 Effects of Project changes on threatened flora

Species or community	Status		Recorded?	Impact description	Significant increase in impact?	Outcome
	TSC Act	EPBC Act				
Ausfeld's wattle	V		Yes	No change – removal of approximately 200 individuals from one sub-population	No	Not significant
Homoranthus darwinioides	V	V	Yes	No change – removal of 227 individuals from one sub-population	No	Significant impact still likely
Ingram's zieria	E	E	Yes	No change – removal of 727 individuals within eight sub-populations	No	Significant impact still likely
Philotheca ericifolia	-	V	No	Removal of potential habitat	No	Not significant
Pine donkey orchid	V	-	No	Removal of potential habitat	No	Not significant
Rulingia procumbens	V	V	No	Removal of potential habitat	No	Not significant
Scant pomaderris	E	-	No	Removal of potential habitat	No	Not significant
Tylophora linearis	V	E	Yes	No change – removal of nine individuals, representing the local known population (within the study area)	No	Significant impact still likely

v Threatened fauna

An additional 327 ha of native vegetation will be impacted by the Project changes. This consists of 81 ha of native pastures in low condition, 153 ha of DNG and 93 ha of woodland and regrowth vegetation. These areas may provide habitat for a range of threatened fauna species.

The significance of impacts from the Project changes was assessed for each of the threatened fauna species recorded or considered likely to occur in the Project area (Table 9.4 and Figure 9.2). No significant additional impacts will occur as a result of the changes.

Table 9.4 Effect of Project changes on threatened fauna

Species or community	Status		Recorded?	Impact description	Significant increase in impact?	Outcome
	TSC Act	EPBC Act				
Australasian bittern	E	-	Yes	Removal of 9 ha of foraging habitat	No	Not significant
Barking owl	V	-	Yes	Removal of 1,500 ha of foraging and breeding habitat and 1,560 ha of foraging regrowth and grassland habitat	No	Significant impact still likely
Black-breasted buzzard	V	-	No	Removal of potential habitat	No	Not significant
Black-chinned honeyeater	V	-	No	Removal of potential habitat	No	Not significant

Table 9.4 Effect of Project changes on threatened fauna

Species or community	Status		Recorded?	Impact description	Significant increase in impact?	Outcome
	TSC Act	EPBC Act				
Blue-billed duck	V	-	Yes	Removal of 9 ha of foraging habitat	No	Not significant
Brolga	V	-	No	Removal of potential habitat	No	Not significant
Brown treecreeper	V	-	Yes	Removal of 1,500 ha of foraging and breeding habitat	No	Significant impact still likely
Bush stone-curlew	E	-	No	Removal of potential habitat	No	Not significant
Diamond firetail	V	-	Yes	Removal of 1,500 ha of foraging and breeding woodland habitat	No	Significant impact still likely
Eastern bent-wing Bat	V	-	Yes	Removal of 1,500 ha of foraging habitat and 16.7 km of cliff line (non-breeding) roosting habitat	No	Not significant
Eastern cave bat	V	-	No	Removal of potential habitat	No	Not significant
Eastern pygmy possum	V	-	No	Removal of potential habitat	No	Not significant
Flame robin	V	-	No	Removal of potential habitat	No	Not significant
Freckled duck	V	-	No	Removal of potential habitat	No	Not significant
Gilbert's whistler	V	-	No	Removal of potential habitat	No	Not significant
Glossy black-cockatoo	V	-	Yes	Removal of 1,500 ha of woodland habitat	No	Significant impact still likely
Grey-crowned babbler	V	-	Yes	Removal of 1,500 ha of woodland habitat	No	Significant impact still likely
Hooded robin	V	-	Yes	Removal of 1,500 ha of woodland habitat	No	Significant impact still likely
Koala	V	V	No	Removal of 142 ha of potential secondary and 27 ha of potential supplementary habitat	No	Not significant
Large-eared pied bat	V	V	Yes	Removal of 1,500 ha of foraging and 16.7 km of cliff line (roosting and potential breeding habitat)	No	Significant impact still likely
Little eagle	V	-	No	Removal of potential habitat	No	Not significant
Little lorikeet	V	-	Yes	Removal of 1,500 ha of woodland habitat	No	Not significant
Little pied bat	V	-	Yes	Removal of 1,500 ha of foraging habitat and 16 km of cliff line habitat	No	Not significant
Malleefowl	E	E	No (abandoned mounds)	Removal of potential habitat	No	Not significant
Masked owl	V	-	Yes	Removal of 1,500 ha of foraging and breeding habitat and 1,560 ha of foraging regrowth and grassland habitat	No	Significant impact still likely
Painted honeyeater	V	-	No	Removal of potential habitat	No	Not significant
Pale-headed snake	V	-	No	Removal of potential habitat	No	Not significant

Table 9.4 Effect of Project changes on threatened fauna

Species or community	Status		Recorded?	Impact description	Significant increase in impact?	Outcome
	TSC Act	EPBC Act				
Powerful owl	V	-	Yes	Removal of 1,500 ha of foraging and breeding habitat and 1,560 ha of foraging regrowth and grassland habitat	No	Significant impact still likely
Regent honeyeater	CE	E, Mi	No	Removal of potential habitat	No	Not significant
Scarlet robin	V	-	No	Removal of potential habitat	No	Not significant
Southern long-eared bat	V	V	Yes	Removal of 1,500 ha of foraging and breeding habitat	No	Significant impact still likely
Sloane's froglet	V	-	No	Removal of 9 ha of potential habitat	No	Not significant
Speckled warbler	V	-	Yes	Removal of 1,500 ha of foraging and breeding habitat	No	Significant impact still likely
Spotted harrier	V	-	No	Removal of 1,500 ha of potential woodland and 1,560 ha of regrowth and grassland habitat	No	Not significant
Spotted-tail quoll	V	V	No	Removal of 1,500 ha of potential woodland habitat	No	Not significant
Square-tailed kite	V	-	No	Removal of 1,500 ha of potential woodland and 1,560 ha of regrowth and grassland habitat	No	Not significant
Squirrel glider	V	-	No	Removal of 1,500 ha of potential woodland habitat	No	Not significant
Superb parrot	V	V	Yes	Removal of 1,500 ha of foraging (overwintering) habitat	No	Not significant
Swift parrot	E	E	No	Removal of 1,500 ha of potential woodland habitat	No	Not significant
Turquoise parrot	V	-	Yes	Removal of 1,500 ha of woodland and 1,560 ha of regrowth and grassland habitat	No	Not significant
Varied sittella	V	-	Yes	Removal of 1,500 ha of woodland habitat	No	Significant impact still likely
White-fronted chat	V	-	Yes	Removal of 9 ha of foraging habitat	No	Not significant
Yellow-bellied sheathtail bat	V	-	Yes	Removal of 1,500 ha of woodland and 1,560 ha of regrowth and grassland habitat	No	Significant impact still likely

vi Indirect impacts

The Project changes all occur in the general impact area assessed in the EA, suggesting few additional indirect impacts are likely. However, as a number of comments were raised about the potential indirect impacts of the Project on sensitive ecological features of the PAA, further assessment is provided for indirect impacts from noise and to NPWS estate.

a. Noise

Trains along the rail spur have the potential to create noise and light impacts to the fauna in nearby remnant habitats. Harmful physiological responses to noise exposure in humans and other animals appear at exposure levels of 55–60 dB(A), when these levels are restricted to small areas or when humans or fauna are close to noise sources (Barber et al 2010).

Updated noise assessments were made near Goodiman SCA. Up to ten train movements are expected in a 24-hour period on the proposed rail spur (five trainloads per day). The proposed noise levels reach a maximum of 48 dB(A) at residences about 200–400 m from the rail spur. This noise level is likened to the noise of an average household. While this is likely to be higher closer to the railway as a train passes, this noise level will not exceed the criteria above to cause physiological responses or harm to fauna nearby. Such noise may cause a flight response for some species; however, as with traffic noise, fauna will most likely become habituated to this noise.

b. Impacts on NPWS Estate

The rail spur and water pipeline routes pass along the boundaries of Goodiman SCA and Yarrobil National Park (NP) in two areas. The indirect impacts on NPWS estate were assessed in the EA for these areas in accordance with the *Guidelines for developments adjoining land and water managed by the Department of Climate Change and Water* (DECCW 2010). The Project changes would not increase any potential impacts on NPWS estate already assessed, with additional buffers proposed between the rail spur and Goodiman SCA, decreasing the potential for indirect impacts in these areas.

The connectivity of Goodiman SCA with existing vegetated links will be severed by the rail spur and associated infrastructure. This impact will be mitigated by installing a fauna passage and associated fencing to funnel fauna to the crossing (see Section 9.1.3).

vii Cumulative impacts

The Project changes will not significantly increase cumulative impacts. The Project will increase the impacts on native woodland and regrowth by 5% to that assessed in the EA. In a regional context, this is not considered a significant increase of cumulative impacts.

viii Matters of national environmental significance

Matters of NES in the PAA are threatened ecological communities, plants, birds, bats, and migratory species. The Project changes will affect the following EPBC Act-listed matters:

- a decrease of 5 ha from clearing Grey Box Grassy woodlands; and
- an additional 10 ha of White Box-Yellow Box-Blakely's Red Gum Grassy Woodland will be cleared.

The Project changes will increase impacts on Box Gum Woodland TEC by 83% compared to the impact assessed in the EA. This is largely from reclassifying native pasture to low condition derived native grasslands representative of this community. The proposed additional impacts to Box Gum Woodland will require offsetting.

Project changes will not significantly increase any impacts to EPBC Act-listed Ingram's zieria, *T. linearis* and *H. darwinioides*. Further, additional significant impacts are not likely for the Large-eared pied bat or Southern long-eared bat, with the loss of an additional 90 ha of foraging habitat. These impacts will be compensated for in the updated offset strategy. Additional potential roosting and breeding habitat will not be impacted by the Project changes.

9.2 Response to submissions

9.2.1 Survey effort for vegetation plots and mapping delineation

Submissions

NA-2, G-17, G-16

Issue

Several submissions comment on the flora survey effort for vegetation mapping and plot-based surveys. OEH does not agree the reported number of vegetation survey plots used per stratification unit between 2009 and 2012 (including previous baseline surveys) was greater than that recommended under the DEC (2004) *Working Draft Threatened Species Survey and Assessment Guidelines* (45 used versus 33 recommended in the guidelines). OEH says the number of required plots for 1,231 ha of Ironbark/Cypress Woodlands should have been 12 and not 10. OEH also considers the stratification units used were very coarse, and should have used the refined 15 vegetation types provided later in the assessment.

Submissions also comment on the amount of survey effort used at the site to determine the vegetation types. One submission comments the flora survey work done in the key areas of impact over 13 days during September to November in 2011, and 13 days between January and March 2010, is inadequate to provide evidence of how the specific figures of vegetation areas were arrived at. It also states the specific areas of vegetation types across the impact area, provided in Table 4.2 (Appendix H), are based on broad-scale mapping completed in 2004 and 2006, and aerial photograph interpretation with limited ground truthing outside the impact area. The comments extend to how this mapping has been used to inform the offset strategy.

