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Appendix N Technical Note - Terrestrial Ecology

N.1 Terrestrial Ecology

N.1.1 Endangered, Vulnerable and Rare Species

Table N-1 addresses the potential likelihood of EVR species occurrences within the Project site. The likelihood of occurrence for each species is based on the following:

- A *likely* presence is provided for those species with preferred habitat and/or essential habitat features (e.g. significant food source, nesting resource, microhabitat, etc.) occurring within the Project site and there are recent records from the locality;
- A *possible* presence is provided for those species with preferred habitat occurring within the Project site, however the habitat is either limited in its extent, size and/or condition.
- An *unlikely* presence is provided for those species with no or unsuitable habitat occurring within the Project site.

Table N-1 Likelihood of occurrence of EVR species on the Project site

Species	Common Name	NC Act Status	EPBC Act Status	Likelihood of Occurrence
BIRDS				
<i>Accipiter novaehollandiae</i>	Grey Goshawk	R	-	Unlikely. Inhabits closed forest types, especially wet sclerophyll forests near the coast. Can extend inland along dense riparian forest along waterways. No such habitat occurs within the Project site.
<i>Calyptorhynchus lathami</i>	Glossy Black Cockatoo	V	-	Unlikely. Inhabits open forests containing <i>Allocasuarina</i> and <i>Casuarina</i> species food trees. Occurs primarily in coastal areas and along the Great Dividing Range. No food trees were observed on the Project site.
<i>Ephippiorhynchus asiaticus</i>	Black-necked Stork	R	-	Unlikely. Inhabits permanent and ephemeral freshwater wetlands and adjacent grasslands and savannah woodlands. Feeds in shallow, still water on a variety of prey including fish, frogs, eels, turtles, crabs and snakes (Pizzey and Knight 2007). Despite some small farm dams and temporary wetland areas within the Project site, these are not considered suitable habitat for this species.
<i>Lopoctinia isura</i>	Square-tailed Kite	R	-	Possible (fly-over). Inhabits the forested and wooded lands of tropical and temperate Australia (Marchant and Higgins 1993). The species may be recorded inland along timbered watercourses (Debus and Czechura 1989). Suitable habitat exists along the Isaac River and the species may occasionally over-fly the Project site.
<i>Neophema pulchella</i>	Turquoise Parrot	R	-	Unlikely. The northern most occurrence of this species is noted as Maryborough and Fraser Island in Garnett & Crowley (2000), which is almost 600 km to the south-east of the Project site.
<i>Nettapus coromandelianus</i>	Cotton Pygmy-goose	R	-	Possible . Preferred habitat is deep freshwater lagoons, swamps and dams, particularly those with waterlilies or other floating vegetation (Marchant and Higgins 1990). Suitable habitat occurs within the Isaac River and individuals may temporarily alight on farm dams within the Project site.

