Hume Highway Upgrade

Tarcutta bypass: Environmental Assessment

Proposed modification

Establish and operate a quarry at Ladysmith Road

NSW Roads and Traffic Authority

June 2010

Hume Highway Upgrade

Tarcutta bypass

Proposed modification - Establish and operate a quarry at Ladysmith Road

Prepared for**:**

NSW Roads and Traffic Authority

Prepared By:

KMH Environmental on behalf of
Tarcutta Hume Alliance
84-86 Murray St
WAGGA WAGGA NSW 2650

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Glossary and abbreviations

AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
CEMP	Construction Environmental Management Plan
DECCW	NSW Department of Environment, Climate Change and Water (formerly Department of Environment and Climate Change)
DEWHA	Commonwealth Department of the Environment, Water, Heritage and the Arts
EECs	Endangered Ecological Communities
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased.
I&I NSW	Industry and Investment NSW
L_{Aeq}	The equivalent continuous sound level is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is a common measure of environmental noise and road traffic noise.
NOW	NSW Office of Water
PPV	Peak particle velocity
RBL	The Rating Background Level for each period is the median value of the assessment background noise level values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.
TSC Act	*Threatened Species Conservation Act 1995* (NSW)

Executive summary

The proposed modification

The Roads and Traffic Authority of NSW (RTA) received approval to construct the Hume Highway Upgrade - Tarcutta Bypass project from the NSW Minister for Planning on 12 January 2010 (the approved project). The approved project includes the construction of a new dual carriageway section of the Hume Highway from approximately two kilometres north of Tarcutta to two kilometres south of Tarcutta, encompassing a total length of approximately seven kilometres.

The Tarcutta Hume Alliance (THA), a consortium consisting of the NSW Roads and Traffic Authority, Leighton Contractors, SMEC, Coffey and AECOM has been established to design and construct the approved project.

The THA is proposing to be establish a quarry at Ladysmith Road near the near the junction with the Hume Highway. Establishment and operation of the quarry is considered to be inconsistent with the Minister's project approval and accordingly a request to modify the project approval will be submitted to the NSW Department of Planning.

The proposed modification would involve four broad activities:

- Quarry site set up.
- Extraction (including drilling and blasting).
- Processing (including crushing and screening).
- Rehabilitation.

Quarrying operations would commence upon receipt of approval and following establishment of environmental controls (anticipated start date July 2010). Quarrying operations would occur over a period of approximately 18 months and would conclude upon completion of construction of the approved project.

For more details on the proposed modification see Section 1.

Need for the proposed modification

The environmental assessment identified the potential need to establish a quarry to supply select fill material needed for the construction of the approved project. Following project approval, the THA has undertaken geotechnical investigations which have confirmed the need to import higher grade materials such as drainage rock, rip rap, select material and densely graded base. A shortfall of approximately 150,000 cubic metres of higher grade materials was identified.

THA investigated the feasibility of importing these materials from existing hard rock quarries and river sand/gravel quarries. As large volumes of construction materials would be required over a relatively small timeframe, existing quarries would be unlikely to be able to provide the required quantities or quality. In addition, existing quarries are located between 40 and 90 kilometres from the approved project (at Wagga Wagga, Gundagai, Holbrook and Tumbarumba) thereby involving significant additional transport distances.

The proposed modification would facilitate access to more locally available sources, reducing transport costs, delivery times, and wear and tear on existing regional roads.

Statutory and planning framework

The Hume Highway Upgrade, Tarcutta bypass was declared to be a project to which Part 3A of the *Environmental Planning & Assessment Act 1979* (EP&A Act) applies by Order dated 20 December 2007. The project was also declared to be critical infrastructure by Order dated 4 March 2009.The Tarcutta Bypass project was approved by the Minister for Planning on 12 January 2010.

The project declaration provided fro the Tarcutta bypass development to include *"any winning or obtaining extractive materials as part of construction work for the Project"*. The proposed quarry

operations would be undertaken exclusively for construction of the Tarcutta bypass. Accordingly, the quarrying operations are subject to assessment under Part 3A of the EP&A Act by virtue of the above Order.

Whilst the environmental assessment for the approved project considered the need to establish external material sources and established guiding criteria for selection of a quarry site, the location and impacts of the proposed quarry are such that they are considered to be inconsistent with the approved project and therefore a modification to the approved project under Section 75W of the EP&A Act is required.

Community and stakeholder consultation

Consultation with the following government agencies and stakeholders was conducted to help identify the environmental issues to be assessed for the proposed modification:

- Wagga Wagga City Council.
- Department of Environment Climate Change and Water.
- Department of Industry and Investment.
- NSW Office of Water.
- Adjacent landowners.

Issues raised have been considered in Section 2 of this report. If the proposed modification is approved, ongoing consultation with the community and stakeholders would be undertaken as required.

Environmental impacts

The proposed modification would result in the following adverse environmental impacts

- Loss of up to 7.25 hectares of native vegetation listed as an endangered ecological community (Box Gum Woodland) under the *Threatened Species Conservation Act 1995*. However, no significant impact on this endangered ecological community is predicted.
- Some minor temporary traffic, transport and access impacts.
- Some minor, temporary disruptions to the rural land use in the form of dust impacts, visual amenity impacts and short-term traffic disruptions.
- Permanent changes to the visual amenity and landscape environment.

This modification report examines the likely consequences of the proposed quarry operations. As part of this assessment, measures to mitigate and/or manage the impacts have been proposed. Where residual impacts are identified additional offsets are proposed.

The environmental impacts, and measures to minimise those impacts, are discussed in Section 3. Section 4 provides a summary of the additional environmental mitigation and management measures that would be implemented to reduce the identified adverse impacts and maximise the benefits of the proposed modification.

Conclusion

The potential environmental impacts associated with the quarrying operations may be adequately managed under the existing environmental management strategies and mitigation measures specified within the *Hume Highway Upgrade, Tarcutta bypass, Environmental Assessment* (Parsons Brinckerhoff 2009). Where required, additional measures have been identified to reduce the adverse impacts and maximise the benefits of the proposed modification.

1. Introduction

1.1. Background

The Roads and Traffic Authority of NSW (RTA) received approval to construct the Hume Highway Upgrade - Tarcutta Bypass project from the NSW Minister for Planning under Part 3A of the EP&A Act on 12 January 2010 (the approved project). The approved project includes the construction of a new dual carriageway section of the Hume Highway from approximately two kilometres north of Tarcutta to two kilometres south of Tarcutta, encompassing a total length of approximately seven kilometres. The project approval is subject to Minister's Conditions of Approval relating to the design, construction and operation of the project.

The project approval is based on a detailed assessment of the environmental impacts of the project. This document should be read in conjunction with the *Hume Highway Upgrade, Tarcutta bypass, Environmental Assessment* (Parsons Brinckerhoff 2009) (the environmental assessment).

The Tarcutta Hume Alliance (THA), a consortium consisting of the NSW Roads and Traffic Authority (RTA), Leighton Contractors (LCPL), SMEC, Coffey and AECOM, has been established to design and construct the approved project.

The environmental assessment identified the potential need to establish a quarry to supply select fill material needed for the construction of the approved project. Following project approval, the THA (on behalf of the RTA) has undertaken geotechnical investigations to further explore the potential for material reuse and refine the estimated volume of material shortfall. It was determined that the material available at the cutting are deeply weathered metasediments. This material would be suitable for reuse as lower grade materials such as general fill, bridging material, upper zone formation and verge material. However, geotechnical investigations confirmed the need to import higher grade materials such as drainage rock, rip rap, select material and densely graded base. A shortfall of approximately 150,000 cubic metres of higher grade materials was identified.

THA initially investigated the feasibility of importing these materials from existing hard rock quarries and river sand/gravel quarries. As large volumes of construction materials would be required over a relatively small timeframe, existing quarries would be unlikely to be able to provide the required quantities or quality. In addition, as existing quarries are located between 40 and 90 kilometres from the approved project (at Wagga Wagga, Gundagai, Holbrook and Tumbarumba), the sourcing of material from these existing commercial operations would increase transport costs, delivery times, and wear and tear on existing regional roads due to the long haulage distances. Accordingly, THA initiated investigation into more locally available sources.

The Environmental Assessment (s6.3.1, Parsons Brinkerhoff 2009) provided guiding criteria for the selection of a quarry site to ensure environmental impacts are minimised. Guiding criteria were as follows:

- More than 40 metres from waterways.
- Areas of low ecological and heritage conservation value.
- Greater than 100 metres from the closest sensitive receiver (unless a negotiated agreement is in place).

Five potential quarry sites were investigated and were subject to preliminary environmental assessment. This included consideration of the guiding criteria outlined above. Two sites were ruled out due to potential environmental impacts. Three short-listed sites were subject to geotechnical investigation. Considering the results of these investigations the proposed site at Ladysmith Road was identified as the preferred quarry site for the following reasons:

- It would be able to provide sufficient volumes of material that meet the quality needs of the approved project.
- It is located relatively close to the approved project (reducing haulage distances) and has easy access to the existing road network (Ladysmith Road and the Hume Highway).
- It would result in the least environmental impact when compared to the other two short-listed sites. While there would be impacts on flora and fauna, impacts to Aboriginal cultural heritage would be avoided and potential noise impacts would be limited as the proposed modification is located approximately 500 metres from the closest sensitive receiver.

Following consideration of geotechnical and environmental considerations the THA proposes to undertake quarry operations at the Ladysmith Road site.

1.2. Statutory position and consistency assessment

The Hume Highway bypass of` Tarcutta was declared by the Minister for Planning to be a project to which Part 3A of the *Environmental Planning & Assessment Act 1979* (EP&A Act) applies by Order dated 20 December 2007 published in NSW Government Gazette (No 4 of 2008). The Minister also declared the project to be critical infrastructure by Order dated 4 March 2009 and published in the gazette (No51 of 2009).

The schedule to the Order provided for the Tarcutta bypass development to include*"(g) any winning or obtaining extractive materials as part of construction work for the Project.*

The proposed quarry operations at the Ladysmith Road site are to be undertaken by the THA exclusively for the purpose of construction of the approved project and would be closed on completion of the approved project. Accordingly, the proposed quarrying operations are subject to assessment under Part 3A of the EP&A Act by virtue of the above Order.

As noted above, the environmental assessment considered the potential need to establish external material sources for the project and established guiding criteria for the selection of a quarry site. Whilst the proposed site at Ladysmith Road has been selected with consideration to these criteria, the impacts are such that proposed quarrying operations are considered not to be consistent with the project approval and therefore would require the Minister to modify the approval in accordance with Section 75W of the EP&A Act.

1.3. Purpose of this report

This report has been prepared to support the RTA request for a modification of the Minister's Approval. The report identifies the proposed changes to the approved project and the conditions of approval which may require modification. An environmental assessment of the proposed modification has been undertaken. New environmental management measures or modifications to existing environmental measures are detailed.

1.4. Overview of the proposed modification

The proposed modification is to establish and operate a quarry at the Ladysmith Road site, located approximately two kilometres west of the intersection of the Hume Highway and Ladysmith Road (also known as Tumbarumba Road) in Kyeamba, 27 kilometres south-west of the approved project (refer to Figure 1). The proposed modification is located on private land, on Lot 2, DP 1128283, within the Wagga Wagga City Council local government area.

The proposed modification is located on the northern side of Ladysmith Road and lies on a low ridgeline underlain by hornfels rocks immediately down slope and to the west of a granite hill known as Mount Kilgowla. It would include an area of approximately 2.2 hectares for excavation of material, an area of approximately four hectares for the crushing and stockpiling of materials, as well a heavy vehicles access track. These activities would be spread over an area of approximately 20 hectares that would be leased from the landowner for the duration of proposed modification.

For the purpose of this report, the 20 hectares lease area is referred to as the assessment area (refer to Figure 2).

THA geotechnical investigations have estimated that approximately 150,000 cubic metres of material, required for construction of the approved project, could be sourced from the proposed modification site.

This would include materials and quantities as outlined in

Table 1.

Table 1. Material types and quantities available at the proposed modification site

Material	Description	Quantity (tonnes)
Drainage rock	A crushed rock material ranging in size from 25 millimetres to 125 millimetres	48,000
Select material zone (SMZ)	A crushed material ranging in size from 75 millimetres to fines to be used for road pavements	240,000
Dense graded base (DGB)	A crushed and screened material less than 20 millimetres to be used for road pavements	20,000
Dense graded subbase (DGS)	A crushed and screened material less than 20 millimetres to be used for road pavements	40,000
Rock rip rap	A rock material ranging in size from 500 millimetres to 125 millimetres	6,000
Other crushed rock products	Verge, temporary road pavements etc.	100,000

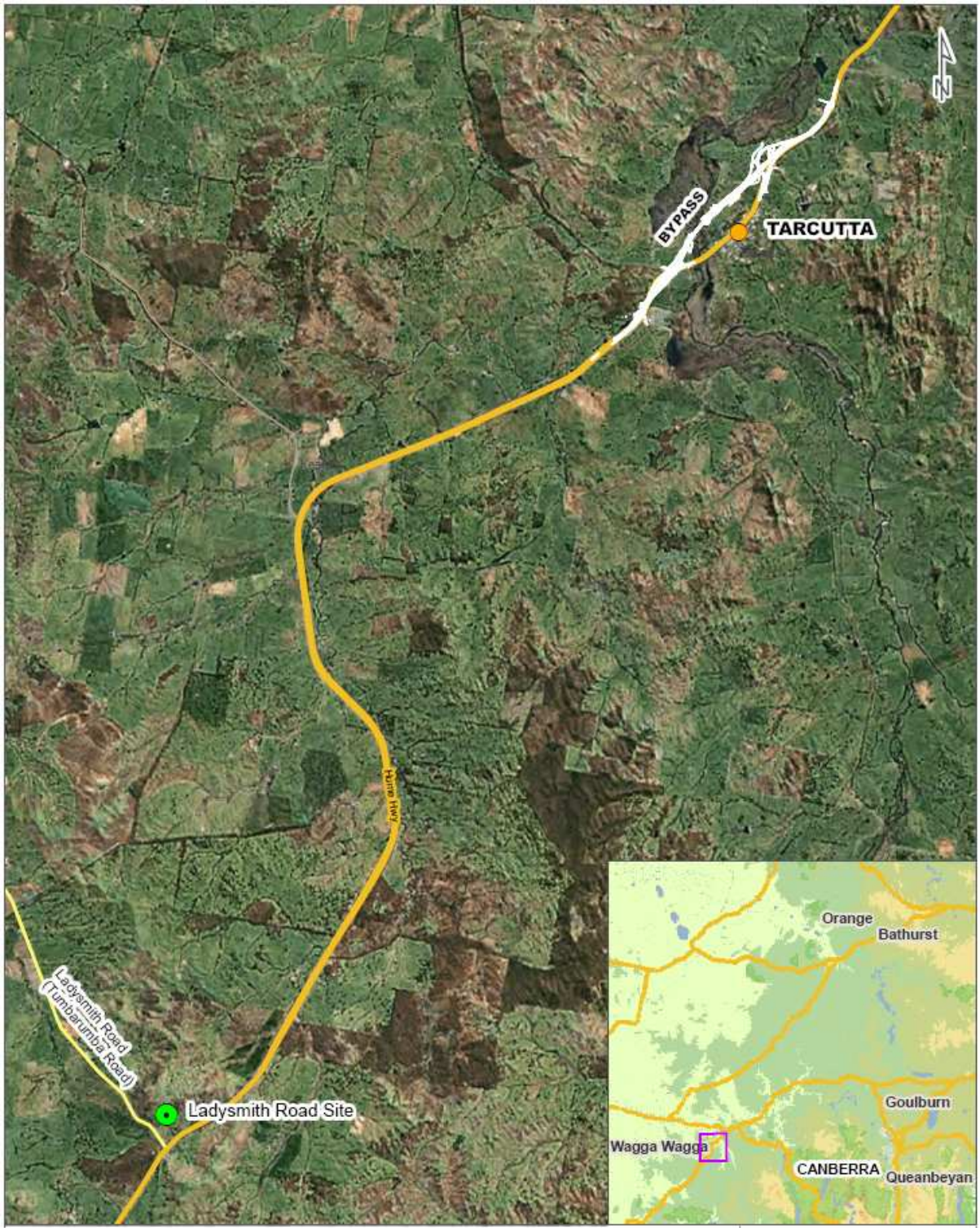


Figure 1. Location of the Proposed Modification

1.5. Operation of the proposed modification

1.5.1. Activities and equipment

The proposed modification includes four broad activities:

- Quarry site set up:
  - Fencing of the lease area and environmentally sensitive areas (cultural heritage and protected vegetation).
  - Installation of erosion and sediment controls.
  - Installation of site amenities and fuel storage areas.
  - Installation of access to Ladysmith Road.
  - Construction of internal access tracks (graded and gravel laid down), stripping of topsoil (stockpiled for reuse) and removal of any trees.

- Extraction (including drilling and blasting) within the north-east portion of the assessment area:
  - Removal of overburden: The initial two to three metres of material is expected to be of a lower quality and would be removed with a dozer. Material would be carted to the processing area (see below).
  - Plant and equipment would include a dozer, two 45 tonne excavators, 40 tonne articulated dump truck, 18,000 litre water cart, two loaders and an air track drill for blasting.

- Processing (including crushing and screening) within the south-west portion of the assessment area:
  - Feed material would be delivered from the quarry face to a feed stockpile. It would then be loaded into the crusher.
  - Crushed material would be stockpiled near to the crusher and tested prior to being transported to the approved project.
  - Plant and equipment would include up to three crushers or screeners.

- Rehabilitation:
  - All structures and access would be removed and the processing area and access tracks would be regraded.
  - The processing area and access tracks would be topsoiled and revegetated with a pasture mix (to be decided in consultation with the landowner).
  - The excavation area (quarry face) would be left as a void. The quarry face would be re-profiled and made stable. This would include 12 metre batters and four metre benches.
  - A mound would be installed at the top of the quarry face and revegetated with native plants endemic to the area. A fence would be installed to prevent access for livestock and humans.

Quarrying operations would commence upon receipt of approval of the modification and following establishment of environmental controls (anticipated start date July 2010). Quarrying operations would occur over a period of approximately 18 months and would cease upon completion of construction for the approved project. At this point, the proposed modification site would be rehabilitated as outlined above. It is anticipated that blasting of hard rock would be required up to 25 times (refer to section 3.4.4). Refer to Figure 2 for proposed quarry layout.

1.5.2. Access and traffic management

Up to two access points on Ladysmith Road would be required to cater for two way movement of haulage trucks. This may include the upgrade of existing farm accesses or the establishment of new access points. A right hand turn lane may be required on Ladysmith Road to provide safe access to the proposed modification site. Access arrangements will be finalised in consultation with Wagga Wagga City Council.

During peak periods of materials demand the maximum extraction would be approximately 6000 tonnes per day. Truck volumes (road trucks) during such periods would be up to 180 truck loads per day. This equates to approximately 16 per hour (or 32 movements per hour).

Standard traffic management measures would be employed to reduce any short-term traffic impacts during the proposed quarrying operations. These measures would be identified in a traffic management plan and would be developed in accordance with the RTA's *Traffic Control at Works Sites Manual* (RTA 2003).

Potential impacts on traffic are assessed in Section 3.5.

1.5.3. Ancillary facilities including water

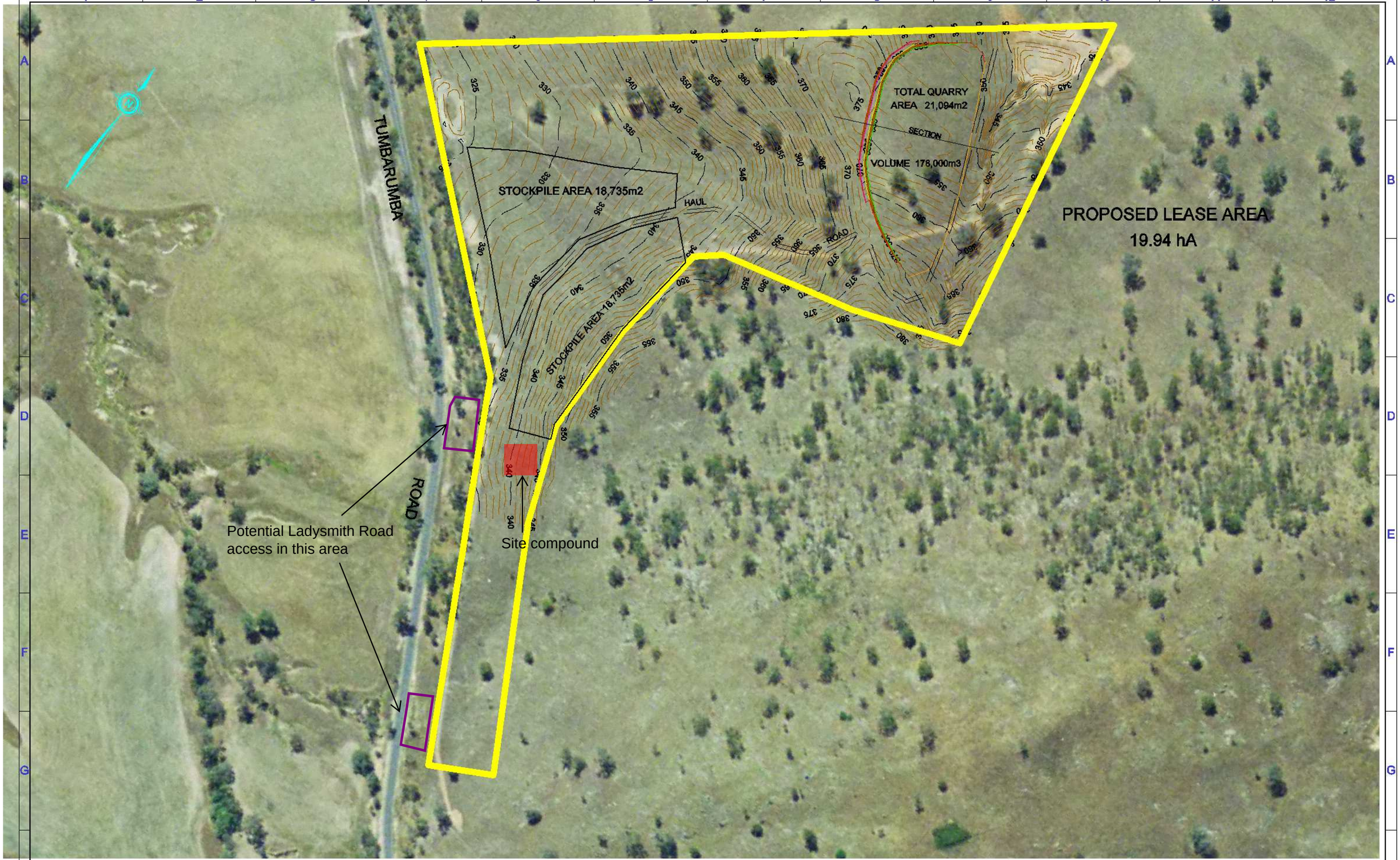
The proposed modification would include the establishment of a construction compound. The location of ancillary facilities are guided by the Minister's Condition of Approval 2.47 which outlines the criteria for locating ancillary facilities as follows:

a. Be located within or adjacent to the project.
b. Have ready access to the road network.
c. Be located to minimise the need for heavy vehicles to travel through residential areas.
d. Be sited on relatively level land.
e. Be separated from nearest residences by at least 200 metres.
f. Not require vegetation clearing beyond that already required for the project.
g. Not impact on heritage sites beyond those already impacted by the project.
h. Not affect the land use of adjacent properties.

The proposed construction compound would be located within the assessment (lease) area (refer Figure 2). Facilities would include a crib shed, amenities and a storage area. The proposed construction compound would have ready access to Tumbarumba (Ladysmith) Road, would not result in additional heavy movement through residential areas, would be located on level land, would be around 500 metres from the closest residence and would not require vegetation clearing or result in impact to heritage. The agricultural land use of adjacent properties would not be affected.

The proposed modification is approximately 27 kilometres south west of the approved project. Should the proposed modification be approved, it would form part of the approved project. The proposed construction compound location would meet criteria a – h (inclusive).

The proposed modification would require water, principally for dust suppression. Between 12 and 14 megalitres would be required over the 18 month operation period (25 kilolitres per day). An existing RTA licensed groundwater bore is located approximately six kilometres north of the proposed modification. Groundwater would be sourced from this bore and would be piped to the proposed modification through a network of PVC pipe (mostly already in place). This bore includes an allocation of 25 megalitres per 12 month period (licence number 40BL191576). Potential impacts on groundwater are assessed in Section 3.3.



REV	AMENDMENTS	APP'D	DATE

Figure 2.2 Proposed quarry layout

GENERAL NOTES / REFERENCES

This drawing is the property of the Tarcutta Hume Alliance and the information contained herein intended for Alliance Partner use only. The Tarcutta Hume Alliance accepts no responsibility for any loss or damages arising from the unauthorised use of this information.

Co-ordinate System - MGA Zone 55
Height Datum - AHD

TARCUTTA HUME ALLIANCE

TARCUTTA BYPASS

SURVEYED / DRAWN BY: KH
CHECKED:
SCALES AT A3: Horiz 1:3500 Vert 1:3500

PLOT DATE: Fri Apr 29 15:29:27 2022

PROPOSED LAYOUT - PLAN

DRAWING STATUS:
DRAWING No.: 1 of
REV.

1.5.4. Working hours

The proposed working hours would be between 7am to 6pm Monday to Friday and 8am to 1pm Saturday with no work on Sunday or public holidays (in accordance with the Minister's Condition of Approval 2.27).

Blasting would be conducted between 9am and 5pm Monday to Friday and 9am to 1pm on Saturday (in accordance with the Minister's Condition of Approval 2.30).

2. Consultation and stakeholder engagement

2.1. Stakeholder consultation

Consultation with the following government agencies was conducted to help identify relevant environmental issues for the proposed modification:

- Wagga Wagga City Council, Department of Environment Climate Change and Water (DECCW), Department of Industry and Investment (I&I NSW) and the NSW Office of Water (NOW).

Issues raised and how they have been considered in this report are detailed in **Table 2**.

Table 2 Summary of stakeholder consultation

Stakeholder	Issue	Specific issue raised	Where addressed
Wagga Wagga City Council	• Access to Ladysmith Road	• *Initial discussions have been undertaken with Wagga City Council. Further consultation will be undertaken to finalise access arrangements on and off Ladysmith Road.*	Section 3.5(Traffic).
Department of Environment Climate Change and Water (DECCW)		• Consultation has been undertaken with DECCW with regards to the proposed quarry through the provision of a draft ecological assessment and a site visit. The ecological assessment has been updated to reflect the issues raised by DECCW during the site inspection.	Section 3.1(Flora and Fauna).
Industry and Investment NSW (I&I NSW) (Minerals, Mine Safety)	Safety	• Bunding and protective fencing is to be placed at the top of quarry to prevent access by plant or personnel. • All vehicle access routes where there is exposure to an edge are to have bunding installed. • The vehicle haul road is to have appropriate passing / layby areas installed to facilitate safe plant movement around site. • LCPL will nominate a suitably qualified Operations Manager as required under the *Mine Health and Safety Act 2004.* • LCPL is to be the nominated as the 'Operator' of the quarry as required under the *Mine Health and Safety Act 2004.* • Compliant plant inspection systems are to be in place to ensure that any plant working on the site is safe and fit for purpose. The operators of the plant are to be suitably qualified and competent. • A Mine Safety Management Plan is to be developed for the proposed modification.	Section 3.5(Traffic) Specific safety issues are not addressed in this document, however THA will prepare a Mine Safety Management Plan for the proposed modification and will comply with all requests of I&I NSW (Minerals, Mine Safety) where required.
	Rehabilitation	• Batters are to be a maximum of 12 metres high with four metres	Section 3.7(Visual amenity and

		benches and a maximum slope of 75 degrees.	landscape).
NSW Office of Water (NOW)		Details of the site have been discussed with NOW and a copy of those details forwarded in hard copy for comment.	Section 3.3((Hydrology (groundwater)

2.2. Community consultation

One landowner would be directly affected by the proposed modification. The proposed modification would be located on the landowners property, approximately 500 metres from the properties residence. Discussions have been held with the landowner who has been made aware of the potential environmental impacts including traffic, noise and dust issues. THA has undertaken consultation with the landowner and secured agreement in principle, pending approval of the changes from the Minister for Planning.

