Memorandum

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From:	Dave Hall	At:	SLR Consulting Australia Pty Ltd
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Subject:	Response to Comments on MNES Chapter		

1 Introduction

This Memorandum has been developed to address comments and recommendations provided by the Department of Agriculture, Water and the Environment (DAWE) on Chapter 25 (Matters of National Environmental Significance) of the Ensham Life of Mine Extension Project Environmental Impact Statement (the EIS). Those comments pertain to three listed threatened species and a response to those comments in relation to each species is provided in the sections below.

2 Squatter pigeon (southern)

2.1 Summary of comments

Table 1 provides a summary of the DAWE comments received in relation to the squatter pigeon.

Table 1 Summary of comments received pertaining to squatter pigeon (southern)

DAWE Comment	DAWE Recommendation
It is unclear how habitat categories were determined. The habitat definitions used appear to have led to suitable habitat for some species being underestimated/ inadequately identified, e.g.: Squatter Pigeon: the assessment only includes land zones 5 and 7 rather than assessing habitat based on the species' specific requirements. From Figure 25-21 some habitat identified as 'dispersal habitat' appears to be suitable breeding/foraging habitat.	Provide a description of how the habitat categories were established and provide reference(s) for each of the habitat criteria used (e.g. breeding/foraging/dispersal). Assess habitat in accordance with species' habitat requirements as outlined in the TOR or SPRAT, and revise mapping and quantification of suitable habitat based on this. Note that if alternative habitat definitions are used, these must be justified with scientifically robust evidence.

2.2 Habitat definitions

A summary of the habitat categories defined in Chapter 25 (Matters of National Environmental Significance) of the EIS is provided below. These definitions are taken directly from the DAWE Species Profile and Threats (SPRAT) database and references therein.

2.3 Foraging and breeding habitat

Chapter 25 identifies that, in Queensland, foraging and breeding habitat is known to be associated with the soil landscapes of Land Zone 5 (well drained sandy or loamy soils on undulating plains and foothills) and Land Zone 7 (lateritic soils on low jump-ups and escarpments) (Department of the Environment and Energy, 2020).

This description of the relevant Land Zones is drawn from the Squatter Pigeon Workshop (2011), as cited in the SPRAT database. The description summarises the more detailed foraging and breeding habitat descriptions provided in the SPRAT database.

Other relevant characteristics of foraging and breeding habitat described in the SPRAT database (not presented in Chapter 25) include:

- Soil landscapes are good indicators of where natural, foraging and breeding habitats for the squatter pigeon (southern) occur (Squatter Pigeon Workshop 2011). Well-draining, gravelly, sandy or loamy soils support the open-forest to woodland communities with patchy, tussock-grassy understories that support the subspecies' foraging and breeding requirements. Given that the subspecies nests in shallow depressions in the ground, it requires well-draining soils. The subspecies also prefers to forage and dust-bathe on bare ground under an open canopy of trees (Squatter Pigeon Workshop 2011).
- Natural foraging habitat for the squatter pigeon (southern) is any remnant or regrowth open-forest to sparse open-woodland or scrub dominated by Eucalyptus, Corymbia, Acacia or Callitris species, on sandy or gravelly soils, within 3 km of a suitable permanent or seasonal waterbody (Squatter Pigeon Workshop 2011).
- Breeding habitat occurs on stony rises occurring on sandy or gravelly soils, within 1 km of a suitable, permanent waterbody (Squatter Pigeon Workshop 2011).

Chapter 25 also summarises squatter pigeon habitat requirements form the SPRAT database in relation to water resources: Breeding habitat is that within 1 km of suitable waterbodies, whereas foraging can occur up to 3 km from such waterbodies. This relates to the references from within the SPRAT database as outlined above.

Waterbodies that are suitable for the species, as detailed in the SPRAT database, are described in Chapter 25 as those that occur on the lower, gentle slopes and plateaus of sandstone ranges (equivalent to Land Zone 10), alluvial clay soils on river or creek flats (represented by Land Zone 3) or non-alluvial clay soils on flats or plains which are not associated with current alluvial deposits (represented by Land Zone 4). The SPRAT database states that, where natural foraging or breeding habitat occurs (i.e. on Land Zones 5 and 7), the squatter pigeon (southern) may be found in vegetation types growing on the above soil types (Squatter Pigeon Workshop, 2011). However, as foraging and breeding habitat is expressly defined as occurring on Land Zones 5 and 7 (Squatter Pigeon Workshop, 2011), vegetation types on Land Zones 3, 4 and 10 that contain suitable waterbodies for the species were assessed as dispersal habitat in Chapter 25.

