Millennium Expansion Project

Environmental Impact Statement

CHAPTER 13:

NATURE CONSERVATION

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13.0 NATURE CONSERVATION

13.1 EXECUTIVE SUMMARY

13.1.1 Values

Millennium Expansion Project's (MEP) nature conservation values include:

- Brigalow (*Acacia harpophylla*)-dominated or co-dominated vegetation listed as 'endangered' under the *Vegetation Management Act 1999* (*VM Act*) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* occupy 85.7 hectares (ha) on the MEP. This is made up of:
  - *Acacia harpophylla-Eucalyptus cambageana* (RE 11.9.1) open forest to woodland on fine-grained sedimentary rocks occupies 78.9 ha;
  - *Acacia harpophylla* and/or *Casuarina cristata* (RE 11.9.5) open forest on fine-grained sedimentary rocks occupies 6.8 ha.
- *Cerbera dumicola*, a shrub, was located within the MEP in two localities and is listed as 'rare' under the *Nature Conservation Act 1992 (NC Act).* A large population covering an area of approximately one hectare will not be impacted. A smaller population consisting of several individuals was located on the creek flats along New Chum Creek;
- one individual of the Brigalow scaly-foot legless lizard (*Paradelma orientalis*) was located within the MEP and is listed as 'vulnerable' under both the *NC Act* and *EPBC Act*;
- the Little Pied Bat (*Chalinolobus picatus*), was located within the MEP and is listed as 'vulnerable' under both the *NC Act* and *EPBC Act*; and
- only one migratory species is known to occur within the MEP, the Rainbow Bee-eater. This species was recorded during field surveys undertaken by Smith (2006).

13.1.2 Issues

The MEP's nature conservation issues include:

- approximately 2.5 ha of Brigalow-dominated or co-dominated vegetation are planned to be cleared based on the MEP proposal and is made up of two patches, one 0.9 ha in size and the other 1.6 ha:
  - 0.9 ha of the southern Brigalow patch (RE 11.9.5) planned to be cleared is located on the western end of the Millennium pit extension. The total area of this patch of Brigalow is 4.6 ha;
  - 1.6 ha of the northern Brigalow patch (RE 11.9.1) planned to be cleared is located on the end of a waste rock emplacement, to the north of the Millennium pit extension. The total area of this patch of Brigalow is 2.3 ha;
- the southern Brigalow patch is also the location where a Brigalow scaly-foot individual was observed. There is a strong possibility that Brigalow scaly-foot individuals within this patch may be impacted if 0.9 ha is cleared as planned;
- several specimens of *Cerbera dumicola*, located along New Chum Creek, may be impacted depending on where the haul road creek crossing is located;

- no special management actions for Rainbow Bee-eater migratory species are considered necessary as it is extremely abundant in the local area and region; and
- the potential to further spread weeds existing on the MEP due to disturbances during mining.

13.1.3 Mitigation Strategies

Strategies to mitigate MEP's nature conservation issues and impacts include the following:

- changes to the proposed mine plan to exclude the 0.9 ha of Brigalow RE from future mining to protect this area and the Brigalow scaly-foot during and post mining;
- developing and implementing an Offsets Program that caters for impacts to vegetation including approximately 20 ha of Brigalow RE previously cleared from the Millennium Mine;
- develop a conservation program for the Brigalow scaly-foot and monitor it and its habitat on an annual basis;
- conduct a second survey to ensure all specimens of *Cerbera dumicola* are located and protected by moving the location of any haul road creek crossing;
- maintain a 100 m buffer along New Chum Creek to protect *Cerbera dumicola* and the creek habitat itself, which may contain specimens of the Ornamental Snake;
- investigate the ability to re-*introduce Cerbera dumicola* into mine rehabilitated areas via seed mix or tube stock plantings;
- develop a conservation program for the large patch of *Cerbera dumicola* to protect this area from all future disturbances during and post mining;
- develop a pest animal and weed management plan for the MEP, including regular monitoring of topsoil stockpiles and disturbed areas to prevent the spread of both listed and unlisted weed species; and
- rehabilitate areas for biodiversity conservation purposes without the use of Buffel Grass (*Pennisetum ciliare*) in the rehabilitation seed mix and monitor to ensure progression towards the representative surveyed communities.

13.2 NATURE CONSERVATION VALUES

The existing nature conservation values that may be affected by the MEP are discussed in this section in the context of 'environmental values' as defined by the *EPBC Act*, *VM Act* and the *NC Act*. **Annexure A** is a standalone report covering all relevant *EPBC Act* issues. It also details the potential impacts on these values and the mitigation measures that will be undertaken to minimise them.

Throughout this section, ecological values listed as 'critically endangered', 'endangered', 'vulnerable' or 'rare' under the *EPBC Act* and/or the *NC Act*, are referred to as 'endangered', 'vulnerable' or 'rare' (EVR). Nomenclature follows taxonomy accepted by the Queensland Herbarium and Queensland Museum. Regional ecosystems (RE's) are described using scientific names in accordance with the convention of the Regional Ecosystem Description Database (REDD).

The broad environmental values of nature conservation include:

- the integrity of ecological processes, including habitats of rare and threatened species;
- biological diversity, including habitats of rare and threatened species;
- integrity of landscapes and places, including wilderness and similar natural places;
- terrestrial and aquatic ecosystems, including the biological resources therein; and
- matters of National Environmental Significance (MNES) protected under the *EPBC Act*.

The majority of the vegetation within the MEP has been extensively modified as a consequence of grazing activities.

13.3 TERRESTRIAL FLORA

Detailed flora investigations over the MEP footprint and immediate surrounds (the 'MEP area') were undertaken by MET Serve Consulting and the results of these investigations are summarised in the following sub-sections. Copies of the technical reports are provided in **Appendix F7 – Terrestrial Ecology** and **Appendix F8 – Aquatic Ecology**.

13.3.1 Fieldwork

Within the MEP and adjacent areas a total of four field surveys were undertaken. Two wet season surveys were conducted in February 2006 and March 2009, and two separate dry season surveys were conducted in June 2003 and October 2004. The survey sites are shown in **Figure 13-1**. The survey methods used over the site visits conducted between 2003 and 2006 included:

- site orientation;
- review of mine plans, topographic plans, air photos and RE maps;
- selection and study of sites for flora species and categorisation of REs;
- selection and study of sites for fauna species (including cryptic);
- traversing the areas by vehicle and on foot examining, and noting flora and fauna species observed, and categorising (ground-truthing) REs (following descriptions of Sattler and Williams, 1999);
- spotlighting for nocturnal animals (e.g. arboreal mammals, geckos);
- 'Anabat' recordings for the remote detection of microbats; and
- Elliott trapping (size A traps) for the capture of small ground dwelling animals.

The vegetation map developed from the field surveys differs in many ways from the RE map obtained from the Department of Environment and Resource Management (DERM). This is not an uncommon result, with ground-truthing an area almost always more reliable than desktop data obtained from analysis of aerial photographs.

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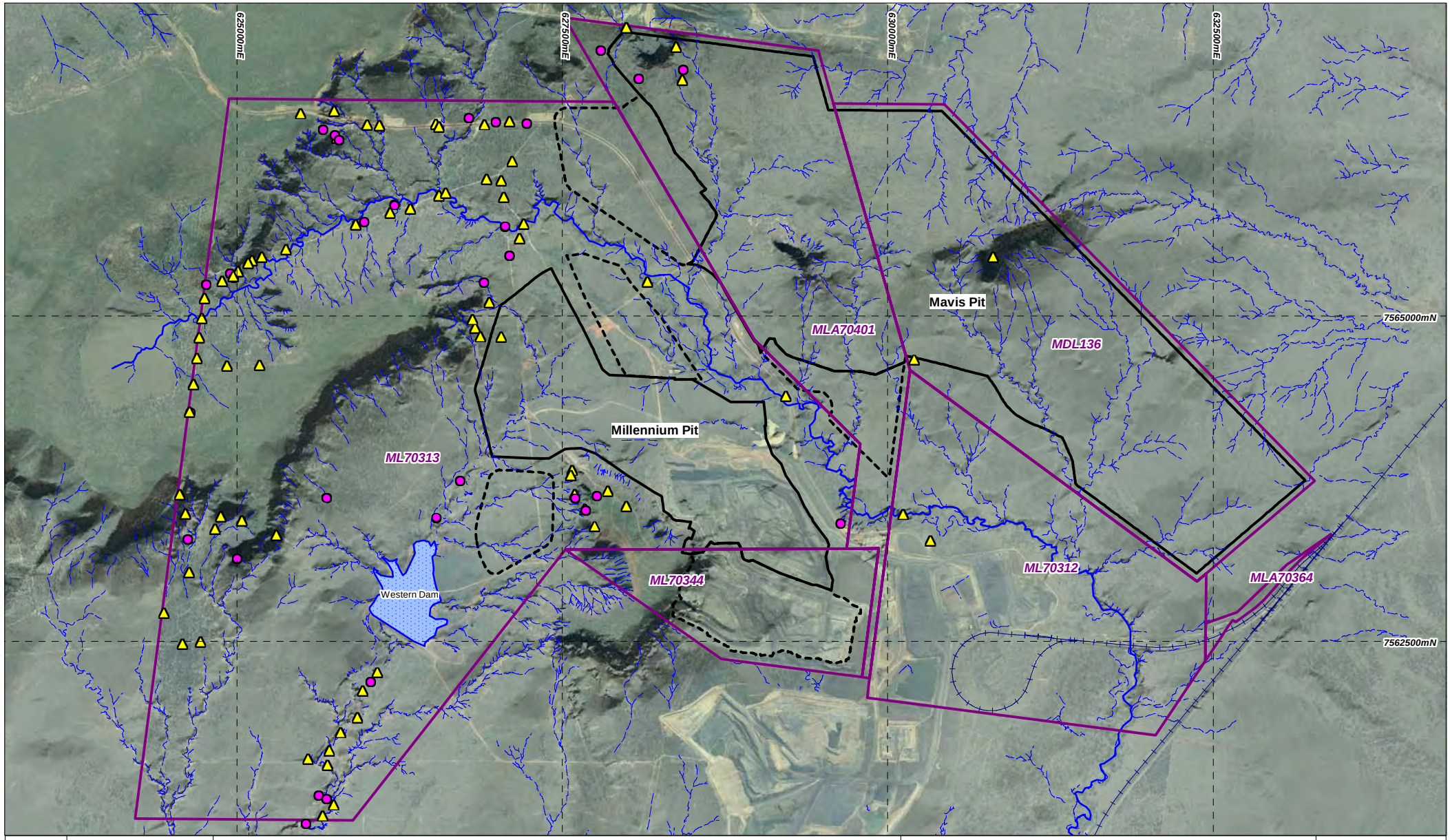

MET SERVE

Peabody

0 800
Metres
Scale: 1:40,000 (A4)

LEGEND

- Peabody tenement
- Railway
- New Chum Creek
- Watercourse
- 2027 pit footprint
- 2027 dump footprint

Survey Site

- Quaternary
- Tertiary

Data Source: Imagery, Infrastructure, Tenement, Topography - Minserve. Flora Survey - BAAM.

Peabody Energy Australia Pty Ltd

Millennium Expansion Project

MEP Vegetation Survey Locations

19/10/2010

Datum: GDA94
Projection: MGA54

FIGURE 13-1

Conditions at the time of the surveys were considered suitable for the detection of all terrestrial flora and fauna. No rain fell during the field surveys. Heavy rainfall occurred during February 2009 (238 mm) and surface water was present in deeper sections of creek-lines and waterways. Grass growth was prolific in response to the favourable conditions. This assessment included recordings of the floristics, structure and condition of all vegetation communities present, including targeted searches for significant species.

Investigation- sites were located in areas representative of regional vegetation types. Within each vegetation community, a minimum of two representative sites (one tertiary and one quaternary-Neldner et al., 2005) were selected and a plot was surveyed. Data collected included floristic composition, community structure, groundcover and a detailed floristic inventory of the dominant and conspicuous woody plants (i.e. trees and shrubs).

Random meander searches for flora species of conservation significance were also undertaken in areas of likely habitat and during vegetation mapping. A condition assessment was conducted using an adapted methodology based on 'Biocondition: A Terrestrial Vegetation Condition Assessment Tool for Biodiversity in Queensland Field Assessment Manual' (Eyre et al., 2006), assessing parameters from this methodology whilst traversing approximately 100 m.

13.3.2 Vegetation Communities

13.3.2.1 Currently Mapped Regional Ecosystems

An RE is a vegetation community that is consistently associated with a particular combination of geology, landform and soil. Certified RE mapping (DERM, Version 6) for the MEP is illustrated in **Figure 13-2** including the conservation status under the *VM Act*. The *VM Act* classifies REs under three conservation categories, namely:

- endangered-less than 10% of the pre-European extent remains in an intact condition across the bioregion;
- of concern-10–30% of the pre-European extent remains in an intact condition across the bioregion; and
- not of concern-over 30% of the pre-European extent remains in an intact condition across the bioregion.

13.3.2.2 Field Verified Regional Ecosystems

Mapping for the bioregion is produced by the Queensland Herbarium at 1:100,000 scale.

Ground-truthing was undertaken to confirm and more accurately determine the extent of the REs present in the MEP area.

Revised RE mapping undertaken by Matrixplus (2009) shows 12 REs within the MEP. Of these, two REs (RE 11.9.5 and 11.9.1) are Brigalow communities which have endangered status under the *VM Act* and the *EPBC Act*. The distribution of the field verified REs within the study area is illustrated in **Figure 13-3** and their attributes presented in **Table 13-1**.

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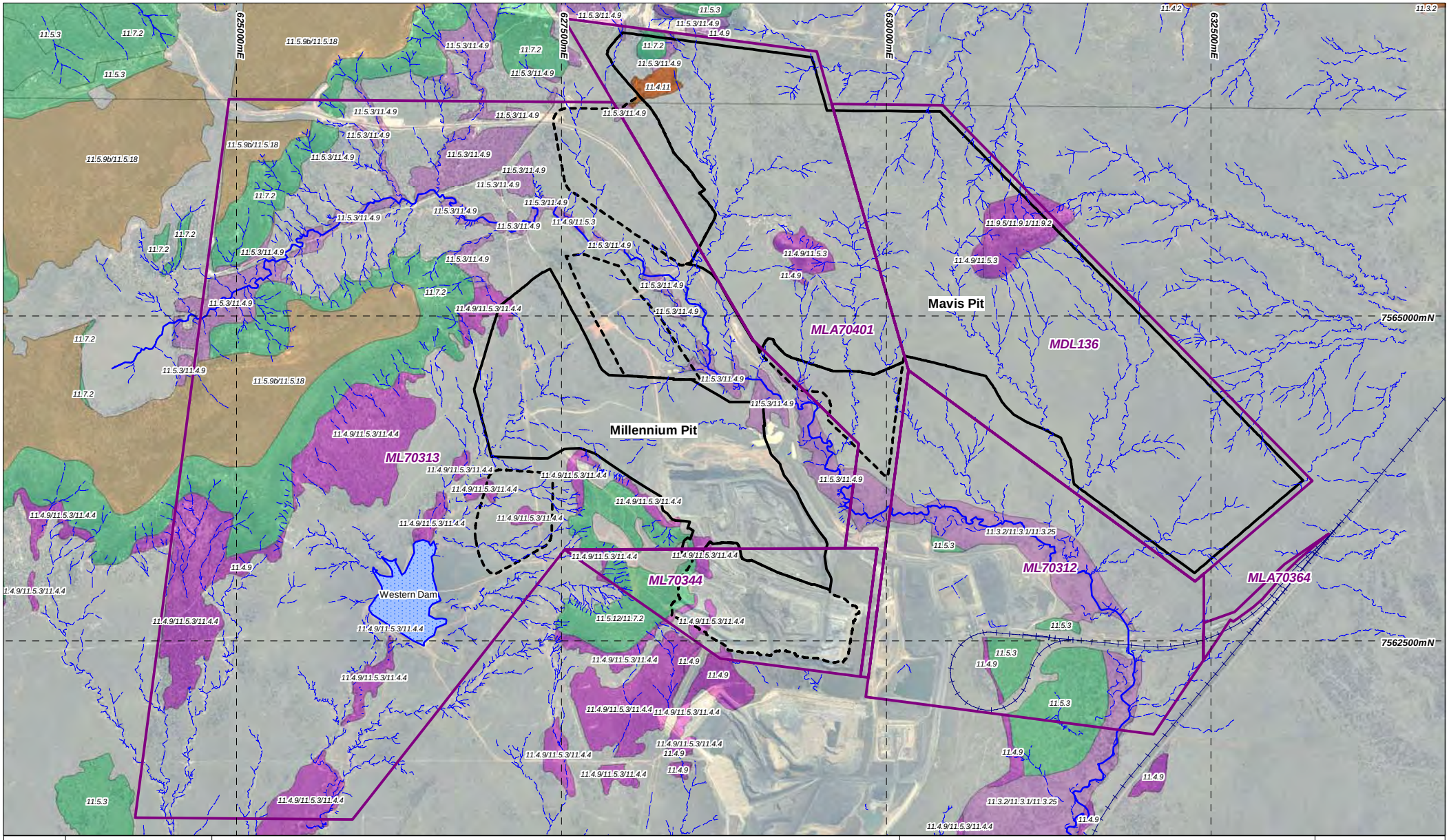

MET SERVE

Peabody

0 800
Metres
Scale: 1:40,000 (A4)

LEGEND

- Peabody tenement
- Railway
- New Chum Creek
- Watercourse
- 2027 pit footprint
- 2027 dump footprint

RE Mapping by VM Poly

- Endangered (dominant)
- Endangered (sub-dominant)
- Of Concern (dominant)
- Of Concern (sub-dominant)
- Not of Concern

Data Source: Imagery, Infrastructure, Tenement, Topography - Minserve.

Peabody Energy Australia Pty Ltd

Millennium Expansion Project

Certified Regional Ecosystems (DERM Mapping)

19/10/2010

Datum: GDA94
Projection: MGA54

FIGURE 13-2

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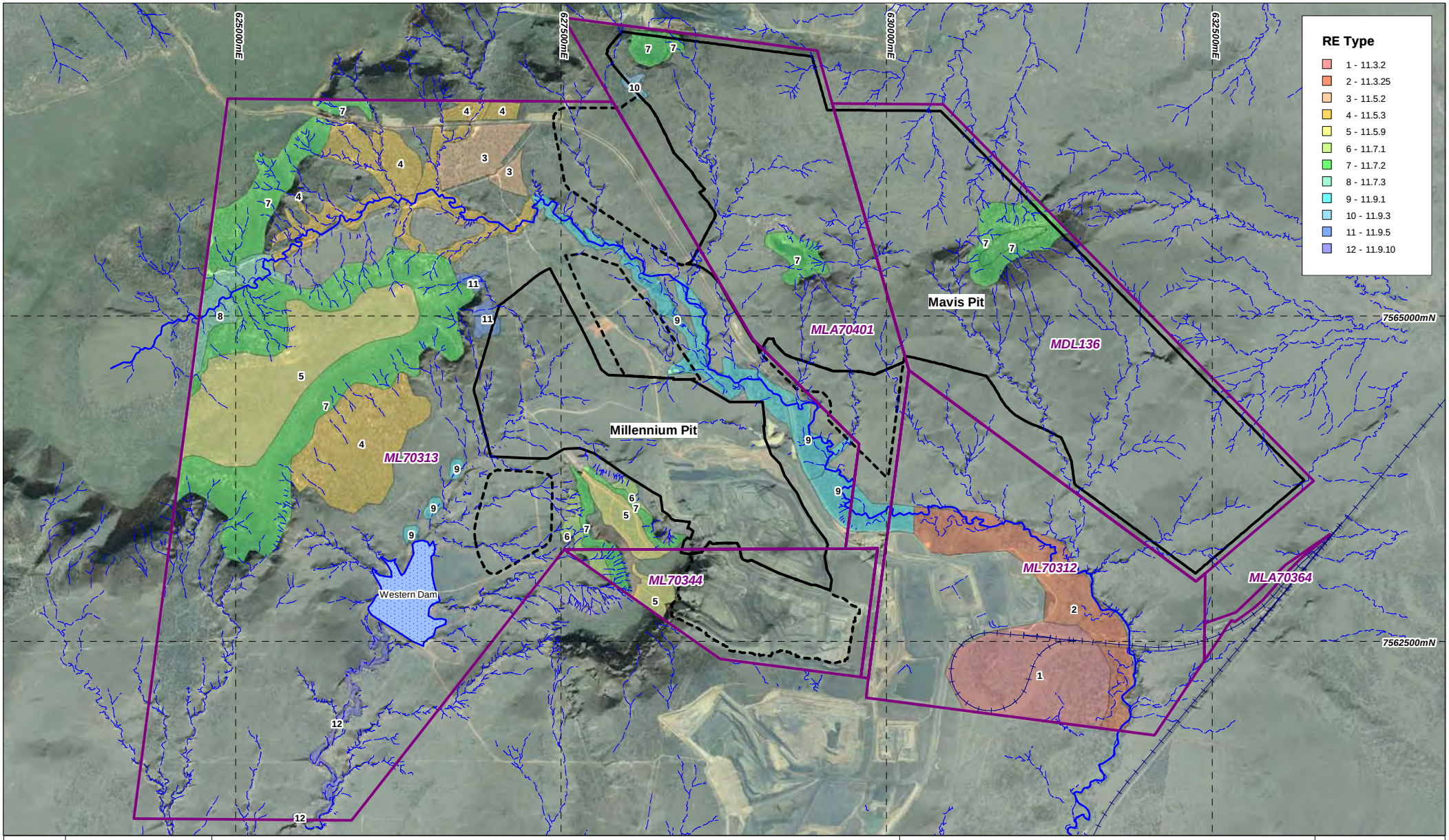

MET SERVE

Peabody

0 800
Metres
Scale: 1:40,000 (A4)

LEGEND
- Peabody tenement
- Railway
- New Chum Creek
- Watercourse
- 2027 pit footprint
- 2027 dump footprint

Data Source: Imagery, Infrastructure, Tenement, Topography - Minserve. RE Mapping - BAAM.