The second closest sensitive receiver is located approximately 1.4 kilometres from the proposed modification, at the old intersection of the Hume Highway and Tumbarumba (Ladysmith) Road. Due to the realignment of Tumbarumba Road as part of the Hume Highway duplication works, traffic on Tumbarumba Road no longer travels past this residence. The residence is still subject to traffic noise from the Hume Highway, however the proposed modification is unlikely to result in substantial noise impacts on this receiver.

Additional potential sensitive receivers are located on the Hume Highway. However, as noted above, due to the existing traffic noise, the proposed modification is unlikely to result in substantial impacts on these receivers.

Issues raised by the community and how they have been considered in this report are outlined in **Table 3**.

Table 3. Summary of Community Consultation

Stakeholder	Issue	Specific issue raised	Where addressed
Affected landowner	Rehabilitation	That the stockpiling area be reinstated to its original condition (all quarry material removed, ground ripped, topsoil spread and revegetated).	Section 3.7 (Visual amenity and landscape).

2.3. Ongoing consultation

THA is committed to ongoing community and stakeholder consultation. Should the proposed modification be approved, the RTA would continue to consult with community members, stakeholders and government agencies.

In accordance with MCoA 3.2 (Community Consultation Strategy) the community would be kept informed of construction progress and matters associated with environmental management. This would include notification of the intention to commence works at the proposed quarry. In addition, landowners adjacent to the proposed modification would be informed of the mechanisms available to them for complaints and enquiries, including the 24 hour 1800 telephone number, the website, and the postal and email addresses.

3. Environmental assessment

This chapter assesses the environmental impacts of the change to the approved project, where these differ from the impacts described in the environmental assessment. New and modified environmental management measures are proposed to minimise impacts.

3.1. Flora and fauna

3.1.1. Assessment approach

The biodiversity assessment was undertaken in accordance with the *Draft Guidelines for Threatened Species Assessment under Part 3A* (DEC 2005) and the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (DEH 2006).

A detailed description of the methodology for this assessment is provided in the report *Flora and Fauna Impact Assessment for the Ladysmith Road proposed quarry site in Tarcutta* (Appendix A). The assessment included:

- Review of databases and literature to identify threatened flora, fauna and ecological communities recorded, or predicted to occur, in the assessment area.
- A field survey on 6 October 2009, 11 February 2010 and 30 March 2010. The surveys sought to assess the extent and condition of vegetation communities and potential flora and fauna habitat, with particular consideration given to species of conservation concern (eg threatened and migratory species or locally significant species).
- Significance assessments on species, populations and ecological communities listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that were recorded or predicted to occur with a moderate or greater likelihood.

3.1.2. Existing environment

The assessment area is predominantly cleared with a few remnant paddock trees, and is currently in use for cattle grazing. The lower slopes are dominated by exotic pasture grasses and forbs. The higher slopes (adjacent to but outside of the assessment area) remain largely intact in terms of native vegetation and are covered with large granite outcrops.

Vegetation communities, including threatened ecological communities

Vegetation within the assessment area comprises a low open grassland dominated by exotic species, with isolated paddock trees present.

Based on the *Biometric Vegetation Types Database* (Benson 2008), the following two broad vegetation community types occur in the assessment area and its surrounds (refer Figure 3):

- Blakely's Red Gum - Long-leaved Box - Cootamundra Wattle shrubby woodland of the southern NSW South Western Slopes Bioregion (Benson 280) within the hilly areas of the proposed modification site; and
- Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion (Benson 282) within the lower slopes.

The proposed quarrying area is representative of the Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion (Benson 282) community (Benson 2008). However the vegetation is considered to be a modified form of this community due to being largely cleared for grazing with the understory modified through the introduction of pasture grasses. As such, the current vegetation community within this area is considered to be exotic pasture with scattered remnant paddock trees. The proposed quarrying area is dominated by exotic grass and forb species, including Patersons Curse, Clover, Barley Grass (*Hordeum* spp.) and Red Brome (*Bromus rubens*). A native forb, Blue Storksbill (*Erodium crinitum*) is also relatively dominant at the site and the native grass Red-leg Grass (*Bothriochloa macra*) is present. Several large mature trees are scattered within this area, including Red Box (*Eucalyptus polyanthmos*), White Box (*Eucalyptus albens*), Grey Box (*Eucalyptus microcarpa*) and Kurrajong (*Brachychiton populneus*).

As the access arrangements on Ladysmith Road are not finalised (refer Section 2.2.2), a 500 m^2 strip of vegetation has been identified to provide for assessment of a worst case scenario (refer to Figure 3). The Ladysmith Road access area has a medium to high disturbance history. The canopy is

dominated by juvenile Blakeley's Red Gum, and includes three mature Blakeley's Red Gum. There is a sparse shrub layer of Hickory Wattle (*Acacia implexa*) while the groundcover is predominantly weedy, dominated by Bearded Oats (*Avena barbata*), while some native grasses such as Purple Wire Grass (*Aristida personata*) are present. The proposed access at Ladysmith Road is representative of the Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion (Benson 282) community (Benson 2008), however is a modified version of this community due to a predominantly weedy understorey or Bearded Oats.

The proposed processing area and internal access road includes Blakely's Red Gum (*Eucalyptus blakelyi*) and Red Box with a weedy understorey dominated by horehound and Bathurst burr. This area has signs of past cultivation, particularly in the lower slopes and the understorey is therefore highly modified. A small portion of the vegetation within the processing area is likely to represent Blakely's Red Gum - Long-leaved Box - Cootamundra Wattle shrubby woodland of the southern NSW South Western Slopes Bioregion (Benson 280) (Benson 2008). However, due to the disturbed nature of the vegetation within the site, it is considered that the vegetation community within the proposed processing area is a highly degraded derived grassland dominated by exotic pasture with scattered remnant paddock trees. The majority of the proposed processing area includes a large patch of highly disturbed cultivated grassland which is not representative of any of the Benson community types.

The Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion (Benson 282) in the assessment area (and Ladysmith Road access area) corresponds with a threatened ecological community, White Box, Yellow Box, Blakely's Red Gum Woodland (Box-Gum Woodland), listed as an endangered ecological community under the TSC Act. Vegetation in the assessment area (and Ladysmith Road access area) is not considered to meet the EPBC Act criteria for this listed community, as the under-story is dominated by exotic species (refer Figure 3).

Box Gum Woodland within the assessment area is of a severely degraded condition due to the dominance of exotic species within the understorey and lack of regeneration of over-storey species. It is considered to be Box Gum Woodland of condition class 5, which includes degraded remnants that have few, if any, native species in the understorey. The conservation value of this remnant, given the wide occurrence of this community within the locality in areas where appropriate management regimes occur such as the travelling stock reserves, is relatively low. The conservation value is further reduced due to the position of the remnant within a relatively cleared agricultural landscape which, under current management practices, lacks the ability for regeneration of native species.

The proposed access from Ladysmith Road is also considered to meet the description of Box-Gum Woodland in accordance with the TSC Act criteria due to the presence of native species on the understorey (includes Snow Grass, Wheat Grass and Purple Wiregrass). It is considered to be Box Gum Woodland of condition class 2 of the listed community, which includes partially cleared or thinned stands with a mixture of native and exotic understorey species. The conservation value of this remnant, given the wide occurrence of this community within the locality in areas where appropriate management regimes occur such as the travelling stock reserves, is moderate.

Flora, including threatened flora

Desktop assessment identified three threatened flora species listed under the TSC Act, two of which are also listed under the EPBC Act, that have been recorded nearby, are predicted to occur, or have habitat in the assessment area. No threatened species were identified during the field survey for the proposed modification. An assessment of the potential for the proposed modification site to provide suitable habitat for threatened species was completed (refer Appendix A). It is considered unlikely that the proposed modification site contains suitable habitat for any threatened flora species.

The noxious weeds Paterson's Curse (*Echium plantagineum*), Bathurst burr (*Xanthium sp.*) and Horehound (*Marrubium vulgare)* were recorded within the assessment area. These are all Class 4 noxious weeds listed under the *Noxious Weeds Act 1993* for the Wagga Wagga local government area.

Fauna, including threatened fauna and fauna habitat

The assessment area, due to its high degree of modification, holds very limited habitat for native fauna. Native vegetation has predominantly been replaced by exotic grassland with only a small number of isolated trees paddock remaining. The assessment area includes three trees with hollows and a number of dead trees suitable for nesting and roosting habitat. The proposed access from Ladysmith Road contains two mature trees with five hollows. Hollows would provide den opportunities

for arboreal mammals, such as the Common Ringtail Possum, however not for the threatened Squirrel Glider which requires mature vegetation and abundant hollows to persist.

No threatened fauna species were observed to be utilising habitat available within the assessment area. In addition, no signs of use were recorded for any threatened species likely to occur within the study area.

Fourteen threatened fauna species listed under the TSC Act have been recorded, are predicted to occur, or have habitat in the assessment area. No threatened species were identified during the field surveys for the proposed modification. Due to the limited habitat available within the assessment area, it was considered unlikely that any threatened fauna species with the potential for occurrence would utilise the habitat present (refer Appendix 2 of Appendix A). Six of the threatened fauna species listed under the TSC Act as likely to occur are also listed under the EPBC Act. It should be noted that the higher slopes adjacent to the assessment area may provide habitat for the threatened Pink-tailed Worm Lizard, listed as vulnerable under both the TSC Act and the EPBC Act (refer to Figure 4 of Appendix A). These areas are outside of the lease area for the project and would not be directly impacted by the construction

Aquatic biodiversity
The assessment area includes a first order watercourse. This is an ephemeral drainage line with limited aquatic habitat potential.

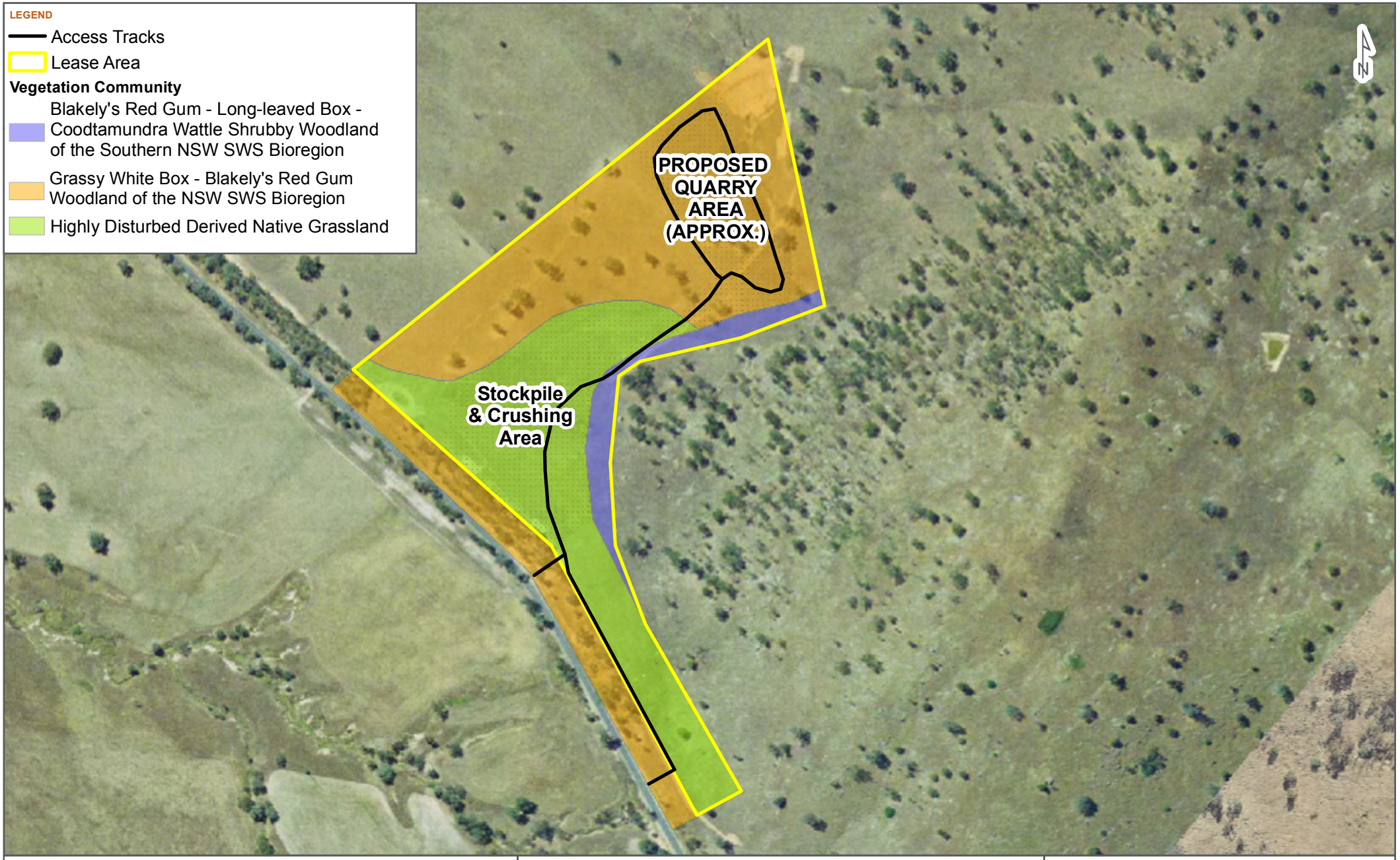


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FIG NO. 3 FIGURE TITLE Vegetaion Communities

PROJECT NO. 3001712 PROJECT TITLE Tarcutta - Hume Alliance

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3.1.3. Potential impacts

Loss of vegetation and fauna habitat

Quarrying and processing

The proposed quarry site has been selected, and the quarrying and processing areas orientated, to reduce the impact on native vegetation. A total of four trees will be required to be removed for the proposed modification. This includes three Blakely's Red Gums and one Kurrajong.

The proposed modification would remove an area of degraded remnant vegetation. As outlined above, this vegetation is considered to be representative of Blakely's Red Gum - Long-leaved Box – Cootamundra Wattle shrubby woodland of the southern NSW South Western Slopes Bioregion (Benson 280) (Benson 2008) and Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion (Benson 282). However, due to the disturbed nature of the vegetation within the proposed modification site, it is considered that the vegetation community within the assessment area is exotic pasture with scattered remnant paddock trees. Approximately 7.25 ha of exotic pasture with scattered remnant paddock trees, including all vegetation communities on site, would be impacted by the proposed modification. This includes:

- 4.87 hectares of highly degraded derived native grassland
- 2.33 hectares of low condition Benson 282; and

Given the broad definition and inclusion of degraded stands, the Benson 282 community and the highly degraded derived native grassland is likely to constitute Box Gum Woodland listed under the TSC Act. A total of 7.25 hectares of this community would be removed for the proposed modification. This total area includes the 0.05 ha for the proposed access at Ladysmith Road. It should be noted that the design has endeavoured to minimise the impacts on remnant trees that are part of this community by orientating the works away from remnant stands of vegetation. The proposed modification has sought to avoid impacts on the most densely vegetated area (refer to Figure 3) and would not impact the higher quality Box Gum Woodland located to the east of the assessment area, which is largely intact native vegetation.

Given that less degraded and larger patches of this community occur nearby, the loss of this small amount of very degraded and low condition TSC Act Box Gum Woodland is unlikely to be significant in the local landscape.

In addition, retained vegetation may be inadvertently impacted by the tracking of heavy plant and equipment within the assessment area. Access tracks would be located and delineated to reduce potential impacts to native vegetation. A small area of potential pink tail worm lizard habitat occurs outside the area to be impacted, adjacent to the proposed processing area. The potential lizard habitat is outside the assessment area, the area outside of the proposal area would be avoided and fenced to ensure no impact to this potential habitat. Refer to Figure 4 of Appendix A.

One hollow bearing Red Box would be removed in the proposed quarrying area. In addition, the proposed modification may result in the disturbance/relocation of dead trees. While the assessment area provides limited fauna habitat, these impacts would further reduce the habitat available for fauna. To reduce these potential impacts, any hollow removed would be replaced (refer to Table 9.8 of the environmental assessment).

Ladysmith Road access

The proposed Ladysmith Road access may require removal of up to 0.05 hectares of vegetation that is considered to be representative of Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion (Benson 282) (Benson 2008) and corresponds to TSC listed Box Gum Woodland. This is considered a worse case scenario should the access arrangement require a slip-lane on Ladysmith Road.

The removal and/or disturbance of the regenerating patch in the roadside reserve to create an access from Ladysmith Road would not constitute a significant impact to the small scale of clearing and the presence of this vegetation community in the locality (refer to Appendix A). This impact would be further reduced should the access be able to be located in the area that is already cleared.

As this regenerating vegetation is in relatively good condition it may provide habitat for woodland birds. However an abundance of this habitat occurs within the Ladysmith Road corridor and given the immature nature of the vegetation, it is not considered that the access would minimise connectivity

along this roadside strip for fauna species. Vegetation removal for the proposed Ladysmith Road access may also impact hollow bearing trees. As outlined above, any hollow removed as part of the proposed modification would be replaced.

Weeds
The proposed modification has potential to disperse weeds. The most likely causes of weed dispersal would include earthworks, movement of soil, and attachment of seed (and other propagules) to vehicles and machinery. Given that most of the vegetation within the assessment area already has considerable weed growth, the overall extent of habitat modification through weed establishment is not likely to increase significantly.

Aquatic flora and fauna
There would be no direct impact to watercourses or aquatic assemblages. Run-off from disturbed surfaces would have the potential to affect water quality in local creeks due to sedimentation (refer to 3.6).

Significance of impacts
Significance assessments were completed under Part 3A of the EP&A Act for threatened species and communities (listed under the TSC Act) that were known or likely to occur within the assessment area, including one threatened ecological community (Box-Gum Woodland). This is supported by the detailed assessments in Appendix A (refer to Appendix 3 of Appendix A). The assessment indicates that the proposed modification is not likely to have a significant or long-lasting impact on any species or ecological community listed under the TSC Act.

This is due to the low condition and conservation significance of 7.20ha of Box-Gum Woodland that is to be disturbed, and the small scale clearing of 0.05ha of moderate condition and conservation significance Box-Gum Woodland.

The proposed modification would result in additional impacts on flora and fauna. Additional mitigation and management measures would be required to adequately manage potential residual impacts on flora and fauna.

3.1.4. Management of impacts

The following mitigation and management measures would be implemented for potential flora and fauna impacts. These would be in addition to those identified in Table 9.8 of the environmental assessment.

Table 4. Flora and Fauna Mitigation and Management Measures

Potential impact	Mitigation and management measure
Impacts on flora and fauna due to access track upgrades	• Access tracks would be kept to a minimum width. • Limit clearing of native vegetation to the minimum necessary to construct and operate the access tracks.
Impacts on flora and fauna due Ladysmith Road access upgrade	• Limit clearing of native vegetation to the minimum necessary to construct and operate the Ladysmith Road access.
Impacts on flora and fauna outside excavation and processing area	• Clearly demarcate the limits of clearing prior to commencement of any quarrying activities to avoid unnecessary vegetation removal.
Impacts on potential Pink Tail Worm lizard habitat	• Potential Pink Tail Worm lizard habitat would be managed as an environmentally sensitive area, demarcated and signposted prior to the commencement of works.
Rehabilitation	• That the stockpiling area be reinstated to its original condition (all quarry material removed, ground ripped, topsoil spread and revegetated).
Cumulative impacts on flora and fauna	• The RTA Biodiversity Offset Package would offset any residual impacts due to the proposed modification. • Rehabilitation of the site to its original condition for cattle grazing (all stone removed, ground ripped, topsoil spread and revegetated).

3.2. Aboriginal heritage

3.2.1. Assessment approach

The Aboriginal cultural heritage assessment was undertaken in accordance with Section 9.9 of the *Aboriginal Cultural Heritage Assessment Report* (CHAR*)* (Technical Paper 2 of the environmental assessment). The assessment included:

- A search of the DECCW Aboriginal Heritage Information Management System (AHIMS) database for the assessment area.
- An archaeological surface survey of the assessment area, conducted on 17 February 2010. The survey consisted of an archaeologist to identify areas of archaeological significance or potential significance.
- An assessment of Aboriginal cultural heritage was undertaken, consisting of both interviews with the knowledge holders and field surveys.

3.2.2. Existing environment

The AHIMS search identified no previously recorded sites within the locality. However, due to the history of Aboriginal occupation in the locality (as identified in the environmental assessment), the proposed modification has the potential to impact on Aboriginal archaeological and cultural heritage.

An archaeological surface survey of the area identified no archaeological items within the assessment area. In accordance with Section 9.10 of the CHAR, as no impacts were identified, no further consultation with the Aboriginal stakeholders was undertaken.

Three places of specific Aboriginal cultural value were identified by the knowledge holders. Two are located within the assessment area and one place is located adjacent to the assessment area. The cultural significance of these places ranged from high to very high. The location of the identified places has been kept confidential due to the culturally sensitive nature of this information.

3.2.3. Potential impacts

There are no known Aboriginal archaeological sites within the assessment area (refer Appendix B).

Three Aboriginal cultural heritage places were identified within proximity to the assessment area. Two cultural places are located within the assessment area and one cultural place is located adjacent to the assessment area.

No works would be permitted in these identified cultural places and as such no cultural heritage place would be impacted by the proposed modification. The location of the cultural places would be identified on a heritage site map and would be fenced if within the quarry site boundary. There would be no direct impact to Aboriginal cultural heritage places.

Significance of impacts

The proposed modification is unlikely to result in additional impacts on Aboriginal heritage. Additional mitigation and management measures would be required to adequately manage potential residual impacts on Aboriginal heritage.

3.2.4. Management of impacts

The following mitigation and management measures would be implemented for potential Aboriginal heritage impacts. These would be in addition to those identified in Table 9.11 of the Environmental Assessment (Parsons Brinkenhoff 2009).

Table 5. Aboriginal Heritage Mitigation and Management Measures

Potential impact	Mitigation and management measure
Impacts on cultural places	• Cultural places within the assessment area would be fenced to provide a one metre buffer to the identified places. Fencing would be carried out in the presence of

Potential impact	Mitigation and management measure
	the identified knowledge holder.

3.3. Hydrology (groundwater)

3.3.1. Existing environment

A first order watercourse is present within the north-west of the assessment area. Kyeamba Creek is located around two kilometres to the west.

Groundwater discharge within the locality is likely to be in the lower lying areas of the landscape (springs), at the break of slope and as base flow to surface water bodies (creeks). As the assessment area generally consists of higher slopes, there is not likely to be groundwater surface discharge within the assessment area. Boreholes were drilled over the proposed site extending bellow the proposed quarry. Groundwater was not encountered during this investigation.

A search on the NSW Government website, www.waterinfo.nsw.gov.au, showed the closest known groundwater bore is located approximately 1.5 kilometres south-west of the proposed modification and is used for stock and domestic purposes. An existing RTA licensed bore (license number 40BL191576) is located approximately six kilometres to the north of the proposed modification.

3.3.2. Potential impacts

No surface water would be extracted for the proposed modification and there would be no work directly within any watercourse. The proposed modification is not likely to result in additional impacts on the local catchment, flooding or water supply.

The proposed modification may result in potential surface water quality impacts. Surface water quality impacts are addressed in Section 3.3.

Due to the topography, groundwater is not expected to be intercepted at by the proposed modification. The proposed excavation depth would be in the order of 20 metres. Geotechnical drilling has been carried out to below this depth without interception of groundwater. While major groundwater inflows are unlikely, it is possible that there would be minor groundwater seepages from rock fractures or defects within the rock. Where practical minor groundwater seepages would be directed back to the natural environment, alternatively this water would be beneficially reused onsite (eg for dust suppression).

The proposed modification would require extraction of groundwater for dust suppression. The estimated volume of water required for the proposed modification would be between 12 megalitres and 14 megalitres (total). Groundwater would be sourced from an existing RTA bore transferred to the proposed modification site via an above ground pipe. The pipe would extend a distance of approximately six kilometres, although the majority of the pipe infrastructure is already in place from the adjacent Hume Highway duplication works. An extension of approximately 1.5 kilometres would be required. Minimal excavation would be required at locations where the pipe crosses existing access tracks. Piping of groundwater to the proposed modification site is not expected to result in any additional environmental impacts.

The RTA bore has an existing allocation of 25 megalitres per 12 month period and would adequately supply the water needs of the proposed modification. Groundwater extraction may affect access to local groundwater supplies for adjacent users. The groundwater monitoring program implemented for the approved project would be extended to manage potential impacts of groundwater extraction. As outlined in the environmental assessment, the monitoring program consists of the following elements:

- Monitoring of groundwater levels and quality prior to groundwater extraction, monthly during extraction, and for a period after completion of extraction.
- Inspection of groundwater bores for serviceability on a weekly basis.

Groundwater level and quality data would be assessed monthly. Should impacts be detected, steps to minimise the impacts would be implemented. These would include:

- Reduction in the extraction rate.

- Increase in the rest time between pumping intervals.
- Temporary use of alternative water supplies.
- Investigation of alternative groundwater bores.

In the unlikely event that groundwater is intercepted through quarrying operations, it is anticipated that this would be localised and within a closed system. All water would be contained onsite and NOW contacted to seek their advice on the management of this water.

Potential impacts on groundwater due to groundwater extraction would be managed through the implementation of a groundwater monitoring program.

Significance of impacts
The proposed modification is unlikely to result in additional impacts on hydrology including groundwater. Mitigation and management measures identified in the environmental assessment would adequately manage potential impacts on hydrology.

3.3.3. Management of impacts
No additional mitigation and management measures are proposed. Mitigation and management measures identified in Table 9.20 of the Environmental Assessment (Parsons Brinkerhoff, 2009) would be implemented for potential groundwater impacts.

3.4. Noise and vibration

3.4.1. Assessment approach
A noise and vibration impact assessment was undertaken for the proposed modification. Refer to Appendix C.

3.4.2. Existing environment
The assessment area is located in a rural environment that has a low ambient noise level. The dominant source of noise within or adjacent to the assessment area are limited to the vehicles using the Ladysmith Road.

Rating background noise levels have been adopted from the environmental assessment (rural residential). The rating background level for rural residential receivers during the daytime period 7.00am to 6.00pm is 32dBA.

There are two sensitive receivers in proximity to the proposed modification:

- Receiver 1 - located approximately 500 metres to the north-west of the proposed modification.
- Receiver 2 - located approximately 1.4 kilometres to the south-west of the proposed modification at the intersection of Hume Highway and Ladysmith Road.

3.4.3. Assessment criteria
Construction[1] noise
The *Interim Construction Noise Guidelines* (ICNG) (DECC 2009) recommends the following standard work hours:

- Monday to Friday 7am to 6pm
- Saturday 8am to 1pm
- No work on Sundays or Public Holiday

The ICNG suggests a construction noise goal (L_{Aeq}) during standard hours of rating background level plus 10 dBA.

[1] Construction' in Section 3.4.3 refers to operation of the proposed modification (excavation and processing).

Table 6. Construction Noise Criteria

Receiver	Day time L_{Aeq} noise goal (dBA)
1	42
2	42

Vibration and blasting
Vibration and blasting criteria for the proposed modification would be the same as that outlined in the environmental assessment. Refer to Section 5.1 and Section 6.2 of Appendix C for vibration criteria (excluding blasting) and blasting criteria respectively.

Construction traffic
Criteria for assessment of road traffic noise are set out in the *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA 1999). The criterion for a proposed change in land use with potential to create additional traffic on existing roads is $L_{Aeq,15hr}$ 60dBA for daytime and $L_{Aeq,9hr}$ 55 BA for night time.

Where the criteria are already exceeded noise levels should be mitigated where reasonable and feasible. In all cases, traffic arising from the development should not lead to an increase in existing noise levels by more than 2dBA.

The existing daytime traffic flow on the Hume highway is 108 heavy vehicles and 201 light vehicles per hour (refer to the environmental assessment).