Response

It is agreed the plot requirements for the Ironbark/Cypress Woodland should have been 12 and not 10 according to the DEC (2004) guidelines. A copy of Table 3.3 from the Terrestrial Ecology Assessment (Appendix H of the EA) is reproduced below (see Table 9.5).

The total vegetation plots surveyed were 45 in comparison with 33 required by the guidelines. Thirteen ironbark/cypress pine plots were surveyed.

The study area was stratified to determine the required survey effort based on available vegetation mapping, soil and topographical information. This is in line with the DEC (2004) guideline, which state:

> The survey area should be initially stratified on biophysical attributes (eg. landform, geology, elevation, slope, soil type, aspect), followed by vegetation structure (eg. forest, woodland, shrubland), and then floristics (eg species).

The stratification units described in Table 9.5 include information on the landform (hill slopes and footslopes, flats and depressions or flats and foot slopes), vegetation structure (woodland, regrowth or pasture) and floristics (ironbark, cypress, box, red gum etc). As such, it is considered that the study area has been stratified appropriately, according to the DEC (2004) guidelines, to determine the effort required for plot-based surveys.

Table 9.5 Stratification units and number of survey plots

Stratification unit	Approximate area[1] (ha)	Number of plots required	Number of plots surveyed (2009–2012)
Ironbark/Cypress Woodlands (hill slopes and foot slopes)	1,231	~~10~~ **12**	13
Box Woodlands (flats and depressions)	80	3	12
Red Gum Woodlands (flats and foot slopes)	191	3	5
Regrowth	365	5	5
Native pasture	967	10	10

Notes: 1.Hectares measured from GIS analysis of the study area

In addition to plot-based surveys, rapid assessments were used across the study area to confirm vegetation mapping and the boundaries of vegetation types (see Figure 3.1 of the Terrestrial Ecology Assessment). These rapid assessments were particularly important for determining the accuracy of vegetation mapping and typing to the Biometric Vegetation Types database.

Vegetation was mapped, as discussed in the methods (Section 3.3.2) of the Terrestrial Ecology Assessment (Appendix H of the EA), using detailed vegetation mapping completed by ERM for the baseline studies, previous broad scale vegetation mapping, aerial photograph interpretation and field surveys. Section 3.3.2 states:

> Vegetation types were assessed in the field using a combination of plot surveys and rapid assessment surveys. Vegetation type boundaries were mapped either on foot or from a vehicle using a global positioning satellite (GPS) receiver, whilst referencing aerial photographs and topographic maps. Field based assessments were followed by aerial photograph interpretation (API) and analysis using a geographic information system (GIS), to create a comprehensive vegetation map of the direct impact areas within the study area.

One submission comments on the flora survey effort, but only cites the EMM targeted threatened flora search dates. Whereas in addition to these dates there were vegetation mapping and ground-truthing surveys as well as the baseline surveys, which included vegetation mapping surveys and targeted flora searches throughout spring 2009 and summer and autumn in 2010. Apart from these, grassland was surveyed in spring 2011 and in January 2013. This combined survey effort is considered to be enough to have sampled the vegetation types within the study area, map these in a GIS and then determine areas of each community.

9.2.2 Survey effort for threatened flora species

Submissions

NA-2, CA-2, G-17

Issue

OEH comments that threatened flora species may have been missed or underestimated as a consequence of inherent autecological traits (ie the relationship between a species and its environment). OEH notes that all four threatened flora species recorded in the Project area may be considered cryptic, or hidden, (in particular *T. linearis*). Moreover, several species that were not recorded but which are known to occur nearby (eg *Rulingia procumbens* and *Philotheca ericifolia*), are all likely to respond positively to fire (and conversely may be absent from areas that have not been burnt for long periods). Therefore, the recent fire history of the Project area would influence the likelihood of detection of such species.

One submission comments there is a high probability that other threatened flora species, such as *Philotheca ericifolia* and *Diuris tricolor,* occur in the area of impact. The submission notes these species have not been included in the offset credits analysis because they were not recorded in the study area and were not considered likely to occur or be impacted by the Project.

Response

Section 3.5 of the Terrestrial Ecology Assessment (Appendix H of the EA) details the methods for the targeted flora species searches. Surveys were undertaken for all flora species with the potential to occur the study area in suitable habitat areas. Targeted flora surveys occurred throughout spring 2009 and summer and autumn in 2010 as part of the baseline surveys. In addition, grassland surveys were undertaken in spring 2011 and EMM completed targeted flora searches of the impact area in spring 2011.

A total of more than 201 hours was spent in the study area targeting threatened flora species in suitable habitat areas. In addition to the targeted searches in the impact area, later in 2012 the offset areas that surround the Project area in suitable habitat were surveyed to identify threatened flora. It is considered the survey effort employed to detect threatened flora species over a number of years and seasons is enough to meet the DEC (2004) threatened species survey guidelines.

A habitat assessment was undertaken for all threatened flora species considered likely to occur in the study area based on previous records in the locality and habitats present (Appendix A of the Terrestrial Ecology Assessment). This included an assessment of *Philotheca ericifolia, Diuris tricolor* and *Rulingia procumbens*, which respectively were considered likely to have a high, high and moderate likelihood of occurring in the study area. This is a reflection of the presence of suitable habitat and the nature of the species (eg response to fire, grass cover). As such, these species were targeted during the threatened species searches in the study area.

Although not recorded during the surveys, the potential impacts of the Project were assessed in accordance with Section 5A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to determine the significance of any Project impacts on these species (see Appendix B). It is considered these have been assessed appropriately given their likely occurrence.

9.2.3 Survey effort for fauna species

Submissions

G-16, G-17, I-10

Issue

Several submissions comment on the survey effort undertaken for fauna species for the Project. They cover a number of issues, namely:

- thoroughness and scale of surveys to detect rare species and species likely to be using the site;
- fauna assessment methods did not use trapping to detect the threatened squirrel glider (*Petaurus norfolcensis*), eastern pygmy possum (*Cercartetus nanus*) or the endangered spotted-tailed quoll (*Dasyurus maculatus maculatus);*
- spotlighting for nocturnal birds and mammals only occurred at 16 locations across the Project area;
- pitfall trapping is the most effective way to detect reptiles which the survey did not use;
- the survey describes a small set of reptiles (25 species out of a regional total of more than 100 species) and relies on Goldney for a reptile species list — Professor Goldney has consistently failed to report Rosenberg's goanna from the region, despite it being picked up near Orange and Hill End, and *Aprasia* has also been recorded in Goulburn River National Park and near Dubbo; and
- the reptile survey work by ERM and EMM is so poor as to be effectively useless in making a determination — it is not possible to say there will not be an impact on species that are not even mentioned, much less discussed.

Response

The fauna surveys were designed to target threatened species with the potential to occur the study area. Accordingly, comprehensive database searches, Biobanking assessments, literature reviews and discussions with local NPWS officers were used to gain information on the occurrence (or potential occurrence) of threatened species within a 30 km radius of the study area. The industry standard for database searches is 10 m radius from the study area. The DEC (2004) *Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities Working Draft* was consulted to ensure the survey effort was adequate.

Reptiles: The minimum survey effort suggested by the DEC (2004) guidelines for threatened reptile nocturnal searches and habitat searches for the stratification unit areas of the study area is 30 hours (see Table 1). The ecological assessment completed 210 person hours of searching (see Table 9.6). This additional effort was considered to compensate for not using pitfall trapping. Where habitat was recorded for a threatened reptile and recent records occurred nearby, but the species was not detected, it was assumed to be present. Therefore it is highly unlikely that any threatened reptile was not considered in the assessment, where suitable habitat was present. Rosenberg's goanna and *Aprasia parapulchella* may have been recorded within the wider region, but the recorded sightings are between 50 and 150 km from the study area. In the absence of any closer records, species records from the site, or suitable habitat on site, it is assumed the species does not occur and will not be impacted by the Project.

Threatened mammals: The mammal species targeted by surveys were considered to be detectable using methods other than Elliott and cage trapping, including hair sampling, scat analysis, infrared cameras, spotlighting and call playback, all of which had recorded the target species in nearby reserves (NPWS 2000). The surveys included spotlighting at 16 locations, which were visited on 29 occasions. This would equate to more than 60 person hours of spotlighting (at least one hour, two persons per visit), which is double that recommended in DEC (2004). All of the threatened species with habitat present within the study area were assessed under state and (where required Commonwealth) legislation. Using a precautionary approach, where suitable habitat occurred, mammal species were assumed to occur whether or not they were detected, to assess the impacts of the Project. The fauna survey effort is summarised in Table 9.6.

Table 9.6 Fauna survey effort

Group	Survey method	Survey effort	Survey timing
General	Habitat assessments and searches for signs	Over 450 person hours	Spring 2009, Summer–autumn 2010, Spring–summer 2011
Reptiles	Active search	96 person hours	Summer 2011
	Nocturnal search	114 person hours	Summer 2011
Birds	Timed diurnal search	69 search areas (20-60 minutes per search)	Winter and spring 2009, Summer and autumn 2010, Winter and summer 2011
Microchiropteran bats	Anabat detection	39 detector nights	Spring 2009 and 2011
	Harp trapping	18 trap nights	Spring 2011
Non-flying mammals	Arboreal hair tubes	1,600 trap nights	Spring–summer 2011
	Ground hair tubes	2,707 trap nights	Spring 2009, summer 2011
	Koala spot assessment	20 person hours at 20 plots	Summer 2011
	Infrared camera surveys	41 days and nights at 15 locations	Spring 2009, summer 2011
Nocturnal birds and mammals	Call broadcasting and spotlighting	16 locations on 29 occasions	Spring and summer 2009, Spring and summer 2011

9.2.4 Survey results

Submissions

G-17, CA-2, NA-2

Issue

These submissions argue there is a lack of plot, rapid assessment, grassland plot data, and targeted threatened flora search methods provided in the EA. The description of flora survey work for the changed mine plans, which was the subject of the baseline ERM surveys, was also considered difficult to follow.

Response

Threatened flora search methodologies and results are provided in the ecological assessment (Sections 3.5 and 5.3). Further details are provided in Section 9.2.2 above. Plot data have now been included.

The design of the mine has changed on a number of occasions since 2009. With each change, the ecological assessments were reviewed and additional surveys undertaken if new areas of impact were identified. The EMM surveys in 2011–2012 focused on areas not already covered in the ERM baseline ecological assessments. The area of focus centred on the vegetated slopes in the north-east and eastern parts of the study area and areas associated with additional infrastructure. The methods for the EMM surveys are presented in the Terrestrial Ecology Assessment. Overviews of these baseline surveys were provided in the TEA when discussing the survey effort in the Project area. The results provided combine the findings of the baseline surveys and the EMM surveys of the Project area.

9.2.5 Assessment of grasslands

Submissions

NA-2, I-10

Issue

OEH comments on the justification provided for not including identified grassland in the study area as derived native grasslands, forming part of the White Box – Yellow Box – Blakely's Red Gum Woodland (Box Gum Woodland) endangered ecological community under the TSC Act. The value of the grassland areas is also questioned by another submission. OEH recommends that plot data collected for grasslands are publically exhibited.