Peabody Energy Australia Pty Ltd

Millennium Expansion Project

Field Verified RE Mapping (RE Type)

19/10/2010

Datum: GDA94
Projection: MGA54

FIGURE 13-3

Table 13-1 Existing Mapped Regional Ecosystems within the MEP area

RE	RE Short Description	*VM Act*	Biodiversity Status	EPBC Act	Extent in Reserves *
11.3.2	*Eucalyptus populnea woodland* on *alluvial plains*	OC	OC	–	Low
11.5.2	*Eucalyptus crebra, Corymbia spp., with E. moluccana* on lower slopes of Cainozoic sand plains/remnant surfaces	NC	NC	–	Low
11.5.3	*Eucalyptus populnea and/or E. melanophloia* and/or *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces	NC	NC	–	Low
11.5.9	*Eucalyptus crebra and other Eucalyptus spp.* and *Corymbia spp. woodland* on Cainozoic sand plains/remnant surfaces, plateaus and broad crests	NC	NC	–	Low
11.3.25	*Eucalyptus tereticornis or E. camaldulensis* woodland fringing drainage lines	NC	OC	–	Low
11.7.1	*Acacia harpophylla* and/or *Casuarina cristata* and *Eucalyptus thozetiana or E. microcarpa* woodland on lower scarp slopes on lateritic duricrust	NC	OC	–	Low
11.7.2	*Acacia spp.* woodland on lateritic duricrust	NC	NC	–	Low
11.7.3	*Eucalyptus persistens, Triodia mitchellii* open woodland on stripped margins of Cainozoic lateritic duricrust	NC	NC	–	Low
11.9.1	*Acacia harpophylla-Eucalyptus cambageana* open forest to woodland on fine-grained sedimentary rocks	E	E	E	Low
11.9.3	*Dichanthium spp., Astrebla spp. grassland* on fine-grained sedimentary rocks	NC	NC	¥	Low
11.9.5	*Acacia harpophylla* and/or Casuarina cristata open forest on fine-grained sedimentary rocks	E	E	E	Low
11.9.10	*Eucalyptus populnea, Acacia* harpophylla open forest on fine-grained sedimentary rocks	OC	E	–	Low

VM Act = Vegetation Management Act 1999; *EPBC Act = Environment Protection and Biodiversity Conservation Act 1999*;

NC = Not of Concern; OC = Of Concern; E = Endangered; – = Not listed

* The extent of regional ecosystems within protected areas is classified as: High >10% of pre-clearing extent; Medium 4-10%; Low <4%

¥ Within the MEP, this RE does not meet the criteria for constituting the Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin TEC.

13.3.3 Vegetation Map Unit Descriptions

Vegetation community descriptions are provided in **Table 13-2** using data derived from site surveys for dominant species within each structural layer, community condition, weed invasion, and approximate areas occupied by individual communities. The distribution of these communities across the MEP is shown in **Figure 13-3**.

At a scale of approximately 1:15,000, the MEP area contains 19 discrete vegetation communities. Of these vegetation communities, 15 are remnant as defined under the provisions of the *VM Act* (Section 6.2), and equate to 11 different RE types.

13.3.4 Non-Remnant Vegetation

The dominant vegetation community within the MEP area is pasture grasses on sands. This community is 'non-remnant' under the *VM Act* and is not similar to any threatened ecological community as defined under the provisions of the *EPBC Act*. This vegetation community does contain some small areas where Brigalow and/or Poplar Box (*Eucalyptus populnea*) are regrowing within the pasture. However, these regrowth areas are at an early stage of development, featuring generally low and sparse woody vegetation which are not easily separated out from the surrounding pasture matrix.

13.3.5 World Heritage and Wetlands of International Importance

The closest World Heritage Property to the MEP is the Great Barrier Reef, the closest section of which is approximately 130 km to the east. The MEP lies within the same catchment as a Wetland of International Importance, being the Shoalwater and Corio Bays Area. The closest section of this RAMSAR site also lies approximately 130 km to the east of the MEP.

13.3.6 Threatened Ecological Communities

The Department of the Environment, Water, Heritage and the Arts (DEWHA) Environmental Reporting Tool indicated the potential presence of two 'Threatened Ecological Communities' (TEC) in the vicinity of the MEP area, namely Brigalow (*Acacia harpophylla*) dominant and co-dominant and Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin.

Field surveys established the presence of the Brigalow TEC which occupies approximately 85.7 ha on the MEP.

The 'Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin' TEC (RE 11.9.3) is present within the MEP, however in this instance the community does not meet the condition thresholds of ecological quality and structural characteristics the *EPBC Act* stipulated for constituting the TEC. Field verification reveals that this community has relatively low floristic and faunal diversity relating to grazing impacts from cattle. In addition, there was evidence of a high level of grazing by rabbits, and overall structural complexity of the environment was low.

The area of 'Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin' within the MEP does not meet the *EPBC Act* criteria as it has less than three of the listed native perennial grass indicator species, and is less than 5 ha in spatial extent, therefore this community is not classified as a TEC.

13.3.7 Significant Species

A total of 196 plant species have been recorded from within the MEP.

13.3.7.1 Conservation Status

Cerbera dumicola was located within the MEP area and is listed as 'rare' under the *NC Act*. No EVR flora species under the *EPBC Act* were observed within the MEP area. The habitat preferences for the seven EVR plants known to occur within the local area are presented in **Table 13-3**. Field observations of the habitats types have been used to predict the likelihood of these species occurring within the MEP. This exercise reveals that two other species-Large-podded Trefoil (*Desmodium macrocarpum*) and *Bertya pedicellata*-could possibly occur. It is highly unlikely that the other four species are present.

Table 13-2 Vegetation Communities of the MEP Area

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
1	Clarkson's Bloodwood tall woodland on red earths Height of EDL*: 24 m Canopy Cover: 43% Area of community within MEP area: 126 ha	11.5.9 (Not of Concern)	Emergent: Absent. Canopy (T1): (20-28 m; av. 24 m) The sparse canopy is dominated by a mix of *Corymbia clarksoniana, C. dallachiana,* and *Eucalyptus crebra* with all species locally dominating to form stands of patches. Sub-Canopy (T2): (4-14 m; av. 9 m) The sparse to mid-dense sub-canopy is dominated by a mix of *Corymbia tessellaris, Alphitonia excelsa, Petalostigma pubescens, Melaleuca viridiflora* with all species locally dominating to form stands or patches. Shrub Layers: (0.5-4 m; 2 m) The sparse to mid-dense shrub layer is dominated by *Trema tomentosa, Acacia leiocalyx* and *Petalostigma pubescens.* Ground Layer: (0-1.5 m; 0.9) Ground strata generally in good condition, native grasses dominate including *Aristida calycina, Enteropogon acicularis*, and *Eragrostis brownii. Melinis repens* has invaded in patches. Notes: Occurs on large flat plains on top of mesas. This community has been less impacted by cattle grazing and clearing for improved pastures. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: *Bertya pedicellata*.	Occurs in the north-western region of the MEP area in ML 70313 at the tops of small ridges. Also located on a mesa in the south of the MEP area immediately adjacent to the waste rock emplacements of the existing Millennium mining operation.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
2	Lancewood tall open forest on laterite and colluvium Height of EDL: 13 m Canopy Cover: 37% Area of community within MEP area: 269 ha	11.7.2 (Not of Concern)	Emergent: 24 (20-28 m) where present the emergent layer is dominated by *Eucalyptus thozetiana* and E. exserta. Canopy (T1):13 (10-24 m) Almost entirely dominated by *Acacia shirleyi*. Sub-Canopy (T2): 7 (2-11 m) Where present the sparse sub-canopy is dominated by *Acacia shirleyi*, *Alphitonia excelsa* and *Alstonia constricta*. Shrub Layers: 1.6 (0.5-3 m) The sparse to mid-dense shrub layer is dominated by *Acalypha eremorum*, *Geijera parviflora, Bertya oleifolia, Phebalium glandulosum* and *Erythroxylum australe*. Ground Layer: 0.4 (0-1.4 m) The patchy ground layer is dominated by areas of skeletal soils and rocks interspersed with native grasses, including *Enteropogon acicularis, Tragus australianus, Paspalidium distans, Aristida lapathifolia, Calyptochloa gracillima* and *Aristida caput-medusae*. Where present, herbs are dominated by *Enchylaena tomentosa, Sida retusa* and *Hibiscus sturtii.* Notes: The remote, inaccessible nature of this vegetation community means that impacts from clearing and grazing are minimal. The ground layers are predominantly native and fallen woody debris is abundant. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: *Cerbera dumicola* is known to occur in the MEP area within this vegetation type. *Bertya pedicellata* has the potential to be present but not found during surveys.	Located on several small ridges in the eastern and northern portion of the site in ML 70313, MLA 70401 and MDL136. This vegetation community is in better condition compared to others within the MEP area.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
3	Mallee Box tall woodland on colluviums Height of EDL: 18 m Canopy Cover: 35% Area of community within MEP area: 19 ha	11.7.3 (Not of Concern)	Emergent: Absent. Canopy (T1): 18 (12-28 m) The mid-dense canopy is dominated by *Eucalyptus persistens* with very occasional *E. cambageana* and *Terminalia oblongata* associated with creek lines. Sub-Canopy (T2): 9 (6-12 m) The mid-dense sub-canopy is dominated by *Eucalyptus persistens* with patches of *Acacia harpophylla* and *Terminalia oblongata* locally dominant along creek lines. Shrub Layers: 2.2 (0.5-4 m) Sparse to mid-dense shrub layer characteristically includes *Alectyon diversifolius, Alstonia constricta, Breynia oblongifolia, Carissa ovata, Acalypha eremorum* and *Grewia latifolia.* Ground Layer: 0.9 (0-2 m) Notes: This community occurs on colluvial/deeply weathered sediments between the two jump-ups in the north of the site. Much of it occurs within a fenced area and subsequently has well developed shrub and native ground layers. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: *Bertya pedicellata*.	Found on the mesa in the western portion of ML 70313. The Mallee Box community occurs within an exclusion area fenced from cattle and consequently has good native sub-canopy, shrub and ground layers.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
4	Brigalow tall woodland on colluvium Height of EDL: 15.5 m Canopy Cover: 37% Area of community within MEP area: 10 ha	11.7.1 (Not of Concern)	Emergent: Absent. Canopy (T1):15.5 (12-20 m) the sparse canopy is dominated by *Acacia harpophylla* with occurrences of *Eucalyptus thozetiana* or *Eucalyptus persistens* (in the north of the MEP area). Sub-Canopy (T2): 10 (8-12m) The sparse to very sparse sub-canopy is dominated by *Acacia harpophylla* and *Terminalia oblongata*. Shrub Layers: 1 (0.5-1.5 m) The sparse to very sparse shrub layer is dominated by *Eremophila mitchellii, Carissa ovata* and *Enchylaena tomentosa*. Ground Layer: 0.6 (0-1.2 m) The mid-dense ground layer is a mosaic of stony bare earth and patches of grasses including *Pennisetum ciliare, Aristida lapathifolia* and *Megathyrsus maximus*. Notes: occurs on lower slopes of jump-ups on colluvial scree. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: *Bertya pedicellata*.	Found on the mesa in the western portion of ML 70313. The Brigalow tall woodlands associated with the southern mesa are in poor condition as the sub-canopy, shrub and ground layers have been cleared for, and impacted by, grazing.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
5	Poplar Box tall woodland on deeply weathered sediments Height of EDL: 18 m Canopy Cover: 53% Area of community within MEP area: 85 ha	11.5.2 (Not of Concern)	Emergent: Absent. Canopy (T1):18 (12-24 m) dominated by *Eucalyptus populnea*, *E. crebra* is often present. Sub-Canopy (T2): 8.8m (1.5-16 m) Where present, the sparse sub-canopy is dominated by *Alphitonia excelsa, Acacia harpophylla, Cassia brewsteri* and *Eucalyptus persistens* on margins of this community. Shrub Layers: 0.8m (0.4-6 m) The upper shrub layer varies between very sparse to mid-dense being dominated by *Alphitonia excelsa, Breynia oblongifolia, Bursaria spinescens, Grewia latifolia* and *Carissa ovata*. Ground Layer: 0.6m (0-1.5 m) The mid-dense to dense grassy understorey is dominated by *Pennisetum ciliare*, with occurrences of *Heteropogon contortus, Sida retusa* and *Hibiscus sturtii.* Notes: The shrub and ground layers have been cleared and grazing pressure and pasture improvement has led to the dominance of *Pennisetum ciliare*. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: *Desmodium macrocarpum*.	Occurs in a belt from the west of the MEP, extending around the southern margins of the mesas in the north-west and out to the north in ML 70313. This community is in poor condition due to clearing in the past for pasture improvement.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
6	Narrow-leaved Ironbark tall woodland on deeply weathered sediments Height of EDL: 15 m Canopy Cover: 43% Area of community within MEP area: 27 ha	11.5.3 (Not of Concern)	Emergent: Absent. Canopy (T1):15 (6-26 m) dominated by *Eucalyptus crebra, Corymbia clarksoniana* and *C. dallachiana* are occasionally present in the canopy. Sub-Canopy (T2): 4.5 (2-12 m) where present, the sparse sub-canopy is dominated by *Acacia leiocalyx, Alphitonia excelsa* and *Petalostigma pubescens.* Shrub Layers: 1.8 (0.3-4 m) The sparse to very sparse shrub layer is dominated by *Carissa ovata*. Ground Layer: 0.7 (0-1.2 m) The mid-dense to dense grassy understorey is dominated by *Pennisetum ciliare* with occurrences of *Heteropogon contortus, Sida retusa, Stylosanthes scabra* and *Hibiscus sturtii*. Notes: The shrub and ground layers have been cleared and grazing pressure and pasture improvement has led to the dominance of *Pennisetum ciliare*. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: *Desmodium macrocarpum*.	Occurs in a belt from the west of the MEP, extending around the southern margins of the mesas in the north-west and out to the north in ML 70313. This community is in poor condition due to clearing in the past for pasture improvement.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
7	Tall riparian open forest on deeply weathered soils Height of EDL: 15 m Canopy Cover: 63% Area of community within MEP area: 59 ha	11.5.3 (Not of Concern)	Emergent: Absent. Canopy (T1):15 (12-22 m) The sparse to mid-dense canopy is dominated by *Eucalyptus cambageana*, *Eucalyptus populnea* and patches of *Acacia harpophylla.* Sub-Canopy (T2): 8 (6-12 m) The sparse sub-canopy is dominated by a mixture of *Terminalia oblongata*, *Lysiphyllum caronii*, *Acacia leiocalyx* and patches of *Acacia harpophylla*. Shrub Layers: 1.7 (1-3 m) The very sparse to sparse shrub layer is dominated by *Alstonia constricta* and *Hovea longipes*. Ground Layer: 0.6 (0-1.5 m) The dense ground layer is dominated by the exotic grass *Megathyrsus maximus* and the native grass *Heteropogon contortus.* Notes: This community is an extension of the Dawson Gum tall riparian open forest that dominates New Chum Creek. In this area, however, it occurs on deeply weathered sediments (land zone 5). Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: None likely observed.	Riparian vegetation associated with New Chum Creek bisects the MEP in a north–south direction. This narrow linear community occurs in the northern part of the MEP in ML 70313.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
8	Dawson Gum tall riparian open forest on sands Height of EDL: 22 m Canopy Cover: 53% Area of community within MEP area: 132 ha	11.9.1 (Endangered)	Emergent: Absent. Canopy (T1): 22 (18-28 m) The sparse to mid-dense canopy is dominated *by Eucalyptus cambageana* with occurrences, some locally dominant, *of E. populnea, Corymbia tessellaris* and *E. camaldulensis*. Sub-Canopy (T2): 13 (10-16 m) The sparse sub-canopy is dominated by juvenile eucalypts characteristic of the canopy and *Lysiphyllum caronii* and *Terminalia oblongata*. Shrub Layers: 3 (0.5-6 m) The sparse to mid-dense shrub layer is dominated by a mixture of *Lysiphyllum caronii, Alstonia constricta* and *Acalypha eremorum*. The lower shrub layer is dominated by *Breynia oblongifolia*. Ground Layer: 0.6 (0-1.5 m) Herbs and forbs within this layer include *Ludwigia octovalvis* and *Cyperus exaltatus*, whilst the grasses are dominated by *Megathyrsus maximus* and *Brachiaria decumbens*. Notes: This community has not been thinned and is structurally and floristically in good condition. Some degradation has occurred through cattle accessing water. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: None likely.	Occurs occasionally throughout ML 70313 and in eastern portion of ML 70312.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
9	Tall riparian open forest on alluvial soils Height of EDL: 24 m Canopy Cover: <60% Area of community within MEP area: 70 ha	11.3.25 (Not of Concern)	Emergent: Absent. Canopy (T1):24 (22-28 m) The sparse canopy is dominated by *Eucalyptus camaldulensis* with occurrences of *E. cambageana* and *Corymbia tessellaris*. Sub-Canopy (T2): Not present Shrub Layers: 3 (2-6 m) The mid-dense shrub layer is dominated by *Hovea longipes, Diospyros humilis, Ehretia membranifolia, Eremophila sp.* and *Cyclophyllum coprosmoides*. Ground Layer: 1 (0-1.75 m) The dense ground layer is dominated by *Megathyrsus maximus* with occurrences of *Bothriochloa bladhii*. Notes: The alluvial soils that support this community are relatively fertile and some agricultural weeds such as *Megathyrsus maximus* dominate the ground layer. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: None likely.	Occurs in the south of the MEP area along New Chum Creek in ML 70312.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
10	Brigalow tall riparian open forest on sands Height of EDL: 14 m Canopy Cover: 45% Area of community within MEP area: 11 ha	11.9.1 (Endangered)	Emergent: Absent. Canopy (T1): 14 m (12-18 m) The sparse canopy is dominated by *Eucalyptus cambageana*. There are occurrences of *Corymbia tessellaris*. Sub-Canopy (T2): 8 (6-11 m) The mid-dense sub-canopy is dominated by *Acacia harpophylla* with occurrences of *Lysiphyllum caronii* and *Terminalia oblongata.* Shrub Layers: 2 (1-4 m). The mid-dense shrub layer is dominated by *Geijera parviflora* and *Lysiphyllum caronii.* Ground Layer: 0.5 (0-0.8 m) the mid-dense to sparse ground layer is dominated by *Pennisetum ciliare*. Notes: This vegetation community exhibits a local dominance in *Acacia harpophylla* within the sub-canopy, and is actually a sub-community of the Dawson gum tall riparian open forest. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: None likely.	Occurs occasionally throughout ML 70313 and in eastern portion of ML 70312.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
11	Poplar Box tall woodlands on alluvial soils Height of EDL: <16 m Canopy Cover: <40% Area of community within MEP area: 79 ha	11.3.2 (Of Concern)	Emergent: Absent. Canopy (T1): The sparse canopy is dominated by *Eucalyptus populnea.* Sub-Canopy (T2): the very sparse sub-canopy is dominated by *Eucalyptus populnea* with occurrences of *Terminalia oblongata* and *Lysiphyllum caronii*. Shrub Layers: very sparse. Ground Layer: the dense ground layer is dominated by *Pennisetum ciliare* with patches of *Megathyrsus maximus.* Notes: Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: *Desmodium macrocarpum*	Located on some alluvial flats associated with New Chum Creek at the very south of the MEP area in ML 70312.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
12	Tall riparian woodland on sands Height of EDL: 8 m Canopy Cover: 37% Area of community within MEP area: 11 ha	11.9.10 (Of Concern)	Emergent: 24 (20-25 m) Where present, *Eucalyptus populnea* dominates the emergent layer. Canopy (T1): 8 (6-12 m) The sparse to very sparse canopy is variously dominated by *Eucalyptus populnea, Acacia harpophylla* and *Terminalia oblongata*. Sub-Canopy (T2): The sub-canopy is generally absent Shrub Layers: 2 (1-3 m) The very sparse to sparse shrub layer is dominated by *Lysiphyllum caronii* and *Terminalia oblongata*. Ground Layer: 0.5 (0-1 m) The dense ground layer is dominated by *Pennisetum alopecuroides*, *Megathyrsus maximus* and *Pennisetum ciliare*. Notes: This community is confined in its entire length to within the bed and banks of the creek line. Past clearing has removed all remnant vegetation to the top-of-bank. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: None likely.	A very narrow band of this vegetation community is associated with the creek line draining from the proposed central dam in ML 70313.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
13	Dawson Gum tall woodland on sands Height of EDL: 19.5 m Canopy Cover: 39% Area of community within MEP area: 4 ha	11.9.1 (Endangered)	Emergent: Absent. Canopy (T1): 19 (15-25 m) The sparse canopy is entirely dominated by *Eucalyptus cambageana*. Sub-Canopy (T2): 6 (3-8 m) The very sparse sub-canopy where it occurs is dominated by *Eucalyptus cambageana* and *Acacia harpophylla*. Shrub Layers: 1.5 (1-2 m) The very sparse shrub layer where it occurs is dominated by regrowth *Eucalyptus cambageana* and *Acacia harpophylla*. Ground Layer: 0.5 (0-1 m) The dense ground layer is dominated by *Pennisetum ciliare*. Notes: Essentially this community consists of patches of remnant canopy trees. All other native vegetation has been cleared from this community for pasture improvement. Weeds of Concern: No weeds of immediate concern within this community. Possible EVR Species: None likely.	Two very small patches of large mature Dawson Gum remain immediately north of the proposed central dam in ML 70313.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
14	Brigalow tall woodland on sands Height of EDL: 16 m Canopy Cover: 57% Area of community within MEP area: 7 ha	11.9.5 (Endangered)	Emergent: Absent. Canopy (T1): 16 (14-18 m) *Acacia harpophylla*. Sub-Canopy (T2): Absent. Shrub Layers: Absent. Ground Layer: The dense ground layer is dominated by *Pennisetum ciliare*. Notes: This community has been cleared of sub-canopy and shrub layers to improve pastures. However, the canopy structure remains. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: None likely.	Occurs at the base of the north mesa in ML 70313.	
15	Mountain Coolabah tall woodland on sands Height of EDL: 15 m Canopy Cover: <40% Area of community within MEP area: 2 ha	11.9.3 (Not of Concern)	Emergent: Absent. Canopy (T1): 15 (12-20 m) The sparse to mid-dense canopy is dominated by Eucalyptus orgadophila. Sub-Canopy (T2): Absent. Shrub Layers: 1.6 (0.5-2 m) The very sparse shrub layer is dominated by Alstonia constricta and *Carissa ovata.* Ground Layer: 0.5 (0-0.8 m) the dense ground layer is dominated by Pennisetum ciliare with occurrences of Stylosanthes scabra and small patches of the native grass Dichanthium sericeum. Notes: This small patch of remnant trees has lost all other native elements through clearing for grazing. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: None likely.	One small patch of Mountain Coolabah (*Eucalyptus orgadophila*), persists in the far north of the MEP area in MLA 70401.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
16	Catkin Wattle regrowth on red earths Height of EDL: 4 m Canopy Cover: <70% Area of community within MEP area: 31 ha	Non-remnant	Emergent: Absent. Canopy (T1): 4 m (2-6 m) *Acacia julifera* Sub-Canopy (T2): Absent. Ground Layer: The dense grass understorey is dominated by native grass species including *Eragrostis speciosa, E. leptocarpa,, E. brownii and Aristida calycina*. Notes: This community is a near monoculture of evenly aged Acacias and is a response to broad-scale clearing. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: None likely.	Occurs on the northwestern-most plateau of the MEP area in ML 70313.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
17	Ironbark–Dawson Gum regrowth on sands Height of EDL: 8 m Canopy Cover: <20% Area of community within MEP area: 17 ha	Non-remnant	Emergent: Absent. Canopy (T1): 8 (6-10 m) The sparse canopy is dominated by an even mix of *Eucalyptus crebra*, E. *cambageana* and *Acacia harpophylla* with occurrences of *Corymbia clarksoniana*. Sub-Canopy (T2): 3 (2-5 m) The sparse sub-canopy is dominated by *Alphitonia excelsa* and *Acacia leiocalyx* with occurrences of *Petalostigma pubescens*. Shrub Layers: 0.5 (0.3-1 m) The very sparse shrub layer is dominated by *Carissa ovata* and *Stylosanthes scabra*. Ground Layer: 0.5 (0-0.8 m) The dense ground layer is dominated by *Pennisetum ciliare*. Notes: There is a complete absence of large, mature, 'remnant' trees within this community. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: None likely.	Occurs in the northern-most portion of the site due to past clearing in ML 70313.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
18	Mallee Box–Poplar box regrowth on deeply weathered sands Height of EDL: 6 m Canopy Cover: <20% Area of community within MEP area: 61 ha	Non-remnant	Emergent: 22 (20-24 m) Very few mature *Eucalyptus persistens* or *E. populnea*. Canopy (T1): 8 (6-10 m) *Eucalyptus persistens* or *E. populnea*. This canopy is very patchy and ranges from very sparse to mid-dense. Sub-Canopy (T2): Absent. Shrub Layers: 1 (0-2 m) The very sparse shrub layer includes *Carissa ovata* and *Breynia oblongifolia*. Ground Layer: Dense ground cover dominated by *Pennisetum ciliare* Notes: Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: None likely.	Scattered throughout the MEP site.	
19	Pasture grasses on sands Height of EDL: 0.5 m Canopy Cover: >70% Area of community within MEP area: 2,220 ha	Non-remnant	Emergent: Absent. Canopy (T1): Absent. Sub-Canopy (T2): Absent. Shrub Layers: Where present, the shrub layer can be sparse to mid-dense and between 0.5-6 m in height. *Eucalyptus populnea* and *Acacia harpophylla* either co-occur or individually dominate the shrub layer. Ground Layer: The dense ground layer is dominated by *Pennisetum ciliare* with very occasional patches of native grasses such as *Dichanthium sericeum, Bothriochloa decipiens* and *Eragrostis brownii*. Notes: Weeds of Concern: No weeds of immediate concern within this community. Possible EVR Species: None likely.	Occurs across the majority of the MEP area. These flats have been extensively cleared for pasture and are now a mosaic of Buffel Grass pasture and patches of low regrowth dominated by Poplar Box and/or Brigalow.	