2.4 Dispersal habitat

Chapter 25 identifies squatter pigeon (southern) dispersal habitat as any forest or woodland occurring between patches of foraging or breeding habitat, and suitable waterbodies. Such patches of vegetation tend not to be suitable for the species' foraging or breeding, but facilitate the local movement of the species between patches of foraging habitat, breeding habitat and/or waterbodies, or the wider dispersal of individuals in search of reliable water sources during the dry season or during droughts (Squatter Pigeon Workshop, 2011).

2.5 Modelling approach

Chapter 25 identifies that the squatter pigeon (southern) habitat modelling rules were developed from the SPRAT database as well as species recovery plans (where available), referral guidelines, approved conservation advice, management plans and peer-reviewed journal articles. Mapping of potential habitat for squatter pigeon (southern) has involved application of these rules to the results of habitat and vegetation community assessments across the Project Site.

The modelling rules specifically incorporated the habitat category definitions described above and taken directly from the SPRAT database. The key parameters considered are vegetation type, soil type and distance from water and the modelling rules for each of these parameters, in relation to each habitat category, are taken directly from references with the SPRAT database.

2.6 Summary

Section 25.7.8.2 of Chapter 25 (Matters of National Environmental Significance) in the EIS provides an appropriate summary of the relevant habitat attributes for categorising squatter pigeon (southern) habitat in the Project Site. The squatter pigeon (southern) species profile from the SPRAT database (and references therein) was the primary source of information used to determine habitat requirements for developing habitat category definitions and modelling rules. This information source is clearly described in the sections detailing Habitat requirements (pg 25-180) and Occurrence and potential habitat (pg 25-181).

In relation to the comment regarding the use of Land Zone 7 in the habitat modelling, it is important to note that, of the relevant Land Zones described for foraging and breeding habitat, only Land Zone 7 occurs within the Project Site. Based on the habitat descriptions within the SPRAT database, and given that the relevant Queensland Land Zones are specifically described in that database, the model rules for foraging and breeding habitat incorporating vegetation type, Land Zone type and distance from water are considered appropriate. These model rules are appropriately referenced, with the SPRAT database being the primary source, and are therefore suitably scientifically robust and consistent with DAWE requirements.

It is acknowledged that, by definition, the squatter pigeon (southern) may occur in areas of dispersal habitat and may therefore use those areas for foraging during dispersal. However, the areas mapped as dispersal habitat are not consistent with the description of preferred foraging habitat in the SPRAT database. The dispersal habitat section of the SPRAT database identifies that the squatter pigeon (southern) often moves into adjacent natural grasslands and highly modified or degraded habitats, such as pastures, stockyards, road reserves, railway easements and settlements, to forage for seed on the ground, drink from stock troughs or dams with gently sloping banks, and dust-bathe on bare, dusty ground (Longmore 1976; Lord 1956; Squatter Pigeon Workshop 2011). While the squatter pigeon (southern) may occur and occasionally forage in areas mapped as dispersal habitat, the primary function of those habitats in relation to the squatter pigeon (southern) would be for the purposes described as dispersal in the SPRAT database. On that basis, no change to the extent of dispersal habitat in the Project Site is proposed.

In relation to the recommendation to assess habitat in accordance with species' habitat requirements as outlined in the TOR or SPRAT—no 'alternative' habitat classification (i.e. different from that described in the SPRAT database) is proposed, and therefore no further justification for the proposed categories, or the criteria used to define those categories, is warranted.

3 Koala

3.1 Summary of comments

Table 2 provides a summary of the DAWE comments received in relation to the koala.

Table 2 Summary of comments received pertaining to the koala

DAWE Comment	DAWE Recommendation
It is unclear how habitat categories were determined. The habitat definitions used appear to have led to suitable habitat for some species being underestimated/ inadequately identified, e.g.: Koala: the habitat assessment only includes areas with more than 50% tree cover, while Koalas are known to use areas with scattered tree cover.	Provide a description of how the habitat categories were established and provide reference(s) for each of the habitat criteria used (e.g. breeding/foraging/dispersal). Assess habitat in accordance with species' habitat requirements as outlined in the TOR or SPRAT, and revise mapping and quantification of suitable habitat based on this. Note that if alternative habitat definitions are used, these must be justified with scientifically robust evidence.