Response

In response to submissions, EMM completed additional rapid assessments of grasslands in January 2013. Results of the assessments were compared to the OEH and SEWPaC identification guidelines, policies and determinations for Box Gum Woodland and Grey Box Woodland Derived Native Grasslands (DNG). As a consequence, 105 ha of grassland previously mapped as native pasture was reclassified as Box Gum Grassy Woodland DNG, 34 ha was reclassified as Grey Box Woodland DNG and an additional 14 ha as Fuzzy Box Woodland DNG, as listed under the TSC Act. No areas were of sufficient quality to qualify for protection under the EPBC Act (determined using the EPBC Act policy statements for the woodlands).

It should be noted that at the time of the January 2013 surveys all areas were depauperate, that is lacking in numbers or undeveloped, in forbs and had low species diversity. All areas of grassland within the PAA have been grazed by cattle and sheep and were typically dominated by *Aristida* spp. (three awn grass) and *Austrostipa* species (speargrass), both of which are grazing tolerant species. Where Box Gum Woodland was present in areas adjacent the grassland, higher species diversity in both forb and grass species was observed, indicating the higher levels of disturbance the grasslands of the PAA have been subject to historically. Grey Box Woodlands of the PAA were observed to be particularly susceptible to weed invasion.

9.2.6 Vegetation and habitat removal

Submissions:

G-19, G-11, G-13, G-20, I-15, G-15, G-2, G-3, G-5, G-13, I-15, I-11, I-12, I-13, G-16, G-17, I-8 G-10 I-10, I-14, I-15

Issue

A number of submissions assert the Project will have impacts on biodiversity that cannot be adequately mitigated or offset, including disturbing 47 km^2 of land with high conservation and agricultural value, groundwater and surface water resources, 1,867 ha of woodland, 39 threatened species and 16 kms of ridgeline habitat. Further comments are made on the water catchment and security of water resources, local extinctions in the Central West CMA and the already over-cleared nature of the region with only a small area being conserved.

The removal or disturbance of key habitat values, including large hollow-bearing trees, ridgeline, foraging areas and important in-stream deep pools and drought refugia, are seen as inconsistent with the recovery of various threatened species listed for protection under the TSC Act and EPBC Act. In addition it is asserted that removing or disturbing key habitat values across 4,700 ha cannot be adequately offset for a range of threatened species.

Response

The Project as reported in the EA will cover an area of 4,700 ha, not 47 km^2. This has now changed to approximately 4,530 ha from the Project refinements. This includes up to 1,960 ha of woodland vegetation and about 1,200 ha of grasslands that will be directly impacted by the Project. This is 21% of the native vegetation within the PAA (see Table 9.1) and 7% of the non-reserved native vegetation within the Talbragar Catchment Management Area sub-region (clipped to the Dubbo 1:250,000 map sheet).

Progressive clearing in the Project footprint will mean that only a proportion of the total vegetation will be removed at any one time. Progressive rehabilitation will reinstate more than 1,900 ha of woodland representative of the existing vegetation types, and more than 1,600 ha of native pasture. The area of woodland vegetation in the PAA will be increased in the long term as a result of the rehabilitation program, though it is recognised that these will be of decreased biodiversity value, and the implementation of offset strategy.

Only 8% of the vegetation to be removed affects endangered ecological communities. Impacts on threatened ecological communities and species habitats will be compensated through the offset strategy. Offsets will result in up to 1,428 ha of TECs conserved, managed and enhanced (based on preliminary calculations of likely offset requirements). About 50% of these offset requirements have already been identified in secured offset areas.

Other vegetation types will be offset, with a minimum 8,000 ha conserved in offset areas (when the package is finalised). Almost 40% of these offset requirements have been secured to date. These areas represent threatened fauna habitat and will provide an offset to clearing ratio of 3:1 for threatened fauna habitat. Proposed offsets contain habitat features for the threatened species impacted by the Project and will protect this habitat in perpetuity. The habitat is on private land and vulnerable to impacts associated with existing agricultural land uses. Indirect offsets will also be provided through funding for research and management of threatened species. This will result in a gain in protected threatened species habitat in the Central West region.

The proposed offsets have been positioned to improve the connectivity of conservation areas and promote the movement of threatened species throughout the locality. The offsets will decrease the isolation of conservation areas and add important habitat conservation areas.

9.2.7 National significance of temperate woodlands

Submission

G-17

Issue

This submission questions the removal of temperate woodland from the study area. In addition the loss of habitat resources from the woodlands, such as hollows, and the loss of habitat for the declining woodland birds of the sheep/wheat belt was an issue. Temperate woodlands are cited as being the most threatened tree ecosystem in Australia.

The submission cites the impacts of clearing, fragmentation and loss of connectivity as having caused major degradation of woodland ecosystems. Conservation of the remaining woodland ecosystem is seen as one of the most urgent priorities for nature conservation and agricultural production.

Response

The Project will result in about 1,986 ha of woodland (and regrowth) being lost from the study area. However, up to 8,000 ha of offset areas have been identified to compensate for these impacts, with a total of 3,826 ha of CHC-owned land secured as offset sites around the Project area. These areas will be conserved in perpetuity to protect and enhance the ecological values present. More than 700 ha of TECs will be conserved by the offset package, with 50% of this requirement already fulfilled by the secured offsets. More than 3,000 ha of temperate woodlands that were in private tenure will be secured and added to the regional conservation network, with an extra 5,000 ha identified as potential additions to the offset package.

In the Project area important woodland resources, such as hollows, are mainly found in areas that have never been cleared or have only been selectively logged, such as along Spring Ridge Road. This area will be conserved within the PAA. All other privately owned woodland areas have been subject to logging and firewood collection, which has reduced the number of mature trees and hollows available for roosting and nesting.

Assessments of the loss of important habitat resources and the use of habitats by fauna of the PAA are described in Section 4.5 and Section 6.3 of the Terrestrial Ecology Assessment.

9.2.8 Impacts on flora

Submissions

G-11, G-17, I-15, G-19, I-14, G-2, G-3, G-5

Issue

The submissions reiterate facts presented in the EA in reference to the impacts of the Project on threatened flora species, which they see as unacceptable, having a significant impact and not being consistent with the recovery of the species.

One submission states a species impact statement (SIS) under the NSW Act should be prepared and that the ecological assessment does not adequately address impacts to matters of National Environmental Significance and should therefore be seen as inadequate under both state and Commonwealth legislation.

Response

The Terrestrial Ecology Assessment states that significant impacts are likely for three of the threatened flora species found in the PAA. Threatened flora species occurrence and the impacts of the Project are detailed in Section 6.3 of the Terrestrial Ecology Assessment. All threatened flora species directly potentially impacted have been assessed under state (and where applicable Commonwealth) legislation. These assessments are provided in Appendix B of the ecological assessment.

There is no requirement for an SIS for Projects being determined under Part 3A of the EP & A Act. Matters of NES were initially addressed in a referral to the Commonwealth, whereby the Project was determined to be a controlled action and was then accepted for assessment under the bilateral agreement between NSW and the Commonwealth. In addition, an updated separate report detailing and assessing matters of NES has also been provided as Appendix D to the Terrestrial Ecology Assessment.

9.2.9 Rehabilitation

Covers submissions

G-16, G-14

Issues

The submissions question the adequacy of mine rehabilitation in relation to loss of habitat and compensation for affected plant and animal species. In addition, they consider the revegetation of cleared areas in the proposed offset lands to be of little benefit to threatened species in the long term, with reference made to Cristescu et al. (2012).

Response

Good practice rehabilitation methods will be used to enhance the habitat provided to threatened species including fauna such as that described in Cristescu et al. (2012), including:

- implementing feral predator control to decrease impacts on recolonising fauna;
- catering for hollow-dependent fauna by providing nest boxes; and
- increasing landscape complexity by adding dead stags, rocks, log piles and coarse woody debris.

In addition to the rehabilitation of the mined areas, the offset lands will secure up to 8,000 ha of native vegetation that is unsecured. This is a net improvement of 6,000 ha of native vegetation conserved and managed for biodiversity within the locality and the region.

At present, only 200 ha of DNG and 340 ha of native pasture have been included in the offset calculations for the offset strategy (Appendix H). However, cleared, disturbed or exotic-dominated areas represent an additional 1,200 ha (24%) of the proposed offsets. It is agreed the highest value to threatened and native species will be areas where there has been no clearing. Nevertheless, revegetation of these disturbed areas will contribute stepping stone habitat for native species. These outcomes are yet to be included in the offset calculations in light of available better quality habitat in proposed offset additions.

Small birds, such as the speckled warbler, in particular, favour these young age revegetated areas (Taylor et al. 1997) and regrowth vegetation has been shown to make an important contribution to landscape restoration in highly-modified agricultural landscapes in the Brigalow Belt bioregion (Bowen et al. 2009). During the Project surveys, threatened species, such as the hooded robin, were associated with areas of regrowth vegetation.

9.2.10 Fauna-related impacts

Submissions

I-10, G-17, I-8, G-19

Issue

These submissions state the ecological impact assessment is deficient and determines a conclusion of 'no significant impact'. They consider the Project will have significant impact on threatened species in the over-cleared Central West region and that such impacts cannot be mitigated or offset.

Response

The Terrestrial Ecology Assessment (Appendix H of the EA) provides a range of avoidance and mitigation measures to minimise impacts on threatened species. However, three EECs, three threatened flora species and 21 threatened fauna species are likely to be significantly impacted by the Project after mitigation (see Table 6.2 of the Terrestrial Ecology Assessment). These species and communities have been assessed according to state and Commonwealth legislation, as provided in Appendix B of the Terrestrial Ecology Assessment. Impacts to species in the context of the region are considered in Appendix B and Section 6.3 of the Terrestrial Ecology Assessment.

Residual impacts on threatened species and communities will be compensated by the offset strategy, which is still being refined and finalised in consultation with OEH and SEWPaC. The resultant offset package will protect threatened species and their habitat in perpetuity in the region. It will also provide indirect offsets through funding for research and management of threatened species. This will result in a gain in protected threatened species habitat in the Central West region.

9.2.11 Impacts on bats

Submissions

G-17, I-15, G-2, G-3, G-5, G-11, G-19

Issue

These submissions reiterate facts presented in the ecological assessment and state that roosting and foraging habitat for threatened microbats within the study area is significant. The loss of ridgeline for the large-eared pied bat is considered significant.

Response

The ecological assessment considered that significant impacts would result for a number of threatened bats including those mentioned in the submissions. All species have been assessed for impacts according to state and Commonwealth legislation (see ecological assessment Appendix B Section B.1 Tables B.19 and B.20 and Section B.2 Table B.33). These impacts cannot be avoided or minimised by the design. As such, mitigation measures including incorporating replacement cave habitat to new structures (eg bridges), and placing roost boxes for hollow-dependent microbat species, will be implemented (Terrestrial Ecology Assessment Table 6.1). In addition, offsets have been secured that contain suitable cave and tree roost habitat for all microbat species that will be impacted by the Project. The protection and management of such habitat in perpetuity will compensate for any residual impacts on microbat species.