Table 13-3 Habitat preferences for EVR species known to occur in the MEP vicinity

EVR Species	NC Act	EPBC Act	Habitat Preference	Likelihood of Occurrence
Desmodium macrocarpum	R	–	Known from Poplar Box woodland with sparse shrub layer, often associated with *Carissa ovata* and *Grewia retusifolia*.	Possible-habitat for this species occurs within Vegetation Communities 5, 6 and 11 Regional Ecosystems; 11.5.2, 11.5.3 and 11.3.2
Bertya pedicellata	R	–	Grows on escarpments and ranges on sandy or gravely soils. Known from low ranges near Coppabella.	Possible-habitat for this species occurs within Vegetation Communities; 1, 2, 3, and 4 Regional Ecosystems; 11.5.9, 11.7.1, 11.7.2, and 11.7.3
Capparis humistrata	E	–	Occurs predominantly on soils derived from serpentinite from Marlborough to Rockhampton.	Unlikely-no suitable habitat or soil types
Dichanthium setosum	R	V	Occurs on heavy, black cracking clay soils in native grass grasslands.	Unlikely-no suitable habitat or soil types
Cerbera dumicola	R	–	Occurs in mixed eucalypt woodland to open forests often along creeks and marshy areas with permanent water.	Known to occur within vegetation communities 11.7.2, and riparian vegetation on- site (Smith, 2003).
Graptophyllum ilicifolium	V	V	Occurs in semi-evergreen vine thickets in rocky areas and along ephemeral creeks	Unlikely-no suitable habitat or soil types
Paspalidium scabrifolium	R	–	Inhabits eucalypt woodlands on the lower and mid slopes of hills and ranges on volcanic derived soils.	Unlikely-no suitable habitat or soil types

VM Act = Vegetation Management Act 1999; *EPBC Act = Environment Protection and Biodiversity Conservation Act 1999*

E = Endangered; V = Vulnerable; R = Rare; – = Not listed

13.3.8 Introduced Species

Of the 196 flora species identified as present within the MEP (refer to **Appendix F7 – Terrestrial Ecology**), 33 (17%) were non-native. Of the 33 non-native flora species observed, three are listed under the *Land Protection (Pest and Stock Route Management) Regulation 2003 (LP Reg)* as requiring management (**Table 13-4**). No unlisted environmental weeds were observed to be reaching nuisance proportions across the MEP area. Many of these species can, however, proliferate in disturbed areas and cause the condition of native vegetation communities to degrade.

Table 13-4 Listed Weed Species Observed Within the MEP

Species	Class-*Land Protection (Pest and Stock Route Management) Act 2002*	Management requirements
Harrisia Cactus (*Harrisia martinii*)	Class 2	Control of declared pests is required by landholders
Prickly Pear (*Opuntia stricta*)	Class 2	Control of declared pests is required by landholders
Parthenium (Parthenium hysterophorus)	Class 2	Control of declared pests is required by landholders
Lantana (*Lantana camara*)	Class 3	May require removal from environmentally significant areas

13.4 TERRESTRIAL FAUNA

13.4.1 Fieldwork

Fauna surveys were undertaken within the MEP area in June 2003, October 2004, February 2006 and October 2009 in the locations shown in **Figure 13-4**. Spotlighting was undertaken to record nocturnal animals, and Anabat recordings were used to identify microchiropteran bats. Any fauna species observed while undertaking the flora surveys for the MEP were also recorded. Standard observational and capture techniques recommended for impact assessment and designed to sample all vertebrate groups were used during the surveys (**Table 13-5**).

While sampling aimed to provide a comprehensive terrestrial vertebrate inventory, it should be recognised that these results reflect a snap-shot of community composition. Species that are rare, cryptic or move over large distances (e.g. migratory or nomadic species) may not be represented within the results.

Table 13-5 Terrestrial Vertebrate Sampling Techniques

Method	Target Group/Species	Effort/Notes
Elliott A traps	Small mammals, some reptiles	Approximately 20 per systematic site for four nights.
Pitfall traps	All small terrestrial vertebrates	Five buckets at each systematic site for five nights.
Funnel traps	Some small and medium terrestrial vertebrates, predominantly reptiles	Four at each systematic site for five nights.
Harp traps	Low flying microchiropteran (insectivorous) bats	Two traps for two nights—used only along potential flyways (two locations).
Anabat call detection	All microchiropteran bats	Used at four locations.
Diurnal bird surveys	All bird species	20 minutes/systematic site on two mornings.
Spotlighting	Nocturnal vertebrates	20 minutes/systematic site + 30 minutes at TA04 + vehicle spotlighting (total 10 hrs).
Specific searches	Small terrestrial vertebrates.	Effort commensurate with physical features. Used opportunistically throughout survey.

Throughout the survey, habitats were assessed with relevance for vertebrate communities and EVR vertebrates. This included noting habitat factors such as the vegetation species present, hollow size and abundance, vegetation layer density and substrate type. Digital photos were extensively collected for later reference.

Opportunistic records of all vertebrate species were collected throughout the survey, particularly while traversing the MEP area.

13.4.2 Habitat Features within the MEP Area

Habitat characteristics and vertebrate diversity suggests that five subjective habitat and corresponding vertebrate community groups occur in the MEP area:

- exotic grasslands;
- woodlands dominated by exotic grasses;
- native understorey woodlands;
- massive rock outcrops; and
- waterway habitats.

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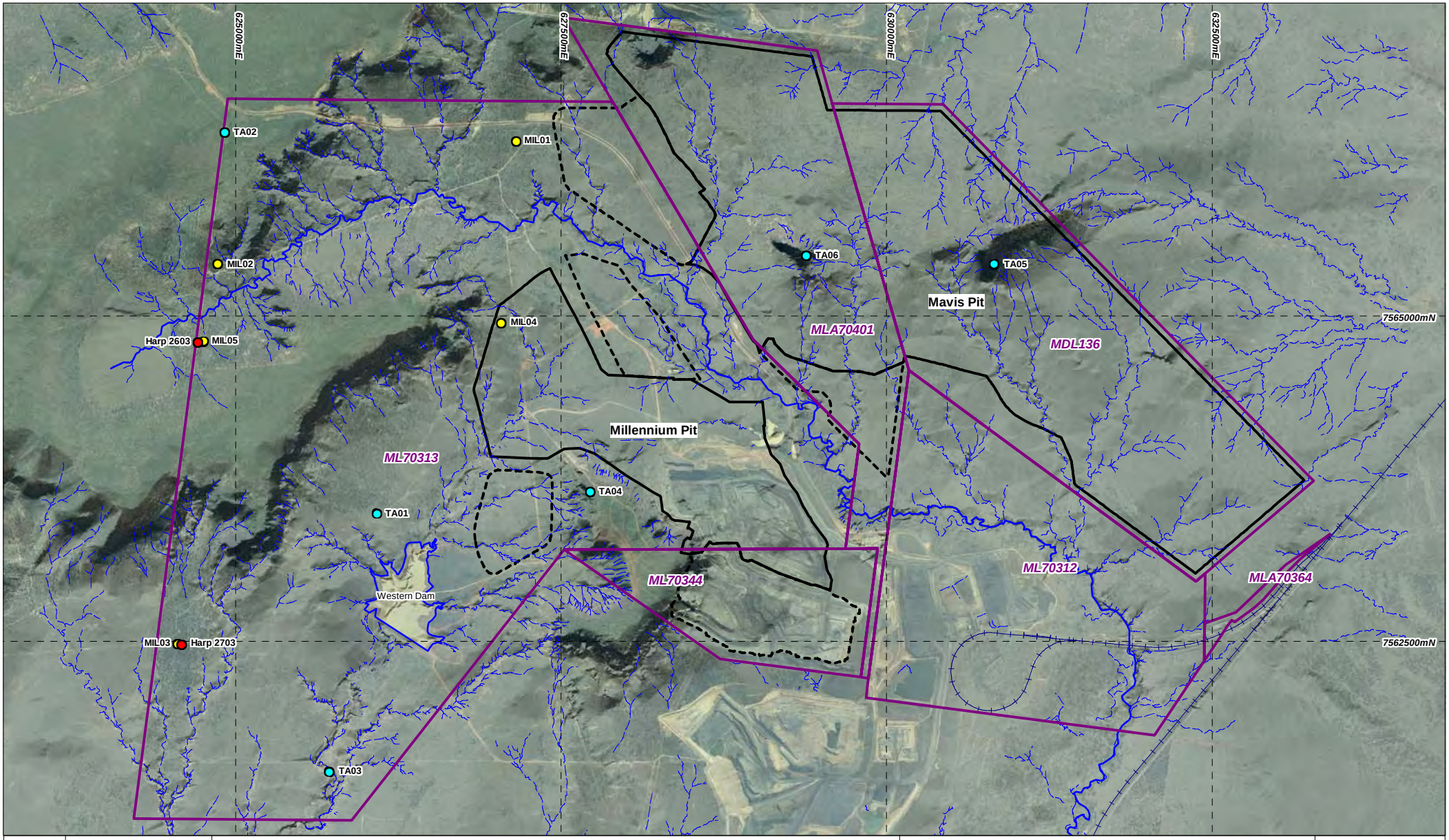


MET SERVE

Peabody

0 800
Metres
Scale: 1:40,000 (A4)

LEGEND

- Peabody tenement
- Railway
- New Chum Creek
- Watercourse
- 2027 pit footprint
- 2027 dump footprint

Survey Type

- Harp Trap
- Systematic Transect
- Target Area

Data Source: Imagery, Infrastructure, Tenement, Topography - Minserve. Flora Survey - BAAM.

Peabody Energy Australia Pty Ltd

Millennium Expansion Project

Fauna Survey Locations on the MEP

25/10/2010

Datum: GDA94
Projection: MGA54

FIGURE 13-4

13.4.2.1 Exotic Grasslands

Exotic grass, particularly Buffel Grass, dominates cleared grazing land and is the most common habitat with the MEP. These areas may or may not include a moderately thick cover of one to two metre high shrubs, typically regrowth species from the original canopy. Hollows are absent and fallen debris is scarce.

Common bird species within these communities included Pied Butcherbird, Torresian Crow, Australian Magpie, Australian Pipit, Black-faced Woodswallow, Nankeen Kestrel and Brown Falcon.

Terrestrial vertebrate communities are considerably less abundant in open grassy areas. Common terrestrial species included Eastern Bearded Dragon *(Pogona barbata*), Spotted Python (*Antaresia maculosa*), Eastern Grey Kangaroo (*Macropus giganteus*), Feral Dogs (*Canis lupus familiaris*) and European Rabbit (*Oryctolagus cuniculus*).

The threatened Squatter Pigeon (*Geophaps scripta scripta*) may occur along roadways and in less dense grassland.

13.4.2.2 Woodlands Dominated by Exotic Grasses

Woodlands dominated by exotic grasses were more abundant on low-lying undulating plains. They include remnant vegetation dominated by both eucalypt species and Brigalow. In both cases, the canopy is sparse and shrubs are scattered, separated by expansive areas of Buffel Grass.

Commonly observed bird species within these communities included Striated Pardalote, Pale-headed Rosella, Singing Honeyeater, Noisy Friarbird, Red-backed Fairy-wren, Peaceful Dove, Double-barred Finch and Weebill.

Small terrestrial vertebrate communities were comparatively poor. Observed species included Ornate Burrowing Frog (*Platyplectrum ornatum)*, Eastern Striped Skink (*Ctenotus robustus*), Common Dwarf Skink *(Menetia greyii),* Eastern Mulch-Slider *(Lerista fragilis)* and Open Litter Rainbow Skink *(Carlia pectoralis*).

Microchiropteran (insectivorous) bat distribution tends not to be influenced by ground strata and bats are likely to be common in both woodlands dominated by exotic grasses and woodlands with native understoreys. Bats observed in woodlands included Gould's Wattled Bat (*Chalinolobus gouldii*), Chocolate Wattled Bat (*C. morio*), Hoary Wattled Bat (*C. nigrogriseus*), Little Pied Bat (*C. picatus*), Gould's Long-eared Bat (*Nyctophilus gouldi*) and Eastern Cave Bat (*Vespadelus troughtoni*).