Species	Common Name	NC Act Status	EPBC Act Status	Likelihood of Occurrence
MAMMALS				
<i>Chalinolobus picatus</i>	Little Pied Bat	R	-	Known. Inhabits dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest, mallee, Bimbil box. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. Known from Poitrel Mine to the west (Ecoserve 2006) and has been previously recorded from the Project site in 2004.
<i>Taphozous trouhoni</i>	Troughton's Sheathtail Bat	E	-	Unlikely. Inhabits wet and dry sclerophyll forests, open woodlands, mulga, spinifex covered hills and grassland. Roosts in caves, abandoned mine shafts or rocky areas. These features are not present within or adjacent to the Project site.
REPTILES				
<i>Denisonia maculata</i>	Ornamental Snake	V	V	Unlikely. Occurs in Brigalow woodland, riparian woodland, and open forest growing on natural levees (Shine 1983; Cogger et al. 1993) and seasonally flooded areas (Wilson and Swan 2008). Despite the presence of Brigalow communities on the Project site, microhabitat features such as fallen logs, native tussocks grasses and shrubs are not present and preclude the occurrence of this species at the Project site.
PLANTS				
<i>Bertya pedicellata</i>		R	-	Unlikely. Occurs in Lancewood (<i>Acacia shirleyi</i>) woodland on ranges. Known from the low ranges near Coppabella. No such habitat occurs within the Project site.
<i>Capparis humistrata</i>	a bush caper	E	-	Unlikely. Occurs predominantly on soils derived from serpentinite from Marlborough to Rockhampton. Qld Herbarium record to the south of Coppabella c.23km to the north-east of the Project site. No such habitat occurs within the Project site.
<i>Cerbera dumicola</i>		R	-	Unlikely. Occurs in mixed eucalypt woodland to open forests often along creeks and marshy areas with permanent water. Such habitat does not occur within the site.
<i>Desmodium macrocarpum</i>	Large-fruited tickfoil	R	-	Possible. Inhabits Poplar Box woodland with sparse shrub layer often in association with <i>Carissa ovata</i> and <i>Grewia retusifolia</i> .
<i>Dichanthium queenslandicum</i>	Queensland blue grass	V	V	Unlikely. Occurs in native grass grasslands on heavy, black cracking clay soils. The patch of native grass grassland mapped by the EPA within the Project site was observed to be absent. Therefore, no suitable habitat for this species occurs within the Project site.
<i>Dichanthium setosum</i>	a bluegrass	R	V	Unlikely. Occurs on heavy, black cracking clay soils in native grass grasslands. The patch of native grass grassland mapped by the EPA within the Project site was observed to be absent. Therefore, no suitable habitat for this species occurs within the Project site.
<i>Digitaria porrecta</i>	Finger panic grass	R	E	Unlikely. Occurs in native grass grasslands, woodlands and open forests with grassy ground cover on fertile soils. No native grass grassland habitat occurs within the Project site.
<i>Gossypium sturtianum</i>	Sturt's Desert Rose	R	-	Unlikely. Occurs on sandy or gravelly soils along dry creek beds, watercourses, gorges or rocky slopes.

Species	Common Name	NC Act Status	EPBC Act Status	Likelihood of Occurrence
<i>Graptophyllum ilicifolium</i>	Holly-leaved Graptophyllum	V	V	Unlikely. Occurs in semi evergreen vine thickets in rocky areas and along ephemeral creeks. Only known from the Eungella region, west of Mackay.
<i>Macropteranthes leiocaulis</i>	Smooth-barked bonewood	R	-	Unlikely. Occurs in semi evergreen vine thickets. Suitable habitat does not occur within the Project site.
<i>Paspalidium scabrifolium</i>	a grass	R	-	Unlikely. Inhabits eucalypt woodlands on the lower and mid slopes of hills and ranges on volcanic derived soils. Such habitats do not occur on the Project site.
<i>Persoonia amaliae</i>	a geebung	R	-	Unlikely. Occurs in dry sclerophyll forest and vine-forest on granite and other well-drained substrates. Suitable habitat does not occur within the Project site.
<i>Solanum adenophorum</i>	a nightshade	E	-	Unlikely. This species is known only from Taunton National Park and Dipperu NP. It occurs in mature Brigalow communities, but also from Gidgee woodland. Soils are deep cracking clays. No such habitat occurs on the Project site.

Several flora and fauna species are possible occurrences within the Project site, including two rare bird species and one rare plant species. The Little Pied Bat (*Chalinolobus picatus*) is known from the Project site.

The Little Pied Bat was detected within the vicinity of the Isaac River in the 2004 survey. Within the region, they are likely to roost in large mature trees with dead limbs or hollowed out stumps. Suitable roost trees occur within the Project site along New Chum Creek. Vegetation clearing for the Haul Road may result in a loss of potential roost trees for this species. Fauna Management Procedures are outlined in the BMA Daunia Project Environmental Management Plan. These include the use of a Spotter-catcher who will ensure that all potential roost trees are identified prior to clearing commencing and that fauna rescues are conducted if injured bats are discovered within felled trees.

The Square-tailed Kite (*Lophoictinia isura*) and Cotton Pygmy-goose (*Nettapus coromandelianus*) have the potential to occasionally over-fly the Project site. The Square-tailed Kite is occasionally recorded inland along major river systems, such as the Isaac River. The Cotton Pygmy-goose is highly mobile and nomadic within its range following localised flooding events. The construction and operation of the Project are considered very unlikely to directly impact on either of these species. Nevertheless, a Spotter-catcher will be present for the duration of the clearing to ensure these species are not impacted.