9.2.12 Impacts on birds

Submissions

G-18, G-2, G-3, G-5, G-17, G-18 G-19 I-14, I-15, G-11

Issues

These submissions focus on the removal of habitat at a time when temperate woodland birds are in decline. The cumulative impact of habitat destruction is considered to be the major cause of long-term declines. Consequently, developments such as the Project contribute and accelerate the extent of decline and, it is anticipated, will result in listing of additional species.

They also comment about the threatened species considered likely to be significantly impacted by the Project (see Table 6.2 of the Terrestrial Ecology Assessment).

In addition to reasserting the facts stated in the ecological assessment, one submission identifies the recent sightings of two regent honeyeaters (*Anthochaera phrygia*) within 15 km of the mine site, at Tallawang, stating it is possible this species would use the woodland areas near the proposed mine site. It also submits that any wetland known to support the Australasian bittern (*Botaurus poiciloptilus*) must be considered important and warrants protection.

Response

EMM considered the regent honeyeater has the potential to occur within the PAA and assessed the species for impacts under both state and Commonwealth legislation (see Appendix B Section B.1 ix Table B.15 and Section B.2 iv Table B.25). EMM also assessed the habitat where the Australasian Bittern was recorded as foraging habitat only and thus it is not known to 'support' the species for extended periods. The species has not been recorded within the PAA since the first observation, despite the many surveys done. In addition, other wetland areas suitable as habitat will be conserved within the wider PAA (see Appendix B Section B.1 xi Table B.11 and Section.2 v Table B.26).

Potential impacts will be mitigated through a biodiversity management plan, which will investigate and implement the best measures to minimise the impacts on fauna from the loss of hollow-bearing trees (eg nest boxes or relocating hollows). In addition, most of the threatened bird species have been identified in the proposed offset areas and suitable habitat resources are present in these areas. The offsets will compensate for any residual impact on birds by protecting and managing these areas perpetuity.

9.2.13 Impacts on groundwater dependent ecosystems

Submissions

G-11, G-15, G-19

Issues

These submissions comment the loss of base flow as a result of drawdown will degrade riparian vegetation and other groundwater dependent ecosystems (GDE), and there has not been enough consideration of the impacts associated with loss of water availability to terrestrial fauna species during drought. Others note deep pools act as drought refugia (refuges) in ephemeral streams and could be degraded GDEs.

In addition they argue the removal or disturbance of key habitat values across 4,700 ha, including important instream deep pool drought refugia, cannot be adequately offset for a range of threatened species. They also state the EA also did not adequately consider that threatened terrestrial species rely on habitat provided by healthy riparian vegetation and access to water during drought.

Response

The Project is expected to have minor effects on GDE (see Section 4.4). Within the PAA there are a large number of farm dams that provide water resources for terrestrial fauna and it is unlikely they would rely solely on the creeks. It was observed during drought in 2009 that the creeks were predominantly dry with very few deep pools, and it is assumed that fauna would have used other resources within the immediate area during this period. These issues are discussed in Section 4.4 of the ecological assessment. Where species rely on aquatic habitat for their survival or breeding, this is discussed in Section 4.5 of the ecological assessment, and in the threatened species impact assessments of Appendix B, where applicable.

Because the main riparian areas will not be subject to direct impacts riparian habitat will be available for threatened species throughout the life of the mine. Indirect impacts to these areas from potential groundwater drawdown are discussed in Section 6.3.2 of the Terrestrial Ecology Assessment. A large water storage dam will provide a permanent water source for the life of the mine for fauna species. Offset areas also contain water resources and will compensate for any loss of water resources for affected species.

9.2.14 Cumulative impacts

Submissions

G-11, G-16, G-17, G-18, G-19, I-15

Issues

These submissions comment the EA does not adequately assess the cumulative habitat loss taking into account the Ulan, Wilpinjong and Moolarben operations to the east, and other potential projects.

The cumulative impacts on bats are seen as a particular issue, as well as potential cumulative impacts on the values of the Hunter Catchment, given that the Project area occurs within the Brigalow Belt South Bioregion, which extends into the upper Hunter.

Others comment on competition for displaced threatened species, with CWEC considering this issue is not adequately addressed.

Response

Section 6.3.3 of the Terrestrial Ecology Assessment discusses the cumulative impacts of the Project. Impact assessments provided in Appendix B also discuss potential cumulative impacts in reference to particular threatened species that could be, or are likely to be, affected, including bats.

The Project area falls within both the Brigalow Belt South and the South Western Slopes, with the two bioregions crossing a number of catchments. Specific discussion of the Hunter Catchment in the assessment is therefore not warranted, unless specific assessments are completed for each of the catchments covered in this wide bioregion. In addition, while the EA recognised there is potential for additional cumulative impacts from future mining projects in the region, it is not possible to predict impacts from projects that are uncertain and where no related spatial information is available.

Discussion of competition for displaced threatened species is provided in Section 6.3.2 of the Terrestrial Ecology Assessment, mainly focusing on the potential indirect impacts on the surrounding NPWS estate. Several mitigation measures have been proposed to minimise competition, including providing replacement hollows and investigating replacing rocky outcrops, given these are a limiting habitat feature in the landscape. The Project will progressively disturb and rehabilitate areas, with the surrounding offset areas regenerating and improving in habitat quality over the life of the mine through the recommended management measures. This will result in a net increase in the amount and quality of habitat in the locality for threatened species. Thus, increased competition for habitat when considered cumulatively in the region, will be suitably mitigated and residual impacts offset for threatened fauna species identified in the Project area.

9.2.15 Biodiversity corridors

Submissions

G-11, G-15, G-17 G-19, NA-2

Issues

These submissions comment that some areas of woodland occurring in the mine footprint were identified by the CW CMA as important regional biodiversity corridors, with the Project expected to cause a significant loss to biodiversity targets and planned landscape connectivity improvements in both the short and medium term.

They question the ability of the offset strategy to mitigate the medium- to long-term losses and argue the potential local extinction of at least 12 threatened species has not been adequately addressed in the offset package. They submit the Project will cause considerable delay in achieving landscape-scale connectivity across the heavily cleared wheat-sheep belt of central NSW, and that the disruption of mature habitat linkages has not been addressed. OEH believes provision should be made for wildlife movement across the rail spur between Goodiman SCA and Tuckland SF, by way of underpasses or other suitable means, particularly in the north-west corner of Goodiman SCA where it abuts a vegetated corridor.

Further, two submissions do not support the claim made in the EA that:

> Ongoing ecological management, rehabilitation works and the offset package will improve the connectivity of remnant habitat within the locality and result in an improvement to the quality, quantity and protection of biodiversity within the region in the medium to long term.

Response

The mine pits occur on the edge of an area identified for vegetation connectivity in data provided by the Central West CMA (see Figure 4.5 of the Terrestrial Ecology Assessment). Consequently there will be some minor impacts on the edge of these corridors, but none of them will be dissected by the Project, with most being improved by the offset strategy.

The offsets are strategically located to increase and promote flora and fauna movement through local and regional corridors. Management measures will be installed to minimise any barrier effects to of the rail spur and associated infrastructure. This includes dedicated fauna passages and combined drainage/fauna underpasses. The offset areas will also enhance the amount and condition of native vegetation surrounding the Project area, improving connectivity in the long term between conservation areas and important patches of habitat.

Rehabilitating areas through natural and assisted regeneration in the offsets will improve the ability of fauna to move through the landscape. Regrowth vegetation has been shown to make an important contribution to landscape restoration in highly-modified agricultural landscapes in the Brigalow Belt bioregion (Bowen et al. 2009). It is also known to provide habitat for a range of fauna species that prefer dense vegetation.

9.2.16 Office for Environment and Heritage Estate

Submission

NA-2

Issues

The OEH comments the likely indirect impacts on OEH Estate as a result of the mine (eg edge effects, fragmentation, noise, light spill and dust) are not specifically addressed. It also comments on the need to consider the impacts from rail traffic noise along the rail spur, particularly where the rail runs next to Goodiman SCA and other areas of intact native vegetation where species may be affected. The OEH recommends further consideration be given to the likely indirect impacts of the proposal on the OEH Estate and the degree to which such impacts could actually be mitigated.

Response

Section 6.3.2 of the Terrestrial Ecology Assessment discusses the potential indirect impacts of noise, dust, fragmentation, edge effects and connectivity. These sections discuss the indirect impacts of the Project on land and habitat surrounding the Project area, including the National Parks estate. In particular, Section 6.3.2 discusses the impacts on land under the NSW Brigalow and Nandewar Community Conservation Area Act 2005, including the key issues under the *Guidelines for developments adjoining land and water managed by the Department of Climate Change and Water* (DECCW 2010) where relevant to the Project.

Mitigation measures will be installed to improve the movement of fauna across mine-related infrastructure in such areas and cleared and disturbed areas will be regenerated over time to create vegetated corridors as part of the offset strategy. Three drains are being designed to incorporate dry fauna passages near the Goodiman SCA and offset areas. In addition, a dedicated fauna crossing will be built in the vegetated corridor to the north of the Goodiman SCA to minimise the barrier effect of the rail spur. Section 9.1.3 provides further information on these.

9.2.17 Nature of mounds in the Project area

Submission

NA-2

Issue

Numerous large earthen mounds occur in the Project area and CHC reported this to the OEH. The OEH made a short site visit with the Proponent in January 2012 to investigate these mounds.

There are a number of possible explanations for their origin, which may span either natural or historical heritage. The Proponent states a precautionary approach was adopted when considering the nature of these mounds in assuming "that they are old, unused Malleefowl mounds" (p. 94). Although the Proponent acknowledges possible alternative origins of these mounds (the "result of past clearing activities where mounds were built-up by piling and burning of tree stumps" (p. 94)), the OEH considers they warrant a proper assessment of their potential significance.

Response

The potential significance of the earthen mounds in respect to their potential European origin has been assessed in the historic heritage response to submissions (see Section 18.2.3). This origin was identified given the presence of charcoal and stumps in some of the mounds, and therefore these were likely a result of past clearing activities where the mounds resulted from piling and burning tree stumps.

The mounds were assessed to determine their significance and the potential Project impacts, in the Terrestrial Ecology Assessment, using the precautionary approach and assuming they were biologically derived. The assessment considered the impacts assuming they were biologically derived (from previous occupancy of the Malleefowl in the Project area). The mounds identified did not appear to have any signs of recent use and the Malleefowl was not identified in the Project area. In discussions with OEH officers on site, it was considered these were old given the erosion noted and lack of signs of use.

The assessment of significance (seven-part test) for the Malleefowl considered the mounds to be inactive; however, this species was considered to have a moderate chance of occurring at the site given the location of known populations nearby. Breeding Malleefowl tend to be sedentary, nesting in the same area year after year (Benshemesh 2007). As no active nests were observed during the breeding season for this species, it was considered unlikely this species is breeding in the Project area. The assessment of significance concluded that potential Project impacts on Malleefowl should it occur in the Project area, would not be significant.