Two EVR species were recorded from woodlands dominated by exotic grasses: Brigalow scaly-foot (*Paradelma orientalis*) and Little Pied Bat (*Chalinolobus picatus*). In addition, the Squatter Pigeon (*Geophaps scripta scripta*) is likely to be found along tracks and roads where grass growth is reduced and Ornamental Snake (*Denisonia maculate)* is possible in these habitats along New Chum Creek. These species were not observed during any field surveys.

13.4.2.3 Native Understorey Woodlands

Woodlands not infested by exotic grasses were predominantly restricted to the escarpments and lower slopes. Within these areas, the ground strata consisted of a mosaic of open ground, grass patches, fallen timber and in some locations small rocks. This provided a complex habitat for ground vertebrates allowing abundant foraging, sheltering and basking opportunities. As a result, terrestrial vertebrates were also more diverse and abundant within these habitats.

Species unique to these habitats included Eastern Barred Wedge-snout (*Ctenotus strauchii),* Fat-tailed Gecko *(Diplodactylus conspicillatus),* Rough Knob-tailed Gecko *(Nephrurus asper*) and Carpentaria Snake *(Cryptophis boschmai*).

Native shrubs species such as Leichhardt Bean (*Cassia brewsteri*) and Currant Bush (*Carissa ovata*) were common, occurring in patches or scattered throughout the vegetation. The increase in vertical complexity favoured Variegated Fairy-Wren, Buff-rumped Thornbill, Inland Thornbill and Grey-crowned Babblers. Grey-crowned Babblers are listed as Near Threatened in the Action Plan for Australian Birds (Duncan *et al*., 1999) due to local extinctions from fragmented habitats in the south of their range (NSW and Victoria).

Dominant canopy species varied but typically included Clarkson's Bloodwood, Queensland Peppermint and Napunyah as well as areas of Lancewood (*Acacia shirleyi*). Where eucalypts were present, small and medium hollows were abundant. Hollow-dependant species such as Australian Owlet Nightjar, a number of microchiropteran bats and Common Brushtail Possum (*Trichosurus vulpecula*) were more common in these habitats.

13.4.2.4 Massive Rock Outcrops

Several features mark this type of habitat as distinct from all other habitats within the MEP area. The most obvious is the presence of large rock cliffs and boulders complete with abundant fissures, cracks, exfoliating rocks and overhangs. Ground-dwelling species will readily inhabit these areas, taking advantage of the ideal sheltering, foraging and basking opportunities. Opportunities for arboreal species also abound on the large cliffs, particularly for small species such as Dubious Cecko (*Gehyra dubia),* Ocellated Velvet Gecko (*Oedura monilis)* and Wall Skink (*Cryptoblepharus virgatus)*. Unadorned Rock-wallabies (*Petrogale inornata*) were recorded within the rocky areas and are unlikely to be distributed away from these habitats.

In addition, large fruiting Rusty Figs (*Ficus rubiginosa*) were found only in these locations. Frugivorous species are likely to be restricted or substantially more abundant in these habitats. Their presence in the area is likely to fluctuate in response to fruiting events. Typical species could include flying-foxes, Southern Figbird, Channel-billed Cuckoo and Eastern Koel.

Hollows within Eucalypts at the base and on top of the cliffs provide habitat for a number of hollow-obligate species. Anabat activity was exceptionally high adjacent to the rock cliffs and is likely to reflect abundant sheltering sites for this group, both within tree hollows and rock crevices.

13.4.2.5 Waterway Habitats

No naturally occurring permanent water habitats occur within the MEP. The only permanent water is a dam, built and used by the existing mining operation (West Dam). This dam has no emergent or floating aquatic vegetation present for small aquatic species and only common aquatic bird species visit the dam. Species noted during the survey included Grey Teal, Australian Wood Duck, Pacific Black Duck, Royal Spoonbill, Darter and Eastern Great Egret. All these species are abundant in the local area.

13.4.3 Fauna Communities

A total of 126 terrestrial vertebrates were identified in the MEP area (refer to **Appendix F7 – Terrestrial Ecology**), including five amphibians, 16 reptiles, 89 birds and 16 mammals. Amphibian, reptile and mammal diversity within the MEP is consistent with the diversity of vertebrate communities found during similar studies in the local area (**Table 13-6**).

Table 13-6 MEP Vertebrate Diversity in Comparison to Local Studies

Study (Source)	Amphibians	Reptiles	Birds	Mammals	Total
Poitrel-Aug 2004 (EIS) (Sinclair Knight Merz, 2005)	0	8	74	17	99
Carborough Downs-Dec 2004 (EIS) (Matrixplus, 2007)	9	27	96	29	161
Carborough Downs-Jul 2004 (EIS) (Matrixplus, 2007)	1	11	57	19	88
Carborough Downs-May 2006 (EIS) (Matrixplus, 2007)	1	14	47	17	73
Daunia 1996 (BMA, 2008)	11	28	102	23	164
Daunia 2004 (BMA, 2008)	0	8	74	16	98
Daunia 2008 (BMA, 2008)	9	5	69	16	99
Millennium Expansion Project (MEP)	5	16	89	16	126

The composition of vertebrate communities within the MEP area varied according to habitat structure.

13.4.3.1 Pest Vertebrates

Four exotic pest species were recorded from within the MEP area:

- Cane Toad (*Rhinella marina*);
- House Mouse (*Mus musculus*);
- European Rabbit (*Oryctolagus cuniculus*); and
- Feral Dog (*Canis lupus familiaris*).

Both the European Rabbit and Feral Dog are declared pest species (Class 2) under the *Land Protection (Pest and Stock Route Management) Act 2002* (*LP Act*). A Class 2 Pest is one that is established in Queensland and has or could have a substantial adverse economic, environmental or social impact. Under the *LP Act*, landowners must take reasonable steps to keep lands free of Class 2 pests.

Feral Dogs were commonly observed within the MEP area and have the potential to affect existing vertebrate populations. In particular, dispersal and recruitment of medium sized mammals such as the Unadorned Rock-Wallaby and Spectacled Hare-Wallaby, may be affected. Many vertebrate species will benefit from the control of Feral Dogs.

Under the *EPBC Act*, 'competition and land degradation by rabbits' is listed as a key threatening process, although it is unlikely that competition is a significant factor within the MEP due to low rabbit numbers. Nevertheless, rabbits provide a stable food source for feral dogs and their control will assist in controlling feral

dog numbers. Rabbit control should not occur unless undertaken concurrently with feral dog control to avoid dogs prey-switching to native species.

In addition to the above key threatening process, '*The biological effects, including lethal toxic ingestion, caused by Cane Toads* (*Bufo marinus*)' is also listed under the *EPBC Act*. Any created waterbody, including ponding areas, roadside ditches, flood channels, etc., can increase breeding opportunities for Cane Toads. Cane Toads are already common throughout the MEP area, however actions should be undertaken, where possible, to avoid increasing Cane Toad breeding opportunities.

Other exotic pest species such as Feral Cat and European Fox are also likely to occur. Both these species are listed as a Class 2 pest under the *LP Act* and as a Key Threatening Process under the *EPBC Act*.

13.4.3.2 Rare and Threatened Fauna

Short-duration surveys are never sufficient to completely sample all components of a vertebrate community (Thompson *et al.*, 2003). Cryptic and rare species are often overlooked, but should not be omitted from the assessment process. Accordingly, an assessment based on the recorded habitat values within the MEP for locally known EVR vertebrates has been conducted.

Two vertebrates listed as EVR under legislation have been confirmed by site surveys to be within the MEP area, while a further two are identified as possible or likely (**Table 13-7**)

Table 13-7 Likelihood of EVR Vertebrates Within the MEP

Common Name	Scientific Name	*NC Act*	*EPBC Act*	Likelihood
Brigalow scaly-foot	*Paradelma orientalis*	V	V	Confirmed
Little Pied Bat	*Chalinolobus picatus*	R	–	Confirmed
Ornamental Snake	*Denisonia maculata*	V	V	Possible
Squatter Pigeon (Southern)	*Geophaps scripta scripta*	V	V	Possible

VM Act = Vegetation Management Act 1999; *EPBC Act = Environment Protection and Biodiversity Conservation Act 1999*
E = Endangered; V = Vulnerable; R = Rare; – = Not listed

13.4.3.3 Non-EVR Migratory Vertebrates

One migratory species, the Rainbow Bee-eater, is known to occur within the MEP. No recorded or likely migratory species will be significantly affected by the proposed activities due to:

- being extremely abundant in the local area and region (Rainbow Bee-eater and *Ardea alba s. lato*); and/or
- having considerable alternative habitat outside of proposed impact areas (Rainbow Bee-eater, *Ardea alba s. lato*, Cattle Egret, Fork-tailed Swift, White-throated Needletail); and/or
- no loss of habitat (Fork-tailed Swift, White-throated Needletail).

No special management actions for migratory species are considered necessary.

13.4.3.4 Ecological Corridors

Corridors facilitate the movement, dispersal and genetic flow of both plants and animals from one area of habitat to another. They are a crucial component of meta-population dynamics and maintain both local and regional biodiversity values by ensuring repopulation, genetic diversity and maintaining population numbers.

The ecological importance of a corridor is influenced by the quality and diversity of vegetation and habitats within the corridor (refer to **Figure 13-5**). Those corridors with higher diversity are generally more successful in facilitating a connection for a wider suite of species. Edge effects, such as weed invasion, predation and competition, also play an important role and therefore the wider the corridor the greater its ecological value. In addition, the corridor may be of higher significance if it connects two areas of important vegetation, even if the corridor itself is highly degraded.

Corridors usually refer to linear strips of vegetation that remain in a landscape subject to broad scale clearing. However ecological corridors may also occur where a particular habitat or vegetation type is restricted to a narrow area within the larger habitat matrix (e.g. riparian vegetation).

Biodiversity Planning Assessment mapping of corridors indicates that no corridors significant at a state and regional level are present within or adjacent to the MEP. However, at a local scale, vegetation within and connecting to the MEP area is likely to be important for local movements. In particular, vegetation along New Chum Creek may facilitate movement of fauna in a north–south direction between vegetation to the north and vegetation along the Isaac River.

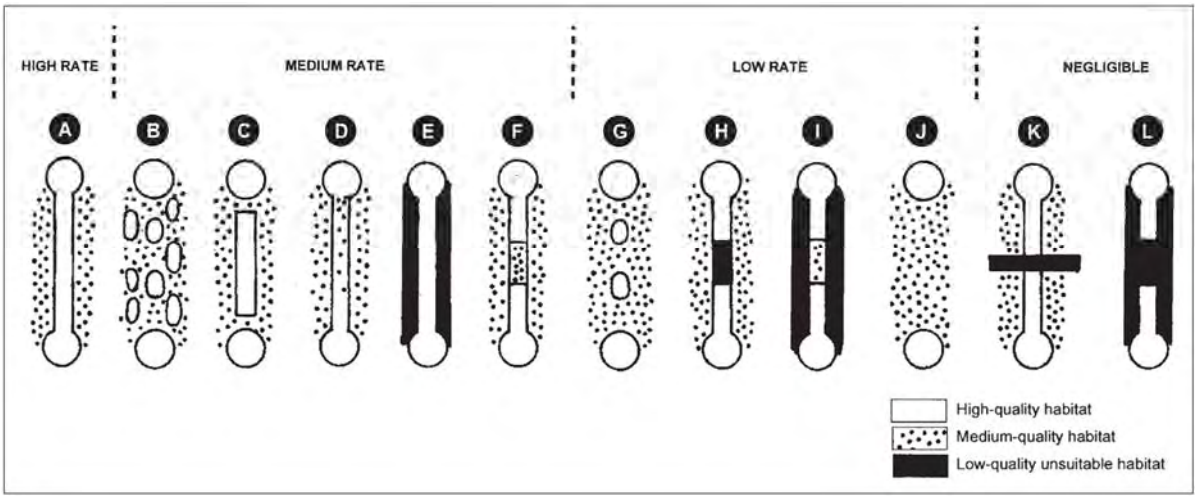


Figure 13-5 Effect of Habitat Diversity on Movement Rates Through Corridors (QDMR, 2000)

Vegetation associated with the mesa outcrop in the south of ML 70313 is not directly connected to other remnant vegetation. However, this area, with its high-quality habitat values, may be acting as a stepping stone for more mobile species such as bats, birds and large terrestrial species such as macropods.

13.5 AQUATIC BIOLOGY

The mine access road traverses a number of New Chum Creek tributaries and eventually New Chum Creek itself, prior to reaching the Red Mountain Joint Venture Coal Handling and Preparation Plant (CHPP).

The MEP area experiences a high level of temporal variability in rainfall and all of the systems are highly ephemeral. The highly seasonal rainfall patterns have a profound influence on aquatic ecological processes at the MEP site with issues such as flow velocity and water quality affecting macroinvertebrate communities. Highly variable velocities and water quality associated with ephemeral systems almost universally result in depauperate macroinvertebrate and fish assemblages, with species sampled generally the most capable of adapting to significant temporal variability.

13.5.1 Sampling Site Selection

Six sites were assessed during the aquatic ecology survey. Site selection was influenced by:

- the need to sample both upstream and downstream of the current mining operation and of the MEP;
- sampling site access;
- the availability of wetted aquatic habitat as many of the creeks on the site flow only during and immediately after a rainfall event. Most sampling sites during March consisted of remnant pools, whilst many proposed sampling sites did not contain water; and
- the location at which water quality samples are currently collected, which provides some historical context for the water quality data and the observed macroinvertebrate assemblages.

Site 1: New Chum Creek Downstream

This site is essentially below the operational area of the existing coal mine.

Site 2: New Chum Creek Upstream

This site provides an assessment of water quality and ecology in New Chum Creek upstream of the influences of the existing Millennium Mine.

Site 3: West Creek Downstream

This site is below a major dam and is used by existing Millennium Mine as an' end of system' water quality monitoring site.

Site 4: West Creek Upstream

This site provides an assessment of water quality and aquatic ecology upstream of the influences of the current mining operations. As the area is relatively low lying, care was taken to ensure the selected site was above the area into which the dam will back up during periods of high water levels, ensuring comparability between upstream and downstream macroinvertebrate and fish populations.

Site 5 and Site 6: NP1 and NP2 (North Poitrel)

These sites are currently outside of the active mining area. The MEP will result in this area being utilised for coal extraction, hence there is potential for future impacts. NP1 and NP2 are very small first order drainage lines emanating within close proximity to the sampling site. Access was difficult, hence only a single site

was sampled on each drainage line, this will become a downstream site when the MEP commences.

13.5.2 Methodology

Macroinvertebrates were sampled using standard field protocols outlined in the Australian Rivers Assessment System (AusRivAS) Queensland field manual (DNRM, 2001), the commonly accepted Australian methodology for assessments of this nature. AusRivAS utilises regional models to statistically compare observed invertebrate assemblages at test sites with those expected at comparable but pristine (reference) sites.

Fish communities were sampled using seine nets and baited traps. A 2 mm mesh seine net was used to sweep each site, with one operator on each bank enabling the entire pool to be netted.

Depending on water depth and pool size, four to five baited traps (45 × 25 × 25 cm) were deployed overnight at each site for a minimum of 14 hours. Traps were positioned near available in-stream habitat (e.g. woody debris; draping aquatic vegetation; or in-stream aquatic macrophytes) where available. All fish were identified to species level and total count recorded prior to being released unharmed at the site of capture.

13.5.3 Existing Environment

13.5.3.1 Macrophytes

At the time of sampling no aquatic macrophytes, emergent or submerged, were recorded at any of the sites. The lack of aquatic vegetation was most likely due to:

- scouring and removal of vegetation during recent high flow events;
- the very steep sided, channelised nature of the watercourses within the MEP, which tend to deter colonisation by emergent species;
- reduced light penetration due to high turbidity, reducing opportunity for colonisation by submerged species; and
- the unconsolidated and mobile sand/silt substrate present at many of the sites.

Surveys of macrophytes at the neighbouring Daunia Coal Mine (BMA, 2008) identified the species indicated in **Table 13-8**.

Table 13-8 Macrophyte species recorded at the Daunia Site-2009

Common Name	Scientific Name
Finger Flat Sedge	*Cyperus digitatus*
N/A	*Persicaria attenuata*
Bunchy Sedge	*Cyperus polystachyos*
Rice Sedge	*Cyperus difformis*
N/A	*Monochoria cyanea*
Jerry-Jerry	*Ammannia multiflora*
Broad-leaf Rush	*Juncus planifolius*
Uniola Flatsedge	*Cyperus unioloides*
Yellow Nutgrass	*Cyperus esculentus*

Common Nardoo	*Marsilea drummondii*
Hairy Nardoo	*Marsilea hirsuta*
Stonewarts	*Nitella* spp.

It is possible that some of these species may colonise the MEP sampling sites when hydrological conditions are favourable.

13.5.3.2 Macroinvertebrates

The study revealed a high number of macroinvertebrate numbers with micro-crustaceans contributing significantly to these figures. Three sites recorded the highest overall abundances of invertebrates, namely West Creek Upstream, NP2 and New Chum Downstream. Micro-crustaceans accounted for 82%, 79% and 45% of the invertebrates recorded, respectively.

Table 13-9 shows macroinvertebrate families recorded across all of the Millennium sites, whilst **Figure 13-6** and **Figure 13-7** show the total abundance and the number of families of macroinvertebrates recorded at each site, respectively.