Desmodium macrocarpum inhabits Poplar box (*Eucalyptus populnea*) woodlands in association with *Carissa ovata* and *Grewia retusifolia*. Broadly suitable habitat occurs within the Project site including *Carissa ovata*, however this is entirely restricted to the Red Mountain Lease area. A Spotter-catcher will complete a pre-clearing survey of likely habitat areas to ensure that rare or threatened species are not present.

N.2 Vegetation Offsets

N.2.1 Policy Context

The Queensland Government Environmental Offsets Policy (QGEOP) makes provision for transitional arrangements for Significant Projects whilst specific issue offset policies are being developed. Under the interim arrangements offsets may be used for Environmental Authorities relating to Mining and Petroleum Activities according to the principles and guidelines of QGEOP. An offset package has been prepared for the Daunia project with reference to the principles contained in the QGEOP.

N.2.2 Values to be Offset

The proposal will impact on two endangered regional ecosystems, RE 12.3.1 and RE12.4.9, mapped as dominant and sub-dominant components of vegetation polygons in the vicinity of the proposed haul road. These regional ecosystems are also a component of the Brigalow Ecological Community which is considered Endangered under the Commonwealth EPBC Act 1999. **Table N-2** below details the total area of endangered regional ecosystem to be cleared and/or disturbed as a result of the project.

Table N-2 Impact on Endangered Regional Ecosystems

Regional Ecosystem Code	ERE Short Description	Total Area Cleared
11.3.2/11.3.1/11.3.25	Acacia harpophylla and/or Casuarina cristata on alluvial plains	11.83
11.4.9	Open-forest, occasionally woodland, dominated by Acacia harpophylla usually with a low tree mid-storey of Terminalia oblongata and Eremophila mitchellii	2.35
11.4.9/11.5.3/11.4.4	Open-forest, occasionally woodland, dominated by Acacia harpophylla usually with a low tree mid-storey of Terminalia oblongata and Eremophila mitchellii	0.04
TOTAL		14.22ha

N.2.3 Proposed Offset Package

It is intended that the loss of endangered regional ecosystems be offset within a proposed environmental offset area at Norwich Park Mine, 70km to the south of the proposed Daunia project. The Norwich Park offset area is approximately 710ha in area and contains at least 350ha of Brigalow dominated regrowth and approximately 150ha of mixed Brigalow, Dawson Gum and Poplar Box regrowth (see **Figure N-1**)