Table 7. Construction Traffic Criteria

Receiver	Daytime $L_{Aeq,15hr}$ noise goal (dBA)
1	n/a – will not be exposed to construction traffic noise from the proposed modification
2	60

3.4.4. Potential impacts

Construction noise impacts
Construction plant and equipment likely to be required for the proposed modification include:

- Dozer
- Excavator (2 x 45 tonne)
- Dump truck (40 tonne)
- Loaders (2 x 988)
- Track drill
- Haul trucks (four in 15 minutes)
- Screeners
- Crushers

The total sound power level ($L_{Aeq,15min}$) is estimated to be around 122 dBA.

Noise levels were predicted taking into account attenuation due to distance and topography. Noise was predicted assuming maximum production of both extraction of material and processing, including movement of haulage trucks. **Table 8** provides predicted construction noise impacts.

Table 8. Construction Noise Impacts

Receiver	Criteria (daytime) (L_{Aeq}) (dBA)	Predicted noise level (dBA)
1	42	39
2	42	25

No exceedances of the construction noise criteria are predicted at either sensitive receiver.

Construction vibration impacts
Vibration levels estimated at a range of distances from an excavator and hydraulic hammer are provided in **Table 9**.

Table 9. Construction Vibration Criteria

Activity	PPV vibration level (mm/s) at distance		
	10 metres	20 metres	30 metres
Hydraulic hammer	3	1.5	1.0

The closest receiver is more than 500 metres from the proposed modification. Vibration would not be detectable at this distance and no impact is predicted.

Blasting impacts
Occasional blasting will be required. This would include up to 25 blasts over the 18 month period, averaging around one blast per week. There would not be more than one blast per day.

Recommended maximum instantaneous charges (MICs) for each cut have been determined using relevant standards and guidelines. These are provided in **Table 10.** Recommended MIC to achieve blasting criteria

Table 10. Recommended MIC to achieve blasting criteria

Receiver	Distance to proposed modification	MIC to meet vibration criterion[1]	MIC to meet overpressure criterion[2]
1	500 metres	240	218

Notes: 1. Vibration criterion = Five millimetres per second for more than five per cent of blasts in a year, and 10 millimetres per second for any blast.
2. Overpressure criterion = 115 dB for more than five per cent of blasts in a year, and 120 dB for any blast.

While the proposed modification may result in additional noise impacts at sensitive receivers due to blasting, appropriate maximum instantaneous charges would be calculated to ensure that the blasting criteria are met, in accordance with the Minister's Conditions of Approval.

Construction traffic impacts
As detailed further in Section 6.5, truck numbers during peak production are expected to be up to 180 per day. This equates to approximately 32 truck movements per hour during peak periods.

Receiver 1 will not be exposed to traffic noise from the proposed modification.

Receiver 2 is exposed to existing traffic noise from the Hume Highway. Predicted noise levels at receiver 2 (at the southern façade) are outlined in **Table 11**.

Table 11. Construction Traffic Impacts

Receiver	Existing traffic noise ($L_{Aeq,15hr}$) (dBA)	Predicted traffic noise (proposed modification only) ($L_{Aeq,15hr}$) (dBA)	Predicted traffic noise (existing plus proposed modification) ($L_{Aeq,15hr}$) (dBA)
2	59	49	59

The proposed modification would not increase the existing road traffic noise at any sensitive receiver.

Significance of impacts
The proposed modification would not result in additional noise and vibration impacts at sensitive receivers. Mitigation and management measures identified in the environmental assessment would adequately manage potential noise and vibration impacts.

3.4.5. Management of impacts

No additional mitigation and management measures are proposed. Mitigation and management measures identified in Table 9.42 of the Environmental Assessment would be implemented for potential noise and vibration impacts.

3.5. Traffic and transport

3.5.1. Existing environment

Access to the proposed modification site is by way of an existing access gate located on Ladysmith Road approximately two kilometres west of the Ladysmith Road and Hume Highway intersection. Ladysmith Road is a two lane rural main road (Council owned).

The existing daytime traffic flow on the Hume Highway is 108 heavy vehicles and 201 light vehicles per hour (refer to the environmental assessment).

3.5.2. Potential impacts

It is anticipated that the haulage of materials from the proposed modification site for use in construction at the approved project would be undertaken on a campaign basis. This would be directed by the nature of material extraction and the demand for construction materials.

During peak periods the expected maximum number of trucks would be around 1000 per week. This equates to approximately 180 trucks per day or 16 per hour. It should be noted that peak periods would be followed by periods of little or no activity, as material is being won from the proposed quarry or as the schedule of road construction places reduces demand on fill material.

The environmental assessment indicated a potential increase in heavy vehicles due to the approved project of around 180 trucks per day. This included 90 trucks for the importation of fill material. Construction vehicles (both light and heavy vehicles) were expected to increase weekday traffic by approximately eight per cent. The proposed modification would further increase the weekday traffic. However, this increase would be relatively small and, as outlined in the environmental assessment, would be difficult to detect above normal daily fluctuations in traffic.

In addition, as the proposed modification is located relatively close to the approved project (when compared to existing commercial operations located in Wagga Wagga, Gundagai, Holbrook or Tumbarumba), the impact of additional truck traffic from the proposed modification would be reduced.

Up to two access points on Ladysmith Road would be required to cater for two way movement of haulage trucks. This may include the upgrade of existing farm accesses or the establishment of new access points. There would be limited impact on traffic travelling on the Ladysmith Road between Wagga Wagga and Tumbarumba.

Haulage vehicles turning right off Ladysmith Road entering the proposed modification site could result in a delay for traffic travelling on the Ladysmith Road between Tumbarumba and Wagga Wagga. A dedicated right hand turn bay would be provided to allow haulage vehicles to safely decelerate and make a right hand turn. It is considered that with the installation of this right hand turn bay there would be limited impact on traffic travelling on the Ladysmith Road between Tumbarumba and Wagga Wagga.

If required, additional standard traffic management measures would be employed to minimise the short-term traffic impacts as a result of the proposed modification. These measures would be identified in specific traffic management plans and would be developed in accordance with the RTA's *Traffic Control at Works Sites Manual* (RTA 2003).

Significance of impacts

The proposed modification would result in additional traffic and transport impacts. These are unlikely to be significant. However additional mitigation and management measures would be required to adequately manage potential residual impacts on traffic and transport.

3.5.3. Management of impacts

The following mitigation and management measures would be implemented for potential traffic and transport impacts. These would be in addition to those identified in Table 9.56 of the Environmental Assessment (Parson Brinkenhoff 2009).

Table 12. Traffic and Transport Mitigation and Management Measures

Potential impact	Mitigation and management measure
Safety hazard on Ladysmith Road	• Provide a right-hand turn deceleration lane on the Ladysmith Road for safe access to the proposed modification site (to be finalised following consultation with Wagga Wagga City Council). • A vehicle movement plan (VMP) would be developed to ensure that haulage contractors use the appropriate route.

3.6. Soils and water quality

3.6.1. Existing environment

The assessment area is generally characterised by rolling moderately steep hills with shallow valleys. The proposed modification would be located on the lower slopes of a northerly trending ridgeline that has an elevation of around 375 metres Australian Height Datum.

Side slopes are consistent around the hill at around 25 to 30 per cent and the ridge crest around 10 per cent. Minor ephemeral erosion drainage lines flank the north-eastern side of the ridge. These drainage lines form an integrated unidirectional tributary network of stream channels that ultimately flow into Kyeamba Creek about two kilometres to the west. There is evidence of rapid runoff and partly stabilised minor sheet and rill erosion.

3.6.2. Potential impacts

The proposed modification would involve blasting of hard rock and excavation of materials. This may increase erosion potential and mobilise sediment, particularly in a rain event. Given the topography, the proposed modification could result in sediment and construction materials and pollutants being transported into dams and watercourses, affecting surface water quality. Increased sedimentation of waterways can smother benthic habitat and organisms, and can increase levels of nutrients, metals and other potential toxicants that attach to the sediment particles.

In addition, other pollutants that could potentially impact surface water quality include:

- Hydrocarbons and chemicals as a result of spills and leaks from construction vehicles or fuels/chemical stores on construction sites.
- Oils and greases from construction equipment.
- Nutrients attached to sediment particles and from fertilisers used in landscaping works.
- Waste water generated from construction sites.
- Gross pollutants/general litter from construction sites.

Best practice erosion and sedimentation control measures would be implemented and maintained. An indicative draft erosion and sedimentation control plan has been prepared. Refer Figure 4.

Upon completion of proposed quarrying, the quarry face would be re-profiled to ensure stabilisation. The low point of the void (in the North West corner) would act as a sediment basin to protect the adjacent drainage line(s). The processing area would be stabilised and rehabilitated. These measures would reduce any long term erosion and sedimentation risk (refer to Section 3.6).

With the implementation of appropriate erosion and sediment controls, impacts on soil and water quality are likely to be minor and short-term in nature.

Significance of impacts

The proposed modification may result in additional soil and water impacts. Additional mitigation and management measures would be required to adequately manage potential residual impacts on soil and water quality.

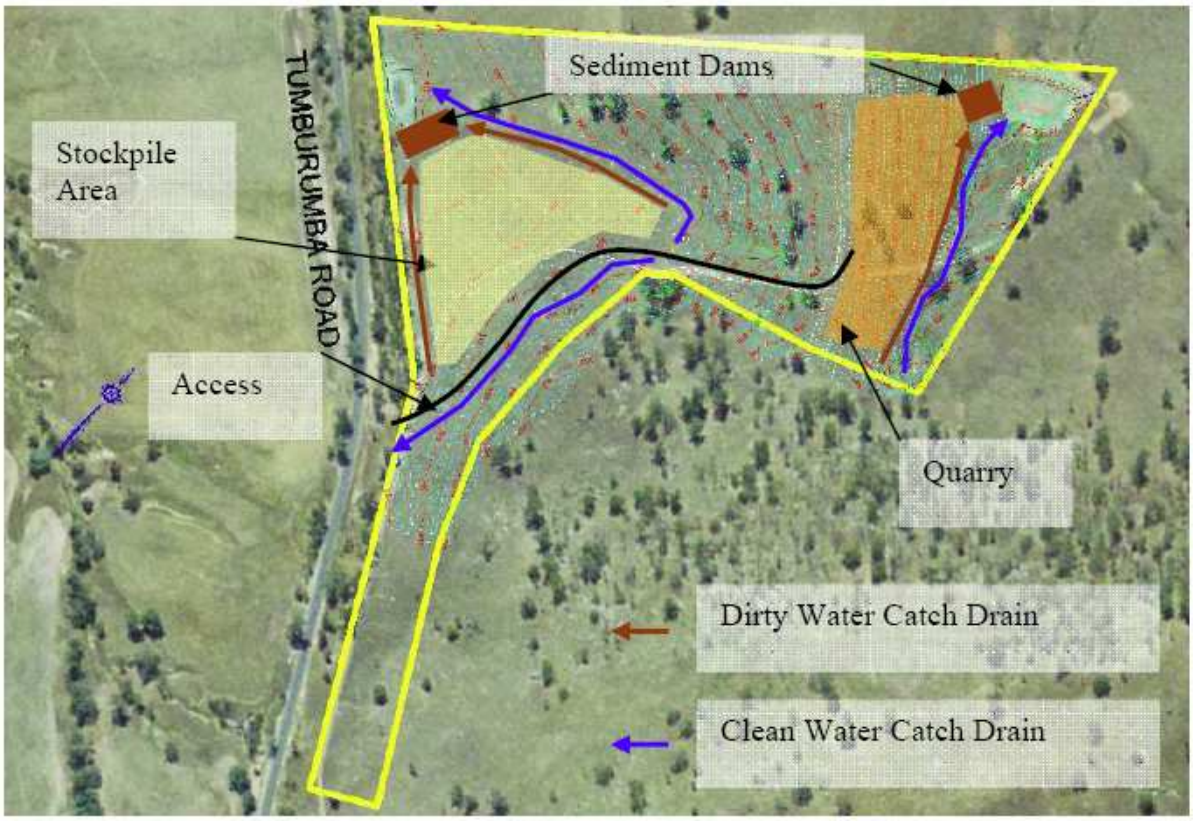


Figure 4. Indicative Erosion and Sediment Control Plan

3.6.3. Management of impacts

The following mitigation and management measures would be implemented for potential soil and water quality impacts. These would be in addition to those identified in Table 10.2 of the Environmental Assessment (Parson Brinkenhoff, 2009).

Table 13. Soil and Water Quality Mitigation and Management Measures

Potential impact	Mitigation and management measure
Impacts on soils and water quality due to uncontrolled access on site	• Access tracks would be kept to a minimum width. • Access routes and turning points would be defined prior to commencement of works. • Access tracks would be demarcated, where required, to limit access.
Erosion and sediment impacts upon completion of quarrying	• The low point of the void (in the north west corner) would act as a sediment basin to protect the adjacent drainage line(s).

3.7. Visual amenity and landscape

3.7.1. Existing environment

The proposed modification is located on the side of a predominantly cleared, moderately sloping hill. From Ladysmith Road the area of excavation would be partially hidden from view to passing motorists by the hill in front. The nearest sensitive receiver is located approximately 500 metres to the north-west. The proposed area of excavation would not be visible from this sensitive receiver.

3.7.2. Potential impacts

During proposed quarrying, processing of material would be visible to passing motorists. These impacts are considered to be minor and short-term in nature.

Upon completion of the proposed modification reinstatement would involve the removal or levelling of any structures/pads/access tracks constructed as part of the proposed modification. All stone would be removed from the materials processing area and the area would be ripped approximately 300 millimetres deep prior to the spreading of stockpiled topsoil. The area will be reseeded with a pasture mix as agreed with the landowner. There would be no long term visual amenity or landscape impacts at the proposed processing area.

The proposed quarrying operation would permanently alter the profile of the hill and the local landscape. Upon completion of proposed quarrying operations, the proposed excavation site would remain as a void in the landscape. It would be re-profiled and benched to make the site stable. Batters would be a maximum of 12 metres high with four metre benches. The maximum slope would be up to 75 degrees. Figure 5 provides an indicative profile upon completion of proposed quarrying. Figure 6 provides a model perspective of the final landform. As the proposed excavation area is not visible from the landowner's residence or passing motorist, there would be no long term visual amenity impact from the proposed excavation area on existing sensitive receivers.

Bunding would be provided at the top of the quarry face (on the southern side of the excavation area). This bund would be revegetated with trees to minimise the visual impact (tree species to be endemic to the area, subject to agreement with the landowner). A fence at the top of the quarry face (installed for safety reasons during the proposed quarrying) would remain in place. Together the bund and fence would act to prevent accidental access to the quarry face. The re-profiled quarry face would principally be a hard rock surface with limited potential for rehabilitation. While the quarry face is likely to be relatively stable, to provide for the change in landscape the construction sediment basin may be converted to a permanent operational basin to protect local waterways from potential impact (refer Section 3.7). As the proposed excavation area would remain as a void space, the proposed modification would result in permanent impacts on the landscape.

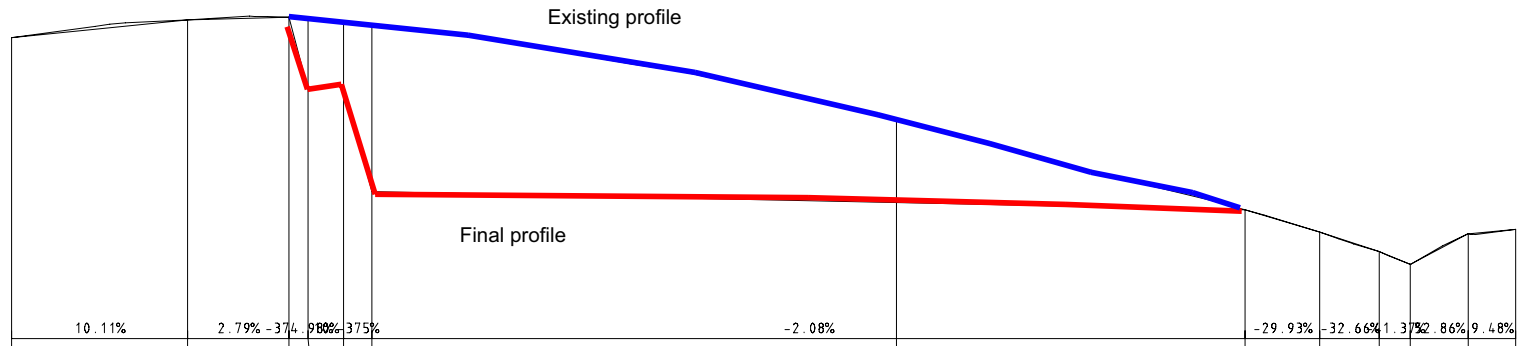
Significance of impacts
The proposed modification would result in additional visual amenity and landscape impacts. Additional mitigation and management measures would be required to adequately manage potential residual impacts on visual amenity and landscape.

3.7.3. Management of impacts

The following mitigation and management measures would be implemented for potential visual amenity and landscape impacts. These would be in addition to those identified in Table 10.5 of the Environmental Assessment (Parson Brinkenhoff, 2009).

Table 14. Visual Amenity and Landscape Mitigation and Management Measures

Potential impact	Mitigation and management measure
Increased erosion potential	• The quarry face would be stabilised through the installation of batters not more than 12 metres high with four metre benches. Batter slopes would not exceed 75 degrees.
Final landform is incompatible with future land-use	• Bunding and fencing would be installed at the top of the quarry face to provide a safety barrier. This would prevent accidental access to the quarry face.



DATUM335

LONG SECTION HERBERTS QUARRY	372	374	374.3	366.2	366.6	354.6	353.4	352.6	350	347.8	346.4	349.8	350.4
EXISTING SURFACE	372	374.01	374.33	374.27	373.88	373.59	362.71	352.56	350.03	347.83	346.38	349.85	350.35
DEPTH	0	0	-0	8.1	7.3	19	9.3	-0	-0	-0	0	-0	0
CHAINAGES	0	19.9	31.3	33.5	37.5	40.7	100	139.4	147.8	154.6	158.1	164.6	170

Figure 5.3 Indicative final profile (upon completion of proposed quarrying)

REV | APP'D | DATE

GENERAL NOTES / REFERENCES

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Co-ordinate System - MGA Zone 55
Height Datum - AHD

TARCUTTA HUME ALLIANCE

TARCUTTA BYPASS

SURVEYED / DRAWN BY: KH
CHECKED:
SCALES AT A3: Horiz 1:600 Vert 1:600

PLOT DATE: Wed Mar 31 14:12:12 2010

HERBERTS QUARRY
LONG SECTION

DRAWING STATUS | DRAWING No. 1 of | REV.

Scale at 1:1000 0 10 20 30 40 50 60 70 80 90 100

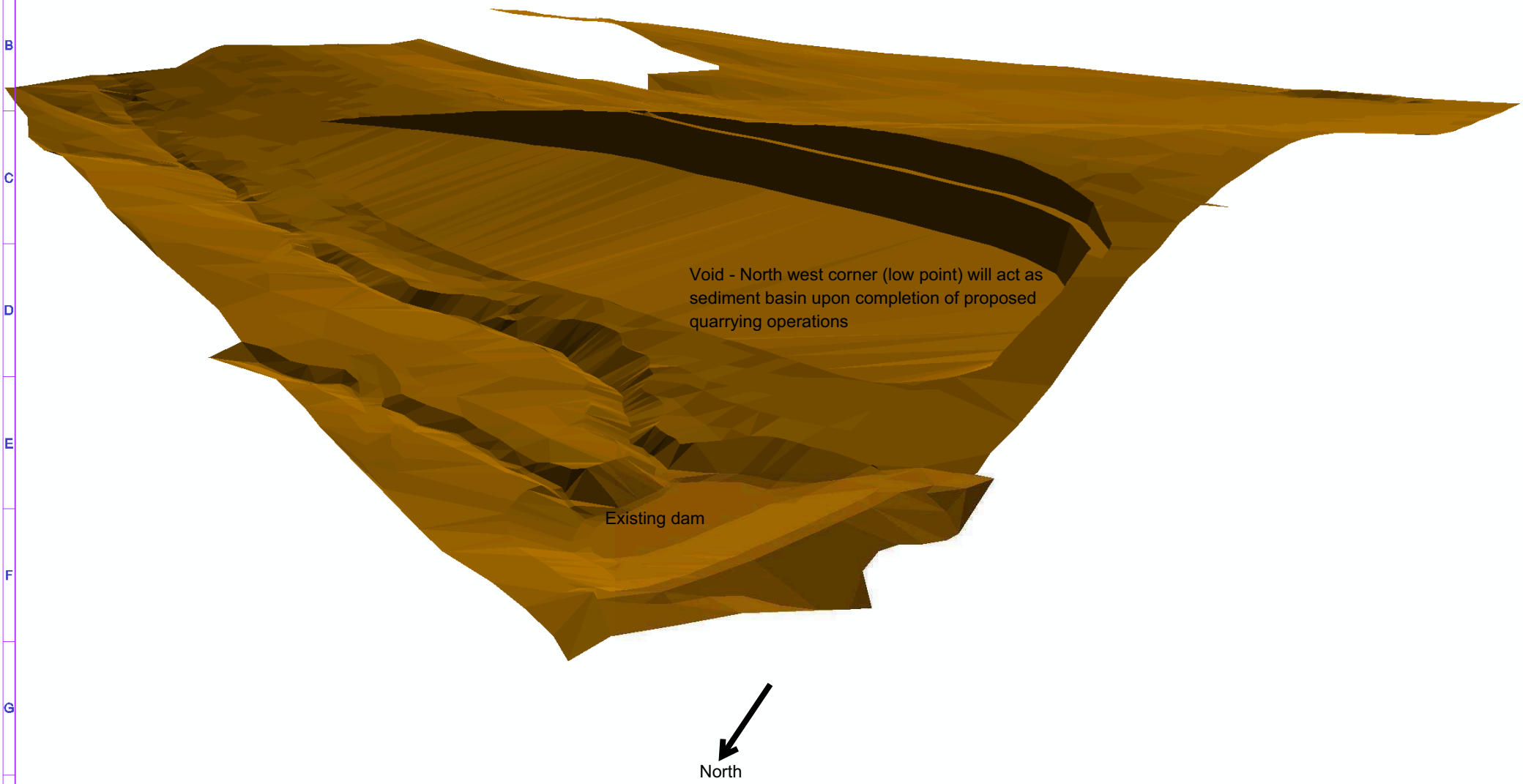

Figure 5.4 Indicative model perspective of the final landform (upon completion of proposed quarrying)

GENERAL NOTES / REFERENCES

This drawing is the property of the Tarcutta Hume Alliance and the information contained herein intended for Alliance Partner use only. The Tarcutta Hume Alliance accepts no responsibility for any loss or damages arising from the unauthorised use of this information.

Co-ordinate System - MGA Zone 55
Height Datum - AHD

TARCUTTA HUME ALLIANCE

TARCUTTA BYPASS

SURVEYED / DRAWN BY KH
DESIGN
SCALES AT A3 Horiz 1:2500 Vert 1:2500

Model perspective of the final landform

DRAWING STATUS
DRAWING No. 1 of
REV.

3.8. Other issues

Table 15. Environmental assessment of Other Issues provides an environmental assessment of the proposed modification's impact on non-Aboriginal heritage, social and economic, air quality, hazards and risk, contaminated land and sustainable management. For these issues the potential impacts or proposed mitigation are considered to be adequately assessed and detailed in the environmental assessment.

Table 15. Environmental assessment of Other Issues

Issue	Environmental assessment
Non-Aboriginal	There are no registered non-Aboriginal items within the assessment area. In addition, as the assessment area is a predominantly cleared grazing paddock with no known historic structures present, and includes relatively steep slopes, there is little potential for the discovery of unidentified items. Additional impacts on non-Aboriginal heritage are not considered likely. The mitigation and management measures proposed within Table 9.15 of the environmental assessment would adequately manage any potential impacts on non-Aboriginal heritage.
Social and economic	The proposed modification is not likely to result in additional social and economic impacts. There would be some impact on amenity. Additional traffic impacts during operation of the proposed modification (on Ladysmith Road and on the Hume Highway between the intersection of the Hume Highway and Ladysmith Road and Tarcutta village). There is also the potential for temporary impacts on the amenity of nearby sensitive receivers (noise and dust). An assessment of these impacts is provided in Section 3.5 (Traffic and transport) and Section 3.4 respectively (Noise and Vibration). The mitigation and management measures proposed within Table 9.44 of the environmental assessment would adequately manage any potential impacts on social and economic issues.
Air quality	The proposed modification is likely to result in air quality (dust) impacts. Potential sources of dust emissions include wind generation from exposed surfaces, wheel generated and as a result of materials handling. Impacts are likely to be short term and of a similar nature to the construction air quality impacts outlined in the environmental assessment. The mitigation and management measures proposed within Table 10.6 of the environmental assessment, including the implementation of best practice management measures and the installation of dust deposition gauges, would adequately manage any potential impacts on air quality.
Hazards and risk	The proposed modification may result in additional impacts on hazards and risk. I&I NSW (Minerals, Mine Safety) have been consulted (refer to Section 4). Table 4.1 outlines the specific safety concerns raised by I&I NSW. THA would prepare a Mine Safety Management Plan for operation of the quarry and would comply with all requests of I&I NSW (Minerals, Mine Safety) where required. In addition, the mitigation and management measures proposed within Table 10.7 of the environmental assessment would manage potential construction impacts on hazards and risk.
Contaminated land	The assessment area is undeveloped grazing land with little potential for contamination. A search of the DECCW contaminated land record of notices register identified no notices within close proximity to the assessment area. The proposed modification is not likely to result in additional impacts on

	contaminated land. The mitigation and management measures proposed within Table 10.8 of the environmental assessment would adequately manage any potential impacts on contaminated land.
Sustainable management	The proposed modification would involve energy consuming activities. Plant and equipment used in the winning, processing and transport of materials would result in the emission of greenhouse gases. Greenhouse gas emissions calculated for the construction of the approved project within the environmental assessment included the emissions relating to the importation of fill materials. The proposed modification would however result in additional blasting and truck movements. It is unlikely that this would result in a substantial increase in greenhouse gases. The proposed modification would result in the production of waste, including green mulch and vegetation, waste fuels, oils, liquids and chemicals, general garbage and sewage from construction compound. Waste streams from the proposed modification would not be in addition to the construction waste streams identified in the environmental assessment. Wastes would be managed in accordance with the waste hierarchy and the *Waste Classification Guidelines* (DECC 2008). The proposed modification is likely to result in some additional impacts on greenhouse gases, energy use and waste management. However, the mitigation and management measures proposed within Table 10.11 of the environmental assessment would adequately manage any potential impacts on sustainable management.

4. Environmental safeguards

Additional environmental mitigation and management measures for the proposed modification are listed in **Table 16. Additional Mitigation and Management Measures**. These measures would be implemented to reduce the identified adverse impacts and maximise the benefits of the proposed modification described in Section 5.

The mitigation and management measures outlined in Table 16 should be read in conjunction with measures outlined in the environmental assessment (where relevant). Additional mitigation and management measures identified in Table 16 would be incorporated (where relevant) in the existing Construction Environmental Management Plan, Construction Flora and Fauna Management Plan, Construction Heritage Management Plan, Construction Noise and Vibration Management Plan and Soil and Water Quality Management Plan for the approved project.