9.2.18 Offset design

Submission

NA-2

Issues

The OEH questions the connectivity of the offset sites, given the position of the Golden Highway in the north and the rail and road corridors in the south. While existing roads are recognised to already represent barriers to fauna, the Project is considered likely to exacerbate these barriers. This is particularly a concern given the likely increase of road use as a consequence of the Project.

While the Terrestrial Ecology Assessment discusses providing fauna movement structures close to the offset areas, the OEH asks for further information on how the Project will address barriers to fauna movement. Such structures are considered to constitute mitigation measures and are not considered part of the overall offset package.

Response

When the EA was prepared details of the proposed fauna movement structures were not available. Details of the design, implementation and demonstrated efficacy of mitigation structures proposed for the Project are now available and are included in Section 9.1.3.

9.2.19 Offset areas

Submissions

NA-2, G-11, G-18, G-19, G-17

Issues

These submissions comment on inconsistency between the maps in the biodiversity offset strategy and the EA and terrestrial ecology report. This mainly relates to the offset area that abuts the Cobbora SCA in the north-west not being depicted in maps showing CHC-owned land. Questions arise about the location of the total offset areas of 5,667 ha and which of these CHC owns. The OEH also identifies that some of the areas not included in the offset package could represent favourable areas for reservation and addition to the OEH estate.

Other comments raise concerns about some offset areas being on known coal resources and question the methods for conservation and certainty of in perpetuity protection.

Response

CHC was still acquiring the offset areas when the EA was completed. As such, some areas identified as potential offsets have now been acquired and some have had detailed surveys completed. While the offset package is not yet complete, it has been updated to reflect these changes and is included as Appendix F. More than 5,000 ha have been secured as offsets, with an expected 8,000 ha in the final offset package. Offsets secured so far contain more than 3,800 ha of native vegetation and will be subject to conservation agreements when the Project is approved.

All proposed offset sites have been chosen in consultation with the Project engineers and geologists. While a small number of properties are in areas overlying potential coal resources, these are likely to be excluded from future mining due to their closeness to Yarrobil NP and long haul distances to coal processing and loading facilities to the north. The Department of Trade and Investment (Resources and Energy) has been consulted about the secured offset areas, and has not raised any objections to the location of the offsets.

CHC is committed to the in perpetuity protection of offset areas. These areas will be reserved under formal conservation agreements as discussed in the offset strategy, with some areas being reserved as part of the OEH estate. The OEH was consulted about the acquisition of identified offset areas, with a number of the secured and proposed offset sites identified as priority areas for addition to the NPWS estate.

9.2.20 Rehabilitation in the offsets

Submission

G-2, G-3, G-10, G-11, G-15, G-19

Issues

Several parties question the inclusion of mine rehabilitation within the offset strategy. They also question replacing habitat features that require significant timeframes to develop, such as hollow-bearing trees, using rehabilitation.

Response

Mine rehabilitation has not been included in the offset package. However, it is discussed in the Terrestrial Ecology Assessment, as it forms part of the overall Project outcomes that will help to bring about a 'maintain or improve outcome' for the Project.

The offset areas contain disturbed woodland remnants and the better quality disturbed areas will be subject to both natural and assisted rehabilitation as part of the offset package. These areas add to the outcomes of the offset strategy and increase the amount of representative habitat for threatened species in the locality.

9.2.21 Long-term protection of offsets

Submissions

G-10, NA-2, G-17, G-18, G-19, G-17 and G-19

Issues

These submissions question the viability of long-term protection of the proposed offset areas. One submission believes there is no certainty provided in the EA that the proposed offset package will be given a secure level of protection in perpetuity. The OEH comments any offset areas that will be transferred to the OEH estate will need to be accompanied by an appropriate level of management funding.

Response

CHC is committed to securing and providing long-term offsets to compensate for the residual Project impacts. The proposed offset areas will be managed for conservation through funding arrangements agreed with the OEH for additions to the OEH estate and by CHC on CHC-owned lands. CHC-owned lands will be subject to a formal conservation agreements on the titles of the land as discussed in the biodiversity offset strategy and its update (Appendix H).

9.2.22 Finalisation of the offset strategy

Submissions

G-17, G-17, G-18, G-19, G-17, G-11 and G-15

Issues

A number of parties note that a completed offset package has not been provided in the EA for public comment. They do consider the Director General's Requirements for a comprehensive offset strategy to be prepared "to ensure that the Project maintains or improves the biodiversity values of the region in the medium to long term (in accordance with NSW and Commonwealth policies)" are met.

Response

It is assumed the commitments made in the biodiversity offset strategy and the statement of commitments, will be incorporated in any Project approval. The biodiversity offset strategy has been updated with additional survey results and land acquisitions made since the EA was exhibited. While the offset package is not yet complete, it has been updated to reflect these changes and is included as Appendix E.

9.2.23 Offset adequacy

Submissions

NA-8, G-17, G-20, I-15, G-17

Issues

The Central West CMA questions whether 'like for like' quality of habitat and vegetation is provided in the offset package that is representative of the Project areas. In addition, comments are made that a Tier 3 or "mitigated net loss" outcome for non- "red flag" vegetation types does not represent a "like for like" offset outcome. In addition, comments are made about the condition of the offset areas not reflecting the quality of the Project areas, with the condition of the Project areas being under-represented.

Response

The offset areas have been strategically placed to surround the Project area to conserve similar vegetation types and habitats. Given their closeness, the offset areas have been subject to a similar disturbance history and are therefore in similar if not better ecological condition, due to the lack of broad-scale clearing for agriculture. The offsets proposed will therefore provide "like for like" habitat for threatened species and for ecological communities of conservation significance in a similar condition.

While non-TEC vegetation is recognised to provide habitat for a range of threatened and declining species, a minimum offset ratio of 3:1 is considered to be suitable, given recent approvals for similar Projects in the region. Such recent approvals only usually provide an offset to impact ratio of 2:1 for similar habitat.

An updated biodiversity strategy is included as Appendix H.

9.2.24 Offset outcomes

Submissions

G-17, G-19, G-17, G-17, G-17, G-5

Issues

The submissions question the adequacy of the proposed offsets to compensate for the loss of mature woodland and native grasslands in the region. Similarly, they claim the credits required for the Project are not matched by the credits generated in the offset areas, according to the Biobanking methodology.

They claim outstanding requirements are needed to compensate for loss of Fuzzy Box Woodland, *H. darwinioides, T. linearis*, Ingram's zieria and breeding habitat for large-eared pied bats. They question whether the proposed additional unsecured offset sites are suitable to provide "like for like" offsets for these significant ecological features.

Response

The offset strategy recognised that additional offsets to those already secured would be required to compensate for the Project impacts. The strategy was prepared to provide the framework for the offset package and to indicate the likely minimum offset requirements.

The offset strategy and resultant package is yet to be finalised. Shortfalls still exist for a number of ecological features, including some threatened flora species and ecological communities for which additional land-based offsets have not yet been found.

Additional offset areas are still being investigated and surveyed. The ultimate offset package will be prepared in negotiation with the OEH and SEWPaC to adequately and practically compensate for all residual impacts from the Project.

9.2.25 Grassland impacts not considered

Submissions

NA-2, NA-2

Issues

Some submissions question whether native pasture areas have been included in the offset strategy. The OEH questions whether the significance of the pasture areas (see Section 9.1.2) were assessed, and that without this being appropriately established, it is difficult to determine the adequacy of the proposed offsets. The OEH recommends that grasslands are considered in the offsets strategy, or that justification is provided for not doing so.

Response

In response to submissions, additional grassland assessments were made in January 2013. Accordingly, 105 ha of native pasture was reclassified as Box Gum Grassy Woodland DNG (TSC Act only), 34 ha was reclassified as Grey Box Woodland DNG (TSC Act only), 14 ha was reclassified as Fuzzy Box Woodland DNG. Other areas included as native pasture were considered to be derived from Ironbark Woodlands and Slaty Gum Woodlands. These additional residual impacts for TECs have been added to the offset requirements (see Appendix H). Also see response in Section 9.2.5.

9.2.26 Indirect offsets

Submissions

NA-2 (35)

Issues

The OEH comments that every opportunity for direct land-based offsets should be exhausted before indirect offset measures are considered. The OEH also considers that the proposed indirect offsets represent mitigation rather than offsetting. The OEH recommends it is consulted for appropriate research actions for TSC Act listed threatened species, should indirect offsets be required.

Response

The nature of threatened species is they are already rare in the region, particularly some of the threatened plants identified in the Project area. Therefore the time needed to identify additional unknown populations is costly and lengthy. Unknown populations may also occur in isolation, fragmented from habitat and known populations, and may be unsuitable for land-based offsets.

EMM has consulted Dubbo OEH threatened species officers about known threatened species populations, the Project's ability to contribute to their management, and also the recommended seed collection, propagation and translocation methods to use to relocate threatened plants from the impact area into suitable habitat within the offset areas. No known populations occur in the PAA or wider region and these cannot be added to the direct, land-based offsets. In addition, the Biobanking expression of interest register does not include any credits for these species.

Information gathered about seed collection, viability, propagation techniques and planting success will add to the knowledge of the species and be part of the recovery plans of these species. While these measures also mitigate against the loss of genetic material, they are considered to be indirect offsets, which will compensate for the loss of threatened plants in the Project area, if successful.

9.2.27 Use of Biobanking assessment methodology

Submissions

G-17, G-17, G-17

Issues

Comments are made about using the Biobanking assessment methodology (BBAM) to determine adequate offset areas, particularly given its reported limitations for a Project of this size. One submission asserts the floristic data that forms the basis for the BBAM is not sufficient.

Response

The OEH requested in its environmental assessment requirements (EARs) that the offsets for the Project be determined in line with the OEH Interim Offset Policy (2010), which uses the BBAM to quantify project impacts and offsets requirements. Therefore this guideline and methodology were used to decide if the offsets were suitable. The use of the policy is considered in the following section.

9.2.28 OEH offset policy

Submissions

NA, G-17

Issues

The OEH questions the interpretation and use of its Interim Offset Policy, particularly where Tier 3 outcomes have been used for non-red flag vegetation communities and some threatened species credits.

Issues are raised about using the credit converter, as it considers this is a tool developed under the biodiversity certification assessment methodology (BCAM), which was considered in the development of the offset strategy, and is therefore not considered appropriate to use under the BBAM. OEH has provided alternative offset requirements using Equation 14 of the BBAM.

The offset strategy has met Tier 2 for six red flagged vegetation communities and three threatened species for which species credits have been required. The submissions suggest the full credit requirements have not been met for one red flagged vegetation community (Fuzzy Box Woodland EEC), two threatened species, and non-red flagged ecosystem credits generally.

The submissions also question the appropriateness of using the BBAM given the level of survey effort at the site.

Response

While the offset strategy aims to offset residual impacts for threatened species and ecological communities for which credits have been generated under the BBAM, it recognises this has not been achieved with the current secured offset areas. As such, additional offset areas are required and, if not available, the outcome may need to be downgraded to a Tier 3 outcome under the OEH Offset Policy.