Table 13-9 Macroinvertebrate Abundance within the MEP area, March 2009

Common name	Order	Family	New Chum-U/S2		New Chum-D/S		West Creek-U/S		West Creek-D/S		NP 2
			Bed	Edge	Bed	Edge	Edge	Bed	Bed	Edge	Bed
Segmented worms	Annelida	Oligochaeta		3	1						1
Water mites	Aracihnida	Acarina	6	1	18	1	11	4	2	3	
Copepods	Calanoida	Centropagidae		1	1	1	1	6			
	Cyclopoida		3	5	48	29	8	18	3		102
Water fleas	Cladocera	Chydoridae		1	16	1					6
		Dapniidae			1			149			31
		Macrothricidae	1		3	2					
		Moinidae						12			
		Sididae		4	6		6	81			17
Hydra	Cnidaria	Hydridae			1						
Beetles	Coleoptera	Dyticidae		2			4	4			
		Hydrophilidae							1		
Freshwater crab	Decapoda	Atyidae			2		2	7			
True flies	Diptera	Ceratopoginae			3	1			2	3	
		Chironomidae (Chironominae)	6	7	25	13	6	2	10	13	20
		Chrironomidae (Tanypodinae)		4	1	8	5	6	1	1	1
		Culicidae				1					2
Mayflies	Ephemoroptera	Baetidae	4	3	14	9	21	39	5	1	3
		Caenidae	3		4	4			1		
Dragonflies	Epiproctophora	Gomphidae			1						
		Hemicordulidae	1	2		1			1		
Bugs	Hemiptera	Corixidae	6	1	7	6	3	6	6	5	2
		Veliidae		1							
Moths	Lepidoptera	Pyralidae						1			
Seed shrimp	Ostracoda	Cyprididae	1		3	1				1	
		Juvenile sp.			3				1		5

Figure 13-6 Number of Macroinvertebrates in the MEP Area, March 2009

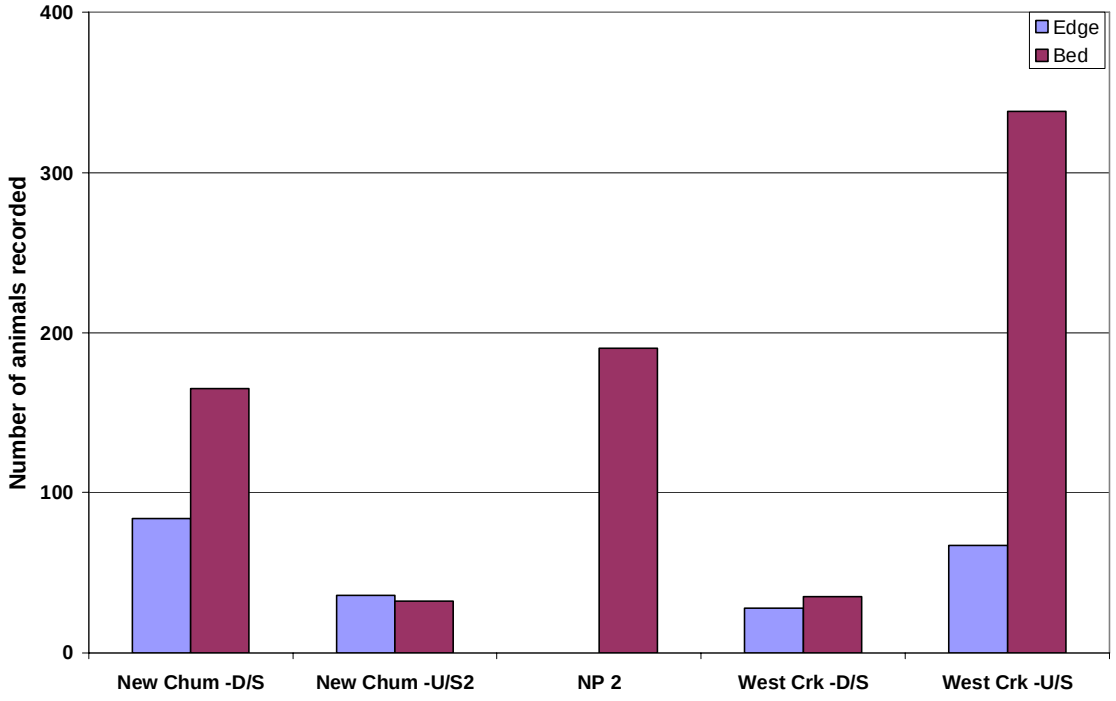
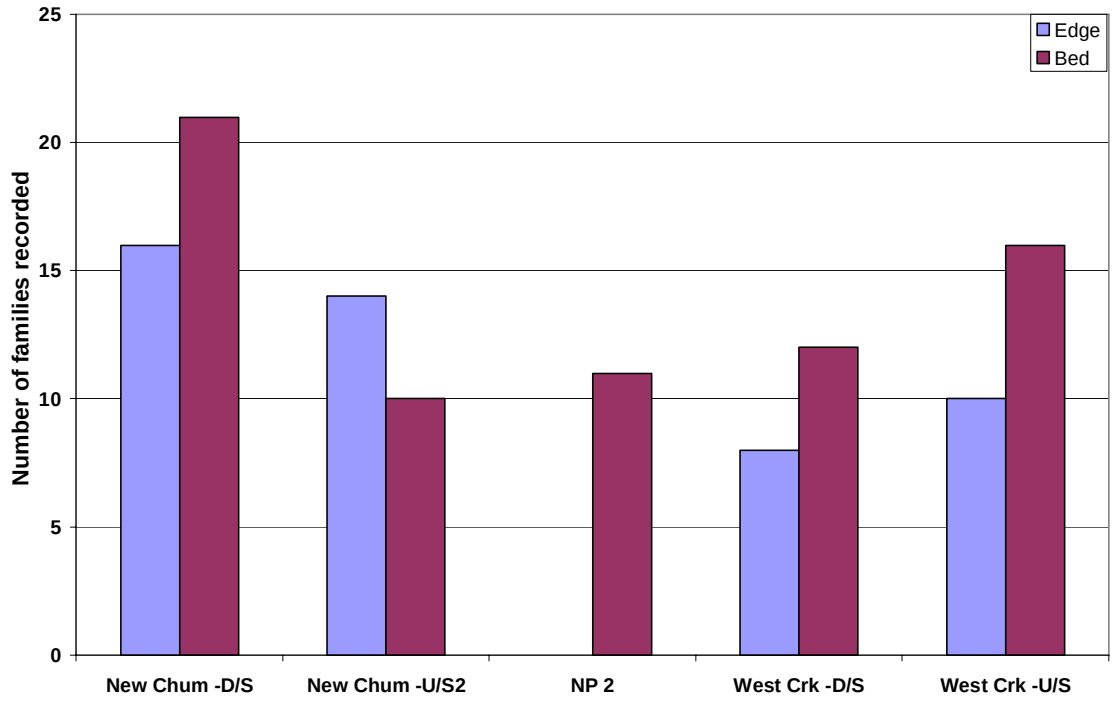


Figure 13-7 Number of Macroinvertebrate Families Within the MEP Area, March 2009



13.5.3.3 Fish

A desktop review of potential fish assemblage was undertaken within the Isaac-Connors River and Fitzroy River catchments (**Table 13-10**) relating to the freshwater reaches.

Table 13-10 Potential freshwater fish within the Isaac-Connors Rivers System

Common Name	Scientific Name
Firetail Gudgeon	*Hypseleotris galii*
Hyrtl's Tandan	*Neosilurus hyrtlii*
Agassiz's Glassfish	*Ambassis agassizii*
Bony Bream	*Nematalosa erebi*
Banded Grunter	*Amniataba percoides*
Fly-speckled Hardyhead	*Craterocephalus stercusmuscarum*
Mouth Almighty	*Glossamia aprion*
Empire Gudgeon	*Hypseleotris compressa*
Western Carp Gudgeon	*Hypseleotris klunzingeri*
Spangled Perch	*Leiopotherapon unicolor*
Eastern Rainbowfish	*Melanotaenia splendida splendida*
Sleepy Cod	*Oxyeleotris lineolatus*
Mosquito Fish	*Gambusia holbrooki*

Field surveys recorded a total of 121 individual fish from five species across all six of the sampling sites (**Figure 13-8**).

Figure 13-9 shows the number of fish and proportion of species recorded during the March 2009 surveys across the MEP area.

Figure 13-8 Number of fish caught and species richness by site during the March 2009 surveys of the MEP area

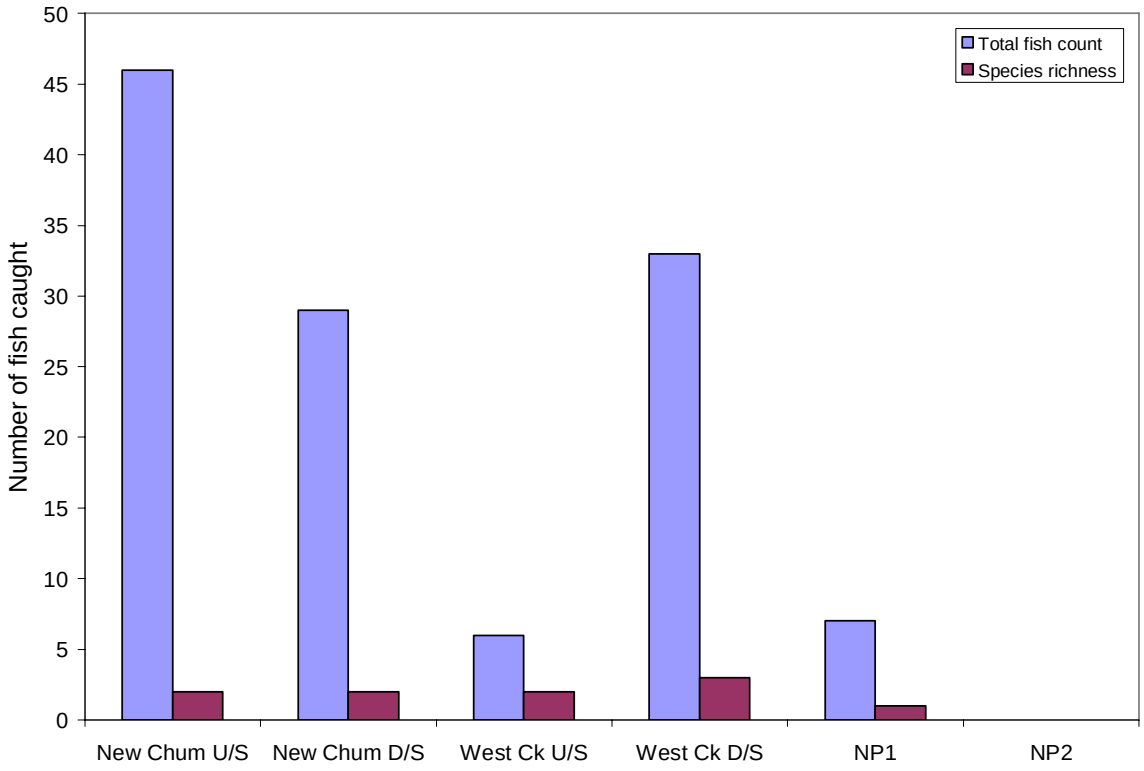
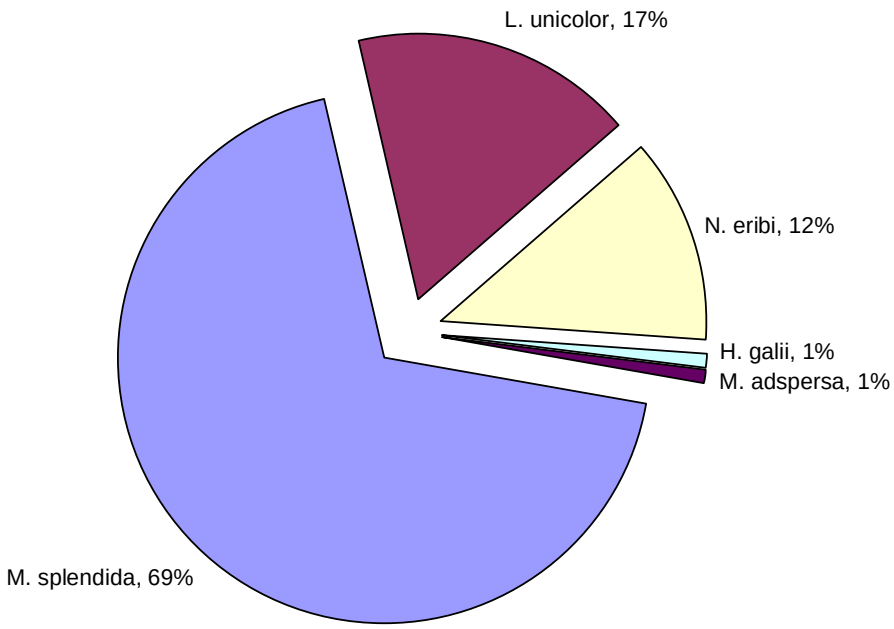


Figure 13-9 Relative Proportion of Fish Species Recorded Across the MEP Area, March 2009



13.5.3.4 Other Fauna

Informal, opportunistic surveys were undertaken to locate and record any other fauna species associated with the MEP waterways. Two frog species were noted at the MEP area:

- Striped Marsh Frog (*Limnodynastes peroni)*, New Chum U/S site; and
- Ornate Burrowing Frog (*Limnodynastes ornatus)*, West Creek D/S and New Chum U/S sites.

Neither of these species is considered to be of conservation significance, with populations stable or suspected of being stable or increasing.

Six turtle species are known to occur within the Fitzroy River catchment, including the EPBC listed (vulnerable) Fitzroy River turtle. The other species include:

- Eastern Snake-necked Turtle (*Chelodina longicollis)*;
- Saw-shelled Turtle (*Elseya latisternum)*;
- Cann's Snake-necked Turtle (*Chelodina canni)*;
- Styx River hybrid (*Chelodina longocillis x canni)*; and
- Krefft's River Turtle (*Emydura macquarii krefftii)*.

No turtles, platypus or crocodiles were recorded during field surveys and no sign of burrows, nests or paths were noted.

No formal surveys of aquatic or semi-aquatic reptiles, mammals or amphibians were performed. Given the intermittent nature of the waterways at the site, lack of suitable aquatic habitat (deep permanent pools with macrophytes) and the absence of reliable aquatic food sources, it is unlikely that turtles, crocodiles or platypus will utilise waterways at the Millennium site in anything more than a transitory way, if at all.

13.6 POTENTIAL IMPACTS AND MITIGATION MEASURES

This section presents the assessment of potential impacts on the terrestrial flora, terrestrial fauna and aquatic biology resulting from the MEP and proposes appropriate mitigation measures.

13.6.1 World Heritage and Wetlands of International Importance

The closest World Heritage Property and Ramsar wetland to the MEP are both approximately 130 km to the east. Given the MEP's considerable distance from these sites, no direct or significant indirect impacts on these values are expected, and no mitigation measures are considered necessary.

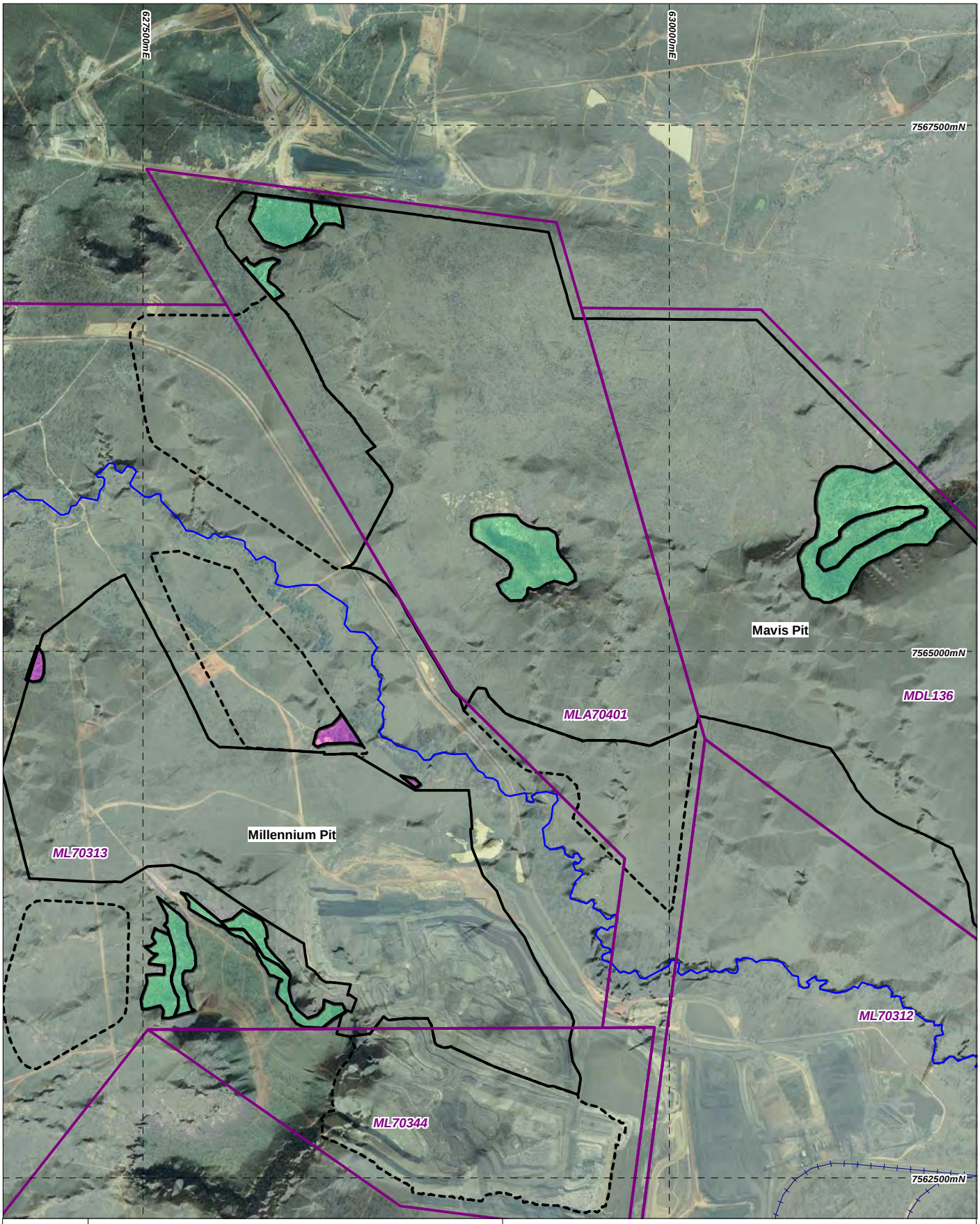
13.6.2 Vegetation Communities and Flora

Clearing of vegetation and habitat is the main impact on flora and fauna associated with the proposed development. Areas that have been mined will mostly be rehabilitated to re-create similar vegetation and habitat though this may take considerable time to achieve (refer to **Chapter 5-Rehabilitation and Decommissioning**).

The conceptual mine plan for the MEP demonstrates that clearing activities will include the proposed open-cut pits, haul roads, water management infrastructure and waste rock emplacement areas (refer to **Figure 13-10**). Existing roads and tracks will be utilised to access the MEP areas. Approximately

66 ha of remnant vegetation is likely to be cleared for the MEP (refer to **Table 13-11**). This includes the loss of 2.9 ha of Brigalow-dominated or co-dominated vegetation listed as Endangered under the *VM Act* and *EPBC Act* (REs 11.9.1 and 11.9.5).

Other areas of vegetation that lie within the proposed pit and waste rock emplacement areas and are thus designated for clearing are REs 11.7.1, 11.7.2, 11.9.3, all of which are designated 'not of concern' under the *VM Act*. Regional ecosystem 11.9.3 is included in the description of the Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin under the *EPBC Act*. A 2.3 ha area of this community is proposed to be disturbed by the proposed MEP however; this RE does not meet the habitat quality and structural requirements for constituting this TEC under the DEWHA (2008) listing advice.



LEGEND

- Peabody tenement
- 2027 pit footprint
- 2027 dump footprint
- Railway
- New Chum Creek

VM Act Status

- Endangered
- Not of Concern

MET SERVE

Peabody

Data Source:
Imagery, Infrastructure, Tenement - Minserve. Topography (250k) - Geoscience Australia.
RE Mapping - BAAM.

Peabody Energy Australia Pty Ltd

Millennium Expansion Project

Proposed Vegetation Loss

0 0.5 1

Kilometres

Scale: 1:25,000 (A4)

19/10/2010

Datum: GDA94
Projection: MGA55

FIGURE 13-10

S:\Projects\PE001 Millennium Coal EIS_Mapinfo\Workspaces\PE001_M257A.wor

Table 13-11 Remnant Vegetation Areas Designated for Clearing for Pit and Waste Rock Emplacements

RE	RE Short Description	*VM Act* Status	Biodiversity Status	*EPBC Act* Status	Total Area in MEP (ha)	Proposed Loss (ha)
11.7.1	*Acacia harpophylla* and/or *Casuarina cristata* and *Eucalyptus thozetiana* or *E. microcarpa* woodland on lower scarp slopes on Cainozoic lateritic duricrust.	Not of concern	Of concern	–	10.3	6.7
11.7.2	*Acacia* spp. woodland on Cainozoic lateritic duricrust.	Not of concern	No concern at present	–	269.8	54.8
11.9.1	*Acacia harpophylla-Eucalyptus cambageana* open forest to woodland on fine-grained sedimentary rocks.	Endangered	Endangered	Endangered	78.9	1.6
11.9.3	*Dichanthium* spp., *Astrebla* spp. grassland on fine-grained sedimentary rocks.	Not of concern	No concern at present	–	2.3	1.6
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks.	Endangered	Endangered	Endangered	6.8	0.9
TOTAL					**368.1**	**65.6**

The Brigalow communities in the proposed open-cut pit and waste rock emplacement areas of the MEP are heavily degraded. Despite these disturbances, these remnants need to be evaluated in their regional context. Brigalow coverage has been drastically reduced throughout its range, primarily as a result of land clearing for agricultural development (DEWHA, 2007).

Remaining patches may act as recruitment sites for ecosystem regeneration, and even small patches have been shown to have significant value in that they provide important habitat for a variety of fauna (Collard *et al.*, 2009).

The planned pit extension will result in the clearing of 0.9 ha of a 4.6 ha patch of Brigalow. This patch in combination with a second 2.3 ha area to the north represents the only instances of this vegetation type within the MEP area.

The southern patch (4.6 ha) of this RE is also the location where a Brigalow Scaly-Foot individual was observed. For this reason it is proposed that the mine plan be changed to exclude this 0.9 ha from future mining and develop a conservation program to protect this area from all disturbances, thereby protecting the Brigalow Scaly-Foot.