Table 16. Additional Mitigation and Management Measures

Issue	Additional mitigation and management measures	Timing[1]
Flora and fauna	• Access tracks would be kept to a minimum width.	Pre-construction, construction.
	• Limit clearing of native vegetation to the minimum necessary to construct and operate the access tracks.	Pre-construction.
	• Clearly demarcate the limits of clearing prior to commencement of any quarrying activities to avoid unnecessary vegetation removal.	Pre-construction.
	• Limit clearing of native vegetation to the minimum necessary to construct and operate the Ladysmith Road access.	Pre-construction, construction.
	• Potential Pink Tail Worm lizard habitat would be managed as an environmentally sensitive area, demarcated and signposted prior to the commencement of works.	Pre-construction, construction.
	• Rehabilitation of the site to its original condition for cattle grazing (all stone removed, ground ripped, topsoil spread and revegetated).	Post-construction
	• The RTA Biodiversity Offset Package would offset any residual impacts due to the proposed modification	Operation
Aboriginal heritage	• Cultural places within the assessment area would be fenced to provide a one metre buffer to the identified places. Fencing would be carried out in the presence of the identified knowledge holder.	Pre-construction.
Traffic and transport	• Provide a right-hand turn deceleration lane on the Ladysmith Road for safe access to the proposed modification site (to be finalised following consultation with Wagga Wagga City Council).	Pre-construction.
	• A vehicle movement plan (VMP) would be developed to ensure that haulage contractors use the appropriate route.	Construction.
Soils and water quality	• Access tracks would be kept to a minimum width.	Pre-construction, construction.
	• Access routes and turning points would be defined prior to commencement of works.	Pre-construction.
	• Access tracks would be demarcated to limit access where required.	Pre-construction, construction.
	• The low point of the void (in the North West corner) would act as a sediment basin to protect the	Operation

	adjacent drainage line(s).	
Visual amenity and landscape	• The quarry face would be stabilised through the installation of batters not more than 12 metres high with four metre benches. Batter slopes would not exceed 75 degrees.	Operation
	• Rehabilitation would be undertaken of the stockpile and access road area of the site to return it to its original condition for cattle grazing (all stone removed, ground ripped, topsoil spread and revegetated).	Post-construction
	• Bunding and fencing would be installed at the top of the quarry face to provide a safety barrier. This would prevent accidental access to the quarry face.	Operation

Note: 'Construction' refers to the proposed quarrying operations (extraction, processing and rehabilitation). For the purpose of this table, 'operation' refers to the post-quarrying phase (ie operation of the approved project)

4.1. Final landform

The disturbance of the project area encompasses the clearing of:

- Quarry – **2.10** hectares, this covers the extent of works in relation to the quarry development.
- Stockpile – **4.87** hectares, this covers the extent of work area for the stockpiling and processing area on site.
- Access – **0.23** hectares, this encompasses the access into the quarry for vehicle movements to and from Ladysmith Road.
- Ladysmith – **0.05** hectares, this covers the extent of clearing for the access to Ladysmith road for the project.

The total area of disturbance therefore covers **7.25** ha. In relation to the extent of impact the **2.10** hectares associated with the quarry and its development are permanent impacts and is not feasible to remediate back to the existing landform. Management measures associated with the final void from the quarry will encompass bunding and fencing of the quarry site (see Table 14).

The areas associated with the access road to the quarry from Ladysmith road and the associated stockpiling and processing area will be remediated back to its existing land use with the removal of all rock and other materials spreading of topsoil and revegetation for its existing use of stock grazing. Therefore following remediation a total of 2.15 hectares will require an offset.

5. Conclusion

The proposed modification would facilitate access to more locally available sources, reducing transport costs, delivery times, and impact on existing regional roads. The proposed modification would result in loss of up to 7.25 hectares of native vegetation. However, no significant impact on any endangered ecological community is predicted. In addition, some minor temporary traffic, transport and access impacts as well as disruptions to the rural land use are anticipated. All proposed impacts are deemed to be sufficiently managed under the existing Construction Environment Management Plan and accompanying strategies.

The proposed modification is consistent with the environmental mitigation and management measures as described in the environmental assessment. Where required, additional measures have been identified to reduce the identified adverse impacts and maximise the benefits of the proposed modification described in Section 4.

References

Benson (2008) 'NSW Vegetation Classification and Assessment: Part 2 Plant communities in the NSW South-western Slopes Bioregion and update of NSW Western Plains plant communities', Version 2 of the NSWVCA database, *Cunnunhamia*, vol. 10, no. 4, pp. 599-673

DEC (2005) *Draft Guidelines for Threatened Species Assessment under Part 3A,* NSW Department of Environment and Conservation, Hurstville

DECC (2008). *Waste Classification Guidelines,* Department of Environment and Climate Change

DECC (2009) *Interim Construction Noise Guidelines,* Department of Environment and Climate Change

DEH (2006) *EPBC Act Policy Statement 1.1 Significant Impact Guidelines,* Department of the Environment and Heritage, Canberra

EPA (1999) *Environmental Criteria for Road Traffic Noise*

RTA (2009) *Hume Highway Upgrade, Tarcutta bypass, Environmental Assessment,* NSW Roads and Traffic Authority

RTA (2003) *Traffic Control at Works Sites Manual*

Appendix A

Flora and fauna assessment

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Flora and Fauna Impact Assessment for Ladysmith Road proposed quarry site in Tarcutta

For: Tarcutta Hume Alliance

JUNE 10, 2010

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TABLE OF CONTENTS

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1 INTRODUCTION

1.1 Background

The Tarcutta Hume Alliance (THA), a consortium comprising Leighton Contractors, AECOM Australia (formerly Maunsell), SMEC Australia and Coffey Geotechnics and the NSW Roads and Traffic Authority (RTA) are undertaking activities to construct a bypass for the Hume Highway at Tarcutta, between Lower Tarcutta Road and Humula Road. This project, known as the Tarcutta Bypass Project (the Project), has been subject to detailed environmental impact assessment which has been approved under Part 3A of the *Environmental Planning and Assessment Act* 1979 (EP&A Act).

Construction projects of this nature often require sourcing of Select Material Zone (SMZ) fill and Drainage Rock. For this Project, such material is required for several parts of the bypass. To source the fill required for this section of highway upgrade, the THA has identified one potential quarry site with material that can be used for select fill, Rock Rip Rap and Drainage Rock.

The proposed quarry is located off Ladysmith Road in Kyeamba, 27 kilometres (km) from the Tarcutta Town Centre. The site is privately owned and is characterised by a ridgeline running up to Mt Kilgowla where metasediments are present (Hornfels). The location of the potential quarry site is shown in Figure 1. The proposed quarry site and associated access and stockpiling areas forms the subject of the current report (the Proposal).

SMEC, as part of the THA consortium, has been commissioned to prepare a flora and fauna impact assessment for the Proposal to remove material from the quarry site. This report will form part of a modifications report to be submitted to the RTA and is thus assessed under Part 3a (under Section 75w) of the EP&A Act.

This flora survey and fauna habitat assessment has been completed to assess the ecological features of the affected area and to determine the impact of activities required for the quarry works on these features. This document details the methodologies used and findings of the flora survey and habitat assessment. Particular emphasis has been placed on the occurrence of threatened species, populations and ecological communities and any potential impacts resulting from the proposed works.

1.2 Proposal area And Surroundings

The proposed Ladysmith Road Quarry is located 27 km from the Tarcutta Town Centre, within the Wagga Wagga Local Government Area. The topography of the quarry site is along a ridgeline with granite outcrops present. The Proposal area has been cleared and is currently used for grazing; however remnant vegetation occurs in the form of scattered mature trees. The area surrounding the Proposal to the east contains better quality remnant vegetation; however this area will not be impacted by the works.

A number of threatened plant and animal communities have been previously recorded in the wider area including Box Gum Woodland, the Dwarf Bush Pea *(Pultenaea humilis)* and the Squirrel Glider *(Petaurus norfolcensis)*. In addition, many uncommon plant species and a number of endangered ecological communities are represented within the greater Wagga Wagga LGA.

1.3 The Proposed Activity

The proposed activity would involve three stages. This includes quarrying operations, associated stockpiling of material and access track upgrades to allow for the movement of

quarry and transport machinery. A description of each of these activities is provided in the following section.

Quarrying Operations

Quarrying would be undertaken using a variety of techniques including blasting, rock hammering, crushing, stockpiling, loading quarried material into trucks, and haulage. The typical machinery to be used for such operations includes a bulldozer, loader, crusher, excavator and haul trucks. At this stage, benching is not required for the quarry design due to the hard nature of the rock. The quarry design will be refined and recommendations will be made for the exposed edges at the top of the potential quarry prior to works beginning.

The size of the proposed quarrying area is approximately 2.1 hectares (ha) (Figure 2). However not all of this area will be quarried, rather this will allow the best rock to be sourced from the site.

Stockpiles

A stockpile is proposed in the flatter areas near the quarry site, with an area of approximately 4.87 ha required for this function (Figure 2).

Access track upgrades

Where necessary, existing tracks will be upgraded to achieve a maximum width of 6 m (disturbing 0.23ha). This will allow access for construction plant including a bulldozer, loader, crusher, excavator and haul trucks to the proposed quarry site. No earthworks are anticipated to be required for access within the property for the road; however some works may be required to ensure safe access to the site from Ladysmith Road.

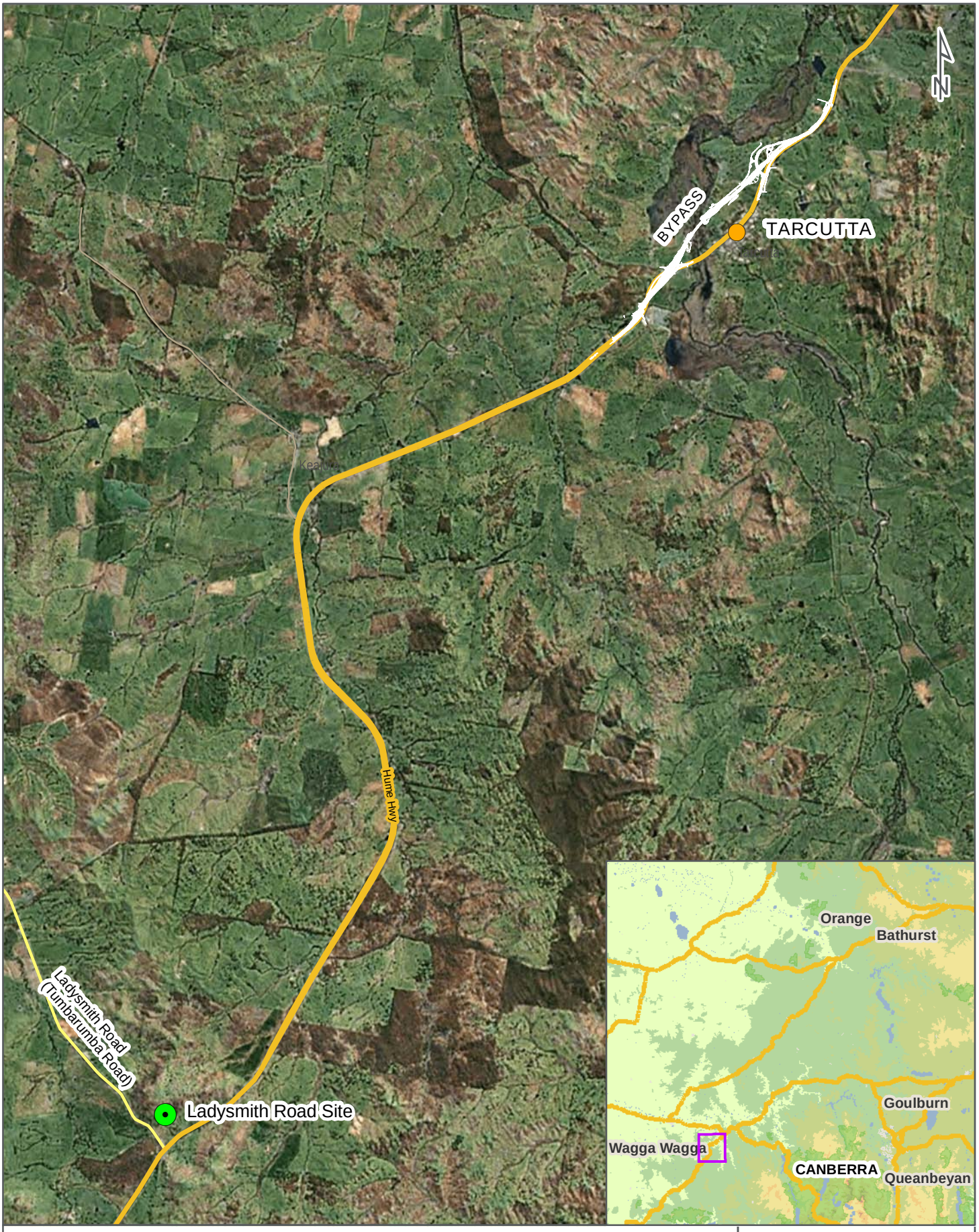
Options in order of preference to access the proposed quarry site from Ladysmith Road to maintain line of sight and/or provide slip lanes are:

1. Ladysmith Road at the existing property gate if no clearing is required;

2. Approximately 270 m south east of existing property gate where there is a break in the road side vegetation (no clearing required); or

3. Ladysmith Road at the existing property gate with slip lanes (clearing required of 0.05 ha of roadside vegetation).

The exact location of this entry and exit point and potential slip lane has not yet been determined in consultation with Wagga Wagga City Council, however a maximum of 0.05ha of vegetation will be removed for the access. As such, the precautionary principle has been applied in assessing the worst case scenario for vegetation removal and its associated impacts. However, the impacts may be reduced if an option with less vegetation removal is selected.



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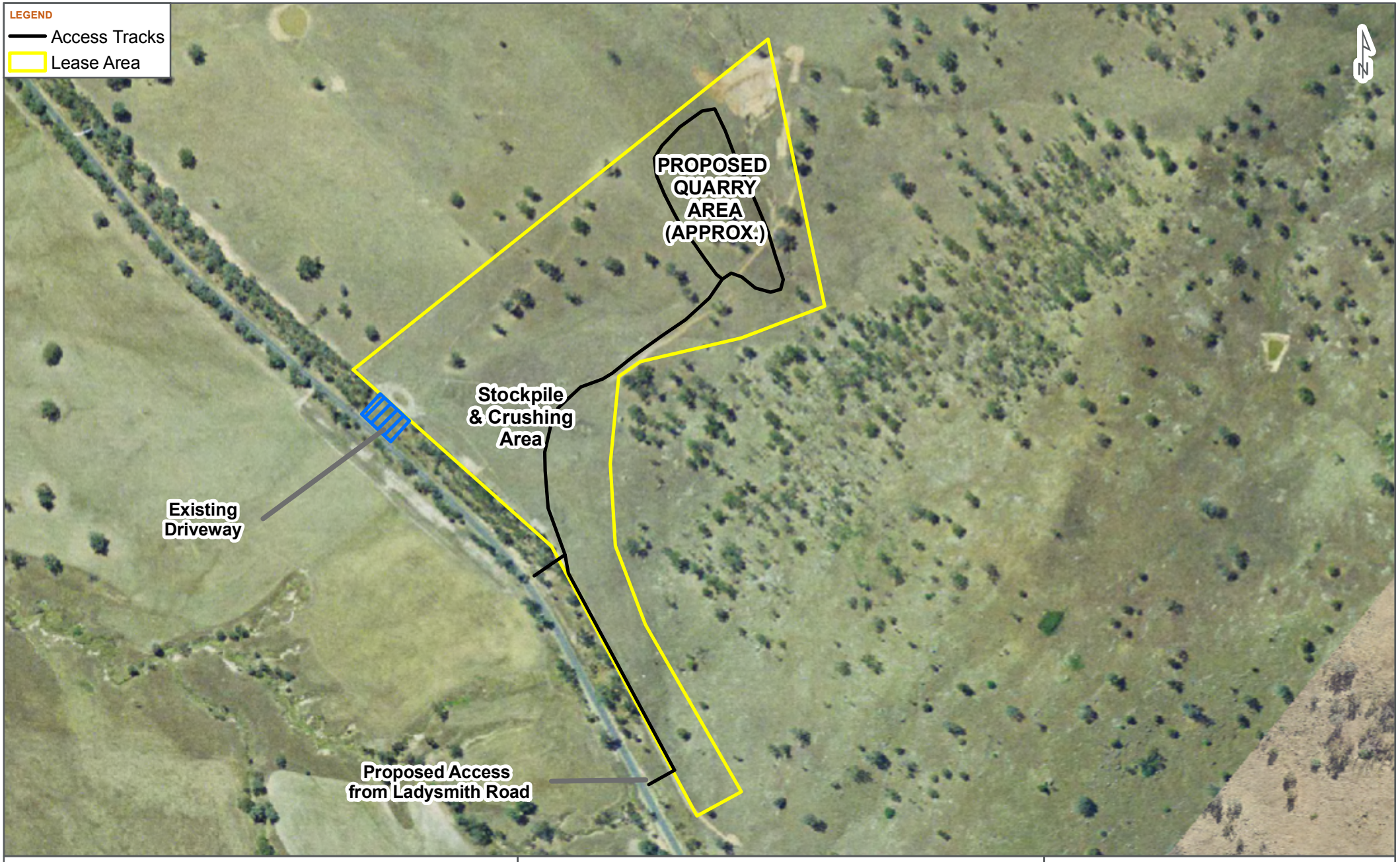

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SMEC

2 METHODOLOGY

The flora survey and fauna habitat assessment was designed to gather as much information as required to assess the impact of the Proposal, which includes the removal of vegetation in discrete areas for access track upgrades within the property, quarrying operations and stockpiling of quarried materials. The assessments were focused upon the impact of the activity on threatened species for which habitat assessment was carried out, and threatened communities for which flora survey was undertaken. Whilst no dedicated fauna survey was carried out, all animals observed opportunistically during the assessment were identified and recorded.

This assessment included an initial desktop review followed by field inspection and survey with particular emphasis on threatened flora and fauna species that could inhabit the site.

2.1 Desktop Review

Desktop research included a review of literature relevant to the ecology of the site, particularly:

- NPWS Wildlife Atlas Database (DECCW 2009a) NSW National Parks & Wildlife Service, Department of Environment, Climate Change & Water (DECCW), Hurstville. Accessed October 2009;
- DECCW Endangered Ecological Community and Threatened Species Profiles (DECCW 2009b);
- EPBC Sprat Database (2010) Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA), accessed online, http://www.environment.gov.au. Accessed February 2010;
- Sinclair Knight Merz (2006) *Hume Highway Duplication: Sturt Highway to Tarcutta, Kyeamba Hill and Little Billabong Ecological Impact Assessment,* report to the Roads and Traffic Authority, November 2006;
- Parsons Brinkerhoff (2009) Hume Highway Upgrade: Tarcutta Bypass: Environmental Assessment;
- Keith D (2004) A compilation map of native vegetation for New South Wales, New South Wales National Parks and Wildlife Service, Hurstville; and
- Benson (2008) New South Wales Vegetation Classification & Assessment Database Project (NSWVCA), accessed within the Vegetation Types Database, DECCW Biometric Assessment Methodology.

2.2 Field Survey

The site inspections and field surveys were carried out on the 6th October 2009, 11th February 2010 and 30th March 2010. On the 6th October 2009 the weather was cool and overcast with a minimum temperature of 2.7°C experienced at night and a maximum of 18.4°C during the day. Gusty winds were experience during the survey with a maximum speed of 44 km/hr recorded around noon (BOM 2009). On the 11th February 2010 the weather was warm with a minimum temperature of 20.2°C and a maximum of 36.6°C. Wind speeds reached a maximum of 52km/hr late in the evening (BOM 2010). On the 30th March the weather was mild with a minimum of 16.1°C and a maximum of 26.1°C achieved. A south-south-east wind reached a maximum of 31km/hr in the afternoon (BOM 2010).

A total of 20 person hours were spent searching the Proposal area and its surrounds by Katie Whiting, Simone d'Unienville, Cassandra Thompson and Daniela Binder, trained

and experienced ecologists. The assessment included a detailed flora survey and fauna habitat assessment.

2.3 Flora Survey

A flora survey was undertaken to identify and assess the vegetation of the site, with emphasis on the potential occurrence of threatened species. The Proposal area was inspected, utilising the "Random Meander" method of flora survey (following Cropper 1993), with all observed significant flora species recorded within the vicinity of the proposed works. In addition, vegetation in the surrounding area was documented. Dominant species were noted, and an assessment was undertaken of the floristic and structural composition of vegetation within and surrounding the site. Weed species were also recorded, with particular reference to those plants listed as noxious weeds under the *Noxious Weeds Act 1993.*

The floristic structure and composition was compared to vegetation profiles (developed by Keith 2004 & Benson 2008) to determine the vegetation community present. The Vegetation Types Database (Benson 2008) includes vegetation types that were developed for each of the 13 NSW catchment management authority areas and was originally created for use with the BioMetric tool under the *Native Vegetation Act* 2003 (DECCW 2009b). These were also compared to relevant NSW Scientific Committee final determinations to determine if the vegetation met the description of any endangered ecological communities (EEC's) known to occur within the Wagga Wagga LGA.

Targeted searches for threatened flora listed under the *Threatened Species Conservation Act* 1995 (TSC Act), *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) and recorded during previous surveys of the Proposal area by Sinclair Knight Merz (2006) were undertaken as part of the survey. Further, a habitat assessment was undertaken for all threatened flora species previously recorded by SKM (2006), within five (5) kilometres of the site or if known to occur in similar habitat to that which is present on the site. Where appropriate, further survey was undertaken in areas adjacent to the proposed works area for threatened flora species where these were considered likely to occur. A comprehensive list of these is contained in Appendix 1.

2.4 Fauna Habitat Assessment

An assessment of the habitat types within the Proposal area and surrounding area were undertaken to determine the suitability for threatened fauna species previously recorded within five (5) kilometres of the site. Where appropriate, further habitat assessment was carried out for threatened fauna species, whose range includes the Proposal area but had not been recorded locally, considered likely to occur or considered likely to utilise the site as habitat (Refer Appendix 2).

Searches were carried out for signs of fauna activity, this included searches for tracks, scats, feathers, scratches as well as active searches under logs and similar habitat features where appropriate.

Detailed and targeted fauna surveys were not undertaken within the Proposal area. The use of habitat assessment is an acceptable approach to consider the likely impact of the proposed activity on fauna. The assessment for the likelihood of such species occurring within the area is provided in Appendix 2. Whilst no formal fauna survey was carried out, all fauna observed opportunistically during the assessment were recorded (Appendix 1).

3 FINDINGS

This section provides a discussion of the desktop assessment and a detailed discussion of findings from the field assessment. It outlines the vegetation communities, endangered ecological communities and threatened flora and fauna previously recorded within the vicinity of the proposed quarry site. It also provides an overview of the surrounding environment and ecological features of the area.

3.1.1 Proposal Site Description

The proposed Ladysmith Road quarry site is essentially a cleared landscape currently in use for cattle grazing. The lower slopes, where the quarry is proposed, are mostly cleared and have been replaced with exotic pasture grasses and forbs. The higher slopes remain largely intact in terms of native vegetation and are covered with large granite outcrops (Plate 1 and Plate 2). A narrow strip of vegetation exists along Ladysmith Road where an access is to be cleared (Plate 3).The soils of the area belong to the Yarragundry Soil Landscape Unit, which is characterised by shallow to moderately deep (40-100cm) Mesotrophic Red Chromosols on crests, ridges and upper slopes and Eutrophic Red Chromosols and mottled Mesonatric Brown Sodosols on the mid to lower slopes (Chen & McKane 1996).

Plate 1 Quarry site, looking south east

Plate 2 Rocky outcrops on hill slopes in the surrounding area

Plate 3 Proposed Access from Ladysmith Road, showing existing access in foreground and Blakely's Red Gum regrowth in background

3.1.2 Mapped Vegetation Communities in Locality

Fine scale mapping has not been undertaken for the Proposal area. As such, the state-wide Keith (2004) *A Compilation Map of Native Vegetation for New South Wales* and the Vegetation Types Database (Benson 2008) was used to predict vegetation communities in the area. The main vegetation type in the broader area is Western Slopes Grassy Woodland (Keith 2004). A description of this community and the comparative Benson (2008) communities are provided below.

Western Slopes Grassy Woodland (Keith 2004)

Western Slopes Grassy Woodland is Eucalypt woodland up to 20 m tall with very sparse shrub stratum and continuous grassy groundcover. It occurs on fertile soils usually derived from basalt and low-quartz sedimentaries, but also granites and acid volcanics, on flat to undulating terrain on the western fall of the Great Dividing Range, receiving 550-750 mm annual rainfall.

Characteristic canopy species include *Eucalyptus albens, E. melliodora, E. blakelyi, Brachychiton populneum* ssp. *populneum, Callitris glaucophylla, with Eucalyptus pilligaensis* and *E. melanophloia* in the north. Shrubs and vines include *Templetonia stenophylla, Eremophila debilis, Pimelea curviflora, Cassinia arcuata, Notelaea microcarpa,* and *Bursaria spinosa.*

Common understorey species include *Themeda australis, Poa sieberiana, Bothriochloa macra, Austrostipa scabra var. falcata, A. aristiglumis, Aristida ramosa* var. *ramosa, A. latifolia, Dichanthium sericeum (*in the north*), Sporobolus creber, Austrodanthonia setacea, Elymus scaber, Lomandra filiformis, Dichondra repens, Cymbonotus lawsonianus, Plantago varia, Goodenia pinnatifida, Convolvulus erubescens, Bulbine bulbosa, Wahlenbergia luteola, Chrysocephalum apiculatum, Microseris lanceolata, Dianella longifolia, Geranium retrorsum, Leptorhynchos squamatus, Stackhousia monogyna, Acaena agnipila, Asperula conferta, Cynoglossum suaveolens, Dichopogon fimbriatus, Wurmbea dioica, Microtis unifolia, Alternanthera nana, Tricoryne elatior, Rumex brownii, Sida corrugata, Chamaesyce drummondii, Solenogyne gunnii, Oxalis perennans, Velleia paradoxa, Vittadinia triloba,* and *Hydrocotyle laxiflora,* and *Wahlenbergia luteola.*

The following two vegetation communities from the Vegetation Types Database (Benson 2008) form part of the Western Slopes Grassy Woodland (Keith 2004):

Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion (Benson 282) (Benson 2008)

This vegetation community is found on the footslopes or lower slopes in hills or low hills mainly in the NSW South Western Slopes Bioregion, including the Murrumbidgee Catchment Management Area where this Proposal area occurs. This tall grassy woodland occurs on clayey soils derived from fine grained sedimentary lithologies or colluvium (Benson 2008). Dominant species include *Eucalyptus albens* and *E. blakelyi* with *E.melliodora* and *E.bridgesiana* as its main associated species (Benson 2008). Understory species characteristic of this community include *Acacia implexa* and *A.decora* with the ground cover including *Themeda australis*, *Poa sieberiana var. sieberiana*, *Elymus scaber*, *Arthropodium minus*, *Bulbine bulbosa*, *Dichopogon fimbriatus* and *Chrysocephalum apiculatum* (Benson 2008). This vegetation community is classed as Western Slopes Grassy Woodland (Keith 2004) described above and is part of the EEC White Box Yellow Box Blakely's Red Gum Woodland.

Blakely's Red Gum - Long-leaved Box - Cootamundra Wattle shrubby woodland of the southern NSW South Western Slopes Bioregion (Benson 280) (Benson 2008)

This woodland vegetation community is located on hill slopes and hillcrests in hilly country, occurring on brown loamy clay soils that have been derived from fine-grained sediments (Benson 2008). The dominant canopy species include *E. blakelyi, E. goniocalyx* and *E. macrorhyncha* with an understorey including *Acacia baileyana*, *A. buxifolia* subsp. *buxifolia*, *Lissanthe strigosa*, *Pultenaea foliolosa*, *Cassinia aculeata* and *Hibbertia obtusifolia* (Benson 2008). Ground species characteristic to this vegetation community include *Austrodanthonia setacea*, *Austrostipa densiflora*, *Themeda australis*, *Chrysocephalum semipapposum*, *Xerochrysum viscose* and *Dianella revoluta* var. *revoluta* (Benson 2008). This vegetation community is classed as Western Slopes Grassy Woodland (Keith 2004) described above.

3.1.3 Vegetation Community within Proposal Area

Vegetation at the site comprises low open grassland dominated by exotic species, with isolated paddock trees present. The vegetation community and dominant species within each of the Proposal areas is provided in the following section. The location of vegetation communities is shown in Figure 3.

Quarry Area

Exotic grass and forb species dominate this area, including Patersons Curse *(Echium plantagineum)*, Clover, Barley Grass (*Hordeum* spp.) and Red Brome (*Bromus rubens*). A native forb, Blue Storksbill (*Erodium crinitum*) is also relatively dominant at the site and the native grass Red-leg Grass (*Bothriochloa macra*) is present. Several large mature trees are scattered within this area, including Red Box (*Eucalyptus polyanthemos*), White Box (*Eucalyptus albens*), Grey Box (*Eucalyptus microcarpa*) and Kurrajong (*Brachychiton populneus*).

This area is generally consistent with the description of Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion (Benson 282) (Benson 2008) community. However the vegetation is considered to be a modified form of this community due to being largely cleared for grazing with the understory modified through the introduction of pasture grasses.