Detailed floristic surveys were completed to determine the vegetation types in the Project area and proposed offset sites. As described in the offset strategy, the vegetation was considered to meet benchmark condition to include in the BBAM. This method was considered appropriate to determine the offset requirements using the BBAM.

The offset package resulting from the strategy is still being finalised. An update to the offset strategy is provided as Appendix H. In the updated strategy other methods are used to assess the suitability of the offsets proposed, secured and commitments made. This includes a comparison of the proposed offsets with recent offset approvals in the region for similar projects.

9.2.29 Threatened species credits

Submissions

G-17, NA-2, NA-2, G-11

Issues

The OEH considers some of the threatened species calculations have been miscalculated as a result of rounding the TG values. The OEH provides alternative species credit outcomes in its submission.

The OEH and others also raise the issue of the outstanding species credits and how these will be addressed in the final offset package. The possibility of downgrading these impacts to a Tier 3 outcome under the OEH offset policy, and assessing this in the offset strategy has raised some issues, including:

- under criterion B, efforts must be made to identify suitable threatened species credits outside of the Project before moving to the next criterion (or indirect offsets); and
- the use of the credit calculator to convert species credits to hectares, as discussed in the issue above, which is not considered to be suitable for species.

The OEH also comments on the inclusion of threatened species, which have not been identified in the Project area but have a moderate or high likelihood of occurrence, into the BBAM calculations. This includes *P. ericifolia*, *Diuris tricolor*, *R. procumbens*, *P. queenslandica*, *Crinia sloanei*, *Hoplocephalus bitorquatus*, *Hamirostra melanostemon*, *Lophoictinia isura*, *Phascolarctos cinereus*, *Dasyurus maculatus*, *Petaurus norfolkensis*, *Miniopterus schreibersii oceanensis* and *Vespa delustroughtoni* (note, the latter two bat species are both ecosystem and species credit species for which habitat constraints would not preclude their consideration as species credit species within the Project area). The OEH recommends providing adequate justification for not considering targeted offsets for other species credit species with a moderate or high likelihood of occurrence in the Project area.

Response

The updated offset strategy provides an assessment of the suitability of offsets for all threatened species recorded or considered to have a moderate or high likelihood of occurring in the Project area. While this has been based on habitat values in consideration of recent similar project approvals, it is considered this assessment provides the necessary justification for the suitability of the proposed offsets.

EMM recognises that some of the species credits may have been inaccurately provided as a result of rounding calculation errors. These have been amended in the updated offset strategy (Appendix H), which also discusses the proposed strategy if land-based offsets cannot be identified for threatened species with outstanding credit or offset requirements.

9.2.30 Ecosystem credit outcomes

Submissions

NA-2, G-11

Issues

The offset strategy in the EA identified a shortfall for ecosystem credits when assessed against the BBAM outcomes. These credits represent habitat for threatened species, where species credits were not generated. The OEH prefers to achieve an offset that is as close as practicably possible to the 'No Net Loss' standard as calculated through the BBAM. Adequate justification for providing a lower standard of offset is required under the OEH's interim offset policy.

OEH questions the theoretical use of the Tier 3 variation criteria, and suggests the assessment has not yet demonstrated the need to reduce the required offset for non-red flag ecosystem credits to a 3: 1 ratio.

Response

The offset strategy has been updated. The BBAM is one of the methods used to assess the adequacy of the proposed offset package, as OEH requested in its EARs; however, a comparison has also been made of offset ratios in the region for similar recent projects. The BBAM was developed for small-scale projects and there has been much difficulty in applying the BBAM to the Project given its size.

As the offset package is still being finalised, only the secured offset areas were assessed against OEH's interim offset policy. Shortfalls for ecosystem and species credits are still present but the strategy provides commitments to offset outcomes and, where required, justifies any reduction in the credit requirements in line with Tier 3 of the policy.

9.3 SWEPaC submissions

9.3.1 Impacts on EPBC Act listed ecological communities (general)

Issues

SEWPaC raises questions about the consistency of the hectare figures for impacts to matters of NES, specifically TECs, particularly between the agricultural and ecological impact assessment reports and the main EA. It is also noted the amount of Box Gum Woodland is vastly different from that given in the Commonwealth Referral.

Response

The correct areas for TECs are 12 ha of Box Gum Woodland and 54 ha of Grey Box Woodland. However, these have now been revised due to further survey work and the total impact area is 22 ha of Box Gum Woodland and 45 ha of Grey Box Woodland.

The referral was submitted at an early stage of the Project when detailed vegetation mapping had not been done. The 360 ha of Box Gum Woodland was estimated from the DIPNR's existing mapping of the study area, which was found to be inaccurate when ground-truthed during detailed surveys.

9.3.2 Avoidance, mitigation and offsets (general)

Issues

SEWPaC requires that measures to avoid, mitigate and offset impacts on EPBC Act listed species and TECs are provided for each species or community that are expected or likely to be significantly impacted by the Project.

Response

The avoidance and mitigation measures were implemented to reduce and ameliorate potential impacts to biodiversity the Project area. These measures are discussed in Section 5.1 of Appendix D the Terrestrial Ecology Assessment.

Specific measures were recommended for key threatened species and communities that are significant in NSW. Some of the same species are also listed under the EPBC Act (see Section 6.2 of the terrestrial ecology assessment). This discusses the relevant avoidance and mitigation measures relevant for each of the matters of NES recorded or considered likely to occur in the Project area.

The offset strategy aims to compensate for residual Project impacts after avoidance and mitigation measures have been implemented. Matters of NES that require offsetting due to residual impacts are:

- Box Gum Woodland;
- Grey Box Woodland;
- large-eared pied bat;
- southern long-eared bat;
- *Tylophora linearis;*
- *Homoranthus darwinioides*; and
- Ingram's zieria.

Direct and indirect offsets are proposed to compensate for impacts on these species. The offsets are detailed for each of the matters of NES above in Section 7.1.3 of Appendix D in the terrestrial ecology assessment and this is a updated in Appendix H to this report. Avoidance and mitigation measures are detailed in Table 9.7.

Table 9.7 Avoidance and mitigation measures for matters of NES that will be significantly impacted by the Project

Status	Recorded?	Impact description	Relevant avoidance and mitigation measures
Threatened ecological communities			
CEEC	Yes	Removes 12 ha of the TEC	• avoidance of impacts to riparian vegetation; • road diversions designed to avoid Box Gum Woodland TEC; • rehabilitation management plan will provide good practice methods for rehabilitation of areas representative of the TEC; • methods will be formulated and implemented to minimise potential introduction and spread of soil pathogens and disease before clearing; • feral animal management will occur in areas surrounding the progressive clearing and rehabilitation areas, in coordination with local NSW National Parks and Wildlife Service and State Forests;
EEC	Yes	Removes 54 ha of the TEC	• road diversions designed to avoid Box Gum Woodland TEC; • rehabilitation management plan will provide best practice methods for rehabilitation of areas representative of the TEC; • methods will be formulated and implemented to minimise potential introduction and spread of soil pathogens and disease before clearing; • feral animal management will occur in areas surrounding the progressive clearing and rehabilitation areas, in coordination with local NSW National Parks and Wildlife Service and State Forests;
Threatened flora species			
V	Yes	Removes 227 individuals from one sub-population in the study area	• minimising impacts on habitat by removing coal conveyor from the design; • weed control in retained vegetation; • methods will be formulated and implemented to minimise potential introduction and spread of soil pathogens and disease before clearing; • feral animal management will occur in areas surrounding the progressive clearing and rehabilitation areas, in coordination with local NSW National Parks and Wildlife Service and State Forests;
E	Yes	Removes 727 individuals from eight sub-populations in the study area	• minimising direct impacts by removing coal conveyor from the design; • moving infrastructure and emplacements to avoid direct impacts; • weed control in retained vegetation; • methods will be formulated and implemented to minimise potential introduction and spread of soil pathogens and disease before clearing;

Table 9.7 Avoidance and mitigation measures for matters of NES that will be significantly impacted by the Project

Status	Recorded?	Impact description	Relevant avoidance and mitigation measures
			• feral animal management will occur in areas surrounding the progressive clearing and rehabilitation areas, in coordination with local NSW National Parks and Wildlife Service and State Forests; • monitor dust deposition in areas containing Ingram's zieria, which are to be retained, with appropriate actions taken if it is found to be affecting plant health;
E	Yes	Removes nine individuals, representing the entire local known population	• minimising impacts on habitat by removal of coal conveyor from the design; • weed control in retained vegetation; • methods will be formulated and implemented to minimise potential introduction and spread of soil pathogens and disease before clearing; • feral animal management will be used in areas surrounding the progressive clearing and rehabilitation areas, in coordination with local NSW National Parks and Wildlife Service and State Forests;
Threatened fauna species			
V	Yes	Removes 1,400 ha of foraging and 16 km of cliff line (shelter habitat)	• minimising impacts on habitat by removal of coal conveyor from the design; • experienced fauna rescue personnel onsite during clearing; • habitat features retained for reinstatement in rehabilitation areas; • identified habitat links severed for the Project will be reconnected as part of the rehabilitation; • light use will be minimised near remnant habitat areas to prevent light spill;
V	Yes	Removes 1,400 ha of foraging and potential breeding habitat	• minimising impacts on habitat by removal of coal conveyor from the design; • a two-stage clearing protocol will be adopted for hollow-bearing trees; • experienced fauna rescue personnel onsite during clearing; • habitat features retained for reinstatement in rehabilitation areas; • identified habitat links severed for the Project will be reconnected as part of the rehabilitation; • light use will be minimised near remnant habitat areas to prevent light spill;

9.3.3 Grassland surveys

Issue

Given that 1,867 ha of woodland vegetation and 1,640 ha of grasslands are proposed to be directly disturbed, SEWPaC wants to know why the grassland survey effort (ie 10 plot surveys, 14 rapid plot assessments and 108 hrs of targeted flora searches) was insufficient to determine the extent of diversity within remnant patches of native grassland. It also requests a discussion about the known and likely extent of EPBC Act listed ecological communities within the study area in the form of derived native grasslands.

Response

Grasslands of the PAA occurr as large remnants of reduced diversity and were surveyed by ERM (2009 and 2011) Additional grassland rapid assessment surveys were made by EMM in January 2013 (additional 23 sites) in response to submissions, to determine and map the occurrence of Box Gum or Grey Box Derived Native Grasslands, as listed under the TSC Act or the EPBC Act.

The high intensity grazing that has occurred across the PAA is considered to have resulted in grasslands that are relatively depauperate in species, that is lacking in numbers or undeveloped, and dominated by grazing tolerant species. Photographs of two of the sites determined to be Box Gum Woodland in the photographs. None of the grassland sites were of sufficient quality to qualify for protection by Woodland DNG under the TSC Act are provided below. The lack of diversity is clearly evident under the EPBC Act.