3.2 Habitat definitions

The statement that "the habitat assessment only includes areas with more than 50% tree cover" is not correct. The description of koala habitat provided in Chapter 25 (pg 25-196) is as follows:

Habitat for the koala within the Project Site (see Figure 25-47, Plate 25-6) has been refined into refuge, foraging and dispersal habitat as per the modelling rules assigned in Table 25-44. These modelling rules are developed from the SPRAT database profile for koala as well as species recovery plans (where available), referral guidelines, approved conservation advice, management plans and peer-reviewed journal articles. Habitat mapping of potential habitat for koala has utilised these rules and the results of habitat and vegetation community assessments across the Project Site.

These criteria are unified by the presence of koala food trees within vegetation communities. Within the Project Site, known koala food trees include:

- Eucalyptus camaldulensis
- Eucalyptus populnea
- Eucalyptus coolabah
- Eucalyptus thozetiana.

Table 3 summarises the habitat definitions provided in Table 25-44 of the EIS.

Table 3 Potential habitat for koala within the Project Site (reproduced from Table 25-44 of the EIS)

Habitat description	Potential habitat type
Remnant and HVR vegetation with at least two koala food trees, OR one koala food tree with more than 50% cover, on Land Zone 3 OR more than 200 ha contiguous.	Refuge/foraging
Other remnant, HVR, regrowth or non-remnant vegetation with at least two koala food trees, OR one koala food tree with more than 50% cover.	Foraging only
All other remnant and HVR vegetation, or non-remnant areas with scattered canopy trees.	Dispersal

3.3 Application of the habitat modelling rules

The habitat factors that are utilised to model and map the extent of each potential habitat type are derived from multiple sources as described above. These sources have been used to develop model rules as follows:

It is important to note that, for habitat that is both refuge and foraging, there is a hierarchical approach to developing the rules by which each attribute is incorporated into the model for each potential habitat type (see Figure 1). The first rule establishes whether there are two or more koala food tree species present in the remnant or regrowth community AND the community occurs on Land Zone 3. If this is not the case, the second rule establishes whether there is one koala food tree species present, with greater than 50% cover AND the community occurs on Land Zone 3. If both the first and second rule prove false, the third rule establishes whether the vegetation is part of a contiguous tract of vegetation greater than 200 ha in size. It is important to recognise the purpose of the function OR in this case: if both parts of any of the rules prove true, the habitat is classified as potential refuge/foraging habitat.

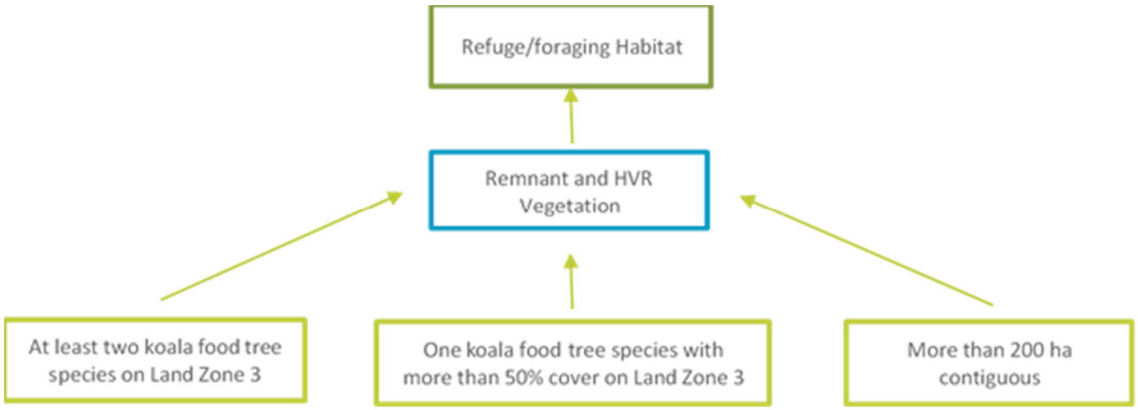

Figure 1 Summary of habitat model rule application for refuge/foraging habitat

For areas that are potential foraging habitat only, the model rules are: other (i.e. not on Land Zone 3) remnant, regrowth or non-remnant vegetation with at least two koala food trees, OR one koala food tree with more than 50% cover. It is again important to note 'or' condition between these two attributes in the rule—habitat that meets either rule is classified as potential foraging habitat.

All other remnant and regrowth vegetation, or non-remnant areas with scattered canopy trees, have been modelled and mapped as dispersal habitat.