Stockpile Area & Access

The stockpile area is proposed to the west of the quarry area while the access road occurs along the eastern side of the stockpiling area. This area includes Blakely's Red Gum (*Eucalyptus blakelyi*) and Red Box with a weedy understorey dominated by Horehound (*Marrubium vulgare*) and Bathurst Burr (*Xanthium spinosum*) (Plate 4). This area has signs of past cultivation and pasture improvement, particularly in the lower slopes and the understorey is therefore highly modified.

Within the higher slopes of the stockpile area, the vegetation is generally consistent with the description of Blakely's Red Gum - Long-leaved Box *(E.goniocalyx)*- Cootamundra Wattle *(Acacia baileyana)* shrubby woodland of the southern NSW South Western Slopes Bioregion (Benson 280) (Benson 2008). Within the lower slopes of the stockpile site, the vegetation is generally consistent with the description of Grassy White Box *(E.albens)* - Blakely's Red Gum - Yellow Box *(E.melliodora)* woodland of the NSW South Western Slopes Bioregion (Benson 282). Due to the disturbed nature of the vegetation within the site, it is considered that the vegetation community within the stockpile area of the Proposal is not representative of the full range of species that these communities contain, and is only generally consistent with their descriptions.

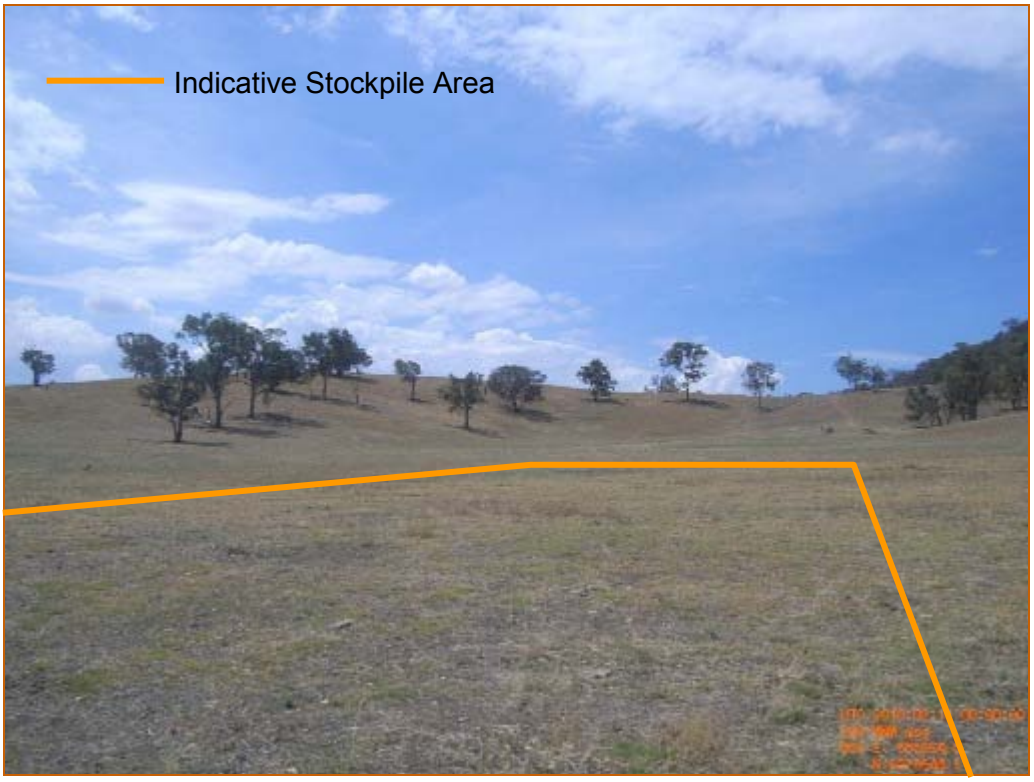

Plate 4 Proposed stockpile area

Access from Ladysmith Road

This 500 m section of Ladysmith Rd has a medium to high disturbance history, with vegetation regrowth occurring mainly on the western side of the existing cleared driveway (See Plate 3). The canopy is dominated by juvenile Blakeley's Red Gum with an approximate cover of 20% an average height of 11 metres. Most trees in this area have a diameter at breast height (DBH) of no greater than 15 cm. Three mature Blakely's Red Gums are also present in this area, one of which occurs near the northern fence boundary line the other two occurring next to the road. White Box (*E. albens*) is also present in the canopy however it is not a dominant species. There is a sparse shrub layer of Hickory Wattle (*Acacia implexa*) and Blakely's Red Gum saplings to seven (7) metres in height. The groundcover is predominantly weedy, dominated by Bearded Oats (*Avena barbata*) however some native grasses such as Purple Wire Grass (*Aristida personata*) are present.

An existing driveway gives access to the proposed quarry site which is approximately 100 metres in length. White Box and Blakely's Red Gum saplings are present near the property fence line and along the road edge. Grasses including Purple Wire Grass are present; however weeds such as Bearded Oats are more prevalent, and in particular the noxious weed species St John's Wort (*Hypericum perforatum*) and Patersons Curse (*Echium plantagineum*) are present. These are further discussed in Section 3.1.6.

The canopy in the eastern section is sparse (5-10%), and is characterised by Blakely's Red Gum. Four (4) mature Blakely's Red Gums are interspersed within the regrowth present in this section. One (1) mature Red Box is also present in this section. The understorey is characterised by Hickory Wattle (<5%), although the Hickory Wattle's distribution is more patchy than in the western section of this road reserve. Blakely's Red Gum saplings occur mainly along the fence line or along the roadside. The site has dense patches of grasses with up to 80% cover, consisting of mainly Weeping Grass (*Microlaena stipoides*).

This area is generally consistent with the description of Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion (Benson 282) (Benson 2008); however it is a modified version of this community due a predominantly weedy understorey of Bearded Oats.

3.1.4 Vegetation Community Outside Proposal Area

Vegetation surrounding the Proposal is a combination of remnant Box-Gum Woodland, secondary grassland, and areas that have been modified for grazing that now support remnant paddock trees with a grassy understorey. The hill slope to the south east of the proposed quarry site includes remnant vegetation with large granite boulders dominating the landscape.

Much of the vegetation surrounding the affected area is dominated by Blakely's Red Gum with an understorey of six native species including Poison Rock Fern (*Cheilanthes sieberi* subsp. *sieberi*), Bluebell species (*Wahlenbergia communis*), Kangaroo Thorn (*Acacia paradoxa*), Speargrass (*Austrostipa scabra* subsp. *falcata*), Wallaby Grass species (*Austrodanthonia* spp.) and Purple Wire-grass (*Aristida personata*). This vegetation is likely to be a disturbed form of Blakely's Red Gum - Long-leaved Box - Cootamundra Wattle shrubby woodland of the southern NSW South Western Slopes Bioregion (Benson 280) (Benson 2008).

This area will not be directly impacted as a result of the Proposal.

3.1.5 Endangered Ecological Communities

Three endangered ecological communities (EECs) listed under the *Threatened Species Conservation Act 1995* (TSC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are known to occur within the Upper Slopes Catchment Management Area sub-region (part of the Murrumbidgee CMA) (DECC 2010). These include:

- White Box – Yellow Box – Blakeley's Red Gum Woodland (TSC Act listing) or White Box – Yellow Box – Blakeley's Red Gum Woodland and Derived Native Grasslands (EPBC Act listing), hereafter referred to as Box-Gum Woodland;
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions, hereafter referred to as Inland Grey Box Woodland; and
- Natural Temperate Grassland of the Southern Tablelands (NSW and ACT).

A description of each of these communities is given below and the potential occurrence of these communities within the Proposal area is discussed based on the desktop assessment and field survey.

Box Gum Woodland

Box Gum Woodland is listed as a critically endangered ecological community (CEEC) under the EPBC Act 1999, and EEC under the TSC Act. The Box – Gum Woodland ecological community occurs in an arc along the western slopes and tablelands of the Great Dividing Range from Southern Queensland through NSW to central Victoria (Beadle 1981).

Box Gum Woodlands are characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box or Blakely's Red Gum trees (TSSC 2006a). In the Nandewar Bioregion, Grey Box (*Eucalyptus microcarpa* or *E. moluccana*) may also be dominant or co-dominant (TSSC 2006a). The tree-cover is generally discontinuous and consists of widely-spaced

trees of medium height in which the canopies are clearly separated (Yates & Hobbs 1997).

The understorey in intact sites is characterised by native grasses and a high diversity of herbs; the most commonly encountered include Kangaroo Grass (*Themeda australis*) Poa Tussock (*Poa sieberiana*), Wallaby Grasses (*Austrodanthonia* spp.), Spear-grasses (*Austrostipa* spp.), Common Everlasting (*Chrysocephalum apiculatum*), Scrambled Eggs (*Goodenia pinnatifida*), Small St John's Wort (*Hypericum gramineum*), Narrow-leafed New Holland Daisy (*Vittadinia muelleri*) and Blue-bells (*Wahlenbergia* spp.). Shrubs are generally sparse or absent, though they may be locally common (NSW NPWS 2002).

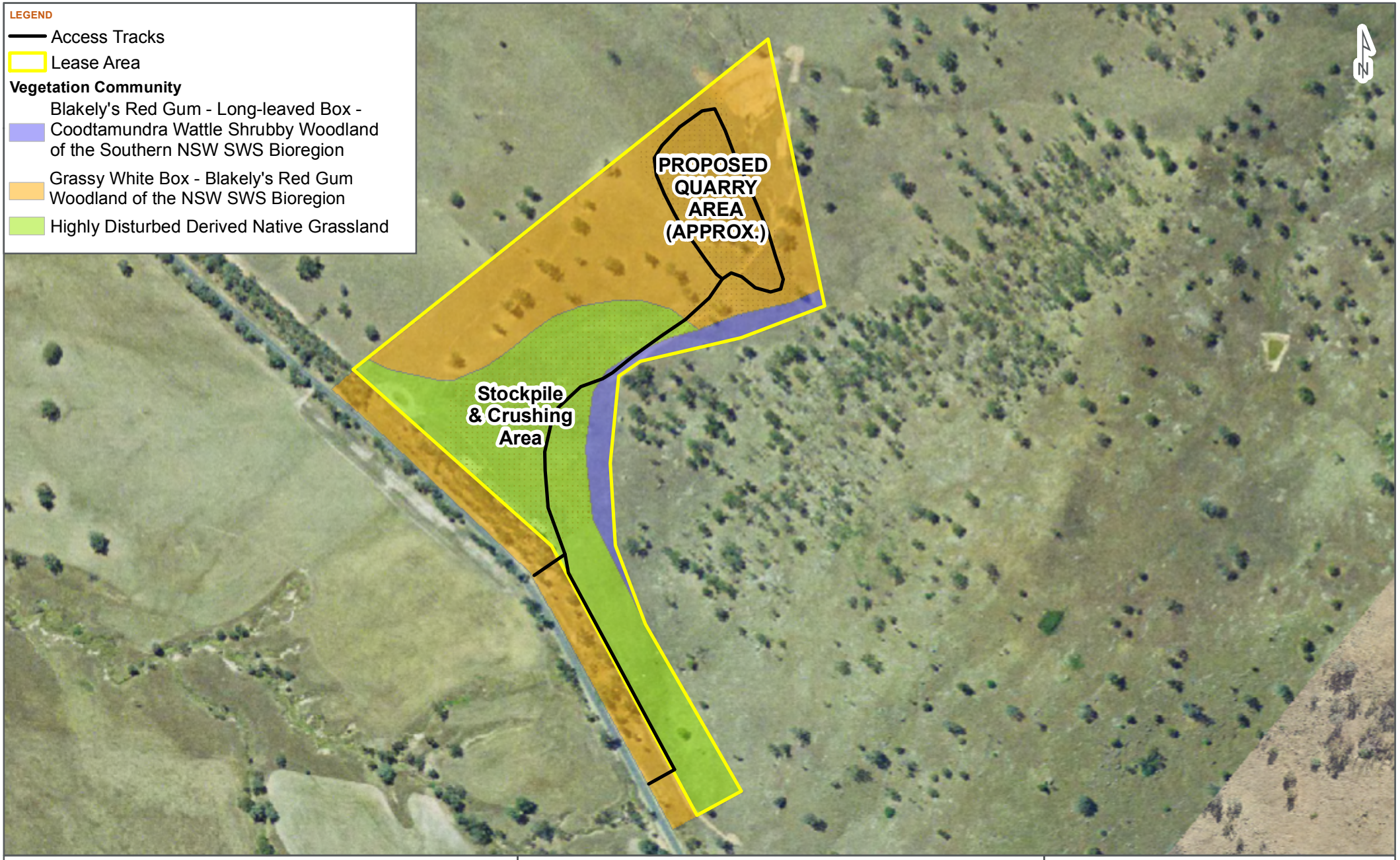

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FIG NO. 3 FIGURE TITLE Vegetaion Communities

PROJECT NO. 3001712 PROJECT TITLE Tarcutta - Hume Alliance

CREATED BY R. Chatfield LOCATION I:\projects\3001712 - Tarcutta Hume Alliance\040 Calculations\40.11 GIS\Threatened Species Monitoring

SMEC

The following criteria (Plate 5) were used to determine if this remnant met the description of the Box-Gum Woodland CEEC under the EPBC Act:

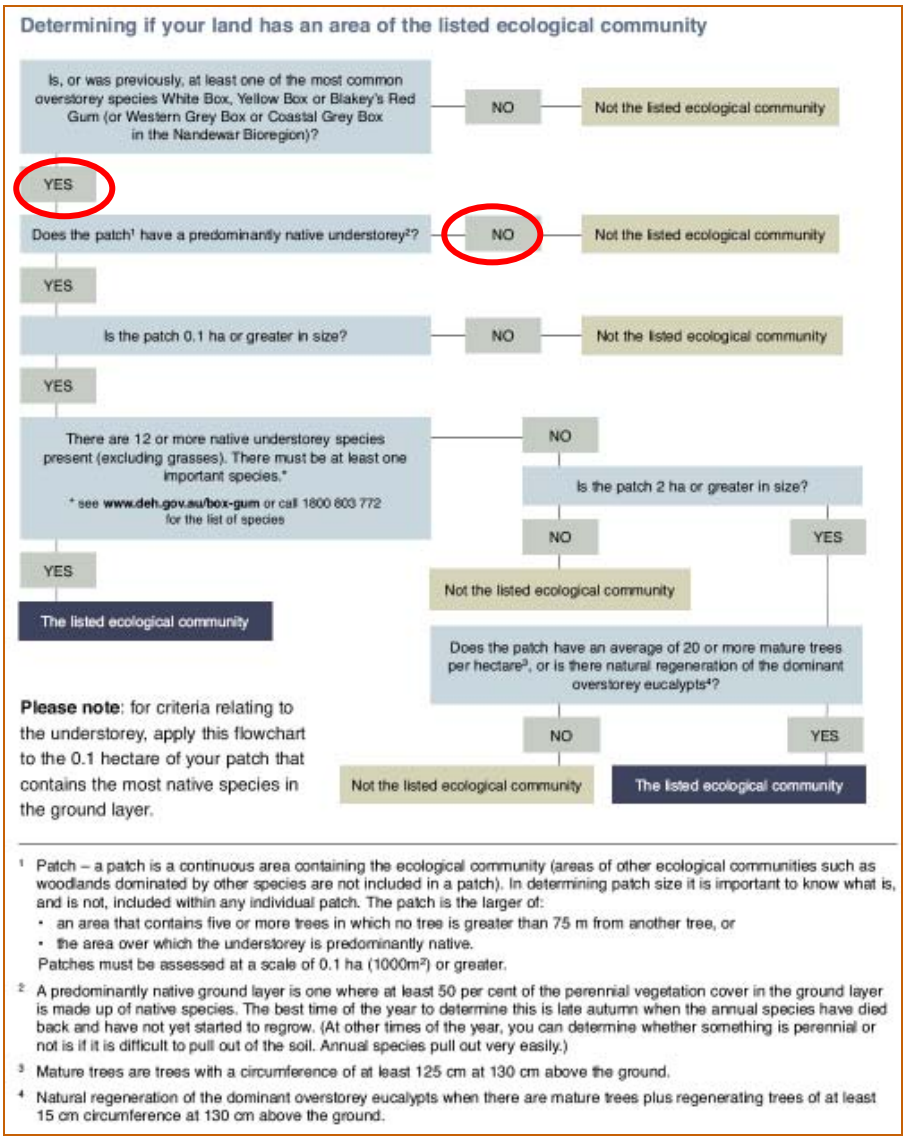
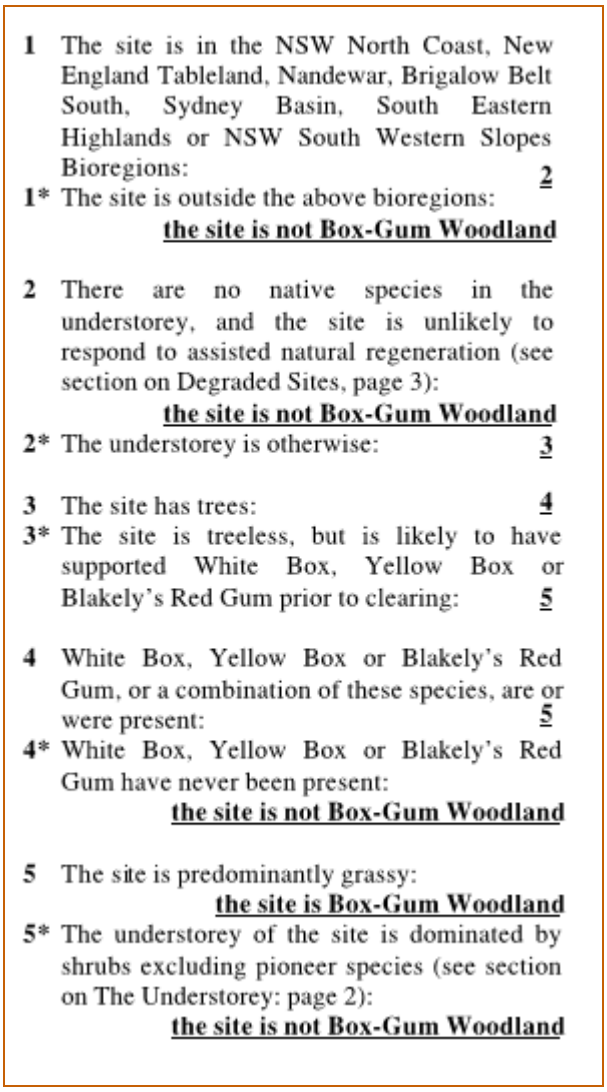


Plate 5. EPBC Act Criteria for Box Gum Woodland compared with vegetation community in proposed quarry and stockpile area (DEH 2006)

The proposed quarry area and stockpile area do not meet the description of Box Gum Woodland under the EPBC Criteria. The consideration of the guidelines is shown in Plate 5. Although the dominant overstorey species include Blakely's Red Gum, the understorey is predominantly exotic and is highly disturbed due to previous pasture improvement, clearing and cultivation.

The proposed access from Ladysmith Road does not meet the EPBC Act criteria for Box-Gum Woodland EEC due to the understorey being dominated by exotic species such as Bearded Oats. Although the eastern section has a predominantly native understorey, this is only comprised of one native species (Weeping Grass) and the patch is smaller than 2ha (approximately 0.7ha). This community has been identified as occurring to the south-south east of the Proposal, in the Kyeamba Travelling Stock Reserve (SKM 2006) which is located approximately 2km to the south east of this area..

Box-Gum Woodland is also listed as an EEC under the TSC Act. The following identification guidelines (Plate 6) have been prepared by NPWS (2002).



1 The site is in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands or NSW South Western Slopes Bioregions: **2**

1* The site is outside the above bioregions: **the site is not Box-Gum Woodland**

2 There are no native species in the understorey, and the site is unlikely to respond to assisted natural regeneration (see section on Degraded Sites, page 3): **the site is not Box-Gum Woodland**

2* The understorey is otherwise: **3**

3 The site has trees: **4**

3* The site is treeless, but is likely to have supported White Box, Yellow Box or Blakely's Red Gum prior to clearing: **5**

4 White Box, Yellow Box or Blakely's Red Gum, or a combination of these species, are or were present: **5**

4* White Box, Yellow Box or Blakely's Red Gum have never been present: **the site is not Box-Gum Woodland**

5 The site is predominantly grassy: **the site is Box-Gum Woodland**

5* The understorey of the site is dominated by shrubs excluding pioneer species (see section on The Understorey: page 2): **the site is not Box-Gum Woodland**

Plate 6. TSC Act Criteria for Box Gum Woodland (NPWS 2002)

The proposed quarry area meets the criteria for this EEC under the TSC Act as shown in Plate 6 above, due to the presence of White Box and Blakely's Red Gum and the presence of native species in the understorey. At present, the condition of this community onsite is considered to be severely degraded due to the dominance of exotic species within the understorey and lack of regeneration of overstorey species. However, the definition of Box-Gum Woodland explicitly recognises that some remnants are degraded. Highly disturbed sites that have few if any native species in the understorey are specifically included in the community provided "*vegetation, either understorey or overstorey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and associated seed bank are still at least partially intact.*"

As per the identification guidelines for this community (DECCW date unknown), the vegetation onsite is considered to be consistent with condition class 5 of the listed community. This includes degraded remnants that have few, if any, native species in the understorey. This condition is typical of Box-Gum Woodland where agricultural practices have been more intensive (e.g. pasture improvement over long periods).

The conservation value of the remnant given the wide occurrence of this community within the locality in areas where appropriate management regimes occur such as the travelling

stock reserves, is relatively low. This is further lowered due to the position of the remnant within a relatively cleared agricultural landscape which under current management practices lacks the ability for natural regeneration of native species. The ongoing nature of the agricultural land uses on and around the site also contributes to an associated decline in community resilience. Consequently, the potential for this area to regenerate either by assisted or natural regeneration to a viable Box-Gum Woodland community is limited and unlikely.

The stockpile site is also considered to meet the description of Box-Gum Woodland in accordance with the TSC Act Criteria (NPWS 2002). Although there are no native species in the understorey, there may still be native species in the seedbank that may respond to assisted natural regeneration. The likelihood of this is low given that there are signs of cultivation in this area. Although, the guidelines suggest that this is hard to prove or disprove (NPWS 2002). The site is treeless but would have supported White Box and/or Blakely's Red Gum prior to clearing given the presence of these trees in the surrounding area. The site is also predominantly grassy. Therefore, this meets the criteria under the category of 'degraded sites'.

The conservation value of the remnant is low given its highly degraded nature and absence of native species in the understorey, and the wide occurrence of this community within the locality in areas where appropriate management regimes occur such as the travelling stock reserves.

The proposed access from Ladysmith Road is also considered to meet the description of Box-Gum Woodland in accordance with the TSC Act Criteria (NPWS 2002). It meets the criteria due to the presence of White Box and Blakely's Red Gum and the presence of native species on the understorey (includes Snow Grass, Wheat Grass and Purple Wiregrass). As per the identification guidelines for this community (DECCW date unknown), the vegetation onsite is considered to be consistent with condition class 2 of the listed community.

This includes partially cleared or thinned stands with a mixture of native and exotic understorey species. This condition is far more common than condition class 1 which has a multi-aged overstorey with a grassy, herb rich understorey however its long term future is often insecure due to inadequate regeneration of understorey species. Despite this, the regeneration of overstorey species, particularly Blakely's Red Gum is prominent in this patch and as such there will be ongoing recruitment of canopy species if the current management regime is retained.

The conservation value of the remnant given the wide occurrence of this community within the locality in areas where appropriate management regimes occur such as the travelling stock reserves, is moderate, particularly to the west of the existing driveway where the overstorey and understorey support a higher frequency and density of native species than the existing driveway and the area to the east.

Inland Grey Box Woodland

Inland Grey Box Woodland is listed as an endangered ecological community under the TSC Act. Inland Grey Box Woodland includes those woodlands in which the most characteristic tree species, *Eucalyptus microcarpa* (Inland Grey Box), is often found in association with *Eucalyptus populneus* subsp. *bimbil, Callitris glaucophylla, Brachychiton populneus, Allocasuarina luehmannii* or *Eucalyptus melliodora*, and sometimes with *Eucalyptus albens*. Shrubs are typically sparse or absent, although this component can be diverse and may be locally common, especially in drier western portions of the community. A variable ground layer of grass and herbaceous species is present at most sites. At severely disturbed sites the ground layer may be absent. The community

generally occurs as an open woodland 15–25 m tall but in some locations the overstorey may be absent as a result of past clearing or thinning, leaving only an understorey.

Inland Grey Box Woodland occurs on fertile soils of the western slopes and plains of NSW. The community generally occurs where annual average rainfall is 375- 800 millimetres (mm) and the mean maximum annual temperature is 22- 26°C.There is a correlation between the distribution of *Eucalyptus microcarpa* communities and soils of Tertiary and Quaternary alluvial origin, largely corresponding with the Red Brown Earths.

The majority of remnant patches of Inland Grey Box Woodland survive with trees largely intact but with the shrub or ground layers degraded to varying degrees through grazing or pasture modification. Some species that are part of the community appear intolerant to heavy grazing by domestic stock and are confined to the least disturbed remnants. This community has not been identified within the surrounding area (SKM 2006).

Inland Grey Box Woodland is not considered to occur within the Proposal area due to the absence of the dominant species Inland Grey Box and associated species *Eucalyptus populneus subsp. bimbil, Callitris glaucophylla, Brachychiton populneus, Allocasuarina luehmannii* or *Eucalyptus melliodora*. Although White Box is sometimes an associated species for this EEC, in this area its occurrence is not considered to signify the presence of the community due to the absence of the dominant species Inland Grey Box and any of the other associated species.

Natural Temperate Grasslands of the Southern Tablelands of NSW and ACT

Natural Temperate Grassland is listed as an EEC under the EPBC Act. It is a native ecological community dominated by native species of perennial tussock grasses. The dominant grasses are *Themeda australis*, *Austrodanthonia* spp., *Austrostipa* spp., *Bothriochloa macra* and *Poa* spp. The upper canopy stratum generally varies in height from mid high (0.25-0.5m), to tall (0.5-1.0m). There is also a diversity of native herbaceous plants (forbs), which may comprise up to 70% of species present. The community is naturally treeless or has less than 10% projective foliage cover of trees, shrubs and sedges in its tallest stratum.

In addition to a wide variety of grasses, native grassland in their natural state contain a high diversity of forbs including sedges, rushes, orchids, lilies and broad-leaved herbs such as daisies. About 700 species of native herbs have been identified in grasslands of south-eastern Australia the majority of which are not grasses. ‘Bare ground’ in grassland may be covered by a layer of lichens and mosses. An important characteristic of the community is that it is naturally treeless, or has less than 10% projective foliage cover of trees, shrubs and sedges in its tallest stratum (ACT Government 2005).

Perennial tussock grasses impart a characteristic structure to natural temperate grassland. Tussocks are often closely spaced, forming an upper stratum of loosely interlacing leaf canopies. This upper canopy stratum varies in cover from open to dense i.e. greater than 70% ground cover. A second lower stratum may be present, typically comprised of shorter perennial and annual grasses growing in the inter-tussock spaces. At ground level, there may also be a third stratum of dwarf forbs and grasses, with occasional mosses and lichens present on bare ground (ACT Government 2005).

Natural Temperate Grassland EEC is not considered to be present within the Proposal area due to the presence of a canopy layer.

3.1.6 Introduced Species

The noxious weed Patersons Curse (*Echium plantagineum*) was recorded at the site, which is a listed noxious weed in the Wagga Wagga LGA. Patersons Curse is listed as a

Class 4 Noxious Weed, requiring that the growth and spread of the plant must be controlled according to measures specified in a management plan published by the local control authority, i.e. Wagga Wagga City Council (DPI 2009). Other environmental weeds recorded during the site survey include Barley Grass (*Hordeum* spp.) and Red Brome *(Bromus rubens).*

European Rabbit (*Oryctolagus cuniculus*) was identified on the hill slope outside of the Proposal area. A rabbit was observed under a large boulder within a crevice, which is potentially being utilised as a warren. It is most likely that this species would forage within the Proposal area.