Photograph 1 Rapid grassland assessment points showing Box Gum Woodland DNG (January 2013)

Historical grassland management in the Project area has included pasture improvement by introducing clovers and lucerne to the native grasslands. Typically, farmers in the area rotate their paddocks based on a five-year cycle, starting with spraying or burning, ploughing, lime and super spreading and then reseeding. Over the years native grasses dominate and the process starts again. These areas, while not in low condition due to the dominance of grazing tolerant native grasses, are considered to be highly disturbed.

The number of required survey sites for grassland areas was determined using DEC (2004) guidelines — see Table 9.8. In addition to 10 grassland survey plots, 37 rapid assessments were undertaken. Given the disturbed nature of grasslands of the PAA this effort is considered more than enough to determine and map the occurrence of TSC and EPBC listed DNG.

Table 9.8 Stratification units and number of survey plots

Stratification unit	Approximate area (ha)[1]	Number of plots required	Number of plots surveyed (2009–2012)
Ironbark/Cypress Woodlands (hill slopes and foot slopes)	1,231	12	13
Box Woodlands (flats and depressions)	80	3	12
Red Gum Woodlands (flats and foot slopes)	191	3	5
Regrowth	365	5	5
Native pasture	967	10	10

Notes: 1. Hectares measured from GIS analysis of the study area

9.3.4 Grassland survey data

Issues

SEWPaC requests evidence (ie reference/s to survey data) to demonstrate that native grasslands on site do not meet the criteria for derived native grasslands associated with the EPBC Act listed BGW and GBW. It also asks for further detail on the existing quality of native grasslands as a result of prior land use.

Response

Areas considered likely to have once supported yellow box, Blakely's red gum, white box or grey box were identified from previous mapping and from aerial photograph interpretation. In addition to the ERM surveys, EMM assessed 23 sites using a rapid assessment technique that involved confirming the site was grassy, determining the diagnostic tree species would have once occurred there, identifying the dominant ground cover species and their relative cover, estimating the cover of native versus exotic species and identifying any native forb species, within about a sample area 400 m^2.

The results of the desktop and field assessments were compared to identification guidelines, policy statements and final determinations to establish whether the area of grassland would be considered an EEC under either the TSC Act or the EPBC Act. The Project's vegetation map was then updated accordingly.

ERM's assessment for the grassland plots undertaken in accordance with the EPBC Act criteria, is provided in Table 9.9 and can be seen below. None of the grassland plots met the description of DNG under the EPBC Act. The same decision process was used at each of the rapid assessment sites.

Table 9.9 ERM grassland plot results against the EPBC Act criteria

CEEC criteria	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7	Site 8	Site 9	Site 10
Foliage projective cover between 10–30% or potential derived native grassland	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Is, or was previously, one of the most common overstorey sp. white box, yellow box, Blakey's red gum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Predominantly native understorey	Yes	No	No	No	Yes	No	No	No	Yes	No
0.1 ha or greater	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12 or more native understorey species (excluding grasses)	No	No	No	No	No	No	No	No	No	No
Meets TSC EEC criteria?	No	No	No	No	Yes (2)	Yes (1)	Yes (3)	Yes (2)	Yes (1)	Yes (1)
Greater than 2 ha	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
20 or more mature trees per ha	No	No	No	No	No	No	No	No	No	No
Regeneration of eucalypts	No	No	No	No	No	No	No	No	No	Yes
Box Gum Grassy Woodland?	No	No	No	No	No	No	No	No	No	No
Meets CEEC criteria?	No	No	No	No	No	No	No	No	No	No

9.3.5 Endangered ecological communities

Issue

SEWPaC identifies that Table 5.1 of the Terrestrial Ecology Assessment should list Coolibah – Black Box Woodlands as an endangered ecological community under the EPBC Act as well as the TSC Act.

Response

It is acknowledged this is an omission and should be included as an endangered ecological community under the EPBC Act. However, it is noted this endangered ecological community was considered in the matters of NES report (included as Appendix D to the Terrestrial Ecology Assessment).

Issue

SEWPaC requests detailed information be included in the EA for threatened ecological communities, including a discussion about all relevant TECs protected under the EPBC Act that have the potential to occur in the study area, including the results of survey findings and any potential impacts on those TECs. Therefore, the following TECs require additional assessment:

- natural grasslands on basalt and fine–textured alluvial plains of northern NSW and southern Queensland;
- the Weeping Myall Woodlands; and

- Coolibah − Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (Coolibah − Black Box Woodlands).

Response

Additional information has been included in Table 9.10 for these TECs. None of these TECs were identified in the Project area and these TECs will not be impacted by the Project.

Table 9.10 Threatened ecological community assessment

Species	Status		Record details and habitat requirements	Likelihood of occurrence	Further assessment required?
	TSC Act	EPBC Act			
Natural grasslands on basalt and fine-textured alluvial plains of northern NSW and southern QLD	-	CEEC	This ecological community occurs from the Darling Downs in Queensland to Dubbo in NSW and incorporates the Liverpool and Moree Plains. This ecological community occurs within the Brigalow Belt South Bioregion and Border Rivers-Gwydir, Central West, Namoi, Condamine, Burnett Mary and Fitzroy Basin Natural Resource Management Regions. The ground layer is typically dominated by perennial native grasses and contains three or more of the indicator native species (see listing advice). In NSW, the national ecological community is included within two vegetation formations identified by Keith (2004); Western Slopes Grasslands (easternmost occurrences around the Liverpool Plain) and Semi-arid Floodplain Grasslands (westernmost occurrences around the Moree Plain).	Unlikely – no naturally occurring grasslands and no basalt derived soil or cracking clay identified within the PAA. No grasslands fitting description identified during extensive flora assessments within the PAA.	No
Weeping Myall Woodlands/ Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	EEC	EEC	The Weeping Myall Woodlands occur in a range from open woodlands to woodlands, generally 4–12 m high, in which weeping myall (*Acacia pendula*) trees are the sole or dominant overstorey species. Other vegetation may also occur in the ecological community, though not as dominant species. These include: western rosewood (*Alectryon oleifolius subsp. elongatus*); poplar box (*Eucalyptus populnea*); or black box (*E. largiflorens*).	*Acacia pendula* was not recorded within the PAA. The community does not occur.	No
Coolibah- Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (Coolibah – Black Box Woodlands)/Coolibah – Black Box Woodland in the Darling Riverine Plains and Brigalow Belt South bioregions	EEC	EEC	Coolibah *(Eucalyptus coolabah subsp. coolabah*) and/or black box are the dominant canopy species. Understorey tends to be grassy. The ecological community is associated with the floodplains and drainage areas of the Darling Riverine Plains and the Brigalow Belt South bioregions.	Neither coolibah nor black box were recorded within the PAA. The community does not occur.	No

9.3.6 Threatened species

Issue

In Table 6.2 of the terrestrial Ecology Assessment the Spotted-tailed Quoll is listed as endangered under the EPBC Act, rather than vulnerable.

Response

It is acknowledged this is an error and it should be included as endangered. It is noted this species was assessed in the matters of NES report correctly as an endangered species.

Issue

SEWPaC comments the potential impacts of the Project on several threatened fauna species that have not been reported as significant, will in fact be significant. They are:

- removing 1,027 ha of suitable denning and foraging habitat for the spotted-tailed quoll;
- removing 1,102 ha of potential foraging habitat for the swift parrot and regent honeyeater;
- loss of 9 ha of potential breeding and foraging habitat for the Australasian bittern; and
- removing 1,867 ha of suitable foraging habitat in the region, given the breeding range of the superb parrot is mostly in the South West Slopes of NSW.

SEWPaC asks for more information on:

- any additional local and regional records of the species;
- the results of any additional surveys or assessments within the study area;
- hectares of suitable foraging and denning habitat impacted and retained within the study area;
- the regional context of spotted-tailed quoll populations, habitat and connectivity;
- the proximity to potential or known breeding habitat for the swift parrot and regent honeyeater;
- how may hectares of mature foraging habitat is proposed to be retained within the study area for the swift parrot and regent honeyeater;
- the quality of existing habitat for the species within the study area for the Australasian bittern;
- the proximity to any known breeding populations and/or critical habitat for the Australasian bittern;
- measures proposed to avoid and mitigate impacts on the species, and measures proposed to offset any unavoidable residual impacts for the Australasian bittern; and
- the regional importance of foraging habitat for the superb parrot in the study area (eg how far is the foraging habitat from known breeding areas for the species, what regional habitat corridors provide breeding and foraging habitat for the species and how will they be impacted by the Project, how much suitable foraging habitat will be retained near the proposed action etc).

Response

Appendix B of the Matters of NES report provides the assessment of the potential impacts on the spotted-tailed quoll, swift parrot, regent honeyeater, Australasian bittern and the superb parrot in line with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines: Matters of National Environmental Significance* (DEH 2006). The matters considered in this assessment include discussions about the fragmentation and isolation of populations, areas of habitat to be impacted, results of surveys and assessments in the Project area and information on the local records of the species.

Regional distribution of matters of NES is included in Section 4.3.6 and Table 4.7 of the matters of National Environmental Significance report. This includes the distribution of local records and known occurrence in regional conservation areas.

Additional regional breeding information was provided by local OEH threatened species officers for bird species listed in the EPBC Act.

The regent honeyeater was known to occur in large numbers and breed in the Cobbora area over 100 years ago. The species can breed anywhere that substantial feeding resources are available, with known resources in the region including white box, yellow box and mugga ironbark. Large known breeding populations of the regent honeyeater occur in the Mudgee-Wollar area and in the Capertee Valley, more than 30 km from the Project area.

Superb parrots are known to breed in the Molong area, some 150 km from the PAA. The individuals observed in the Project area are likely to have been moving through to breeding areas, following foraging resources such as the flowering Mugga Ironbarks.

The Australasian bittern requires large reed beds to nest. It is likely the closest breeding site is the Macquarie Marshes, some 300 km from the Project area. No suitable breeding habitat occurs in the Project area.

9.3.7 Threatened flora

Issue

SEWPac states the EA must provide a discussion about potential impacts on the EPBC Act listed vulnerable *Philotheca ericifolia*, which has a high likelihood of occurrence in the study area. This must include information about the adequacy of survey efforts, whether any further surveys are required, and if the species was found in the study area, whether it would constitute an important population. As per the EPBC Act assessment requirements, if a species is not considered to be present (or is unlikely to be impacted), detailed information must be included in the EA to support the conclusions.

Response

Table B.30 of the EA (Section B.1 ix) provides an assessment and discussion of *P. ericifolia*. Section 3.5 of the terrestrial ecology assessment (Appendix H of the EA) details the methods used for the targeted flora species searches. All flora species with the potential to occur within the study area in suitable habitat areas were surveyed. Targeted flora surveys were undertaken throughout spring 2009, and summer and autumn in 2010 as part of the baseline surveys. In addition to these, the grassland surveys were undertaken in spring 2011; EMM completed targeted flora searches of the impact area in spring 2011.

More than 201 hours were spent in the study area targeting threatened flora species in suitable habitat areas. In addition to the targeted searches in the impact area, later surveys were done in the offset areas that surround the Project in suitable habitat to identify threatened flora species in 2012. The survey effort used to detect threatened flora species over a number of years and seasons is considered sufficient to meet the DEC (2004) threatened species survey guidelines.