13.6.2.1 EVR Species

Cerbera dumicola

The shrub, *Cerbera dumicola,* is known to occur within the MEP, being restricted to two localities. The larger population is located on the slopes of the western mesa, and has plants spread over an area of approximately one hectare. This population will not be impacted by the proposed infrastructure.

The smaller population consists of several individuals on the creek flats along New Chum Creek. These plants have the potential to be impacted by the proposed haul road across New Chum Creek.

As *Cerbera dumicola* is not listed under the *EPBC Act*, impacts on this species will not constitute a MNES. However, it is listed as rare under the *NC Act* and is therefore considered in this assessment. Limited information is available on the ecology of this species. While a minimum 100 m buffer is planned to be maintained along New Chum Creek, direct impacts on *Cerbera dumicola* are possible if the proposed haul road crosses New Chum Creek where the plants occur. It is suggested that this species be investigated as to its ability to be re-introduced into mine rehabilitated areas post mining.

13.6.2.2 Introduced Plants

A total of 33 exotic plant species were observed within the MEP area.

Harrisia Cactus (*Harrisia martinii*), Parthenium (*Parthenium hysterophorus*) and Prickly Pear (*Opuntia stricta*) are listed as Class 2 weeds under the *LP Act*. Under the *LP Act*, reasonable measures are required to be taken to control them. They are scattered in low numbers throughout the MEP area and currently do not pose a threat to environmental values in most areas. The discrete occurrence of these species makes their control easy using registered herbicides.

Lantana (*Lantana camara*) is classified as a weed of national significance (WONS). Such weeds have been identified and listed in order to provide a framework to prioritise weed management at the federal, state, regional and local levels. As such, it is recommended that control of this species also forms part of the MEP's environmental management planning. However, as the State Government is responsible for legislation relating to weeds, and Lantana is a Class 3 weed under the *LP Act*, there is no legislative requirement for control other than within or adjacent to an Environmentally Significant Area (ESA).

Most of the environmental weeds found on MEP area are neither listed under the *LP Act* nor classified as WONS, nevertheless they can proliferate in disturbed areas and degrade the condition of native vegetation communities. Regular monitoring of topsoil stockpiles and disturbed areas should be conducted as part of a formalised weed management plan to prevent the spread of both listed and unlisted weed species.

Peabody has developed a draft Environmental Standard for Exotic Species Management which is included in **Appendix F7 – Terrestrial Ecology**.

Further control of weeds may be achieved by the following general measures:

- restriction of light vehicle movement in areas outside of regular activity, particularly irregularly used tracks;
- restriction of all vehicle movement during and following rainfall; and
- strict wash-down procedures for all vehicles (including clearing and construction machinery) entering clearance zones, grazing areas or conservation areas.

13.6.3 Terrestrial Fauna Habitats and Communities

To develop the MEP, approximately 66 ha of vegetation will need to be cleared. These areas may have once supported a unique vertebrate community, however the habitat is now extremely fragmented and of poor quality. The bulk of vertebrate species and communities recorded in these habitats are common within the region. The loss of these areas is therefore likely to have only a minor localised impact within the MEP itself which could be overcome by planned offsets.

In addition to potential offset measures, the creation of native bushland habitats through rehabilitation measures within the MEP after mining will contribute to the mitigation of impacts on fauna. If areas are to be rehabilitated for biodiversity conservation purposes, Buffel Grass should not be included in any seed mix or encouraged into rehabilitation areas. Buffel Grass is recognised as one of Australia's worst environmental weeds (Humphries *et al.*, 1991). Its use is contradictory to biodiversity goals, however it may be appropriate where low intensity cattle grazing is proposed for final land use.

13.6.3.1 EVR Species

Brigalow Scaly-Foot (*Paradelma orientalis*)

One Brigalow Scaly-Foot was recorded from a Buffel Grass-infested patch of Brigalow within the MEP area at Site MIL04. This small patch of habitat falls within the current mine plan area and therefore was designated to be cleared.

A Species Management Plan for the Brigalow scaly-foot has been developed for the MEP and is included as **Annexure B**. If the clearing of the vegetation containing the Brigalow scaly-foot is unavoidable, it may result in mortality of individual Brigalow Scaly-foots present, but is unlikely to have a significant impact on the wider population.

Ornamental Snake (*Denisonia maculata*)

Ornamental Snakes have not been identified within the MEP to date. However, the species is highly cryptic and may only be detected during ideal conditions. While not ideal, habitat values suggest that the species might occur and should therefore be considered.

Habitat suitable for the species is located along New Chum Creek. The occurrence of this suitable habitat, and local records, suggest that the species might occur and should be considered in the impact assessment. Mine plans indicate that a 100 m buffer will be retained along New Chum Creek. Therefore, no disturbance of this potential Ornamental Snake habitat is anticipated, other than a 1.3 ha cleared area for the haul road creek crossing and the 1 ha under current pit projections. Clearing activities will thus result in the loss of 2.3 ha of this potential habitat.

Squatter Pigeon (*Geophaps scripta scripta*)

No Squatter Pigeons have been recorded within the MEP area. Although habitat for the species is not optimal, they are still regularly recorded in exotic grasslands where the grass is sparse or low. However, the Squatter Pigeon is highly mobile and therefore able to avoid clearing activities, reducing the risk of individual mortality. Direct impacts from clearing are therefore expected to be negligible and no particular management is deemed necessary.

Few studies have been conducted on the effect of fire on Squatter Pigeons, however the ecologically similar Partridge Pigeon (*Geophaps smithii*) is threatened by fire (Garnett and Crowley, 2000). Fire should therefore be excluded from areas of optimal habitat for this species in the north of the MEP.

Little Pied Bat (*Chalinolobus picatus*)

The Little Pied Bat is expected to occur in most areas of remnant vegetation, but highest densities are likely in higher quality vegetation in the north of the MEP. Alternative habitat outside of the lease is abundant, particularly to the north.

The species is relatively abundant in the local area and regularly encountered during field surveys. Any minor loss of habitat is likely to have only localised impacts to the species. No specific management actions are considered necessary.

13.6.3.2 Impacts on Migratory Species

Only one Migratory species the Rainbow Bee-eater is known to occur within the MEP. No recorded or likely migratory species will be significantly affected by the proposed activities due to:

- being extremely abundant in the local area and region (Rainbow Bee-eater and *Ardea alba s. lato*); and/or
- having considerable alternative habitat outside of proposed impact areas (Rainbow Bee-eater, *Ardea alba s. lato*, Cattle Egret, Fork-tailed Swift, White-throated Needletail); and/or
- no loss of habitat (Fork-tailed Swift, White-throated Needletail).

No special management actions for migratory species are considered necessary.

As the MEP area does not feature any sites in, or adjacent to, areas containing important resting, feeding or breeding sites for migratory species of conservation concern listed under any international or bilateral agreements, no impacts on such values are anticipated.

13.6.3.3 Pest Vertebrates

Pest vertebrates are known to increase in association with anthropogenic activities. Many of the identified pest species are known to have significant ecological impacts by:

- increasing predation (e.g. dogs/cats/foxes);
- increasing competition for resources (e.g. cats/rabbits/deer);
- habitat degradation (e.g. deer/rabbits);
- reducing vegetation recruitment following an event such as fire or mechanical disturbance (e.g. deer/rabbits); and

- increasing mortality within local populations through methods other than predation or competition (e.g. Cane Toads).

It is not anticipated that the proposed activities will significantly increase the abundance of pest species in the area. Nor is it considered likely that any increases that do occur will significantly affect the existing ecological balance and diversity of the site. However, efforts should be made to control these pests including:

- performing regular pest control actions in conjunction with local authorities and landholders, particularly for pests such as dogs, cats and foxes; and
- ensuring that any putrescible waste is not allowed to accumulate outside of designated areas. These designated areas should be animal proof and wastes regularly removed or buried.

The control of these pest species will alleviate existing pressures on vertebrate communities and improve ecological processes such as corridor movements. Their control may therefore improve local biodiversity values.

13.6.3.4 Ecological Corridors

The proposed disturbance is largely restricted to the southern and central portions of the MEP where only poor corridor values are present (refer to **Figure 13-11**). The loss of these vegetation communities is unlikely to significantly affect local populations or traditional movement patterns. It will be important to ensure that animals are still able to freely move to and from the mesa in ML 70313. This could be achieved by keeping the south-western side of the mesa free from disturbance. Corridor values could also be enhanced in this area by revegetating areas to the west of the mesa with native species.

Vegetation and habitat bordering the north-west of the in ML 70313 are more likely to contribute to local movement patterns and local biodiversity values. These areas are unlikely to be directly impacted by the mining activities. Existing disturbance within these areas, as caused by cattle grazing, should be reduced to improve local corridor values.

Dispersing or moving vertebrates may avoid areas of unsuitable habitat and therefore be forced to traverse narrow stretches of vegetation. Increases in vertebrate activity may encourage predators resulting in a corresponding increase in mortality. The control of introduced predators, as previously described may assist in local movement and dispersal.

13.6.4 Potential Impacts on Aquatic Biology

The MEP has the potential to impact on aquatic communities both directly and indirectly. Based on the staged mine plans presented in this EIS, the likely alterations to aquatic ecosystems within the MEP will largely revolve around alterations to surface water hydrology and stormwater water quality. Impacts on New Chum and West Creeks may take the form of poor quality stormwater runoff, altered catchment hydrology and/or physical impacts such as creek crossings, vegetation clearing or construction of mining infrastructure.

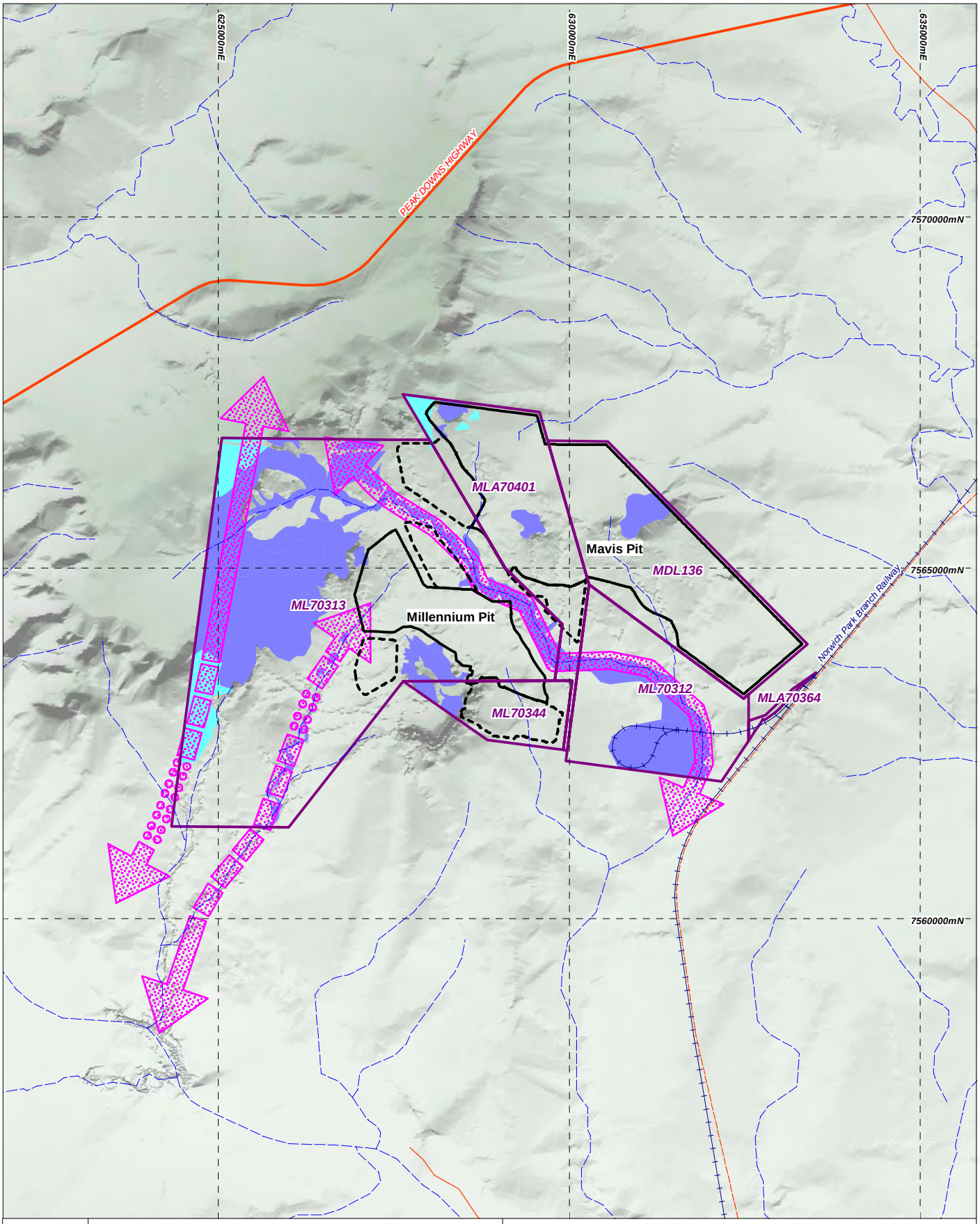
13.6.4.1 Impacts on Aquatic Macrophytes

Aquatic macrophytes were absent from the site at the time of sampling, possibly due to the scouring effect of wet season flooding, although it is not uncommon for seasonal streams to have a low abundance and diversity of macrophytes. Macrophyte taxa recorded at the neighbouring Daunia Coal Mine (BMA, 2008), are probably representative of the species that may colonise

the Millennium waterways when conditions permit. No species of conservation significance were recorded at that site.

13.6.4.2 Impacts on Aquatic Fauna

Aquatic faunal assemblages on the MEP are in relatively good condition by comparison to other ephemeral systems. However, they were dominated by hardy taxa that tolerate and readily adapt to a wide variety of environmental conditions.



LEGEND

- Peabody tenement
- 2027 pit footprint
- 2027 dump footprint
- Railway
- Watercourse

Vegetation

- Regrowth
- Remnant

Corridor Quality

- High
- Medium
- Low

Data Source:
Imagery, Infrastructure, Tenement - Minserve. Topography (250k) - Geoscience Australia.
RE Mapping - BAAM.

MET SERVE

Peabody

S:\Projects\PE001 Millennium Coal EIS_Mapinfo\Workspaces\PE001_M258A.wor

Peabody Energy Australia Pty Ltd
Millennium Expansion Project

Ecological Corridor Values for the MEP

0 2 4

Kilometres

Scale: 1:75,000 (A4)

19/10/2010

Datum: GDA94
Projection: MGA55

FIGURE 13-11

Macroinvertebrates

Macroinvertebrate communities were relatively diverse for an intermittent system, though the species present tended to be tolerant of both water quality and habitat decline. There was no discernable difference between assemblages at the bottom end of the catchment as compared with those at the top, suggesting that current mine management practices are not having a discernable impact on the taxa present.

Some loss of macroinvertebrate habitat will occur, notably with the loss of the upper end of West Creek and of NP1 and NP2. However, at this point in the catchment all of these creeks are essentially drainage lines of little or no environmental significance and represent a very small proportion of the overall habitat of this type within the region.

Given the scarcity of higher aquatic species (fish, turtles, platypus), the macroinvertebrate assemblages do not represent a significant food source, hence no flow-on impacts to the trophic structure of the systems are likely. It is highly likely that many of the taxa recorded will re-establish when the mine is rehabilitated. Further, no species of conservation significance at a national or state level were identified.

The MEP is expected to reduce the volume of water entering these systems, which creates the potential for shifts in macroinvertebrate assemblages. However, the taxa recorded from ephemeral systems tend to be somewhat more tolerant than those from more permanent water bodies, particularly with respect to hydrology and conductivity. It is therefore likely that such shifts will be within the normal range for these systems under annual wetting and drying cycles.

The macroinvertebrate assemblages in this instance are not critical to any higher animal species of conservation significance (e.g. fish, turtles, platypus) and do not in themselves contain threatened species or communities. It is therefore considered likely that any changes to macroinvertebrate assemblages that might arise as a result of the MEP are inconsequential in a local or regional context.

Fish

None of the fish species either recorded at the site or identified through the database searches are of conservation, recreational or commercial fishing significance.

The MEP will result in minor loss of habitat for the species that utilise these headwaters, although the area that will be lost is minor by comparison to the total available habitat of this type within the region. These systems are unlikely to represent high quality spawning or foraging habitat for any of the species captured or identified, hence their loss is extremely unlikely to influence downstream populations.

It is anticipated that the MEP will result in a reduction in the overall catchment area for New Chum and West Creeks, with a resulting reduction in the volume of surface runoff entering these systems and potentially a reduction in the frequency, magnitude and/or duration of flood events. These outcomes will result in reduced opportunities for the fish species identified in this study to penetrate into and colonise the headwaters of these drainages. However, these streams are first order systems and represent a very small proportion of the available habitat of this type locally. The fish species recorded are ubiquitous

and hardy, hence it is unlikely that the MEP will have a discernable impact on fish locally or regionally.

Given the tenacity of the fish species involved, it is highly likely that rehabilitation of the site following mine closure will result in their return to the post-mine drainage system.

Other Aquatic Fauna

The direct impacts on frog populations will be minimised with the introduction of a 100 m buffer between the MEP and New Chum Creek. However altered hydrology and/or water quality resulting from the expansion could impact on frogs at a local scale. Given that the species in question are common at a local and regional scale, and that there is significant similar habitat in the local area, it is very unlikely that the MEP will have a significant impact on these species on a local or regional scale.

Drainage areas that lie within the proposed excavation areas at Millennium Pit (i.e. West Creek headwaters) and Mavis Pit (NP1 and NP2) will be lost due to excavation, hence mitigation of these impacts is not possible. Whilst offsets or translocations could be considered, these systems represent a small area of marginal aquatic habitat that has negligible conservation value and does not support any threatened species or communities. No mitigation or offsets are therefore suggested for impacts on NP1, NP2 or the upper extent of West Creek.

13.6.5 Proposed Offsets

The Commonwealth Government requires offsets for impacts to Matters of National Significance under the *EPBC Act* through the '*Draft Policy Statement: Use of environmental offsets under the Environmental Protection and Biodiversity Conservation Act 1999'.* The MEP offsets strategy complies with this policy.

At the State level, there are two separate legislative instruments relating to offsets. The *VM Act Policy for Vegetation Management Offsets 28 September 2007* is not applicable to mining activities. The *Environmental Protection Regulation 2008* (*EP Regulation*) has a draft policy ('*Policy for Biodiversity Offsets: Consultation Draft')* which has been taken into consideration for the MEP offsets.

The final Offsets Program will ensure that the identified offsets are managed to maintain and enhance biodiversity values.

The potential loss of terrestrial fauna habitat areas within the MEP may be compensated by establishing environmental offsets in areas surrounding the MEP on land owned by Peabody. Under the *EPBC Act,* these offsets must deliver a real conservation outcome, in that the habitat must be protected in perpetuity and actively managed for long-term conservation purposes.

The currently identified offsets options meet *EPBC Act* requirements in that they:

- have the same ecological community as the areas proposed for clearing;
- are located within the same bioregion and the MEP site;
- are strategically located to enhance connectivity to either a protected area, large areas of remnant vegetation or riparian corridors;
- require the management of remnant vegetation and in some cases high value re-growth vegetation; and
- provide habitat for *EPBC Act* listed threatened species and the *NC Act* listed Little Pied Bat.

Peabody has undertaken a deliberate, methodical approach to determine its obligation under the *EPBC Act*. The determination by SEWPAC was that the MEP could have significant impacts on Threatened Species and Communities.

Peabody engaged specialist companies to assist in the development of an offsets strategy to ultimately lead to an offsets arrangement that satisfies the interests of the Commonwealth and the State.