3.1.7 Threatened Flora

One (1) threatened flora species has been recorded in the locality, Dwarf Bush Pea (*Pultenaea humilis*). No threatened flora species were found to occur within or in close proximity to the Proposal area. An assessment of the potential of this site to provide suitable habitat for threatened species was completed (see Appendix 2). It is considered unlikely that the site contains suitable habitat for any threatened flora species recorded within the surrounding area or likely to occur within the locality.

3.1.8 Fauna And Fauna Habitat

The Proposal area has been previously disturbed for use as grazing land, and holds very limited habitat for native fauna, due to its high degree of modification. The area is essentially cleared, and native vegetation has been replaced by exotic grassland (pasture). The exotic grassland may provide foraging opportunities for Eastern Grey Kangaroo (*Macropus giganteus*), however would be generally unsuitable for other ground dwelling mammals or reptiles due to the very limited cover available.

Bird species recorded during the survey utilising the Proposal area included Superb Fairy Wren (*Malurus cyaneus*), Willie Wagtail (*Rhipidura leucophrys*) and Brown Honeyeater (*Lichmera indistincta*). Birds of prey are likely to utilise the large grassy area for foraging. A Wedge-tailed Eagle (*Aquila audax*) and Nankeen Kestrel (*Falco cencrhoides*) were observed flying above and near the Proposal area. Common marsupials are also likely to utilise the Proposal area.

The proposed access from Ladysmith Road contains a patch of regenerating Blakely's Red Gum Woodland with occasionally present mature trees. Within this area, two (2) large trees with a total of five (5) hollows are present (Figure 4). These trees and their hollows would provide den opportunities for small number of arboreal mammals including Common Ringtail Possum (*Pseudocheirus peregrinus*), however not for the threatened Squirrel Glider which requires mature vegetation and abundant hollows to persist. The locally dense patches of grass within this area would provide foraging opportunities for granivorous birds such as Red-browed Finch (*Neochmia temporalis*) in addition to reptiles such as Eastern Brown Snake (*Pseudonaja textilis*) which both occur in Wagga Wagga LGA.

The higher slopes, outside of the Proposal area, contain mid-mature forest comprised mainly of regrowth, however several mature Eucalypts are also present throughout this area that contain well developed hollows, which would provide den opportunities for arboreal mammals such as Common Ringtail Possum (*Pseudocheirus peregrinus*) and the Common Brushtail Possum *(Trichosurus vulpecular)*. These trees also provide nesting opportunities for hollow dependent birds such as the threatened Brown Treecreeper *(Climacteris picumnus victoriae)*. The open woodland structure of the higher slopes also provides foraging opportunities for Superb Fairy Wren (*Malurus cyaneus*), and Brown Honeyeater (*Lichmera indistincta*), and a range threatened bird species including the Speckled Warbler *(Pyrrholaemus saggitatus)*, Hooded Robin *(Melanodryas cucullata*

cucullata), Scarlet Robin *(Petroica boodang)*, Diamond Firetail *(Stagnopleura guttata)*, Turquoise Parrot *(Neophema pulchella)* and Varied Sittella *(Daphoenositta chrysoptera)*. However, these higher slopes are located outside the impact area and will not be affected directly by the Proposal.

Potential habitat for reptile species including the Pink-tailed Worm Lizard *(Aprasia parapulchella),* (also outside the Proposal area), where there is an abundance of scattered rocks and also some larger boulders. This habitat is expected to be utilised for both basking and shelter within the longer grass and rock crevices. Evidence of the Carpet Python (*Morelia spilota*) has been recorded within the locality, approximately 2km to the south (SKM 2006). This species is considered regionally significant in the South West Slopes Bioregion and Wagga Wagga LGA (SKM 2006). Potential habitat is available within the slopes area amongst the boulders, rocks and tall grass amongst the remnant vegetation. However this potential habitat will not be directly impacted as part of the proposed works.

3.1.9 Threatened Fauna

Several species of threatened fauna have been recorded within the vicinity of the Proposal area, during previous surveys associated with the Hume Highway Duplication (SKM 2006). In addition, some threatened species have not previously been recorded in the area; however have the potential to occur due to habitat features. No threatened fauna species were observed within the Proposal area or surrounding areas during surveys. In addition, no signs of use were recorded for any threatened species likely to occur within the Proposal area.

Threatened species previously recorded in the area or with the potential to occur are as follows:

- Pink-tailed Worm Lizard *(Aprasia parapulchella);*
- Striped Legless Lizard *(Delma impar);*
- Gang-gang Cockatoo *(Callocephalon fimbriatum);*
- Brown Treecreeper *(Climacteris picumnus victoriae);*
- Swift Parrot *(Lathamus discolor);*
- Turquoise Parrot *(Neophema pulchella);*
- Superb Parrot *(Polytelis swainsonii);*
- Speckled Warbler *(Pyrrholaemus saggitatus);*
- Diamond Firetail *(Stagnopleura guttata);*
- Regent Honeyeater *(Xanthomyza phrygia);*
- Scarlet Robin *(Petroica boodang);*
- Little Eagle *(Hieraaetus morphnoides)*
- Hooded Robin *(Melanodryas cucullata cucullata)*
- Varied Sittella *(Daphoenositta chrysoptera);*
- Squirrel Glider *(Petaurus norfolcensis);*
- Koala *(Phascolarctos cinereus);*
- Spotted-tailed Quoll *(Dasyurus maculatus maculatus);* and
- Greater Long Eared Bat (*Nyctophilus timoriensis), syn* South-eastern Long-eared Bat *(Nyctophilus sp.2)* in Churchill (2008).

There is a the potential for several of the threatened bird species, including Brown Treecreeper, Turquoise Parrot, and Superb Parrot to occur at the site (see Appendix 2). However, this potential of occurrence is considered to be low due to the general absence of hollow resources at the site for breeding habitat and the limited foraging resources the

site offers. There is also the potential for Scarlet Robin to occur at the site during the autumn and winter seasons when it moves into more open and cleared habitats (Morcombe 2000), however this potential is low given the relatively small quantities of fallen timber at the site as this species requires abundant fallen timber and logs to forage from (DECC 2005). An assessment of the impact upon these species is discussed in Section 4, and assessments are at Appendix 3. These assessments have been prepared using the Draft Guidelines for Threatened Species Assessments in relation to Part 3A Major Projects (DEC and DPI 2005).

Outside of the impact area, there is potential habitat for Pink-tailed Worm Lizard, which occurs on the upper slopes of the site. However, as this is outside of the quarry area it will not be impacted directly. It is likely that bird species including Swift Parrot and Speckled Warbler may occasionally utilise the hill slopes to the east of the area of proposed works (outside the area of impact) due to the presence of suitable foraging habitat including a large stand of mature White Box for Swift Parrot, and occasional shrubs and grasses which may provide breeding and foraging opportunities for the Speckled Warbler (DECC 2005). The Scarlet Robin, Hooded Robin and Varied Sittella may also occur on this upper slope, due to the structural complexity of the woodland habitat structure including mature trees with hollows and abundant fallen timber (DECC 2005, DECCW 2010b). This area of habitat is represented on Figure 4 (threatened reptile and woodland bird habitat).

The hill slope to the south-east of the area of proposed works may also provide foraging and breeding opportunities for mammals such as Greater long-eared Bat and Spotted-tail Quoll. The large stand of mature White Box with hollows may provide breeding and shelter habitat for both species and the presence of fallen timber may provide shelter habitat for Spotted-tail Quoll (DECC 2005). As this habitat is outside the area of impact, these species would not occur. As such, no further assessment was carried out.

Although Gang-gang Cockatoos descend to more open woodland habitats during the winter, it is unlikely that they would occur at the site due to the lack of Box-Ironbark Woodland at the site (DECC 2005).

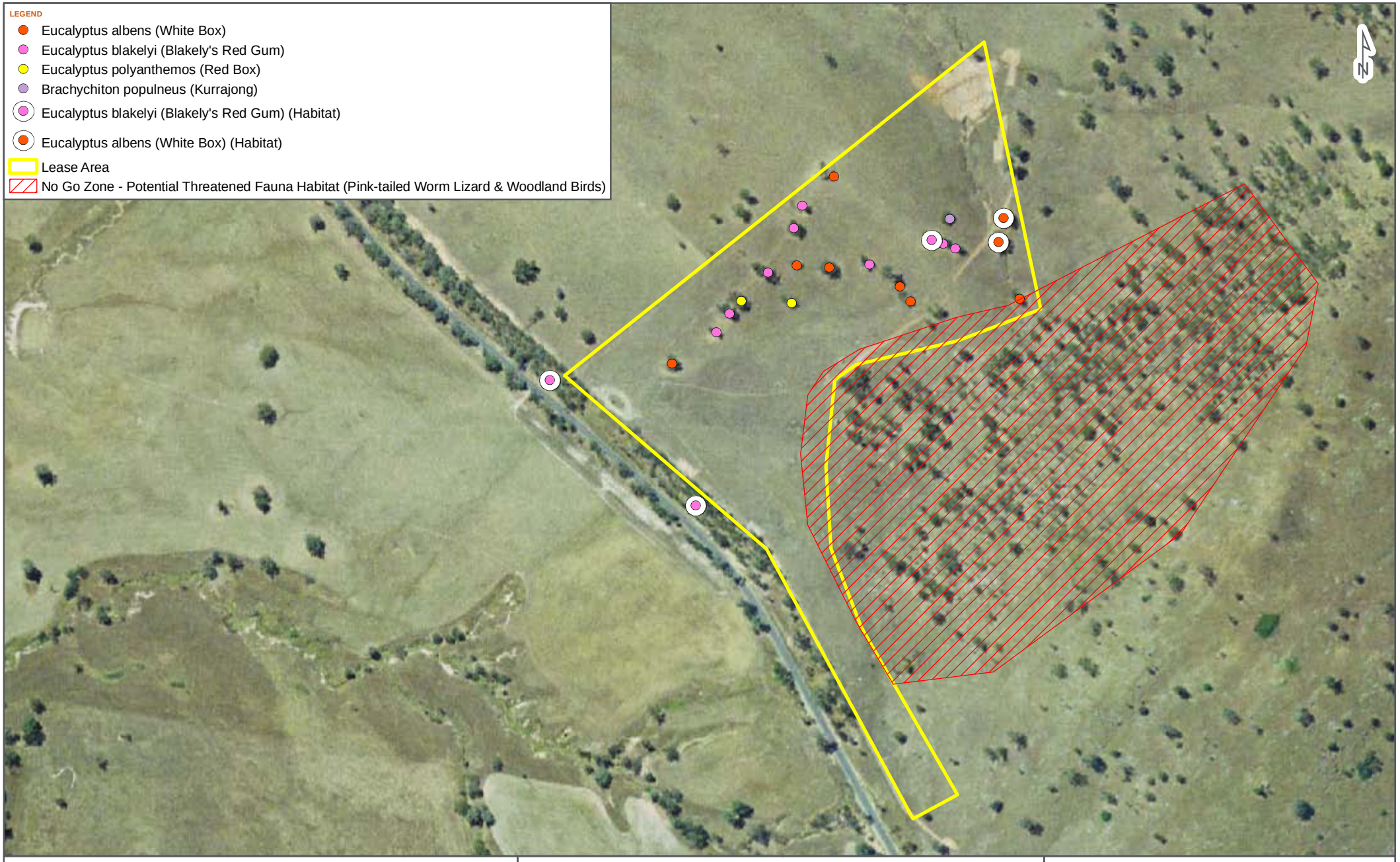
Diamond Firetails would not occur at the site due to the lack of breeding habitat in the form of a shrubby understorey. Diamond Firetails are a sedentary species (DECC 2005), and as such if breeding habitat is absent they are unlikely to forage at the site.

Regent Honeyeaters would not utilise the site for breeding purposes as it only breeds in the Capertee Valley and the Bundarra – Barraba regions. Further, the site lacks foraging habitat for this species in the form of Box – Ironbark Woodland with which this species is usually associated (DECC 2005).

It is also unlikely that Little Eagles would occur at the site due to the absence of breeding habitat in the form of tall trees within a remnant patch of vegetation. Further, this species is an aerial hunter (Debus and Ley 2009) and as such foraging habitat would not be impacted if present. Potential habitat for the prey species of the Little Eagle e.g. small birds and mammals may be impacted at the site, although it is marginal to poor habitat.

The Proposal area is not considered to provide potential habitat for Squirrel Gliders due to the low density of trees and lack of midstorey, which they are known to have a preference for. This species has also been recorded approximately 1km away in the Kyeamba Travelling Stock Reserve (van der Ree et al 2009). However, this is outside the construction area and as such is unlikely to be affected. There is potential for the surrounding vegetation on the hill slope to provide potential habitat for this species due to the large mature hollow bearing trees observed. However the low degree of connectivity to larger, more suitable habitat for this species and lack of tall trees suitable for gliding and movement reduce the likelihood of the surrounding vegetation being utilised.

Large mammals such as Koalas and Spotted-tail Quoll are also unlikely to occur at the site. Koalas are infrequently observed at higher elevations due to lower soil fertility and reduced nutrients in trees (Lunney et al 2000). As all of these species are unlikely to occur in the area of proposed works, no further assessment was carried out.



DATE 10/06/2010 **SCALE** 1:6,500 **PAGE SIZE** A4 **COORDINATE SYSTEM** MGA Z 55

FIG NO. 4 **FIGURE TITLE** Fauna Habitat

PROJECT NO. 3001712 **PROJECT TITLE** Tarcutta - Hume Alliance

CREATED BY R. Chatfield **LOCATION** I:\projects\3001712 - Tarcutta Hume Alliance\040 Calculations\40.11 GIS\Threatened Species Monitoring

SMEC

4 IMPACT ASSESSMENT

4.1.1 Vegetation Communities

The Proposal will remove an area of degraded remnant vegetation. This vegetation is considered to be generally consistent with Blakely's Red Gum - Long-leaved Box - Cootamundra Wattle shrubby woodland of the southern NSW South Western Slopes Bioregion (Benson 280) (Benson 2008) within the hilly areas of the quarry site, while is more representative of Grassy White Box - Blakely's Red Gum - Yellow Box woodland of the NSW South Western Slopes Bioregion (Benson 282) within the lower slopes.

However due to the disturbed nature of the vegetation within the site, it is considered that the vegetation community within the stockpile area of the Proposal site is exotic pasture with scattered remnant paddock trees. Approximately 7.2 ha of exotic pasture with scattered remnant paddock trees, including all vegetation communities onsite, will be removed/disturbed for the Proposal. This includes 5.1 ha of highly degraded derived native grassland, and 2.1 ha of Benson 282.

A total of 4 trees will be required to be removed for the Proposal (Figure 4). This includes three Blakely's Red Gum and one Kurrajong. One of the Blakely's Red Gum trees has been identified as a habitat tree containing hollows. Additionally, a maximum of 0.05 ha of Grassy White Box – Blakely's Red Gum – Yellow Box woodland of the NSW South Western Slopes Bioregion will be cleared for the access from Ladysmith Road.

4.1.2 Endangered Ecological Communities

Given the broad definition of this community and inclusion of degraded stands, the exotic pasture with scattered remnant paddock trees is likely to constitute Box Gum Woodland, an endangered ecological community (EEC) listed in NSW under the TSC Act. A total of 2.1 ha of this community will be removed for the quarry site itself. Stockpiling will occur over a further 4.87 ha of highly degraded derived native grassland that has a very low potential for regeneration if grazing was removed. This site has also been previously cultivated. An access track of 380 m in length and 6 m in width will be constructed leading into the quarry site which traverses both the highly degraded derived native grassland and the low condition Box Gum Woodland. This translates to an area of disturbance of approximately 0.23 ha.

Given the high level of disturbance of this vegetation community, the loss of this small amount of very degraded and low condition Box Gum Woodland is unlikely to be significant in the local landscape. Further, its importance is further reduced by the presence of less degraded and larger patches of this community occurring nearby which are associated with the Hume Highway, Ladysmith Road and also Kyeamba Travelling Stock Reserve. However, there will be a low level cumulative impact from small scale vegetation clearing.

The removal and/or disturbance of discrete patches of Box Gum Woodland in the roadside reserve to create an access from Ladysmith Road will not have a significant impact due to the small scale of clearing and the presence of this community in the Kyeamba Travelling Stock Reserve, located to the direct south of the project area.

Considerable areas of this community have been recently removed for the duplication of the nearby Hume Highway. This has led to a decline in the community in the locality. The proposal will add a cumulative impact of 7.2ha of decline for this community, albeit in a very low condition. Additionally, there will be a cumulative impact associated with the removal of 0.05ha of moderate condition Box-Gum Woodland for the access from Ladysmith Road. However, a Biodiversity Offset Strategy has been drafted to compensate

for the loss of this community and other biological features of the Hume Highway Duplication. This will aid in the improvement of the condition and extent of Box Gum Woodland in the wider locality into the future. The Biodiversity Offset Strategy will also take into account the area of low condition Box-Gum Woodland to be removed for the proposal, as well as the clearing required for the Tarcutta Bypass Project.

An Assessment of Significance was carried out under Part 3A of the EP&A Act to determine if the proposed works would significantly impact this EEC. This full assessment is presented at Appendix 3. The impacts resulting from the proposed activity are not deemed to be significant as the Ladysmith Road Quarry site does not contain areas of high conservation value. Whilst 7.2 ha of Box-Gum Woodland will be impacted at the site, this is of low conservation value in the area. A further 0.05ha of moderate conservation value Box-Gum Woodland will be removed to create an access from Ladysmith Road. However, given the small scale of clearing, its removal to create a small access way does not constitute a significant impact to Box Gum Woodland in the locality. The individual native plants likely to be affected by the proposal do play an important role in maintaining the long-term viability of the ecological community at the site scale, as they are the only remnants of the original community. However, this is not considered to have a significant impact to Box-Gum Woodland in the locality.

One hollow bearing tree is to be removed for the proposed activity, and bush rock and fallen timber will be relocated adjacent to the site so that these habitat features are retained. These features are sited in a highly disturbed agricultural setting and do not occur in abundance, and as such they play an important role in maintaining the long-term viability of the ecological community, hence their retention.

Duration of the impacts is not long term as there is no intention to extend quarrying operations beyond completion of the Tarcutta Bypass Project. Impacts in the area to be quarried (2.1ha) will be permanent and irreversible as the topsoil and subsoil will be removed, preventing the regeneration of native plants. However, as the vegetation is of low conservation value, this is not deemed to be significant. The removal of 0.05ha of Box-Gum Woodland for the access from Ladysmith Road will be permanent. However, given the small scale of clearing, this does not constitute a significant impact. Impacts in the stockpiling area will be temporary as material will be removed from site and used for the project. To reduce the residual impacts, topsoil from the quarry site will be stockpiled and stored for later re-spreading over the stockpile site and internal access following the completion of construction.

4.1.3 Threatened Flora

The Dwarf Bush Pea, listed as a vulnerable species under the TSC Act has been recorded as occurring within five kilometres of the Proposal area. An assessment of the likely occurrence of this flora species within the Proposal area was undertaken (see Table 3, Appendix 2).

The assessment found that the Proposal area is unlikely to provide habitat for this species. Soils in the Proposal area comprised of mottled Mesonatric Brown Sodosols on the mid to lower slopes (Chen & McKane 1996), and not the required sandy loams or clays of previously recorded specimens. The required soils would occur at a lower elevation in the landscape, and not within any of the impact areas.

4.1.4 Fauna

Quarrying Operations

Quarrying operations are likely to have an impact on common fauna species that utilise the limited habitat resources within the Proposal area. However as these species are highly mobile (mainly birds and kangaroos) and due to the presence of intact vegetation on the hill slope, outside of the area of impact, it is considered that this impact will be minor.

Sediment-laden run-off is likely to occur as a result of the quarry operations. No watercourses occur within the Proposal area. However, this run off may transport sediment disturbed by the quarry operations down the valley side, where the quarry site is situated, and into nearby waterways and dams. Clean water would be diverted around the site to reduce transport of sediments and therefore the impact on dams outside of the area of impact and riparian areas nearby. Downhill of the site, sediment laden water should be captured within primary sediment dams.

A current dam downstream of the potential quarry area potentially provides habitat for water birds within the locality such as the Australian Wood Duck *(Chenonetta jubata)* and Pacific Black Duck *(Anas superciliosa)*. Sedimentation of this resource would impact on the foraging potential for bird species during the life span of the works, should this occur. However, any impact will be temporary and minor in nature.

There is a natural rocky area forming an intermittent waterway in times of heavy rainfall along the valley side within the Proposal area that contains taller grass and scattered rocks and is likely to provide habitat for common reptile species. Part of this area is likely to be disturbed as part of the proposed quarry works. However, this impact is considered to be minimal and temporary, and is not considered to be significant given the extensive reptile habitat provided on the upper slope nearby and outside the Proposal area.

Stockpile

Stockpiling will only impact on understorey vegetation and the foraging habitat this provides to common fauna species. Further, it will be temporary in nature and no trees will need to be removed for these works. As such, stockpiling works will temporarily remove a small area of foraging habitat for common bird and mammal species (such as the kangaroo) during the works period.

Access Track Upgrades

As access track upgrades are likely to involve minor earthworks, it is possible that some foraging habitat for common fauna species will be temporarily removed. Some small areas of embedded rocks were scattered along the access track near the hill crest in the Proposal area which may provide habitat for reptile species. However, given the lack of native grass species, it is considered unlikely that these areas would contain potential habitat for any threatened reptile species and as these resources occur elsewhere in surrounding vegetation the loss of these features for common fauna species will be minor.

Approximately 0.05ha of vegetation may require removal for the instatement of an access from Ladysmith Road. This regenerating vegetation is in relatively good condition and may provide habitat for woodland birds that require cover. However, given the small scale of clearing, an abundance of this habitat within the Ladysmith Road corridor, and the immature nature of the vegetation, it is not considered that the access would minimise connectivity along this roadside strip for fauna species, particularly since there is already an informal access track established in the area.

4.1.5 Threatened Fauna

A large number of threatened fauna species listed under the TSC Act and/or EPBC Act have been recorded within the locality. A habitat assessment was undertaken for selected species that were considered likely to occur in the Proposal area to determine if suitable habitat was available (see Appendix 2).

There is the potential for several of the threatened bird species, including the Brown Treecreeper, Turquoise Parrot, and Superb Parrot to occur at the site (see Appendix 2). However, this potential of occurrence is considered to be low due to the general absence of hollow resources at the site for breeding habitat. There is also the potential for the Scarlet Robin to occur at the site during the autumn and winter seasons when it moves into more open and cleared habitats (Morcombe 2000), however this potential is low given the relatively small quantities of fallen timber at the site as this species requires abundant fallen timber and logs to forage from (DECC 2005).

The impacts to these species resulting from the proposed activity are not deemed to be significant as the Ladysmith Road Quarry site does not contain areas of high conservation value to these species, and they have a low potential for occurrence. Whilst 6.4ha of vegetation will be impacted at the site, this is of low conservation value in the area to these species due to the notable absence of required habitat features such as tree hollows for breeding (only 3 hollows present in one tree to be disturbed). A further 0.05ha of vegetation will be removed to create an access from Ladysmith Road, however, given the high degree of mobility of these species, it is not considered that the access would minimise connectivity along this roadside strip for fauna species, particularly since there is already an informal access track established in the area.

No important or threatened populations of these species occur in the Wagga Wagga LGA, and as such, the individual animals which may be affected by the proposal do not play an important role in maintaining the long-term viability of their respective species or populations.

Only one hollow bearing tree is to be removed for the proposed activity, which will be re-used as coarse woody debris and habitat for ground-dwelling fauna adjacent to the site. Small quantities of bush rock and fallen timber will be relocated from the quarry site. These features will be relocated adjacent to the site so that they are retained. These features are sited in a highly disturbed agricultural setting and do not occur in abundance, and as such they play an important role in maintaining the long-term viability of the respective species and their local populations.

The duration of the impacts are not long term as there is no intention to extend quarrying operations outside of the Tarcutta Bypass Project. The impacts in the area to be quarried (2.1ha) will be permanent and irreversible as the topsoil and subsoil will be removed, preventing the regeneration of native plants and habitat in this area. However, as the vegetation is of low conservation value to these species, its removal is not deemed to be significant. The removal of 0.05ha of Box-Gum Woodland for the access from Ladysmith Road will be permanent. However, given the small scale of clearing and the retention of connectivity, this does not constitute a significant impact to these species. Impacts in the stockpiling area will be temporary as material will be removed from site and used for the project.

It is likely that the higher slopes of the site may provide habitat for the threatened Pink-tailed Worm Lizard, Swift Parrot, Speckled Warbler, Hooded Robin, Scarlet Robin, Diamond Firetail, Turquoise Parrot, Varied Sittella, Greater Long-eared Bat and Spotted-tail Quoll. However, as no quarrying operations will be carried out in this area the direct impacts are considered to be negligible. In addition, as this area would not be directly impacted by the Proposal, further assessment of these species was not undertaken for this report. During operations the higher slopes should be delineated as a “No-Go” Zone for construction (Figure 4).

The proposal area was not considered to constitute habitat for the Diamond Firetail, ,Regent Honeyeater, Little Eagle, Squirrel Glider, Koala and Spotted-tail Quoll. No impact is expected to these threatened species thus no further assessments were carried out.

5 RECOMMENDED MITIGATION AND MANAGEMENT MEASURES

The following measures are recommended to be implemented, to minimise any potential impacts to common and rare flora and fauna and their habitats within the vicinity of the Proposal area.

- The access from Ladysmith Road should be located in the area already disturbed by the existing driveway to minimise vegetation removal and impacts to the EEC;
- Stockpiles should be located within an area that has been previously cleared of canopy species and not within the drip-line of any trees to be retained;
- Topsoil from the quarry area should be appropriately stockpiled and stored for re-spreading over the stockpile site and internal access area. The internal access area should be lightly tilled (or ripped, depending upon the level of compaction) prior to topsoil re-spreading to improve soil conditions. A rehabilitation management plan should be prepared to detail such actions;
- Management actions, in accordance with the CEMP for the Project should be prepared detailing measures for the control of noxious weeds found at the site prior to, during and after construction, in accordance with the requirements of the *Noxious Weeds Act 1993*;
- Monitoring of weed infestation is recommended at regular intervals after works have been undertaken in accordance with the CEMP;
- Appropriate erosion and sediment control measures will be constructed and maintained. A stabilisation and rehabilitation plan should be prepared for implementation following the completion of construction;
- Stockpiles should be protected with appropriate sediment and erosion control measures such as siltation fences and/or bunding to prevent unwanted runoff into the floodplains or aquatic ecosystems downstream;
- The re-instatement of felled and fallen timber and rocks associated with the Proposal as fauna habitat within the Proposal area and its surrounds, should be investigated;
- An ecologist is to be present during the felling of trees identified as habitat trees (see Figure 2); and
- During operations, the higher slopes to the east of the proposed work area (shown on Figure 4) should be delineated as a “No-Go” Zone for construction.

6 CONCLUSIONS

This survey was undertaken to assess the environmental impacts of quarrying operations, stockpiling of material and the upgrade of access tracks at the proposed quarry site at Ladysmith Road for the Tarcutta Bypass Project.

The flora of the Proposal site was surveyed and a fauna habitat assessment was undertaken to determine the diversity of species occurring or with the potential to occur within the Proposal area and surrounding area. In addition, an assessment of the likelihood for the potential occurrence of threatened species, populations and communities within the Proposal area was undertaken.

The Proposal will result in the loss of 4 mature paddock trees and an area of 7.2 ha of disturbed understorey dominated by exotic and pasture grasses and weeds. Additionally, the proposal will require the disturbance/removal of 0.05ha of regenerating woodland to create an access from Ladysmith Road.

The Proposal area was found to contain suitable habitat for a range of common and potentially threatened flora species including one (1) listed EEC, Box-Gum Woodland. The proposed quarrying operations will impact an area of 2.1 ha of a much degraded form of this community. The proposed stockpiling area will impact approximately 4.87 ha of highly degraded derived native grassland containing few native species which has a low potential for regeneration if the current grazing regime was removed. This site has been previously cultivated and has a low to unlikely potential to regenerate given the current management regime. An access track of 380m in length and 6m in width will be constructed through the highly degraded derived native grassland, disturbing a further 0.23 ha. Due to the poor condition of Box-Gum Woodland in this location and its siting in a highly cleared and fragmented agricultural landscape, the works are expected to have a low impact upon this EEC if appropriate mitigation measures outlined in this report are enacted.