A habitat assessment was undertaken for all threatened flora species considered likely to occur in the study area based on previous records in the locality and habitat present (Appendix A of the terrestrial ecology assessment). This included an assessment of *Philotheca ericifolia, Diuris tricolor* and *Rulingia procumbens*, which were considered likely to have a high, high and moderate likelihood of occurring in the study area, respectively. This is a reflection of the presence of suitable habitat and the nature of the species (eg response to fire, grass cover). As such, these species were targeted during the threatened species searches in the study area.

It is considered the species has been assessed appropriately.

9.3.8 Offset strategy

Issue

SEWPaC requests the offsets provided under the EPBC Act be consistent with the new Commonwealth *EPBC Act Environmental Offsets Policy* (Oct 2012).

Response

Appendix H provides an assessment of the proposed offset strategy under the new Commonwealth offset policy.

9.4 Conclusion

Submissions raise a number of issues related to the terrestrial ecology impacts of the Project. Additional surveys were done to determine the ecological values of the grassland areas in the Project area, which identified a number of derived grassland communities that relate to threatened ecological communities. Additional mitigation and management strategies have been devised to ameliorate some of the Project impacts, and the offset strategy has been updated with additional offset areas and results of offset surveys. While the offset strategy is still being finalised, commitments for offset requirements have been made and the final offset package will be negotiated with the OEH and SEWPaC so that it adequately compensates for the Project's residual impacts. It is anticipated that with the implementation of these commitments, along with the proposed mitigation and rehabilitation strategies, the Project will improve the condition, extent and protection of biodiversity in the locality and region in the long term.

9.5 Aquatic ecology assessment of project changes

9.5.1 Relevant project changes

Few of the Project changes are relevant to aquatic ecology, but the following could have some impact and have been assessed:

- minor adjustments to the Project footprint as a result of changes to local roads, pipeline route, rail spur refinement and haul roads;

- changing the size of the intake in the Cudgegong River to 2.0 mm, which is not expected to increase the velocity above identified aquatic ecology thresholds; and
- water previously trapped by Woolandra Dam will be released to Blackheath Creek as the dam is decommissioned, which enters Laheys Creek before its confluence with Sandy Creek.

9.5.2 Assessment method

A desktop review was undertaken of the Project changes to determine the significance of any impacts on aquatic biota. The location of significant aquatic features, including threatened ecological communities, known occurrences of the freshwater catfish and the location of persistent pools in the creeks of the Project area, were all reviewed.

9.5.3 Environmental management

Most of the environmental management measures recommended in the EA remain applicable. However, additional information is available for the provision of monitoring and controlled freshwater releases to the aquatic systems of the Project area, to mitigate any potential impacts to persistent pools.

i Aquatic monitoring strategy

An aquatic monitoring strategy (AMS) will be developed for the Project. It will aim to detect changes resulting from the Project on the quality and quantity of water in the persistent pools of Laheys and Sandy creeks. The AMS will include:

- details of the proposed water level gauges, location and frequency of monitoring water level data at the persistent pools and reference sites (for comparison);
- monitoring the condition and health of instream biota representative of the Darling River aquatic ecological community and the freshwater catfish;
- the identification of trigger values for freshwater dam releases and/or water from the raw water dam to be released;
- details on existing flow data so that freshwater releases mimic natural patterns in flow, capture seasonality in the frequency, magnitude and duration of flows, as well as the natural variability to which the native fauna are adapted, where possible;
- monitoring the quality of freshwater releases;
- an adaptive management framework with feedback mechanisms; and
- a reporting program.

ii River monitoring committee

Fisheries NSW asks that a river monitoring committee (including Fisheries NSW, NSW Office of Water and other appropriate agencies) is formed to be involved in the adaptive management framework and feedback loop for the AMS. The committee would provide feedback on the AMS and any updates to this document, and review the AMS monitoring results and later reports.

iii Freshwater releases

Freshwater releases will occur from sediment dams and the raw water dam only if water quality meets with the objectives in the water management plan and accords with the AMS. Releases will supplement base flows over the life of the mine in the ephemeral waterways and will aim to mitigate any adverse impacts on the freshwater catfish.

9.5.4 Impacts

Additional flows from removing the Woollandra Dam will have a beneficial impact on aquatic biota downstream of its confluence with Blackheath Creek. Because most of the deep persistent pools occur downstream of Blackheath Creek, the releases may mitigate some of the potential impacts associated with groundwater drawdown and lessen forecast increases to the amount of time these pools are dry over the life of the mine.

The increase in the intake at the Cudgegong River from 1.9 mm to 2.0 mm is still within the identified guidelines in the aquatic assessment to minimise any impacts to fish and their eggs. The proposed changes in size will not increase the velocities of the intake to the identified threshold of >0.3 m/s.

9.5.5 Response to submissions

i Impacts on deep pools and the Lowland Darling River aquatic ecological community

Submissions

G-5, G-6, G-11, G-14, G-17, G-19

Issues

The submissions comment on the potential impacts of groundwater drawdown and the loss of low flows during drought on the deep pools that act as drought refugia (refuges) in Laheys Creek, Sandy Creek and the Talbragar River. It is noted the aquatic systems in these areas are part of the endangered Lowland Darling River aquatic ecological community. The submissions comment about the potential impacts from increased fragmentation through loss of low flow connectivity and groundwater drawdown, particularly in periods of prolonged drought.

Response

There appears to be some connection of the persistent pools along Sandy Creek, Laheys Creek and the Talbragar River with the alluvium aquifer where it occurs. These persistent pools are considered to be GDEs where alluvium is close to the surface. Where these occur within the potential groundwater drawdown zone, it is likely that there will be impacts on groundwater base flow into these pools. This may increase drying events during operation of the Project, particularly when coupled with reduced surface water runoff into the waterways.

Notwithstanding the Surface Water Assessment (EA Appendix E) has determined that the deep pools associated with Laheys Creek, Sandy Creek and the Talbragar River depend mainly on the surface water flow regime. Rainfall and flood recharge is expected to be enough to sustain the local alluvium aquifers for several months after floods, despite drawdown from mining. Despite this, mitigation measures have been devised should the Project significantly affect persistent pools. Mitigation will involve the controlled release of clean water to maintain water levels in persistent pools along Laheys and Sandy creeks if they are reduced by groundwater drawdown.

ii Impacts to the threatened freshwater catfish (*Tandanus tandanus*)

Submissions

G-5, G-6, G-11, G-17, G-19, NA-7

Issues

The submissions comment about the potential impacts on the threatened freshwater catfish as a result of loss of low flows and base flows from the Project. The concerns relate to the potential for local extinction of the species.

Response

Potential impacts to this species will be closely monitored and appropriate mitigation measures enacted should drought refugia be impacted by the Project. This adaptable monitoring program will be developed in consultation with the river monitoring committee (see Section 9.5.3). Appropriate compensatory measures will be devised, including providing funding for removing barriers to fish passage in the greater Macquarie River system, which would help with the regional conservation of the species. Such compensation is considered appropriate for any residual impacts on this species, should there be any.

iii Impacts on the Cudgegong River

Submission

NA-7

Issues

Fisheries NSW asks to be consulted about the design of the pump intakes and pump screen structures at the Cudgegong River to minimise the entrainment and entrapment of juvenile fish and larvae. Fisheries NSW also asks for details of the operation and management of the pump and intake structure, including start-up operations.

Further, detailed construction environmental management plans (CEMPs) are to be provided to Fisheries NSW for review and comment before the intake structure is built at the Cudgegong River. The plans are to outline:

- details of the dredging footprint;
- translocation protocols for fish if site dewatering is required;
- erosion and sedimentation control plans; and
- potential blockages to fish passage and how they are to be managed.

Response

CHC will consult NSW Fisheries about the design of the pump intakes and pump screen strictures on the Cudgegong River. This will include providing NSW Fisheries with details of the operation and management of these structures.

The appropriate CEMPs will be provided to Fisheries NSW for comment and review before any works on the intake structure at the Cudgegong River. The CEMP will include the requested information.

iv Construction potentially impacting waterways

Submission

NA-7

Issues

The submission comments about the compliance of the proposed waterway crossing for the Project with the *Fisheries NSW Policy and Guidelines for Fish Friendly Waterway Crossings* (2003) and *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (2003). Fisheries NSW also asks to be notified before to any construction activities occur within the waterways.

Response

The waterway crossings will be designed according to the above-mentioned guidelines as discussed in the aquatic ecology assessment. CHC will notify Fisheries NSW before any construction activities within the waterways.

v Mitigation of riparian pools

Submissions

NA-2 NA-7, G-5

Issues

The OEH, Fisheries NSW and others reiterate the importance of mitigation measures for the potential impacts of the Project on persistent pools. They comment that mitigation strategies should be implemented during mining and following mine closure to ameliorate, or improve, these impacts. The OEH recommends investigating mitigation strategies to establish adequate buffer areas between creeks and areas of disturbance to protect pools. The OEH seeks further detail on the proposed level of treatment of waters that will be discharged to the creeks and mitigation strategies that protect and minimise impacts to groundwater dependent pools.

Response

The potential for impacts on persistent pools as a result of the Project has been identified in the aquatic ecology assessment and appropriate mitigation measures devised. Mitigation will involve the controlled release of clean water to maintain water levels in persistent pools along Laheys and Sandy creeks if these are reduced by groundwater drawdown. The proposed quality and treatment of discharge water is discussed in the surface water assessment (Appendix F). In addition, hydrological and ecological monitoring of persistent pools will be undertaken, and if this indicates impacts to freshwater catfish are likely to occur and that these impacts will not be mitigated by the controlled release of clean water, compensation measures for the loss of habitat will be provided.

Sediment dams will collect water from the mining and construction areas. In addition, coffer dams are to be used for any in-stream works and these areas revegetated in accordance with the rehabilitation strategy. This will minimise any potential impacts associated with in-stream works and sedimentation in the local aquatic systems.

vi Aquatic monitoring

Submission

NA-7

Issue

Fisheries NSW requests an aquatic management framework (AMS) be developed to monitor and manage impacts on the aquatic ecology of Sandy and Laheys Creeks during the mine's operation. This should include establishing a river monitoring committee to oversee the preparation, implementation, monitoring and review of the framework. It is to have particular reference to the endangered Murray-Darling population of freshwater catfish.

Response

An AMS and river monitoring committee will be established for the Project. Further details of these are provided in Section 9.5.3.

9.6 Conclusion

The Project changes will not significantly change any potential impacts on aquatic ecology. Rather, decommissioning Woolandra Dam on Blackheath Creek may benefit aquatic biota downstream through providing additional surface water flows over the life of the mine. Additional information has been provided for the establishment of an AMS using adaptive management principles. This includes the formation of a receive increased surface water flows during median and wet years which may offset the loss of groundwater inflow to the pools river monitoring committee to review monitoring outcomes and provide advice in the adaptive feedback loop. These measures will appropriately mitigate and manage Project impacts on persistent pools and important aquatic biota, including the freshwater catfish.

A undertaking to prepare an AMS and establish a river monitoring committee has been added to the Project commitments.