The process undertaken involved the following steps:

- Research of various databases, for the purpose of the MEP EIS, on flora and fauna found, or expected to occur, within the region.
- The outcomes of searches enabled a targeted survey program to be developed and completed on the expansion areas.
- The site specific survey enabled the communities to be identified with some contrast to the high level broad scale mapping.
- The expected impacts (clearing, encroachment or interference with natural corridors) from the MEP were overlain on the mapped communities.
- A register of the impacted communities and their expected coverage was then calculated refining the offset obligations.
- A regional desktop review of similar vegetation communities was completed, targeting the species found onsite.
- These areas then led to a search of property tenure that resulted in a list of properties, landholders and aspects such as the scale of the property, tenure type and any overlying tenements.
- Three study areas were identified on a property owned by Peabody with ground-truthing surveys undertaken during June and July 2010.
- One of these areas (Study Area 1) was determined to contain suitable environmental values for use as an offset with remnant and high value and immature regrowth vegetation. The immature regrowth is between 2 and 4 metres in height and, with management, can be expected to reach mature status within the life of the MEP. The area will also provide a "bank" for other Peabody operations (Ecofund 2010). [Under a prior agreement, change of ownership on this property has occurred delaying the creation of a vegetation offsets management plan as the new owner will need to agree to title changes and the plan implementation.]
- Preliminary management options were also identified to assist in providing understanding to the landowner of what would be the expectation of a nature refuge located on their property. This would include fencing, grazing regime, fire management, pest and weed control, maintenance and management for approximately 15 years and annual reporting of compliance.

The next steps to be completed by Peabody include:

- Discussion with the landowner of Study Area 1 over the potential for establishing an offsets area on their property including changes to the property title (December 2010-February 2011).
- If the landowner is interested in establishing a nature refuge, a presentation of an offsets package to SEWPAC would occur with expected negotiations over the inclusions and the boundaries (April – June 2011).
- Develop and lodge the offsets management plan (July 2011)

- Secure property tenure for the offsets area through a legally binding mechanism (January 2012).
- If the owner of the current assessed area is not agreeable to pursuing an offsets arrangement, then the next suitable property owners of the 15 identified in the Environmental Offsets Options Report (Ecofund 2009) will be contacted, with confirmation surveys undertaken.

13.6.6 Cumulative Impacts

13.6.6.1 Terrestrial Ecology

Extensive broadscale clearing has occurred in the Brigalow Belt Bioregion since the Brigalow Land Development Scheme began in the 1960s and required landholders to develop land at a certain rate per annum in order to retain their leases (Australian Greenhouse Office, 2000). Overall, the development of mining in the region has resulted in limited clearing compared to other industries such as grazing.

However, the historic broadscale clearing by other industries has effectively ceased, while the mining industry is in the process of expansion. Furthermore, clearing has been less extensive in areas where there was an identified potential for coal mining and therefore many of the larger areas of remnant vegetation lie over the region's coal resources.

Recognising the extent of clearing that has occurred historically, the MEP planning has taken careful consideration to avoid and minimise the clearing of remnant vegetation, particularly vegetation listed as rare or endangered under Queensland and/or Commonwealth legislation. These areas, nominated by governments, represent an important approach to managing cumulative regional impacts.

The MEP will result in the clearing of approximately 2.5 ha hectares of Endangered Brigalow woodland, which represents approximately <0.01% of the remaining area of this vegetation community within the Brigalow Belt North Bioregion. The remainder of the MEP's disturbance footprint comprises grassland dominated by introduced Buffel Grass.

0.9 ha of Brigalow dominant woodland has been retained within the MEP Site through rearranging the mine footprint during the MEP's planning phase. Rehabilitation of the MEP site will seek to incorporate native tree, shrub and grass species where appropriate.

The MEP will not pose a significant threat to habitats for threatened species, and will not result in any habitat fragmentation.

Peabody will provide vegetation offsets during the assessment process.

13.6.6.2 Aquatic Ecology

The MEP will disturb a small section of a defined water course (the New Chum Creek crossing haul road). The MEP will result in the removal of some ephemeral drainage lines; however these drainage lines are highly disturbed, and are a low value aquatic habitat. The cumulative effect across the Isaac River Catchment is also expected to be minimal.

Numerous mining operations are operating in similar ecological areas (ephemeral creeks and drainage paths) within the Isaac River catchment. The Isaac River catchment is mostly covered by either mining leases, mining claims or exploration permits (coal, petroleum and mineral). Current mining leases only

cover a small portion of the catchment, at approximately 1,800 km^2 or 8%. Exploration permits, however, cover approximately two thirds of the catchment and if extensively developed they have the potential to cause significant cumulative impacts to aquatic ecology in the region.

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A-1 ANNEXURE A - MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE, *EPBC ACT*

Executive Summary

Values

The MEP nature conservation values relating to *EPBC Act* listed species and communities include:

- Brigalow (*Acacia harpophylla*)-dominated or co-dominated vegetation listed as 'endangered' under the *Vegetation Management Act 1999* (*VM Act*) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* occupy 85.7 hectares (ha) on the MEP. This is made up of:
  - *Acacia harpophylla-Eucalyptus cambageana* (RE 11.9.1) open forest to woodland on fine-grained sedimentary rocks occupies 78.9 ha;
  - *Acacia harpophylla* and/or *Casuarina cristata* (RE 11.9.5) open forest on fine-grained sedimentary rocks occupies 6.8 ha.
- one individual of the Brigalow scaly-foot legless lizard (*Paradelma orientalis*) was located within the MEP and is listed as 'vulnerable' under both the *NC Act* and *EPBC Act*;
- the Little Pied Bat (*Chalinolobus picatus*), was located within the MEP and is listed as 'vulnerable' under both the *NC Act* and *EPBC Act*; and
- only one migratory species is known to occur within the MEP, the Rainbow Bee-eater. This species was recorded during field surveys undertaken by Smith (2006).

Issues

MEP's nature conservation issues include:

- approximately 2.5 ha of Brigalow-dominated or co-dominated vegetation are planned to be cleared based on the MEP proposal and is made up of two patches, one 0.9 ha in size and the other 1.6 ha:
  - 0.9 ha of the southern Brigalow patch (RE 11.9.5) planned to be cleared is located on the western end of the Millennium pit extension. The total area of this patch of Brigalow is 4.6 ha;
  - 1.6 ha of the northern Brigalow patch (RE 11.9.1) planned to be cleared is located on the end of a waste rock emplacement, to the north of the Millennium pit extension. The total area of this patch of Brigalow is 2.3 ha;
- the southern Brigalow patch is also the location where a Brigalow scaly-foot individual was observed. There is a strong possibility that Brigalow scaly-foot individuals within this patch may be impacted if 0.9 ha is cleared as planned; and
- no special management actions for Rainbow Bee-eater migratory species are considered necessary as it is extremely abundant in the local area and region.

Mitigation Strategies

Strategies to mitigate MEP's nature conservation issues and impacts include the following:

- changes to the proposed mine plan to exclude the 0.9 ha of Brigalow RE from future mining to protect this area and the Brigalow scaly-foot during and post mining;
- developing and implementing an Offsets Program that caters for impacts to vegetation including approximately 20 ha of Brigalow RE previously cleared from the Millennium Mine;
- develop a conservation program for the Brigalow scaly-foot and monitor it and its habitat on an annual basis; and
- rehabilitate areas for biodiversity conservation purposes without the use of Buffel Grass (*Pennisetum ciliare*) in the rehabilitation seed mix and monitor to ensure progression towards the representative surveyed communities.

Nature Conservation Values

The existing nature conservation values that may be affected by the MEP are discussed in this section in the context of 'environmental values' as defined by the *EPBC Act*. It also details the potential impacts on these values and the mitigation measures that will be undertaken to minimise them.

Throughout this section, ecological values listed as 'critically endangered', 'endangered', 'vulnerable' or 'rare' under the *EPBC Act* are referred to as 'endangered', 'vulnerable' or 'rare' (EVR). Nomenclature follows taxonomy accepted by the Queensland Herbarium and Queensland Museum. Regional ecosystems (RE's) are described using scientific names in accordance with the convention of the Regional Ecosystem Description Database (REDD).

The broad environmental values of nature conservation include:

- the integrity of ecological processes, including habitats of rare and threatened species;
- biological diversity, including habitats of rare and threatened species;
- integrity of landscapes and places, including wilderness and similar natural places;
- terrestrial and aquatic ecosystems, including the biological resources therein; and
- matters of National Environmental Significance (MNES) protected under the *EPBC Act*.

The majority of the vegetation within the MEP has been extensively modified as a consequence of grazing activities.

Terrestrial Flora

Detailed flora investigations over the MEP footprint and immediate surrounds (the 'MEP area') were undertaken by MET Serve Consulting and the results of these investigations are summarised in the following sub-sections. Copies of the technical reports are provided in **Appendix F7 – Terrestrial Ecology** and **Appendix F8 – Aquatic Ecology**.

Fieldwork

Within the MEP and adjacent areas a total of four field surveys were undertaken. Two wet season surveys were conducted in February 2006 and

March 2009, and two separate dry season surveys were conducted in June 2003 and October 2004. The survey sites are shown in **Figure 13-1** in **Chapter 13 – Nature Conservation** above. The survey methods used over the site visits conducted between 2003 and 2006 included:

- site orientation;
- review of mine plans, topographic plans, air photos and RE maps;
- selection and study of sites for flora species and categorisation of REs;
- selection and study of sites for fauna species (including cryptic);
- traversing the areas by vehicle and on foot examining, and noting flora and fauna species observed, and categorising (ground-truthing) REs (following descriptions of Sattler and Williams, 1999);
- spotlighting for nocturnal animals (e.g. arboreal mammals, geckos);
- 'Anabat' recordings for the remote detection of microbats; and
- Elliott trapping (size A traps) for the capture of small ground dwelling animals.

The vegetation map developed from the field surveys differs in many ways from the RE map obtained from the Department of Environment and Resource Management (DERM). This is not an uncommon result, with ground-truthing an area almost always more reliable than desktop data obtained from analysis of aerial photographs.

Conditions at the time of the surveys were considered suitable for the detection of all terrestrial flora and fauna. No rain fell during the field surveys. Heavy rainfall occurred during February 2009 (238 mm) and surface water was present in deeper sections of creek-lines and waterways. Grass growth was prolific in response to the favourable conditions. This assessment included recordings of the floristics, structure and condition of all vegetation communities present, including targeted searches for significant species.

Investigation- sites were located in areas representative of regional vegetation types. Within each vegetation community, a minimum of two representative sites (one tertiary and one quaternary-Neldner et al., 2005) were selected and a plot was surveyed. Data collected included floristic composition, community structure, groundcover and a detailed floristic inventory of the dominant and conspicuous woody plants (i.e. trees and shrubs).

Random meander searches for flora species of conservation significance were also undertaken in areas of likely habitat and during vegetation mapping. A condition assessment was conducted using an adapted methodology based on 'Biocondition: A Terrestrial Vegetation Condition Assessment Tool for Biodiversity in Queensland Field Assessment Manual' (Eyre et al., 2006), assessing parameters from this methodology whilst traversing approximately 100 m.

Vegetation Communities

Currently Mapped Regional Ecosystems

An RE is a vegetation community that is consistently associated with a particular combination of geology, landform and soil. Certified RE mapping (DERM, Version 6) for the MEP is illustrated in **Figure 13-2** in **Chapter 13 – Nature Conservation.**

Field Verified Regional Ecosystems

Mapping for the bioregion is produced by the Queensland Herbarium at 1:100,000 scale.

Ground-truthing was undertaken to confirm and more accurately determine the extent of the REs present in the MEP area.

Revised RE mapping undertaken by Matrixplus (2009) shows 12 REs within the MEP. Of these, two REs (RE 11.9.5 and 11.9.1) are Brigalow communities which have endangered status under the *EPBC Act*. The distribution of the field verified REs within the study area is illustrated in **Figure 13-3** in **Chapter 13 – Nature Conservation** and their attributes for those designated as Threatened Ecological Communities (TECs) is presented in **Table 1-1** below.

Table 1-1 Existing Mapped Regional Ecosystems within the MEP area designated as Threatened Ecological Communities

RE	RE Short Description	*VM Act*	Biodiversity Status	EPBC Act	Extent in Reserves *
11.9.1	*Acacia harpophylla-Eucalyptus cambageana* open forest to woodland on fine-grained sedimentary rocks	E	E	E	Low
11.9.5	*Acacia harpophylla* and/or Casuarina cristata open forest on fine-grained sedimentary rocks	E	E	E	Low

VM Act = Vegetation Management Act 1999; *EPBC Act = Environment Protection and Biodiversity Conservation Act 1999*;

NC = Not of Concern; OC = Of Concern; E = Endangered; – = Not listed

* The extent of regional ecosystems within protected areas is classified as: High >10% of pre-clearing extent; Medium 4-10%; Low <4%.

Vegetation Map Unit Descriptions

Vegetation community descriptions relevant to the two TECs identified are provided in **Table 1-2** using data derived from site surveys for dominant species within each structural layer, community condition, weed invasion, and approximate areas occupied by individual communities. The distribution of these communities across the MEP is shown in **Figure 13-3** in **Chapter 13 – Nature Conservation**.

Table 1-2 Vegetation Communities of the MEP Area relating to TECs

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
10	Brigalow tall riparian open forest on sands Height of EDL: 14 m Canopy Cover: 45% Area of community within MEP area: 11 ha	11.9.1 (Endangered)	Emergent: Absent. Canopy (T1): 14 m (12-18 m) The sparse canopy is dominated by *Eucalyptus cambageana*. There are occurrences of *Corymbia tessellaris*. Sub-Canopy (T2): 8 (6-11 m) The mid-dense sub-canopy is dominated by *Acacia harpophylla* with occurrences of *Lysiphyllum caronii* and *Terminalia oblongata.* Shrub Layers: 2 (1-4 m). The mid-dense shrub layer is dominated by *Geijera parviflora* and *Lysiphyllum caronii.* Ground Layer: 0.5 (0-0.8 m) the mid-dense to sparse ground layer is dominated by *Pennisetum ciliare*. Notes: This vegetation community exhibits a local dominance in *Acacia harpophylla* within the sub-canopy, and is actually a sub-community of the Dawson gum tall riparian open forest. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: None likely.	Occurs occasionally throughout ML 70313 and in eastern portion of ML 70312.	

No.	Description	Analogous RE (*VM Act* Status)	Dominant Species	Location/Condition (Where Relevant)	Photograph
14	Brigalow tall woodland on sands Height of EDL: 16 m Canopy Cover: 57% Area of community within MEP area: 7 ha	11.9.5 (Endangered)	Emergent: Absent. Canopy (T1): 16 (14-18 m) *Acacia harpophylla*. Sub-Canopy (T2): Absent. Shrub Layers: Absent. Ground Layer: The dense ground layer is dominated by *Pennisetum ciliare*. Notes: This community has been cleared of sub-canopy and shrub layers to improve pastures. However, the canopy structure remains. Weeds of Concern: No weeds of immediate concern observed within this community. Possible EVR Species: None likely.	Occurs at the base of the north mesa in ML 70313.	

At a scale of approximately 1:15,000, the MEP area contains 19 discrete vegetation communities. Of these vegetation communities, 15 are remnant as defined under the provisions of the *VM Act* (Section 6.2), and equate to 11 different RE types.

Non-Remnant Vegetation

The dominant vegetation community within the MEP area is pasture grasses on sands. This community is 'non-remnant' under the *VM Act* and is not similar to any threatened ecological community as defined under the provisions of the *EPBC Act*. This vegetation community does contain some small areas where Brigalow and/or Poplar Box (*Eucalyptus populnea*) are regrowing within the pasture. However, these regrowth areas are at an early stage of development, featuring generally low and sparse woody vegetation which are not easily separated out from the surrounding pasture matrix.

World Heritage and Wetlands of International Importance

The closest World Heritage Property to the MEP is the Great Barrier Reef, the closest section of which is approximately 130 km to the east. The MEP lies within the same catchment as a Wetland of International Importance, being the Shoalwater and Corio Bays Area. The closest section of this RAMSAR site also lies approximately 130 km to the east of the MEP.

Threatened Ecological Communities

The Department of the Environment, Water, Heritage and the Arts (DEWHA) Environmental Reporting Tool indicated the potential presence of two 'Threatened Ecological Communities' (TEC) in the vicinity of the MEP area, namely Brigalow (*Acacia harpophylla*) dominant and co-dominant and Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin.

Field surveys established the presence of the Brigalow TEC which occupies approximately 85.7 ha on the MEP.

RE 11.9.3 is included in the 'Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin' TEC. This RE is present within the MEP, however in this instance the community does not meet the condition thresholds of ecological quality and structural characteristics the *EPBC Act* stipulates for constituting the TEC. In addition, the community does not meet the requirements under the listing advice (DEWHA 2008) for good quality grassland, having less than three of the listed native perennial grass indicator species, and being less than 5 ha in spatial extent.

Significant Species

A total of 196 plant species have been recorded from within the MEP.

Conservation Status

No EVR flora species under the *EPBC Act* were observed within the MEP area. The habitat preferences for the two EVR plants under the *EPBC Act* known to occur within the local area are presented in **Table 1-3**. Field observations of the habitats types have been used to predict the likelihood of these species occurring within the MEP. This exercise reveals that two other species-Large-podded Trefoil (*Desmodium macrocarpum*) and *Bertya pedicellata*-could possibly occur. It is highly unlikely that the other four species are present.

Table 1-3 Habitat preferences for EVR species under the EPBC Act known to occur in the MEP vicinity

EVR Species	NC Act	EPBC Act	Habitat Preference	Likelihood of Occurrence
Dichanthium setosum	R	V	Occurs on heavy, black cracking clay soils in native grass grasslands.	Unlikely-no suitable habitat or soil types
Graptophyllum ilicifolium	V	V	Occurs in semi-evergreen vine thickets in rocky areas and along ephemeral creeks	Unlikely-no suitable habitat or soil types

EPBC Act = Environment Protection and Biodiversity Conservation Act 1999

E = Endangered; V = Vulnerable; R = Rare; – = Not listed

Terrestrial Fauna

Fieldwork

Fauna surveys were undertaken within the MEP area in June 2003, October 2004, February 2006 and October 2009 in the locations shown in **Figure 13-4** in **Chapter 13 – Nature Conservation**. Spotlighting was undertaken to record nocturnal animals, and Anabat recordings were used to identify microchiropteran bats. Any fauna species observed while undertaking the flora surveys for the MEP were also recorded. Standard observational and capture techniques recommended for impact assessment and designed to sample all vertebrate groups were used during the surveys (**Table 1-4**).

While sampling aimed to provide a comprehensive terrestrial vertebrate inventory, it should be recognised that these results reflect a snap-shot of community composition. Species that are rare, cryptic or move over large distances (e.g. migratory or nomadic species) may not be represented within the results.

Table 1-4 Terrestrial Vertebrate Sampling Techniques

Method	Target Group/Species	Effort/Notes
Elliott A traps	Small mammals, some reptiles	Approximately 20 per systematic site for four nights.
Pitfall traps	All small terrestrial vertebrates	Five buckets at each systematic site for five nights.
Funnel traps	Some small and medium terrestrial vertebrates, predominantly reptiles	Four at each systematic site for five nights.
Harp traps	Low flying microchiropteran (insectivorous) bats	Two traps for two nights—used only along potential flyways (two locations).
Anabat call detection	All microchiropteran bats	Used at four locations.
Diurnal bird surveys	All bird species	20 minutes/systematic site on two mornings.
Spotlighting	Nocturnal vertebrates	20 minutes/systematic site + 30 minutes at TA04 + vehicle spotlighting (total 10 hrs).
Specific searches	Small terrestrial vertebrates.	Effort commensurate with physical features. Used opportunistically throughout survey.

Throughout the survey, habitats were assessed with relevance for vertebrate communities and EVR vertebrates. This included noting habitat factors such as the vegetation species present, hollow size and abundance, vegetation layer density and substrate type. Digital photos were extensively collected for later reference.

Opportunistic records of all vertebrate species were collected throughout the survey, particularly while traversing the MEP area.

Habitat Features within the MEP Area

Habitat characteristics and vertebrate diversity suggests that five subjective habitat and corresponding vertebrate community groups occur in the MEP area:

- exotic grasslands;
- woodlands dominated by exotic grasses;
- native understorey woodlands;
- massive rock outcrops; and
- waterway habitats.