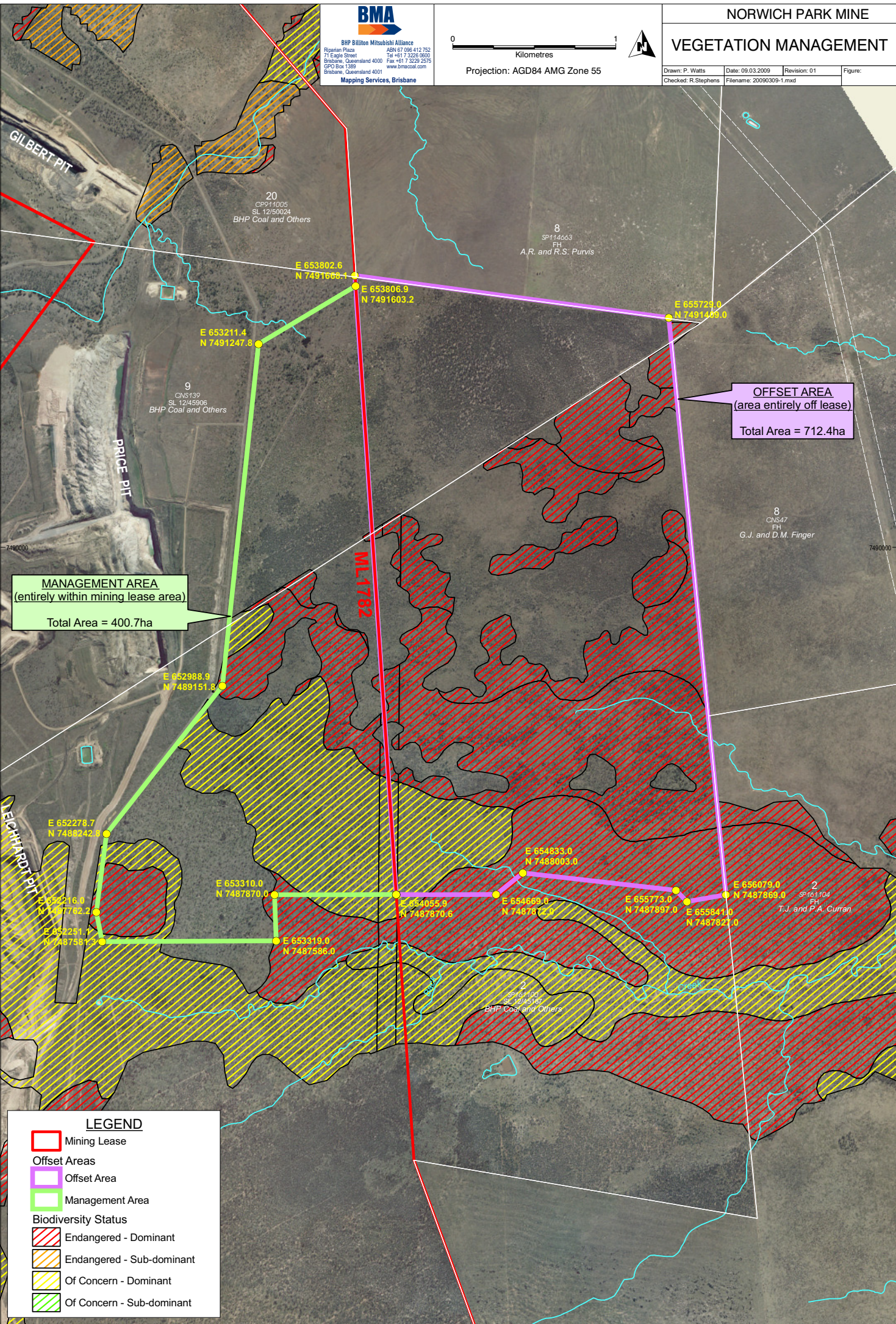
The Norwich Park offset area has been used to satisfy an offset requirement for the Norwich Park East Pit Development but was designed to acquit the offset requirement of additional projects as required. The area was essentially established by BMA as an 'off-set bank' to acquit offset obligations of multiple projects. The Offset area managed by BMA includes an area of 710 ha with an adjoining area of 400 ha to be managed with the offset so that a much larger conservation area is able to be retained and managed – a total of 1100 ha. The off-set area includes both remnant vegetation and regrowth, dominated by Brigalow.

It is intended that an offset of 20ha of Brigalow dominated vegetation be provided to acquit the offset obligations of the Daunia project. The area will be protected under a Nature Refuge agreement. A nature refuge is a voluntary agreement between a landholder and the Queensland Government that acknowledges a commitment to manage and preserve land with significant conservation values while allowing compatible and sustainable land uses to continue.

The proposed offset area contains remnant regional ecosystem 11.4.9, which is dominated by Brigalow. The area also contains a substantial area of Brigalow regrowth. The total area of Brigalow included within the 710ha offset site is estimated at approximately 350ha. The area of Brigalow regrowth included within the category “Brigalow, Dawson Gum and Poplar Box woodland regrowth” cannot be accurately quantified, however, if this area is conservatively estimated at 50% of the total for the category, regrowth containing Brigalow may comprise an area 77ha.

The proposed offset area conserves a variety of regional ecosystems including 11.4.9 (Brigalow on clay plains), 11.4.13 (*E. orgadophila* on clay plains), 11.4.2 (Mixed Eucalypt/Corymbia grassy woodland on clay plains) and regrowth examples of these communities.

Furthermore, the proposed Offset area contains a substantial proportion of vegetation in the configuration of a consolidated block of habitat, at least 1.5km wide. From an ecological perspective, this represents sound conservation planning as it minimises the potential for edge effects within the offset area and increases the likelihood of strong natural regeneration of cleared areas with minimal intervention.