The proposed access from Ladysmith Road will impact 0.05 ha of regenerating Box-Gum Woodland. Assessments carried out using the Draft Guidelines for Impact Assessments for Part 3A projects (DEC & DPI 2005) determined that the removal or disturbance of 0.05 ha of vegetation for the access to Ladysmith Road does not constitute a significant impact to the endangered ecological community in the locality due to the small scale of clearing, the retention of connectivity and the presence of this vegetation community in the Kyeamba Travelling Stock Reserve, located directly 2km south-south-east of the project area.

The assessment determined that the impact of removing 7.2 ha of low condition Box-Gum Woodland at the site and 0.05ha of moderate condition Box-Gum Woodland is not significant as:

- It is of low conservation value in the area,
- Although the individual plants likely to be affected by the proposal play an important role in maintaining the long-term viability of the ecological community at the site, they do not play an important role in the locality;
- Only one hollow bearing tree is to be removed for the proposed activity which will be re-used as coarse woody debris adjacent to the site. Bushrock and fallen timber will be relocated adjacent to the quarry site.
- The habitat features present at the site are located in a highly disturbed agricultural setting and do not occur in abundance, and as such they play an important role in maintaining the long-term viability of the ecological community. As such, they are being retained;

- The duration of the impacts are not long term as there is no intention to extend quarrying operations outside of the Tarcutta Bypass Project. The impacts in the area to be quarried (2.1ha) will be permanent and irreversible as the topsoil and subsoil will be removed, preventing the regeneration of native plants. However, as the vegetation is of low conservation value, this is not deemed to be significant.
- The removal of 0.05ha of Box-Gum Woodland for the access from Ladysmith Road will be permanent. However, given the small scale of clearing and the retention of connectivity, this does not constitute a significant impact to the ecological community.
- Impacts in the stockpiling area will be temporary as material will be removed from site and used for the project.

The site was also found to contain low quality habitat for several threatened bird species including the Brown Treecreeper, Turquoise Parrot, and Superb Parrot. However, their potential of occurrence is considered to be low due to the general absence of hollow resources at the site for breeding habitat and the limited foraging resources the site offers. There is also the potential for the Scarlet Robin to occur at the site during the autumn and winter season when it moves into more open and cleared habitats (Morcombe 2000).

The assessment concluded that the impact of removing 6.4ha of low condition habitat at the site and 0.05ha of moderate condition habitat is not significant as:

- The Ladysmith Road Quarry site does not contain areas of high conservation value to these species, and they have a low potential for occurrence. Whilst 6.4ha of vegetation will be impacted at the site, this is of low conservation value in the area to these species due to the general absence of required habitat features such as tree hollows for breeding (only 3 hollows present in one tree to be disturbed).
- A further 0.05ha of vegetation will be removed to create an access from Ladysmith Road. However, given the small scale of clearing and the retention of connectivity, the proposal does not constitute a significant impact to these highly mobile species.
- No important or threatened populations of these species occur in the Wagga Wagga LGA, and as such, the individual animals which may be affected by the proposal do not play an important role in maintaining the long-term viability of their respective species or populations.
- Only one hollow bearing tree is to be removed for the proposed activity, which will be re-used as coarse woody debris and habitat for ground-dwelling fauna adjacent to the site. Small quantities of bush rock and fallen timber will be relocated from the quarry site. These features will be relocated adjacent to the site so that they are retained. These features are sited in a highly disturbed agricultural setting and do not occur in abundance, and as such they play an important role in maintaining the long-term viability of the respective species and their local populations.
- The duration of the impacts are not long term as there is no intention to extend quarrying operations outside of the Tarcutta Bypass Project. The impacts in the area to be quarried (2.1ha) will be permanent and irreversible as the topsoil and subsoil will be removed, preventing the regeneration of native plants and habitat in this area. However, as the vegetation is of low conservation value to these species, its removal is not deemed to be significant. The removal of 0.05ha of Box-Gum Woodland for the access from Ladysmith Road will be permanent. However, given the small area to be cleared, the retention of connectivity and the high degree of mobility of these species, the proposal does not constitute a significant impact. Impacts in the stockpiling area will be temporary as material will be removed from site and used for the project.

Further, it is considered that any impacts resulting from the proposed activity can be managed by implementing the recommendations presented in Section 5 of this report.

7 REFERENCES

Australian Museum (2006) Birds in Backyards. www.birdsinbackyards.net, accessed April 2010.

ACT Government (2005) A Vision Splendid of the Grassy Plains Extended: ACT Lowland Native Grassland Strategy. Action Plan No. 28 (Arts, Heritage and Environment, Canberra).

Barrett, G.W., Ford, H.A. and Recher, H.F. (1994) Conservation of woodland birds in a fragmented rural landscape. *Pacific Conservation Biology* 1: 245-256 In Department of Environment, Climate Change and Water (DECCW) (2008) NSW Scientific Committee final determination: Brown treecreeper (eastern subspecies) – vulnerable species listing http://www.nationalparks.nsw.gov.au/npws.nsf/Content/Brown+treecreeper+eastern+subspecies+-+vulnerable+species+listing Accessed February 2010,

Bureau of Meteorology (2010) [Online Database] Daily Weather Observations: Wagga Wagga NSW. www.bom.gov.au. Accessed February 2010.

Bureau of Meteorology (2009) [Online Database] Daily Weather Observations: Wagga Wagga NSW. www.bom.gov.au. Accessed October 2009.

Chen XY & McKane DJ (1996) Soil Landscapes of the Wagga Wagga 1:100 000 Sheet, Department of Land and Water Conservation, Sydney.

Cropper S (1993) Management of Endangered Plants. CSIRO, Melbourne.

Debus, S.J.S. & Ley, A.J. (2009) Aspects of the breeding cycle of the Little Eagle *Hieraaetus morphnoides, Australian Field Ornithology,* 26, pp 76-99.

Department of Environment, Climate Change and Water (DECCW) (2010a) [Online Database] Threatened Species: species, populations and ecological communities of NSW. www.threatenedspecies.environment.nsw.gov.au Accessed February 2010.

DECCW (2010b) Varied Sittella (*Daphoenositta chrysoptera*) vulnerable species listing, NSW Scientific Committee - final determination. http://www.environment.nsw.gov.au/determinations/variedsittellaFD.htm, accessed April 2010.

Department of Environment, Climate Change and Water (DECCW) (2009a) NSW National Parks and Wildlife Service: Wildlife Atlas Data, received October 2009.

Department of Environment, Climate Change and Water (DECCW) (2009b) Endangered Ecological Community and Threatened Species Profiles http://www.threatenedspecies.environment.nsw.gov.au/tsprofile/index.aspx Accessed October 2009.

Department of Environment, Climate Change and Water (DECCW) (2009c) Vegetation Types Database http://www.environment.nsw.gov.au/biobanking/vegtypedatabase.htm Accessed February 2010.

Department of Environment, Climate Change and Water (DECCW) (2008a) Vegetation Types Database – BioMetric and Biobanking tool. Database accessed online http://www.environment.nsw.gov.au/biobanking/vegtypedatabase.htm Accessed February 2010 Accessed February 2010.

Department of Environment, Climate Change and Water (DECCW) (2008b) Recovery plan for the koala (*Phascolarctos cinereus*) November 2008 Department of Environment, Climate Change and Water.

Department of Environment, Climate Change and Water (DECCW) (2005) Threatened species: species, populations and ecological communities of NSW http://www.threatenedspecies.environment.nsw.gov.au/index.aspx Accessed February 2010.

Department of Environment and Heritage (DEH) (2006) White Box-Yellow Box-Blakeley's Red Gum Woodland and Derived Native Grasslands EPBC Act Policy Statement, Australian Government Department of Environment and Heritage.

Department of Primary Industries (NSW) (2009), [Online Database] Noxious Weed Declarations for Wagga Wagga LGA. http://www.dpi.nsw.gov.au, Accessed October 2009.

Department of the Environment, Water, Heritage and the Arts (DEWHA) (2010) [Online Database] Environment Protection and Biodiversity Conservation Act Protected Matters Search Tool. http://www.environment.gov.au/erin/ert/epbc/index.html , Accessed February 2010.

Environment Australia (2000) Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1. - Summary Report. Department of Environment and Heritage, Canberra. In Department of Environment, Climate Change and Water (DECCW) (date unknown) Identification guidelines for endangered ecological communities: White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland) http://www.environment.nsw.gov.au/resources/nature/box-gumIdGuidelines.pdf Accessed February 2010.

Keith D. (2004) A compilation map of native vegetation for New South Wales, NSW National Parks and Wildlife Service, Hurstville.

Lunney D, Matthews A, Moon C and Ferrier S (2000) Incorporating habitat mapping into practical koala conservation on private lands, *Conservation Biology* 14(3), pp 669 – 680.

Morcombe, M. (2000) *Field Guide to Australian Birds*, Steve Parish Publishing, Archerfield Queensland.

National Parks and Wildlife Service (NPWS) (2002) Identification Guidelines for Endangered Ecological Communities: White Box Yellow Box Blakely's Red Gum Woodland (Box Gum Woodland), NSW National Parks and Wildlife Service, Hurstville.

Sinclair Knight Merz (SKM) (2006) Hume Highway Duplication: Sturt Highway to Tarcutta, Kyeamba Hill and Little Billabong Ecological Impact Assessment November 2006.

Threatened Species Scientific Committee (TSSC) (2006a). Commonwealth Listing Advice on Amendments to the List of Ecological Communities under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act): White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland. [Online]. Department of the Environment, Water, Heritage and the Arts.

van der Ree, R., Soanes, K., Wilson, C. & Harrison, L. (2009) *Hume Highway Duplication Threatened Species (Squirrel Glider) Monitoring Draft Report Autumn 2009,* unpublished report to the Roads and Traffic Authority, New South Wales, Australian Centre for Urban Ecology, Royal Botanic Gardens Melbourne

Yates, C.J. & R.J. Hobbs (1997) Temperate Eucalypt Woodlands: a review of their status, processes threatening their persistence and techniques for restoration in *Australian Journal of Botany* 45: 949-973.

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APPENDIX 1 SPECIES RECORDED DURING SURVEY

Table 1 Flora species recorded

Family	Scientific Name	Common Name
Adiantaceae	*Cheilanthes sieberi subsp. sieberi*	Poison Rock Fern, Mulga Fern
Asteraceae	*Taraxacum officinale**	Dandelion
Boraginaceae	*Echium plantagineum^*	Patersons Curse
Campanulaceae	*Wahlenbergia communis*	Bluebell sp.
Clusiaceae	*Hypericum perforatum^*	St Johns Wort
Cyperaceae	*Carex appressa*	Tall Sedge
Fabaceae - Faboideae	*Acacia paradoxa*	Kangaroo Thorn
Fabaceae - Faboideae	*Acacia implexa*	-
Fabaceae – Faboideae	*Trifolium arvense**	Haresfoot Clover
Geraniaceae	*Geranium solanderi*	Native Geranium
Myrtaceae	*Eucalyptus albens*	White Box
Myrtaceae	*Eucalyptus blakelyi*	Blakely's Red Gum
Myrtaceae	*Eucalyptus microcarpa*	Grey Box
Myrtaceae	*Eucalyptus polyanthemos*	Red Box
Phormiaceae	*Dianella revoluta*	Blue Flax Lily
Poaceae	*Aristida personata*	Purple Wire-grass
Poaceae	*Austrodanthonia sp.*	Wallaby Grass
Poaceae	*Austrostipa scabra subsp. falcata*	Speargrass
Poaceae	*Avena barbata**	Bearded Oats
Poaceae	*Bothriochloa macra*	Red-legged Grass
Poaceae	*Briza minor**	Quaking Grass
Poaceae	*Bromus rubens**	Red Brome
Poaceae	*Elymus scaber*	Wheat Grass

Family	Scientific Name	Common Name
Poaceae	*Eragrostis spp.*	Lovegrass
Poaceae	*Hordeum sp.**	Barley Grass
Poaceae	*Microlaena stipoides*	Weeping Grass
Poaceae	*Paspalum urvillei**	Giant Paspalum
Poaceae	*Poa sieberiana*	Snow Grass
Poaceae	*Sporobolus creber*	Rats tail Grass
Polygonaceae	*Acetosella vulgaris**	Sheep Sorrel
Plantaginaceae	*Plantago lanceolata**	Plantain
Scrophulariaceae	*Verbascum thapsus**	Great Mullein
Sterculiaceae	*Brachychiton acerifolius*	Illawarra Flame Tree
Sterculiaceae	*Brachychiton populneus*	Kurrajong

Table 2 Fauna species recorded

Family	Scientific Name	Common Name
Accipitridae	*Aquila audax*	Wedge-tailed Eagle
Bovidae	*Bos taurus**	Domestic Cattle
Cacatuidae	*Cacatua roseicapilla*	Galah
Falconidae	*Falco cenchroides*	Nankeen Kestrel
Leporidae	*Oryctolagus cuniculus*	European Rabbit
Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo
Maluridae	*Malurus cyaneus*	Superb Fairy Wren
Maluridae	*Malurus lamberti*	Variegated Fairy Wren
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater
Petroicidae	*Microeca fascinans*	Jacky Winter
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail

APPENDIX 2 THREATENED SPECIES HABITAT ASSESSMENT

Table 3 Threatened Flora Species Habitat Assessment

Species Name	TSC Act Status	EPBC Status	Habitat Requirements (DECC 2005)	Likelihood of Occurrence
Ammobium craspedioides Yass Daisy	V	V	The Yass Daisy is a rosette-forming perennial. The spring flower heads are hemispherical buttons, to 20 mm wide, and surrounded at the base by papery leaf-like structures (bracts). Found from near Crookwell on the Southern Tablelands to near Wagga Wagga on the South Western Slopes. Most populations are in the Yass region. Found in dry forest, Box-Gum Woodland and secondary grassland derived from clearing of these communities. Grows in association with a large range of eucalypts (*Eucalyptus blakelyi, E. bridgesiana, E. dives, E. goniocalyx, E. macrorhyncha, E. mannifera, E. melliodora, E. polyanthemos, and E. rubida*). Apparently unaffected by light grazing, as populations persist in some grazed sites.	This species is often associated with a predominantly native grassy understorey or in secondary native pasture. Although associated species, *Eucalyptus blakelyi* and *E. polyanthemos* occur within the Proposal area, suitable habitat is not available for this species due to intensive grazing and the dominance by exotic species, No further assessment is required.
Pine Donkey Orchid *Diuris tricolor* (syn. *Diuris sheaffiana)*	V	V	The Pine Donkey Orchid is distributed on the western slopes of NSW, extending from south of Narrandera all the way to the far north of NSW. Localities include several sites west of Wagga Wagga. This species inhabits sclerophyll forest among grass, often associated with native Cypress Pine (*Callitris* spp.). It is found in sandy soils, either on flats or small rises. This species is usually recorded as common and locally frequent in populations, though they have also been observed in lower number, with only one or two plants observed. They have been recorded growing in large colonies as well as in disturbed areas. Associated species include *Callitris glaucophylla*, *Eucalyptus populnea*, *Eucalyptus intertexta*, Ironbark and Acacia shrubland. The understorey where this species has been recorded is often grassy with herbaceous plants such as Bulbine species. The Pine Donkey Orchid flowers from September to November or generally spring.	The Proposal area is not considered to provide potential habitat for this species due to the absence of sandy soils and associated species, such as *Callitris glaucophylla*, *Eucalyptus populnea*, *Eucalyptus intertexta*, Ironbark and the absence of Acacia shrubland. No further assessment is required.
Dwarf Bush Pea *Pultenaea humilis*	V	-	*Pultenaea humilis* is rare in New South Wales and Tasmania, but relatively common in Victoria (de Kok and West 2002). In NSW, *Pultenaea humilis* is currently known from three confirmed localities in the NSW South Western Slopes bioregion. The extent of occurrence of *Pultenaea humilis* in NSW is estimated to be approximately 6 000 km2. However the total population of *Pultenaea*	Surveys were carried out in the flowering period of this species; however it was not detected. Soils in vicinity to this record are characterised by mottled Mesonatric Brown Sodosols on the mid to lower slopes (Chen & McKane 1996). The Proposal area does not have the required soils to

			humilis in NSW is unknown. Flowering from October to December; fruiting from November to December. *Pultenaea humilis* is found in isolated remnants of native woodland and forest communities that occur in extensively cleared agricultural landscapes. Occurs on a variety of soils ranging from sandy loams to clays.	support this species due to its high position in the landscape where clays and sandy loams are not present. No further assessment is required.

Table 4 Threatened Fauna Species Habitat Assessment

Species Name	TSC Act Status	EPBC Status	Habitat Requirements (DECC 2005)	Likelihood of Occurrence
Pink-tailed Worm Lizard *Aprasia parapulchella*	V	V	The Pink-tailed Worm Lizard is only known from the Central and Southern Tablelands, and the South Western Slopes. There is a concentration of populations in the Canberra/Queanbeyan Region. Other populations have been recorded near Cooma, Yass, Bathurst, Albury and West Wyalong. This species is also found in the Australian Capital Territory. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (*Themeda australis*). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks; the burrows have been constructed by and are often still inhabited by small black ants and termites. Feeds on the larvae and eggs of the ants with which it shares its burrows. It is thought that this species lays 2 eggs inside the ant nests during summer; the young first appear in March.	There is a natural rocky depression within the Proposal area that contains taller grass and scattered rocks within the quarry area that may contain very limited habitat for this species. However, it is considered that this is sub optimal habitat. There is potential for this species to occur in the area upslope from the proposed quarry (Figure 4). However as this area is not within the area of impact no further assessment is required.
Striped Legless Lizard *Delma impar*	V	V	The Striped Legless Lizard occurs in the Southern Tablelands, the South Western Slopes and possibly on the Riverina. Populations are known in the Goulburn, Yass, Queanbeyan, Cooma and Tumut areas. Also occurs in the ACT, Victoria and south-eastern South Australia. Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Also found in secondary grassland near Natural Temperate Grassland and occasionally in open Box-Gum Woodland. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass (*Themeda australis*), spear-grasses *Austrostipa* spp. and poa tussocks *Poa* spp., and occasionally wallaby grasses *Austrodanthonia* spp. Sometimes present in modified grasslands with a significant content of exotic grasses. Sometimes found in grasslands with significant amounts of surface rocks, which are used for shelter. Actively hunts for spiders, crickets, moth larvae and cockroaches. Two papery eggs are laid in early summer. Goes below ground or under rocks or logs over winter.	The Proposal area does not contain suitable grassland to provide habitat for this species due to high level of grazing and dominance by exotic non tussock forming species. There is potential habitat for this species within the surrounding area, on the grassy, rocky hill slope where Wallaby Grass and Spear Grass was recorded. However as this area is not within the area of impact no further assessment is required.
Gang Gang Cockatoo *Callocephalon fimbriatum*	V	-	The Gang-gang Cockatoo is distributed from southern Victoria through south- and central-eastern New South Wales. In New South Wales, the Gang-gang Cockatoo is distributed from the south-east coast to the Hunter region, and inland to the Central Tablelands and south-west slopes. It occurs regularly in the Australian Capital Territory. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee. In summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In winter, may occur at lower altitudes in drier more open eucalypt forests and woodlands, and often found in	Although this species occurs at lower altitudes in winter in open eucalypt forests and woodlands, the proposal area lacks their preferred habitat, Box-Ironbark assemblages. No further assessment is required.

			urban areas. May also occur in sub-alpine Snow Gum Eucalyptus pauciflora woodland and occasionally in temperate rainforests. Move to lower altitudes in winter, preferring more open eucalypt forests and woodlands, particularly in box-ironbark assemblages, or in dry forest in coastal areas. Favours old growth attributes for nesting and roosting.	
Brown Treecreeper *Climacteris picumnus victoriae*	V	-	The Brown Treecreeper is endemic to eastern Australia and occurs in eucalypt forests and woodlands of inland plains and slopes of the Great Dividing Range. It is less commonly found on coastal plains and ranges. The western boundary of the range of *Climacteris picumnus victoriae* runs approximately through Wagga Wagga, Temora, Forbes, Dubbo and Inverell and along this line the subspecies intergrades with the arid zone subspecies of Brown Treecreeper *Climacteris picumnus picumnus*. The eastern subspecies lives in eastern NSW in eucalypt woodlands through central NSW and in coastal areas with drier open woodlands such as the Snowy River Valley, Cumberland Plains, Hunter Valley and parts of the Richmond and Clarence Valleys. The population density of this subspecies has been greatly reduced over much of its range, with major declines recorded in central NSW and the northern and southern tablelands. Declines have occurred in remnant vegetation fragments smaller than 300 hectares that have been isolated or fragmented for more than 50 years. Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains. Sedentary, considered to be resident in many locations throughout its range; present in all seasons or year-round at many sites; territorial year-round, though some birds may disperse locally after breeding. Gregarious and usually observed in pairs or small groups of eight to 12 birds; terrestrial and arboreal in about equal proportions; active, noisy and conspicuous while foraging on trunks and branches of trees and amongst fallen timber; spend much more time foraging on the ground and fallen logs than other treecreepers. When foraging in trees and on the ground, they peck and probe for insects, mostly ants, amongst the litter, tussocks and fallen timber, and along trunks and lateral branches; up to 80% of the diet is comprised of ants; other invertebrates (including	This species is known to inhabit Box Gum Woodland, the vegetation community present within the Proposal area. This remnant has been modified by clearing and continues to be disturbed by the present land use as grazing pasture. Therefore it is considered that the remnant paddock trees that are considered to be part of Box-Gum Woodland offer sub optimal habitat for this species and that the surrounding woodland vegetation on the hill slope that has not been disturbed would provide better quality habitat for this species, though still limited in comparison to the areas of known habitat nearby in travelling stock reserves. **See Appendix 3 for an assessment of this species against the Part 3A Draft Guidelines for Threatened Species Assessment (DEC & DPI 2005)**

			spiders, insects larvae, moths, beetles, flies, hemipteran bugs, cockroaches, termites and lacewings) make up the remaining percentage; nectar from Mugga Ironbark (E. sideroxylon) and paperbarks, and sap from an unidentified eucalypt are also eaten, along with lizards and food scraps; young birds are fed ants, insect larvae, moths, craneflies, spiders and butterfly and moth larvae. Hollows in standing dead or live trees and tree stumps are essential for nesting. The species breeds in pairs or co-operatively in territories which range in size from 1.1 to 10.7 ha (mean = 4.4 ha). Each group is composed of a breeding pair with retained male offspring and, rarely, retained female offspring. Often in pairs or cooperatively breeding groups of two to five birds. Breeding habitat is in live trees, dead standing or fallen timber, stumps or posts with hollows greater than 6 cm diameter.	
Swift Parrot *Lathamus discolor*	E	E	Migrates to the Australian south-east mainland between March and October. On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany (*Eucalyptus robusta*), Spotted Gum (*Corymbia maculata*), Red Bloodwood (*C. gummifera*), Mugga Ironbark (*E. sideroxylon*), and White Box (*E. albens*). Commonly used lerp infested trees include Grey Box (*E. microcarpa*), Grey Box (*E. moluccana*) and Blackbutt (*E. pilularis*). Return to some foraging sites on a cyclic basis depending on food availability. Following winter they return to Tasmania where they breed from September to January, nesting in old trees with hollows and feeding in forests dominated by Tasmanian Blue Gum E. globulus.	There is potential foraging habitat within the Proposal area due to the occurrence of White Box. However due to the small number of these trees that will be potentially disturbed which do not provide abundant flowering or lerp infestations, and with the presence of remnant woodland vegetation on the hill slope which potentially provides more suitable habitat, this is not considered to be an important food resource for this species. Breeding habitat is also absent as this species only breeds in Tasmania. No further assessment is required.
Turquoise Parrot *Neophema pulchella*	V	-	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. Nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.	The modified nature of the Proposal area due to clearing and grazing is considered to provide sub-optimal habitat for this species along the edge near that vegetated hill slope. It is considered that the vegetation hill slope would provide better quality foraging habitat for this species due to the presence of several grass species including Spear Grass and Wallaby Grass. Small and medium sized hollows were observed in a small proportion of the remnant trees within the Proposal area. However due to the exposed nature of these trees and distance from the woodland vegetation on the hill slope they are considered to provide sub optimal breeding habitat. **See Appendix 3 for an assessment of this species against the Part 3A Draft Guidelines for Threatened Species Assessment (DEC & DPI 2005)**

Greater Long-eared Bat (south eastern form) *Nyctophilus timoriensis*	V	V	The south eastern form of the Greater Long-eared Bat distribution coincides approximately with the Murray Darling Basin, with the Pilliga Scrub region being the distinct stronghold for this species. This species inhabits a range of vegetation types, including mallee, bulloke *Allocasuarina leuhmanni* and box eucalypt dominated communities. It is more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. This species roosts in tree hollows, crevices, and under loose bark. They area a slow flying agile bat, utilising the understorey to hunt non-flying prey, especially caterpillars and beetles, and will even hunt on the ground. Mating takes place in autumn with one or two young born in late spring to early summer.	The vegetation within the Proposal area contains a modified Box-Gum Woodland community which has been reduced in canopy and native grass species due to past and present land uses. The Proposal area is considered to provide potential sub optimal foraging habitat for this species if present, due to disturbance and the absence of an understorey which this species is known to utilise to forage on non-flying prey species. In addition the Proposal area is not considered to provide suitable breeding habitat for this species due to the absence of suitable sized hollows. The surrounding area includes remnant, intact vegetation on a hillside that will not be directly impacted as part of the proposed works. This vegetation is considered to provide better quality foraging habitat if this species is present within the area, No further assessment is required.
Superb Parrot *Polytelis swainsonii*	V	-	Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Nest in small colonies, often with more than one nest in a single tree. Breed between September and January. May forage up to 10 km from nesting sites, primarily in grassy box woodland. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain.	Due to the highly modified nature of the Box-Gum Woodland vegetation within the Proposal area it is considered to provide sub optimal foraging habitat for this species. With the vegetation on the hill slope, outside of the area of impact considered to provide better quality habitat. This species is known to breed in nests in hollows mainly in tall riparian River Red Gum Forest or Woodland. Due to the small number of hollows within the Proposal area and the disturbed nature of the vegetation community it is considered highly unlikely that this species would utilise the hollows for breeding. Rather more intact woodland found in the locality with Travelling Stock Reserves and the River Red Gums along Tarcutta Creek are considered to provide greater potential for breeding habitat. No further assessment is required. **See Appendix 3 for an assessment of this species against the Part 3A Draft Guidelines for Threatened Species Assessment (DEC & DPI 2005)**

Speckled Warbler *Pyrrholaemus saggitatus*	V	-	The Speckled Warbler lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. The diet consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees. Pairs are sedentary and occupy a breeding territory of about ten hectares, with a slightly larger home-range when not breeding. The rounded, domed, roughly built nest of dry grass and strips of bark is located in a slight hollow in the ground or the base of a low dense plant, often among fallen branches and other litter. A side entrance allows the bird to walk directly inside. A clutch of 3-4 eggs is laid, between August and January, and both parents feed the nestlings. The eggs are a glossy red-brown, giving rise to the unusual folk names 'Blood Tit' and 'Chocolatebird'. Some cooperative breeding occurs. The species may act as host to the Black-eared Cuckoo. Speckled Warblers often join mixed species feeding flocks in winter, with other species such as Yellow-rumped, Buff-rumped, Brown and Striated Thornbills.	The Proposal area is not considered to provide habitat for this species due to its disturbed nature resulting in dominance by non tussock forming exotic species. There is potential habitat for this species on the vegetated hill slope, outside of the proposed area of impact, where native grasses and shrubs occur. No further assessment is required.
Diamond Firetail *Stagnopleura guttata*	V	-	Groups separate into small colonies to breed, between August and January. Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Feeds exclusively on the ground, on ripe and partly-ripe grass and herb seeds and green leaves, and on insects (especially in the breeding season).Usually encountered in flocks of between five to 40 birds, occasionally more. Nests are globular structures built either in the shrubby understorey, or higher up, especially under hawk's or raven's nests. Birds roost in dense shrubs or in smaller nests built especially for roosting. Appears to be sedentary, though some populations move locally, especially those in the south. Has been recorded in some towns and near farm houses.	No breeding habitat is present because a shrubby understorey is absent. As populations are sedentary and there is no breeding habitat available at the sites, it is unlikely that they would forage within the Proposal area. No further assessment is required.
Little Eagle *Hieraaetus morphnoides*	V	-	The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. It occurs as a single population throughout NSW. It occupies open eucalypt forest, woodland or open woodland. She oak or acacia woodlands and riparian woodlands of interior NSW are also used. This species nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter. Lays two or three eggs during spring, and young fledge in early summer. Preys on birds, reptiles and mammals, occasionally adding large insects and carrion.	No breeding opportunities are present for this species within the area of proposed works as this species makes its nest within a remnant patch of tall vegetation. The vegetation within the site is sparse and disturbed, which would leave the nest very exposed. There is potential for this species to forage over the area. However, given that this species does most of its foraging in flight (Debus and Ley 2009) it is not considered that the proposal activities would impact upon this species. No further assessment is required.