The DAWE comment specifically regarding the use of the 50% cover attribute is noted. This attribute is taken from the EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) (Department of the Environment, 2014). The attribute relates to assessing vegetation composition in relation to habitat critical to the survival of the koala. The referral guidelines provide a habitat assessment tool in which high-value habitat in the context of vegetation composition is defined as that with "2 or more known koala food tree species, OR 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata". Given the source of this attribute is taken from guidelines for assessing the habitat value and significance of impacts to the koala as a matter of national environmental significance, it is considered an appropriate source for the development of the above model rules.

3.4 Habitat modelling outcomes

The outcome of the application of the above model rules is that all remnant and regrowth vegetation communities, as well as non-remnant vegetation with scattered trees, have been incorporated into the koala habitat mapping. The only areas that have been excluded from the foraging habitat mapping layer are Acacia communities—being those dominated by Brigalow (Acacia harpophylla) and Lancewood (Acacia shirleyi). Representative photographs taken from the Fauna Technical Report (AECOM, 2020) are provided in Figure 2 and clearly illustrate that these communities do not provide suitable foraging habitat for the koala. These communities do not contain 2 or more known koala food tree species and do not contain one food tree species that alone accounts for more than 50% of canopy vegetation.

(A) Brigalow community	(B) Lancewood community
	

Figure 2 Representative photographs of Acacia communities within the Project Site (from AECOM, 2020)

Overall, the habitat modelling outcomes have incorporated all areas supporting koala food trees into koala habitat mapping: areas containing a scattered canopy of food trees have been captured as dispersal habitat, those with either two food species or greater than 50% cover of one food species have been captured as foraging habitat, and those areas that also have connectivity values or are located in riparian areas (and therefore are likely have higher leaf-moisture content) have also been mapped as refuge habitat. The attributes used in the model are justifiable as highly relevant to koala as evidenced by the habitat mapping model output. Furthermore, they are derived from sources specifically developed to assess the significance of habitat in relation to impact assessment under the Environment Protection and Biodiversity Conservation Act 1999. No 'alternative' habitat classification (i.e. different from that described in relevant DAWE policy documentation) is proposed, and therefore no further justification for the proposed categories, or the criteria used to define those categories, is warranted.

4 Greater Glider

4.1 Summary of comments

Table 4 provides a summary of the DAWE comments received in relation to the greater glider.

Table 4 Summary of comments received pertaining to greater glider

DAWE Comment	DAWE Recommendation
It is unclear how habitat categories were determined. The habitat definitions used appear to have led to suitable habitat for some species being underestimated/ inadequately identified, e.g.: Greater Glider: the habitat assessment only includes remnant woodland, while Greater Glider are known to use any woodland with sufficient hollows.	Provide a description of how the habitat categories were established and provide reference(s) for each of the habitat criteria used (e.g. breeding/foraging/dispersal). Assess habitat in accordance with species' habitat requirements as outlined in the TOR or SPRAT, and revise mapping and quantification of suitable habitat based on this. Note that if alternative habitat definitions are used, these must be justified with scientifically robust evidence.

4.2 Habitat definitions

The DAWE comment specifically regarding the use of remnant status as a prerequisite for greater glider habitat suitability is noted. There is a discrepancy between the definitions of greater glider habitat in the Occurrence and potential habitat section under 25.7.8.3 and the definitions in Table 25-42: the former does not stipulate remnant status as a habitat suitability factor, but the latter does. The definition under the Occurrence and potential habitat section is:

The Nogoa River and the connected tributaries are considered suitable for breeding, denning, foraging and dispersal habitat due to the large patch size, connectivity and high abundance of hollow bearing trees containing medium to large hollows. The potential habitat connections along the vegetated waterways provide movement corridors and refuge habitat for this species in an otherwise cleared and generally unsuitable landscape. Other habitat types within the Project Site are not considered suitable for the greater glider because they lack a high density of large hollow-bearing mature eucalypts, which are important for foraging and denning.

The definitions prescribed in Table 25-42 of the MNES Chapter 25 reflect the above with the sole exception that remnant status is added to the criteria for both 'breeding, denning and foraging' habitat and 'foraging and dispersal' habitat.

These criteria are in accordance with the Threatened Species Scientific Committee's Conservation Advice: Greater Glider (TSSC, 2016), which identifies that in southern Queensland the greater glider requires at least 2-4 live den trees (defined as large, old trees with large hollows) per 2ha of suitable forest habitat, with the exception of the criterion for remnant status.