N.2.4 Consistency with the QGEOP

The proposed offset area is consistent with the principles of the QGEOP for the following reasons:

- the proposed offset relates to impacts on very small remnants of Brigalow woodland in poor condition on a Mining Lease Area which is intended for development. It does not replace or undermine existing environmental standards and is consistent with Principle 1 of the QGEOP;
- the Daunia Project was designed to avoid the largest patch of remnant vegetation on the ML and is therefore consistent with Principle 2 of the QGEOP;
- the proposed offset is a part of a large, consolidated area of habitat with higher ecological value and integrity than the area to be impacted. The proposed offset is therefore consistent with Principle 3 of the QGEOP;
- principle 4 of the QGEOP demands that offsets provide environmental values as similar as possible to those being lost. The offset area contains a similar mix of regional ecosystem types to those being impacted and is therefore consistent with Principle 4 of the QGEOP;
- the offset is being secured prior to the impact occurring and is therefore consistent with Principle 5 of the QGEOP;
- the proposed offset package will conserve an area of habitat which otherwise would not have been conserved, and is therefore consistent with Principle 6 of the QGEOP; and
- principle 7 of the QGEOP requires the offset to be legally secured for the duration of the offset requirement. The proposed offset area will be protected under a Nature Refuge agreement and is therefore legally secured in perpetuity.

In addition to achieving policy compliance, the proposed offset area provides the following ecological benefits:

- the area to perimeter ratio is favourable (ie the perimeter is small in comparison to the area). From a conservation management viewpoint there are many advantages to such a configuration;
- the condition of vegetation to be provided within the offset area is comparable (or better) to the vegetation to be lost;
- no revegetation is required to achieve remnant status of the majority of the offset area; and
- the offset area contains potential habitat for the nationally threatened Squatter Pigeon, Ornamental Snake and Brigalow Scalyfoot.

N.3 Mitigation of Impacts to Terrestrial Flora and Fauna

N.3.1 Terrestrial ecology – Mitigation of impacts

The mitigation measures put forward in the EIS were commensurate with the observed ecological values of the Project site (in terms of extent, quality and condition of vegetation and habitat features) and the potential impacts on those values.

A comprehensive survey effort has been expended throughout the Project site (and on the adjacent Poitrel Lease area) with a particular emphasis on rare and threatened species. The survey effort is summarised in **Table N-3**.

Table N-3 Summary of survey effort over Poitrel and Daunia Leases

Survey		Survey Methods	Effort Expended
SKM 2004	6 sites on Poitrel Lease 2 sites on Red Mountain Lease	Flora sites Elliot traps Pitfall traps Spotlighting Bat detector Harp traps Diurnal herpetofauna searches Diurnal bird counts Nocturnal call playback	26 sites 240 trap nights 52 trap nights 17 person hours 7 nights 7 trap nights 40 person hours 4 person hours 1 night
Ecoserve 2006	9 sites on Poitrel Lease	Quaternary Flora sites Rapid habitat assessment sites and opportunistic fauna sightings	9 sites
SKM 2008	18 comprehensive sites on Daunia Lease	Flora sites Diurnal bird search (targeting southern Squatter Pigeon) Diurnal herpetofauna searches (targeting Brigalow Scaly-foot) Nocturnal herpetofauna searches	18 sites 9 person hours 9 person hours 36 person hours

The EIS states that “The Project Site has a long history of vegetation clearing and grazing, resulting in:

- significant losses of remnant forest and woodland;
- suppression of natural regeneration;
- loss of topsoil through erosion including the loss of productive seed banks;
- a reduction in native shrub and groundcover diversity and abundance; and
- weed invasion, particularly the proliferation of Buffel grass and Parthenium weed.”

Despite the limited ecological value of the Project site, commitments have been made to avoid areas of mapped remnant vegetation (i.e. Brigalow community) and to minimise construction and operational impacts on retained vegetation and habitats. A response has been prepared for each individual issue outlined in **Section 1.3.1**, which includes mitigation measures and Project commitments.