Rare and Threatened Fauna

Short-duration surveys are never sufficient to completely sample all components of a vertebrate community (Thompson *et al.*, 2003). Cryptic and rare species are often overlooked, but should not be omitted from the assessment process. Accordingly, an assessment based on the recorded habitat values within the MEP for locally known EVR vertebrates has been conducted.

Two vertebrates listed as EVR under legislation have been confirmed by site surveys to be within the MEP area, while a further two are identified as possible or likely (**Table 1-5**)

Table 1-5 Likelihood of EVR Vertebrates within the MEP

Common Name	Scientific Name	*NC Act*	*EPBC Act*	Likelihood
Brigalow scaly-foot	*Paradelma orientalis*	V	V	Confirmed
Ornamental Snake	*Denisonia maculata*	V	V	Possible
Squatter Pigeon (Southern)	*Geophaps scripta scripta*	V	V	Possible

VM Act = Vegetation Management Act 1999; *EPBC Act = Environment Protection and Biodiversity Conservation Act 1999*
E = Endangered; V = Vulnerable; R = Rare; – = Not listed

Other Fauna

Informal, opportunistic surveys were undertaken to locate and record any other fauna species associated with the MEP waterways.

Six turtle species are known to occur within the Fitzroy River catchment, including the EPBC listed (vulnerable) Fitzroy River turtle.

No turtles, platypus or crocodiles were recorded during field surveys and no sign of burrows, nests or paths were noted.

No formal surveys of aquatic or semi-aquatic reptiles, mammals or amphibians were performed. Given the intermittent nature of the waterways at the site,

lack of suitable aquatic habitat (deep permanent pools with macrophytes) and the absence of reliable aquatic food sources, it is unlikely that turtles, crocodiles or platypus will utilise waterways at the Millennium site in anything more than a transitory way, if at all.

Potential Impacts and Mitigation Measures

This section presents the assessment of potential impacts on the terrestrial flora, terrestrial fauna and aquatic biology resulting from the MEP.

Potential Impacts on World Heritage and Wetlands of International Importance

The closest World Heritage Property and Ramsar wetland to the MEP are both approximately 130 km to the east. Given the MEP's considerable distance from these sites, no direct or significant indirect impacts on these values are expected, and no mitigation measures are considered necessary.

Potential Impacts on Vegetation Communities and Flora

Clearing of vegetation and habitat is the main impact on flora and fauna associated with the proposed development. Areas that have been mined will mostly be rehabilitated to re-create similar vegetation and habitat though this may take considerable time to achieve (refer to **Chapter 5-Rehabilitation and Decommissioning**).

The conceptual mine plan for the MEP demonstrates that clearing activities will include the proposed open-cut pits, haul roads, water management infrastructure and waste rock emplacement areas (refer to **Figure 13-10** in **Chapter 13 – Nature Conservation**). Existing roads and tracks will be utilised to access the MEP areas. Approximately 66 ha of remnant vegetation is likely to be cleared for the MEP. This includes the loss of 2.9 ha of Brigalow-dominated or co-dominated vegetation listed as Endangered under the *EPBC Act* (REs 11.9.1 and 11.9.5).

Regional ecosystem 11.9.3 is included in the description of the Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin under the *EPBC Act*. A 2.3 ha area of this community is proposed to be disturbed by the proposed MEP however; this RE does not meet the habitat quality and structural requirements for constituting this TEC under the DEWHA (2008) listing advice.

The Brigalow communities in the proposed open-cut pit and waste rock emplacement areas of the MEP are heavily degraded. Despite these disturbances, these remnants need to be evaluated in their regional context. Brigalow coverage has been drastically reduced throughout its range, primarily as a result of land clearing for agricultural development (DEWHA, 2007).

Remaining patches may act as recruitment sites for ecosystem regeneration, and even small patches have been shown to have significant value in that they provide important habitat for a variety of fauna (Collard *et al.*, 2009).

The planned pit extension will result in the clearing of 0.9 ha of a 4.6 ha patch of Brigalow. This patch in combination with a second 2.3 ha area to the north represents the only instances of this vegetation type within the MEP area.

The southern patch (4.6 ha) of this RE is also the location where a Brigalow Scaly-Foot individual was observed. For this reason it is proposed that the mine plan be changed to exclude this 0.9 ha from future mining and develop a conservation program to protect this area from all disturbances, thereby protecting the Brigalow Scaly-Foot.

Potential Impacts on Terrestrial Fauna Habitats and Communities

To develop the MEP, approximately 66 ha of vegetation will need to be cleared. These areas may have once supported a unique vertebrate community, however the habitat is now extremely fragmented and of poor quality. The bulk of vertebrate species and communities recorded in these habitats are common within the region. The loss of these areas is therefore likely to have only a minor localised impact within the MEP itself which could be overcome by planned offsets.

In addition to potential offset measures, the creation of native bushland habitats through rehabilitation measures within the MEP after mining will contribute to the mitigation of impacts on fauna. If areas are to be rehabilitated for biodiversity conservation purposes, Buffel Grass should not be included in any seed mix or encouraged into rehabilitation areas. Buffel Grass is recognised as one of Australia's worst environmental weeds (Humphries *et al.*, 1991). Its use is contradictory to biodiversity goals, however it may be appropriate where low intensity cattle grazing is proposed for final land use.

Impacts on EVR Species listed under the EPBC Act

Brigalow Scaly-Foot (Paradelma orientalis)

One Brigalow Scaly-Foot was recorded from a Buffel Grass-infested patch of Brigalow within the MEP area at Site MIL04. This small patch of habitat falls within the current mine plan area and therefore was designated to be cleared. The proposed mitigation strategy for the Brigalow scaly-foot is to alter mine plans to exclude this area from mining and develop a conservation plan to protect (including fencing) and monitor this habitat and the Brigalow Scaly-Foot on an annual basis. If the clearing of this patch is unavoidable, it is likely to result in mortality of individual Brigalow Scaly-Foots present, but is unlikely to have a significant impact on the wider population. This will also benefit other vertebrate species found within the habitat.

Ornamental Snake (Denisonia maculata)

Ornamental Snakes have not been identified within the MEP to date. However, the species is highly cryptic and may only be detected during ideal conditions. While not ideal, habitat values suggest that the species might occur and should therefore be considered.

Habitat suitable for the species is located along New Chum Creek. The occurrence of this suitable habitat, and local records, suggest that the species might occur and should be considered in the impact assessment. Mine plans indicate that a 100 m buffer will be retained along New Chum Creek. Therefore, no disturbance of this potential Ornamental Snake habitat is anticipated, other than a 1.3 ha cleared area for the haul road creek crossing and the 1 ha under current pit projections. Clearing activities will thus result in the loss of 2.3 ha of this potential habitat.

Squatter Pigeon (Geophaps scripta scripta)

No Squatter Pigeons have been recorded within the MEP area. Although habitat for the species is not optimal, they are still regularly recorded in exotic grasslands where the grass is sparse or low. However, the Squatter Pigeon is highly mobile and therefore able to avoid clearing activities, reducing the risk of individual mortality. Direct impacts from clearing are therefore expected to be negligible and no particular management is deemed necessary.

Few studies have been conducted on the effect of fire on Squatter Pigeons, however the ecologically similar Partridge Pigeon (*Geophaps smithii*) is threatened by fire (Garnett and Crowley, 2000). Fire should therefore be excluded from areas of optimal habitat for this species in the north of the MEP.

Little Pied Bat (Chalinolobus picatus)

The Little Pied Bat is expected to occur in most areas of remnant vegetation, but highest densities are likely in higher quality vegetation in the north of the MEP. Alternative habitat outside of the lease is abundant, particularly to the north.

The species is relatively abundant in the local area and regularly encountered during field surveys. Any minor loss of habitat is likely to have only localised impacts to the species. No specific management actions are considered necessary.

Impacts on Migratory Species

Only one Migratory species the Rainbow Bee-eater is known to occur within the MEP. No recorded or likely migratory species will be significantly affected by the proposed activities due to:

- being extremely abundant in the local area and region (Rainbow Bee-eater and *Ardea alba s. lato*); and/or
- having considerable alternative habitat outside of proposed impact areas (Rainbow Bee-eater, *Ardea alba s. lato*, Cattle Egret, Fork-tailed Swift, White-throated Needletail); and/or
- no loss of habitat (Fork-tailed Swift, White-throated Needletail).

No special management actions for migratory species are considered necessary.

As the MEP area does not feature any sites in, or adjacent to, areas containing important resting, feeding or breeding sites for migratory species of conservation concern listed under any international or bilateral agreements, no impacts on such values are anticipated.

Pest Vertebrates

Pest vertebrates are known to increase in association with anthropogenic activities. Many of the identified pest species are known to have significant ecological impacts by:

- increasing predation (e.g. dogs/cats/foxes);
- increasing competition for resources (e.g. cats/rabbits/deer);
- habitat degradation (e.g. deer/rabbits);
- reducing vegetation recruitment following an event such as fire or mechanical disturbance (e.g. deer/rabbits); and
- increasing mortality within local populations through methods other than predation or competition (e.g. Cane Toads).

It is not anticipated that the proposed activities will significantly increase the abundance of pest species in the area. Nor is it considered likely that any increases that do occur will significantly affect the existing ecological balance and diversity of the site. However, efforts should be made to control these pests including:

- performing regular pest control actions in conjunction with local authorities and landholders, particularly for pests such as dogs, cats and foxes; and
- ensuring that any putrescible waste is not allowed to accumulate outside of designated areas. These designated areas should be animal proof and wastes regularly removed or buried.

The control of these pest species will alleviate existing pressures on vertebrate communities and improve ecological processes such as corridor movements. Their control may therefore improve local biodiversity values.

Ecological Corridors

The proposed disturbance is largely restricted to the southern and central portions of the MEP where only poor corridor values are present (refer to **Figure 13-11** in **Chapter 13 – Nature Conservation**). The loss of these vegetation communities is unlikely to significantly affect local populations or traditional movement patterns. It will be important to ensure that animals are still able to freely move to and from the mesa in ML 70313. This could be achieved by keeping the south-western side of the mesa free from disturbance. Corridor values could also be enhanced in this area by revegetating areas to the west of the mesa with native species.

Vegetation and habitat bordering the north-west of the in ML 70313 are more likely to contribute to local movement patterns and local biodiversity values. These areas are unlikely to be directly impacted by the mining activities. Existing disturbance within these areas, as caused by cattle grazing, should be reduced to improve local corridor values.

Dispersing or moving vertebrates may avoid areas of unsuitable habitat and therefore be forced to traverse narrow stretches of vegetation. Increases in vertebrate activity may encourage predators resulting in a corresponding increase in mortality. The control of introduced predators, as previously described may assist in local movement and dispersal.

Proposed Offsets

The Commonwealth Government requires offsets for impacts to Matters of National Significance under the *EPBC Act* through the '*Draft Policy Statement: Use of environmental offsets under the Environmental Protection and Biodiversity Conservation Act 1999'.* The MEP offsets strategy complies with this policy.

At the State level, there are two separate legislative instruments relating to offsets. The *VM Act Policy for Vegetation Management Offsets 28 September 2007* is not applicable to mining activities. The *Environmental Protection Regulation 2008* (*EP Regulation*) has a draft policy ('*Policy for Biodiversity Offsets: Consultation Draft')* which has been taken into consideration for the MEP offsets.

The final Offsets Program will ensure that the identified offsets are managed to maintain and enhance biodiversity values.

The potential loss of terrestrial fauna habitat areas within the MEP may be compensated by establishing environmental offsets in areas surrounding the MEP on land owned by Peabody. Under the *EPBC Act,* these offsets must deliver a real conservation outcome, in that the habitat must be protected in perpetuity and actively managed for long-term conservation purposes.

The currently identified offsets options meet *EPBC Act* requirements in that they:

- have the same ecological community as the areas proposed for clearing;
- are located within the same bioregion and the MEP site;
- are strategically located to enhance connectivity to either a protected area, large areas of remnant vegetation or riparian corridors;
- require the management of remnant vegetation and in some cases high value re-growth vegetation; and
- provide habitat for *EPBC Act* listed threatened species and the *NC Act* listed Little Pied Bat.

Peabody has undertaken a deliberate, methodical approach to determine its obligation under the *EPBC Act*. The determination by SEWPAC was that the MEP could have significant impacts on Threatened Species and Communities.

Peabody engaged specialist companies to assist in the development of an offsets strategy to ultimately lead to an offsets arrangement that satisfies the interests of the Commonwealth and the State.

The process undertaken involved the following steps:

- Research of various databases, for the purpose of the MEP EIS, on flora and fauna found, or expected to occur, within the region.
- The outcomes of searches enabled a targeted survey program to be developed and completed on the expansion areas.
- The site specific survey enabled the communities to be identified with some contrast to the high level broad scale mapping.
- The expected impacts (clearing, encroachment or interference with natural corridors) from the MEP were overlain on the mapped communities.
- A register of the impacted communities and their expected coverage was then calculated refining the offset obligations.
- A regional desktop review of similar vegetation communities was completed, targeting the species found onsite.
- These areas then led to a search of property tenure that resulted in a list of properties, landholders and aspects such as the scale of the property, tenure type and any overlying tenements.
- Three study areas were identified on a property owned by Peabody with ground-truthing surveys undertaken during June and July 2010.
- One of these areas (Study Area 1) was determined to contain suitable environmental values for use as an offset with remnant and high value and immature regrowth vegetation. The immature regrowth is between 2 and 4 metres in height and, with management, can be expected to reach mature status within the life of the MEP. The area will also provide a "bank" for other Peabody operations (Ecofund 2010). [Under a prior agreement, change of ownership on this property has occurred delaying the creation of a vegetation offsets management plan as the new owner will need to agree to title changes and the plan implementation.]
- Preliminary management options were also identified to assist in providing understanding to the landowner of what would be the expectation of a nature refuge located on their property. This would include fencing, grazing regime, fire management, pest and weed control, maintenance and management for approximately 15 years and annual reporting of compliance.

The next steps to be completed by Peabody include:

- Discussion with the landowner of Study Area 1 over the potential for establishing an offsets area on their property including changes to the property title (December 2010-February 2011).
- If the landowner is interested in establishing a nature refuge, a presentation of an offsets package to SEWPAC would occur with expected negotiations over the inclusions and the boundaries (April – June 2011).
- Develop and lodge the offsets management plan (July 2011)
- Secure property tenure for the offsets area through a legally binding mechanism (January 2012).
- If the owner of the current assessed area is not agreeable to pursuing an offsets arrangement, then the next suitable property owners of the 15 identified in the Environmental Offsets Options Report (Ecofund 2009) will be contacted, with confirmation surveys undertaken.

B-1 ANNEXURE B - SPECIES MANAGEMENT PLAN FOR BRIGALOW SCALY-FOOT

Species management plan for Brigalow Scaly-foot

Paradelma orientalis

Status

NC Act: vulnerable; EPBC Act: vulnerable

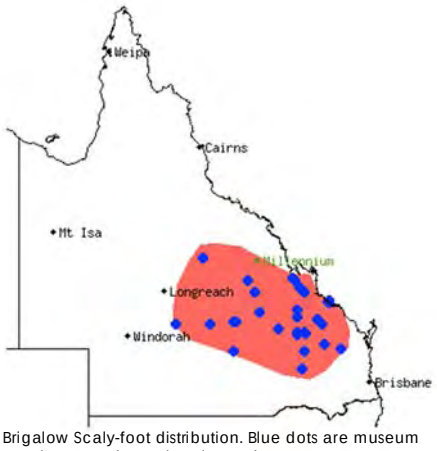
Description

Body is greyish-brown, with a paler belly. Head and neck are dark, with a pale blotch on the nape. Body scales are smooth and glossy in 18 (occasionally 20) rows at mid-body (Wilson 2005).

Image © Stewart Macdonald

Distribution

The Brigalow Scaly-foot is found mainly in the Brigalow Belt bioregion, from Inglewood in the south, north to Emerald and east to Gladstone (DERM 2010). It extends west to the western edge of the Briglow Belt bioregion near Charleville and Alpha (Wilson 2005; S. Macdonald, unpublished data), with at least one record from Idalia National Park in the Mulga Lands (DERM Wildnet data).



Brigalow Scaly-foot distribution. Blue dots are museum specimens; red area is estimated range

Ecology

The Brigalow Scaly-foot is a nocturnal legless lizard found in a wide variety of forest and woodland habitat types (Tremul 2000; Wilson 2005). As its common name suggests, this is often brigalow but can also include ironbark, spotted gum, cypress pine, hickory wattle and she-oak woodlands on both cracking clay soils and sandy substrates (Schultz and Eyre 1997; Tresmul 2000). As the species spends most of its time moving along the ground, surface structure is likely to be an important factor in its habitat preference. It has been recorded sheltering under sandstone slabs, logs, dense leaf litter and grass tussocks (Richardson 2006). However, the species can be recorded from modified landscapes including small remnants and grasslands dominated by exotic grass species (e.g., Buffel Grass), particularly when adjacent to favourable habitats (S. Macdonald, pers. obs.).

They are likely to forage on a variety of invertebrates, but have also been observed climbing small Acacia bushes to lick exuding sap (Tremul 2000).

Threats

While it may be common in suitable areas (S. Macdonald, unpublished data), habitat loss has been identified as a probable threat, along with habitat degradation caused by agriculture and grazing (Cogger *et al.* 1993). Other potential threats include predation by feral species (e.g., cats, dogs and foxes) and inappropriate roadside management (Richardson 2006). Individuals are often encountered as they cross roads on warm nights (S. Macdonald, unpublished data), so vehicles may also pose a threat.

Millennium Expansion Project Impacts

One Brigalow Scaly-foot was recorded from the Millennium Expansion Project area in an isolated patch of Brigalow (*Acacia harpophylla*) with a dense layer of Buffel Grass. This patch was located in the north-east of the proposed Millennium Pit expansion and is part of a larger patch of relatively intact vegetation that extends to the north and east, outside of the proposed pit expansion. While the species was recorded from only one location, the species is likely to be more widespread within the project area and surrounding region.

The clearing of this patch of vegetation will possibly result in direct mortality of Brigalow Scaly-foot individuals, as well as reducing available habitat for those individuals that persist. Impacts on this species can be reduced by following the management actions outlined below.

General management actions to reduce impact on this species

- As much as is practicable, only areas absolutely necessary for the construction and operation of the project will be cleared. Vegetation clearance will be managed through a GIS system and the relevant worksite permits (e.g., permit to disturb).
- Rehabilitate disturbed areas as mine operations allow.
- Revegetate and rehabilitate surrounding areas.
- Utilise standard dust suppression techniques and strategically rehabilitate available disturbed areas to minimise the net loss of vegetation.
- Minimise feral predation by implementing pest animal management measures.
- Implement measures to reduce fauna mortality on roads (eg speed limits, warning signs, induction of drivers) and ensure appropriate treatment of injured/orphaned animals, during both construction and operational phases.
- Where practicable, retention of important habitat features such as large hollow-bearing trees (live or dead), nest boxes and log piles. Some ground debris (e.g. fallen logs, felled trees) and cleared vegetation can be relocated to surrounding habitat to increase the structural complexity of remaining habitat.

Specific management actions to reduce impact on this species

- Any additional records of this species collected from the project site must be reported to the site Environmental personnel to enable up-to-date tracking of the species' presence.
- Any Brigalow Scaly-foot individuals accidentally killed on-site, where known, will be preserved and sent to the Queensland Museum.
- Take into account known habitat preferences of the Brigalow Scaly-foot when considering vegetation offset areas.
- As an indirect offset, research into habitat requirements and spatial ecology of the Brigalow Scaly-foot will be assessed. This research would contribute to a better understanding of the species and allow for more targeted habitat offset acquisition in the future.
- Ensure all mine workers are aware of the potential presence of this species and instruct them to modify activities accordingly (e.g. stop clearing if a Brigalow Scaly-foot is encountered, notification to site environmental personnel, be aware of the species on roads at night).

- Pre-clearing trapping and translocation of Brigalow Scaly-foot (from the immediate vicinity of the known, recorded location on the MEP) will be undertaken to help reduce individual mortality. It is noted that translocation will only be successful where the surrounding habitat is both suitable and protected.
- Carefully manage fire regimes in remaining remnant vegetation to ensure the retention of key habitat components, such as leaf litter and woody debris.

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