4.3 Habitat modelling outcomes

Breeding, denning and foraging habitat

The habitat criteria described above are those that were applied to the habitat modelling for 'breeding, denning and foraging' habitat. The outcome of the application of these criteria is that all eucalypt woodlands in the Project Site containing sufficient density of live den trees are classed as 'breeding, denning and foraging' habitat. While these habitats correspond to remnant woodlands connected to Nogoa River and mosquito creek, these are also the only habitats in the Project Site that meet the definitions of suitable habitat for greater glider outlined in the Conservation Advice.

Foraging and dispersal habitat

'Foraging and dispersal' habitat modelling has focussed on incorporating habitat connection and movement corridor values. The model has incorporated all woodlands within 120m of 'breeding, denning and foraging' habitat regardless of vegetation species composition or remnant status. This is evident in the existing model output for 'foraging and dispersal' habitat, as regrowth brigalow communities in close proximity to 'breeding, denning and foraging' habitat have been incorporated into that habitat mapping.

4.4 Adjustments to Chapter 25 section 25.7.8.3 Greater glider (Petauroides volans)

The model rules have been misrepresented where they are summarised in EIS Chapter 25, Table 25-42. This table has been updated to reflect the actual model rules applied, as follows:

- The word 'remnant' has been removed from the definitions for both 'breeding, denning and foraging habitat' and 'foraging and dispersal' habitat.
- The definition of 'breeding, denning and foraging' habitat has been adjusted to reflect the live denning tree threshold more accurately and the source of that information.
- The word 'eucalypt' has been removed from foraging and dispersal habitat description as the model outputs for this habitat category also include non-eucalypt remnant and regrowth vegetation.

It is important to note that these adjustments to the terminology in Table 25-42 have been made to accurately reflect the model rules originally applied. There has been no change to the actual application of the model rules or the model outputs in Chapter 25.

The removal of remnant status from the habitat descriptions in Table 25-42 did not lead to any change in the extent of either class of greater glider habitat in the Project Site. For 'breeding, denning and foraging' habitat the remnant status of the communities shown in the output mapping coincide with areas supporting suitable hollow-bearing tree density, but remnant status does not form part of the model rules. The removal of the word 'eucalypt' from the 'foraging and dispersal' habitat description did not change any outputs as non-eucalypt communities were already captured, as detailed in the other columns in Table 25-42.

5 Conclusion

A review of the habitat criteria for squatter pigeon identified these were in accordance with those described in the SPRAT database and other appropriate sources, in that these define suitable foraging and breeding habitat as occurring in Land Zones 5 and 7, and suitable water sources as being habitats in select other Land Zones proximal to foraging and breeding habitat. On this basis it is concluded that the approach for assessing squatter pigeon habitat is scientifically robust and based on appropriate inputs derived from DAWE resources and advice, and that the habitat modelling outcomes accurately represent the extent of squatter pigeon habitat in the Project Site. This memo serves to provide further clarification and justification for the approach used.

The DAWE comment regarding the habitat assessment for koala was found to be incorrect. The habitat assessment for koala incorporates all vegetation communities containing koala food trees (select Myrtaceae spp.) and delineates habitat categories by the number and canopy dominance of food tree species. HVR and non-remnant vegetation communities containing scattered food trees are recognised as potential dispersal habitat for koala; the delineation of habitat categories is based upon the habitat quality assessment tool provided in the EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory). On this basis it is concluded that the koala habitat modelling outcomes are accurate and based on a sound and robust set of criteria derived from resources developed for the assessment of impacts to the koala in a highly relevant context. This memo serves to clarify the approach used and the accuracy of the outcomes.

The DAWE comment regarding the use of remnant status as a criterion for greater glider habitat was noted. The criterion was removed from the definitions of greater glider habitat in Table 25-42. Review of the remaining assessment criteria revealed that these are in accordance with the Conservation Advice for greater glider. The removal of remnant status from the habitat suitability criteria had no effect on the habitat modelling outcomes for greater glider in the Project Site.

6 References

AECOM (2020). Ensham Life of Mine Extension Project – Fauna Technical Report. Prepare for Ensham Resources Pty Ltd (05 May 2020). AECOM Australia Pty Ltd.

Department of the Environment (2014). EPBC Act Referral Guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory). Canberra: Department of the Environment.

Department of the Environment and Energy (2020). Species Profile and Threats Database. Canberra: Department of the Environment and Energy.

Squatter Pigeon Workshop (2011). Proceedings from the workshop for the Squatter Pigeon (southern). 14-15 December 2011. Toowoomba Office of the Queensland Parks and Wildlife Service.

Threatened Species Scientific Committee (2016). Conservation Advice Petauroides volans greater glider. Canberra: Department of the Environment.

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