- *a Species Management Plan could be developed*

Fauna Management Procedures are outlined in the BMA Daunia Project Environmental Management. It contains a range of measures to actively protect and minimise potential impacts to fauna such as:

- employ a competent and experienced Spotter-catcher (a person who holds a Rehabilitation Permit from the EPA to capture and release fauna) to be present during tree clearing operations to:
 - inspect vegetation and fauna microhabitat (e.g. hollow logs, timber piles, etc.) for fauna prior to tree clearing commencing;
 - relocate fauna to adjacent habitat areas that are captured prior to and during clearing operations; and
 - rescue fauna injured during clearing operations.
 - temporarily fence off habitat to be retained; and
 - clear habitat sequentially, whereby the smaller trees and shrubs are removed leaving larger trees to be cleared several days later. This provides a disturbance stimulus to move fauna away from clearing areas.
- *more could be done to rehabilitate or restore habitat values and connectivity;*

The Project site has limited habitat values for fauna, which is borne out by the paucity of habitats and fauna species observed during comprehensive and targeted fauna surveys. Furthermore, connectivity values of the Project site have been severely reduced given the absence of large habitat patches and the absence of suitable connector corridors (refer to EIS Section 8.5.3.3).

The Isaac River provides regional corridor values within the local area and New Chum Creek provides some connectivity to this feature. However, as stated in the EIS, the functionality of the New Chum Creek corridor has already been reduced by creek diversion works associated with Poitrel Mine, and will be further compromised by future open cut operations. Disturbance to vegetation as a result of the Project will be limited to the development of a haul road and light vehicle access road within an area which will essentially function as an isolated patch of vegetation.

The suite of fauna species currently utilising the New Chum Creek corridor are considered to be highly mobile fauna (e.g. bats and open country birds) that are not adverse to significant breaks in canopy cover or edge effects. It is expected that the Haul Road is unlikely to present a barrier for these species and as such rehabilitation of areas disturbed during construction would be largely ineffectual in restoring connectivity values of the Project site.

- *it is also likely that more than the erection of signs could be done to reduce fauna deaths on the Project's roads – such as the installation of fauna underpasses and control fencing;*

As stated in the response above, the construction of the Haul Road is unlikely to affect the movement of open country birds and bats through the New Chum Creek corridor and such species are unlikely to be significantly affected by road traffic. Fauna groups that are likely to benefit from the installation of underpasses and guide fencing are small to medium size ground-dwelling mammals (e.g. dasyurids, bandicoots, rodents), reptiles and amphibians. As discussed in the EIS, these fauna groups are under-represented within the Project site and no rare, threatened or otherwise significant species (within these groups) were observed. Therefore, the installation of a fauna underpass is considered to be unnecessary.

- *the type of fencing to be used to protect vegetation should be chosen to avoid damage to native animals;*

The vegetation protection fencing to be used during vegetation clearing works are temporary barriers that ensure that vegetation that has been identified for retention is not unintentionally disturbed. The most common temporary fences used in vegetation clearing include orange barrier mesh fencing and three strand galvanised wire fences with star pickets. These and other temporary fencing options are generally not harmful to fauna and will be employed during vegetation clearing works.

- *glider poles could be used particularly near haul roads; and*

The EIS states, "The Project site provides virtually no suitable habitat for arboreal mammals. Several Yellow-bellied Gliders (*Petaurus australis*) were recorded from the broader Study Area in riparian tall open forest habitat associated with the Isaac River during surveys in 2004. Whilst moderately common, the species distribution was restricted to this area and no observations were made on the (Daunia) Project site. This is consistent with previous sightings (made by the Central Queensland University [CQU] in 1996 on Poitrel Mine). No other arboreal mammals were recorded during the 2004 or 2008 field surveys, however, two species were recorded by CQU on Poitrel Mine, namely the Greater Glider (*Petauroides volans*), which is restricted to riparian habitat, and the Common Brushtail Possum (*Trichosurus vulpecula*), which was more widely distributed."

Due to the absence of gliders from the proposed Haul Road location and the broader Project site, the installation of glider poles across the Haul Road is considered to be unnecessary.

- *clearing could be done sequentially with the use of spotter-catcher to help avoiding felling trees with animals still in them and to help move animals to nearby, safe habitat.*

As stated previously, the BMA Daunia Project Environmental Management Plan contains measures to manage the impacts of the Project construction and operation on fauna and fauna habitat values. This plan includes the use of a sequential clearing method and a Spotter-catcher will be on-site for the duration of the clearing works.

N.3.2 References

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