Scarlet Robin *Petroica boodang*	V	-	The Scarlet Robin is found from SE Queensland to SE South Australia and also in Tasmania and SW Western Australia. In NSW, it occurs from the coast to the inland slopes. After breeding, some Scarlet Robins disperse to the lower valleys and plains of the tablelands and slopes. Some birds may appear as far west as the eastern edges of the inland plains in autumn and winter. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude. The Scarlet Robin is primarily a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding. In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees. The Scarlet Robin is a quiet and unobtrusive species which is often quite tame and easily approached. Birds forage from low perches, fence-posts or on the ground, from where they pounce on small insects and other invertebrates which are taken from the ground, or off tree trunks and logs; they sometimes forage in the shrub or canopy layer. Scarlet Robin pairs defend a breeding territory and mainly breed between the months of July and January; they may raise two or three broods in each season. This species' nest is an open cup made of plant fibres and cobwebs and is built in the fork of tree usually more than 2 metres above the ground; nests are often found in a dead branch in a live tree, or in a dead tree or shrub. Eggs are pale greenish-, bluish- or brownish-white, spotted with brown; clutch size ranges from one to four. Birds usually occur singly or in pairs, occasionally in small family parties; pairs stay together year-round. In autumn and winter, the Scarlet Robin joins mixed flocks of other small insectivorous birds which forage through dry forests and woodlands.	There is potential habitat for the Scarlet Robin in the Box-Gum regrowth where the Ladysmith Road access is to be constructed. There is also potential autumn and winter habitat for this species in the grazed paddocks with the scattered trees classified as vegetation community Benson 280. **See Appendix 3 for an assessment of this species against the Part 3A Draft Guidelines for Threatened Species Assessment (DEC & DPI 2005)**
Regent Honeyeater *Xanthomyza phrygia*	E	E	The Regent Honeyeater is a flagship threatened woodland bird whose conservation will benefit a large suite of other threatened and declining woodland fauna. The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River She oak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. Every few years non-breeding flocks are seen	It is unlikely that this species would occur within the Proposal area due to the disturbed nature of the vegetation community and the absence of ironbark species. In addition there was a low abundance of mistletoes and low canopy cover. No further assessment is required.

			foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast. Birds are occasionally seen on the south coast. In the last 10 years Regent Honeyeaters have been recorded in urban areas around Albury where woodlands tree species such as Mugga Ironbark and Yellow Box were planted 20 years ago. The Regent Honeyeater is a generalist forager, which mainly feeds on the nectar from a wide range of eucalypts and mistletoes. Key eucalypt species include Mugga Ironbark, Yellow Box, Blakely's Red Gum, White Box and Swamp Mahogany. Also utilises: *E. microcarpa*, *E. punctata*, *E. polyanthemos*, *E. mollucana*, *Corymbia robusta*, *E. crebra, E. caleyi, Corymbia maculata, E.mckieana, E. macrorhyncha, E. laevopinea*, and *Angophora floribunda*. Nectar and fruit from the mistletoes *A. miquelii, A. pendula, and A. cambagei* are also eaten during the breeding season. When nectar is scarce lerp and honeydew comprise a large proportion of the diet. Insects make up about 15% of the total diet and are important components of the diet of nestlings. A shrubby understorey is an important source of insects and nesting material. Colour-banding of Regent Honeyeater has shown that the species can undertake large-scale nomadic movements in the order of hundreds of kilometres. However, the exact nature of these movements is still poorly understood. It is likely that movements are dependent on spatial and temporal flowering and other resource patterns. To successfully manage the recovery of this species a full understanding of the habitats used in the non-breeding season is critical. There are three known key breeding areas, two of them in NSW - Capertee Valley and Bundarra-Barraba regions. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River She oak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and She oaks. Also nest in mistletoe haustoria. An open cup-shaped nest is constructed of bark, grass, twigs and wool by the female. Two or three eggs are laid and incubated by the female for 14 days. Nestlings are brooded and fed by both parents at an average rate of 23 times per hour and fledge after 16 days. Fledglings fed by both parents 29 times per hour.	
Hooded Robin *(Melanodryas cucullata cucullata)*	V	-	The Hooded Robin is widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. However, it is common in few places, and rarely found on the coast. It is considered a sedentary species, but local seasonal movements are possible. The south-eastern form (subspecies cucullata is found from Brisbane to Adelaide and throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by subspecies picata. Two other subspecies occur outside NSW. It prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. This species requires structurally diverse habitats featuring mature eucalypts,	The proposal area is not considered to provide habitat for this species due to the low degree of structural habitat diversity. It is considered likely that this species may use the structurally diverse habitat on the hill slopes located to the south-south-east of the proposal. However, this is located outside the area of direct impact. No further assessment is required.

			saplings, some small shrubs and a ground layer of moderately tall native grasses. They often perch on low dead stumps and fallen timber or on low-hanging branches, using a perch-and-pounce method of hunting insect prey. Territories range from around 10 ha during the breeding season, to 30 ha in the non-breeding season.	
Varied Sittella *(Daphoenositta chrysoptera)*	V	V	Varied Sittellas are endemic and widespread in mainland Australia. They are a sedentary species that inhabit eucalypt woodlands and forests throughout their range. They prefer rough-barked trees like stringybarks and ironbarks or mature smooth barked gums with hollows or dead branches. They forage predominantly by gleaning on tree trunks or branches, moving downwards or along branches, searching for insects and nest in a deep open cup, like a cone, of bark and spider web, decorated on the outside with long pieces of bark, camouflaged to look like the fork or branch where it is placed (Australian Museum 2006; DECCW 2010b). Threats to this species include reduction in the structural complexity of habitat, including reductions in canopy cover, shrub cover, ground cover, logs, fallen branches and leaf litter;	The proposal area is not considered to provide habitat for this species due to the low degree of structural habitat diversity. It is considered likely that this species may use the structurally diverse habitat on the hill slopes located to the south-south-east of the proposal. However, this is located outside the area of direct impact. No further assessment is required.
Squirrel Glider *Petaurus norfolcensis*	V	-	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Live in family groups of a single adult male one or more adult females and offspring. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein.	The Proposal area is not considered to provide potential habitat for this species due to the low density of trees and lack of midstorey, which they are known to have a preference for. This species has also been observed approximately 1km away in the Kyeamba Travelling Stock Reserve (van der Ree et al 2009). However, this is outside the construction area and as such is unlikely to be affected. There is potential for the surrounding vegetation on the hill slope to provide potential habitat for this species due to the large mature hollow bearing trees observed. However the low degree of connectivity to larger, more suitable habitat for this species and lack of tall trees suitable for gliding and movement reduce the likelihood of the surrounding vegetation being utilised. No further assessment is required.
Koala *Phascolarctos cinereus*	V	-	The Koala has a fragmented distribution throughout eastern Australia from north-east Queensland to the Eyre Peninsula in South Australia. In NSW it mainly occurs on the central and north coasts with some populations in the western region. It was historically abundant on the south coast of NSW, but now occurs in sparse and possibly disjunct populations. Koalas are also known from several sites on the southern tablelands. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in	This species is unlikely to inhabit the Proposal area. Although the primary feed tree species for the region are present including Blakely's Red Gum and White Box, Koalas are unlikely to utilise these sites due to their position in the landscape. Higher elevations such as that experienced at the Proposal area produce lower soil fertility, therefore fewer nutrients in feed trees. (Lunney et

			any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Generally solitary, but have complex social hierarchies based on a dominant male with a territory overlapping several females and sub-ordinate males on the periphery. Females breed at two years of age and produce one young per year.	al 2000). Further, in low rainfall areas, Koalas have also been shown to use areas of higher soil moisture such as waterways (DECC 2008b) which do not occur in close vicinity due to its position in the landscape. No further assessment is required.
Spotted-tail Quoll *Dasyurus maculatus maculatus*	V	E	The range of the Spotted-tailed Quoll has contracted considerably since European settlement. It is now found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. Only in Tasmania is it still considered common. Average litter size is five; both sexes mature at about one year of age. Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock crevices, boulder fields and rocky-cliff faces as den sites. Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and may raid possum and glider dens and prey on roosting birds. Use 'latrine sites', often on flat rocks among boulder fields and rocky cliff-faces; these may be visited by a number of individuals; latrine sites can be recognised by the accumulation of the sometimes characteristic 'twisty-shaped' faeces deposited by animals. Consumes a variety of prey, including gliders, possums, small wallabies, rats, birds, bandicoots, rabbits and insects; also eats carrion and takes domestic fowl. Females occupy home ranges up to about 750 hectares and males up to 3500 hectares; usually traverse their ranges along densely vegetated creek lines.	The Proposal area is not considered to provide suitable den habitat for this species due to the small hollows found within the paddock trees. The vegetation on the hill slope may provide den habitat for this species due to the presence of rock crevices and boulders, however this area will not be impacted as part of the proposed works. Due to the modified nature of the woodland vegetation found within the Proposal area, the foraging habitat is considered to be sub-optimal, if this species was to occur within the surrounding area. It is considered that the remnant undisturbed vegetation on the hill slope would provide better quality foraging habitat.

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APPENDIX 3 ASSESSMENTS OF SIGNIFICANCE UNDER SECTION 3A OF THE EP&A ACT

The following questions are provided in Appendix 3 of the Draft Guidelines for Threatened Species Assessment (DEC & DPI 2005) to aid in the identification of important factors and/or heads of consideration that must be considered by proponents and consultants when assessing potential impacts on threatened species, populations, or ecological communities, or their habitats for development applications assessed under Part 3A of the *Environmental Planning and Assessment Act 1979.*

a) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

i. displaces or disturbs threatened species and/or populations;
ii. disrupts the breeding cycle;
iii. disturbs the dormancy period;
iv. disrupts roosting behaviour;
v. changes foraging behaviour;
vi. affects migration and dispersal ability;
vii. disrupts pollination cycle;
viii. disturbs seedbanks;
ix. disrupts recruitment (i.e. germination and establishment of plants;
x. affects the interaction between threatened species and other species in the community (e.g. pollinators, host species, mycorrhizal associations).

b) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

i. disturbs any permanent, semi-permanent or ephemeral water bodies;
ii. degrades soil quality;
iii. clears or modifies native vegetation;
iv. introduces weeds, vermin or feral species or provides conditions for them to increase and/or spread;
v. removes or disturbs key habitat features such as trees with hollows, caves and rock crevices, foraging habitat;
vi. affects natural revegetation and recolonisation of existing species following disturbance.

c) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

d) How is the proposal likely to affect current disturbance regimes?

i. modifies the intensity and frequency of fires;
ii. modifies flooding flows.

e) How is the proposal likely to affect habitat connectivity?

i. creates a barrier to fauna movement;
ii. removes remnant vegetation or wildlife corridors;
iii. modifies remnant vegetation or wildlife corridors.

f) How is the proposal likely to affect critical habitat?

i. removes or modifies key habitat features;

ii. affects natural revegetation or recolonisation of existing species following disturbance;
iii. introduces weeds, vermin or feral species;
iv. generates or disposes of solid, liquid and gaseous waste;
v. uses pesticides, herbicides, other chemicals.

Following the guidelines, impacts will be significant if:

i. areas of high conservation value are affected;
ii. individual animals or plants and/or subpopulations that are likely to be affected by the proposal play an important role in maintaining the long-term viability of the species, population or ecological community;
iii. habitat features that are likely to be affected by the proposal play an important role in maintaining the long-term viability of the species, population or ecological community;
iv. the duration of impacts are long-term;
v. the impacts are permanent and irreversible.

The following assessments have been undertaken to assess the potential impacts arising from the Ladysmith Quarry site:

1) White Box – Yellow Box – Blakely's Red Gum Woodland; and

2) A combined assessment for threatened birds:

   a) Brown Treecreeper;

   b) Turquoise Parrot;

   c) Superb Parrot; and

   d) Scarlet Robin.

The assessments are presented below.

1) White Box Yellow Box Blakely's Red Gum Woodland Endangered Ecological Community

White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland) is an endangered ecological community listed under the *Threatened Species Conservation Act 1995* (TSC Act). It is also listed as a critically endangered ecological community under the *Federal Environment Protection and Biodiversity Conservation Act 1999*, though the community composition is slightly different to the TSC Act listed community and the remnant within the Proposal area does not meet the Commonwealth description of the community.

Box-Gum Woodland is an open woodland community in which the most dominant species are White Box (*Eucalyptus albens*), Yellow Box (*E. melliodora*) and Blakely's Red Gum (*E. blakelyi*) (DECCW, 2005). Intact stands that contain diverse upper and mid-storeys and ground layers are rare. Modified sites include the following:

- Areas where the main tree species are present ranging from an open woodland formation to a forest structure, and the ground layer is predominantly composed of exotic species; and

- Sites where the trees have been removed and only the grassy ground layer and some herbs remain (DECCW, 2005).

Using the five step key, it was determined the vegetation within the Proposal area at Ladysmith Road met the description of the TSC listed community. In the proposed quarry and stockpile areas, the community is dominated by White Box and also includes Blakely's Red Gum. At present, the condition of this community onsite is considered to be severely degraded due to the dominance of exotic species within the understorey and lack of regeneration of overstorey species. However, the definition of Box-Gum Woodland explicitly recognises that some remnants are degraded. Highly disturbed sites that have few if any native species in the understorey are specifically included in the community provided "*vegetation, either understorey or overstorey or both, would, under appropriate management, respond to assisted natural regeneration, such as where the natural soil and associated seed bank are still at least partially intact.*"

As per the identification guidelines for this community (DECCW date unknown), the vegetation onsite is considered to be consistent with condition class 5 of the listed community. This includes degraded remnants that have few, if any, native species in the understorey. This condition is typical of Box-Gum Woodland where agricultural practices have been more intensive (e.g. pasture improvement over long periods).

The conservation value of the remnant given the wide occurrence of this community within the locality in areas where appropriate management regimes occur such as the travelling stock reserves, is relatively low. This is further lowered due to the position of the remnant within a relatively cleared agricultural landscape which under current management practices lacks the ability for regeneration of native species.

In the proposed access from Ladysmith Road, the canopy is dominated by Blakely's Red Gum regrowth. The canopy cover of mature vegetation is sparse due to historical clearing for agriculture, with remnant trees scattered across the Proposal area. The understorey is dominated by exotic species due to disturbance by grazing, with only two native species recorded, the herb Blue Storksbill and the native Red-leg Grass. Other native grasses occur along the roadside reserve where an access is to be made including Snowgrass and Purple Wiregrass.

The proposed access from Ladysmith Road is also considered to meet the description of Box-Gum Woodland in accordance with the TSC Act Criteria (NPWS 2002). It meets the criteria due to the presence of White Box and Blakely's Red Gum and the presence of native species on the understorey (includes Snow Grass, Wheat Grass and Purple Wiregrass). As per the identification guidelines for this community (DECCW date unknown), the vegetation onsite is considered to be consistent with condition class 2 of the listed community.

This includes partially cleared or thinned stands with a mixture of native and exotic understorey species. This condition is far more common than condition class 1 which has a multi-aged overstorey with a grassy, herb rich understorey however its long term future is often insecure due to inadequate regeneration of understorey species. However, the regeneration of overstorey species, particularly Blakely's Red Gum is prominent in this patch and as such there will be ongoing recruitment of canopy species if the current management regime is retained.

The conservation value of the remnant given the wide occurrence of this community within the locality in areas where appropriate management regimes occur such as the travelling stock reserves, is moderate, particularly to the west of the existing driveway where the overstorey and understorey have a higher density and contain more native species than the existing driveway and the area to the east.

The proposed works within the Proposal area include a quarry site, stockpile sites and an access upgrade from Ladysmith Road into the site. Works will require the clearing of four eucalypt trees associated with this community within the Proposal area, earthworks to be

able to secure fill material and rock material as part of the quarrying operations, and the placement of quarried rock material on areas considered to constitute part of the listed community. The quarry works are temporary, for the supply of fill and rock for a road project. However, the loss of remnant trees will be permanent as after the works are completed the area will be regenerated only with pasture (exotic) seed as requested by the land holder. A total maximum area of 7.25 ha of the community onsite will be directly impacted by the works.

a) How is the proposal likely to affect the lifecycle of a threatened species and/or population?

This question is irrelevant as Box-Gum Woodland is an endangered ecological community.

b) How is the proposal likely to affect the habitat of a threatened species, population or ecological community?

The proposal will degrade soil quality through the removal of topsoil and subsoil for quarrying operations. This impact will be localised as it is confined to the quarry area, which is approximately 2.1ha in size. The removal of topsoil and subsoil will also prevent natural revegetation and recolonisation of existing species following disturbance in this discrete area.

Four native trees will be impacted as part of the proposed works as well as disturbance to the ground cover during the life of the quarry. The Box-Gum Woodland is considered to have poor condition due to historical disturbance of clearing for agriculture, pasture improvement and current grazing practices and is currently threatened by these practices. There is no juvenile recruitment within the quarry or stockpile area, most likely due to grazing pressure and with a continuance of this the long term survival and recruitment of the canopy species is uncertain. A further 0.23ha of this low quality vegetation community will be disturbed by plant driving over an access track leading from the site entry point, through the stockpile and crushing area to the quarry site which is approximately 380 m in length and 6 m in width.

An additional 0.05ha of vegetation meeting the description of Box-Gum Woodland will be cleared to create an access from Ladysmith Road. This patch of vegetation shows a high degree of regeneration of the dominant overstorey Eucalypts, and as such is a more viable patch of vegetation that could respond to assisted regeneration. The location of this access has not yet been confirmed; however it will avoid the removal of significant trees and will only clear a discrete patch (0.05ha) of juvenile Blakely's Red Gums. Given the small scale of clearing, an abundance of this habitat within the Ladysmith Road corridor, and the immature nature of the vegetation, it is not considered that the access would minimise connectivity along this roadside strip for flora species, particularly since there is already an informal access track established in the area.

Stockpiling and will occur over an area of 4.87ha of a highly degraded derived native grassland, largely dominated by exotic species that has a low potential of regeneration if grazing was removed from the site which has been previously cultivated. An access track also runs through this area leading up to the quarry site itself.

The proposal is unlikely to introduce additional weeds into the site as management actions will be prepared detailing the control measures for noxious weeds in accordance with the CEMP. Further, monitoring of weed infestation will be carried out at regular intervals in accordance with the CEMP.

c) Does the proposal affect any threatened species or populations that are at the limit of its known distribution?

This question is irrelevant as Box-Gum Woodland is an endangered ecological community. However, the site falls within the normal distribution of Box-Gum Woodland within the south-western slopes bioregion, and is not at the limit of its known distribution.

d) How is the proposal likely to affect current disturbance regimes?

Current disturbance regimes at the site include grazing. The proposed activity will require the removal of stock from the works area for the duration of quarrying. Grazing will continue after quarrying operations have ceased and the area has been seeded with a pasture grass mix (non-native) at the request of the landowner.

e) How is the proposal likely to affect habitat connectivity?

It is not considered that the existing Box-Gum Woodland surrounding the impact zone would become fragmented or isolated from other areas of habitat as a result of the proposed action. This is due to the remnant Box-Gum Woodland within the quarry area already being modified and fragmented. Past clearing for agriculture has fragmented the vegetation and grazing reduces the likelihood of juvenile species developing and thus the likely long-term degradation of this community if such practices continue.

The removal/disturbance of 0.05 ha of regenerating Blakely's Red Gums for the access to Ladysmith Road would not increase the isolation of this remnant as it is already isolated in the landscape. Further, due to the small scale of clearing, it will not significantly fragment this patch of vegetation. The exchange of genetic material of plants will still occur over this area, thus will not isolate or fragment the patch itself. However, this impact can be further reduced if an option to locate the access in the area that is already disturbed for the existing driveway, retaining the regrowth.

f) How is the proposal likely to affect critical habitat?

Critical habitat has not been declared for this endangered ecological community. The proposal requires the removal of one hollow bearing tree. However, due to the small number of hollows and the sub-optimal habitat this single tree offers, and the presence of good quality remnant vegetation on the hill slopes with hollows, which is outside of the area of impact, it is considered that the proposed action will not affect the habitat of this community in the locality.

Dead wood and bush rocks are present within the area of proposed impact. However, it is considered that if these are re-instated following the completion of quarrying activities that the proposed action will not affect the habitat of this community in the locality.

Evaluation of impacts

The impacts as a result of the proposed activity are not deemed to be significant as the Ladysmith Road Quarry site does not contain areas of high conservation value.

Whilst 7.2 ha of Box-Gum Woodland will be impacted at the site, this is of low conservation value in the area. A further 0.05ha of moderate conservation value Box-Gum Woodland will be removed to create an access from Ladysmith Road. However, given the small scale of clearing, its removal to create a small access way does not constitute a significant impact to Box Gum Woodland in the locality. The individual native plants likely to be affected by the proposal do play an important role in maintaining the long-term viability of the ecological community at the site scale, as they are the only remnants of the original community. However, this is not considered to have a significant impact to Box-Gum Woodland in the locality.

One hollow bearing tree is to be removed for the proposed activity, and bush rock and fallen timber will be relocated adjacent to the site so that these habitat features are retained. These features are sited in a highly disturbed agricultural setting and do not occur in abundance, and as such they play an important role in maintaining the long-term viability of the ecological community, hence their retention.

Duration of the impacts is not long term as there is no intention to extend quarrying operations beyond completion of the Tarcutta Bypass Project. Impacts in the area to be quarried (2.1ha) will be permanent and irreversible as the topsoil and subsoil will be removed, preventing the regeneration of native plants. However, as the vegetation is of low conservation value, this is not deemed to be significant. The removal of 0.05ha of Box-Gum Woodland for the access from Ladysmith Road will be permanent. Given the small scale of clearing, this does not constitute a significant impact. Impacts in the stockpiling area will be temporary as material will be removed from site and used for the project.

2) Threatened Birds

The proposal requires the disturbance of approximately 7.25 ha of Box-Gum Woodland, which the threatened birds discussed below are associated with. However, due to the disturbed nature of the proposal area and the low condition that the Box-Gum Woodland within this area is currently in, habitat for these species is considered to be suboptimal.

a) Brown Treecreeper

The Brown Treecreeper is listed as a vulnerable species under the TSC Act. It is Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (*Eucalyptus camaldulensis*) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.

This species is known to inhabit Box Gum Woodland, the vegetation community present within the Proposal area. This remnant has been modified by clearing and continues to be disturbed by the present land use as grazing pasture. Therefore it is considered that the remnant paddock trees that are considered to be part of Box-Gum Woodland offer sub optimal habitat for this species and that the surrounding woodland vegetation on the hill slope that has not been disturbed would provide better quality habitat for this species, though still limited in comparison to the areas of known habitat nearby in travelling stock reserves. Turquoise Parrot

The Turquoise Parrot is listed as a vulnerable species under the TSC Act. It lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Usually seen in pairs or small, possibly family, groups and have also been reported in flocks of up to thirty individuals. Prefers to feed in the shade of a tree and spends most of the day on the ground searching for the seeds or grasses and herbaceous plants, or browsing on vegetable matter. Forages quietly and may be quite tolerant of disturbance. However, if flushed it will fly to a nearby tree and then return to the ground to browse as soon as the danger has passed. This species nests in tree hollows, logs or posts, from August to December. It lays four or five white, rounded eggs on a nest of decayed wood dust.

Due to the modified nature of the Proposal area, it is considered to provide sub-optimal habitat for this species along the edge near that vegetated hill slope. It is considered that the vegetation hill slope would provide better quality foraging habitat for this species due to the presence of several grass species including Spear Grass and Wallaby Grass. Small

and medium sized hollows were observed in a small proportion of the remnant trees within the Proposal area. However, due to the exposed nature of these trees and distance from the woodland vegetation on the hill slope they are considered to provide sub optimal breeding habitat.

b) Superb Parrot

The Superb Parrot is listed as a vulnerable species under the TSC Act. This species inhabits Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Nest in small colonies, often with more than one nest in a single tree. Superb Parrots breed between September and January. They may forage up to 10 km from nesting sites, primarily in grassy box woodland. Feed in trees and understorey shrubs and on the ground and their diet consists mainly of grass seeds and herbaceous plants. Also eaten are fruits, berries, nectar, buds, flowers, insects and grain.

Due to the highly modified nature of the Box-Gum Woodland vegetation within the Proposal area, it is considered to provide sub optimal foraging habitat for this species. The vegetation on the hill slope, outside of the area of impact considered to provide better quality habitat. This species is known to breed in nests in hollows mainly in tall riparian River Red Gum Forest or Woodland. Due to the small number of hollows within the Proposal area and the disturbed nature of the vegetation community it is considered highly unlikely that this species would utilise the hollows for breeding. Rather more intact woodland found in the locality with Travelling Stock Reserves and the River Red Gums along Tarcutta Creek are considered to provide greater potential for breeding habitat.

c) Scarlet Robin

The Scarlet Robin is listed as a vulnerable species under the TSC Act. The Scarlet Robin lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. This species lives in both mature and regrowth vegetation. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Scarlet Robin habitat usually contains abundant logs and fallen timber: these are important components of its habitat. The Scarlet Robin breeds on ridges, hills and foothills of the western slopes, the Great Dividing Range and eastern coastal regions; this species is occasionally found up to 1000 metres in altitude. The Scarlet Robin is primarily a resident in forests and woodlands, but some adults and young birds disperse to more open habitats after breeding. In autumn and winter many Scarlet Robins live in open grassy woodlands, and grasslands or grazed paddocks with scattered trees. The Scarlet Robin is a quiet and unobtrusive species which is often quite tame and easily approached. Birds forage from low perches, fence-posts or on the ground, from where they pounce on small insects and other invertebrates which are taken from the ground, or off tree trunks and logs; they sometimes forage in the shrub or canopy layer. The Scarlet Robin is only a seasonal visitor to the area, migrating into open and cleared habitats in autumn and winter (Morcombe 2000).

There is potential habitat for the Scarlet Robin in the Box-Gum regrowth where the Ladysmith Road access is to be constructed. There is also potential autumn and winter habitat for this species in the grazed paddocks with the scattered trees classified as vegetation community Benson 280; however this potential for occurrence is low due to the small amount of fallen timber present. This species requires abundant fallen timber and log from which to forage (DECC 2005).

a) ***How is the proposal likely to affect the lifecycle of a threatened species and/or population?***

Due to the level of disturbance within the Ladysmith Road Quarry site and the limited habitat opportunities in terms of hollows for breeding, there is a very low potential for the Brown Treecreeper, Turquoise Parrot and Superb Parrot to use the site as breeding habitat. As such, there are no impacts expected to their respective lifecycles. Further, the lifecycle of the Scarlet Robin will not be affected as it is only a seasonal visitor to the area in the non-breeding season (Morcombe 2000).

Due to the highly modified nature of the Box-Gum Woodland vegetation within the Proposal area, it is considered to provide sub optimal foraging habitat for these species, and therefore is not considered to change their foraging behaviour. The vegetation on the hill slope, outside of the area of impact considered to provide better quality habitat.

a) ***How is the proposal likely to affect the habitat of a threatened species, population or ecological community?***

A total of 6.4ha of low condition Box-Gum Woodland and 0.05ha of moderate condition Box-Gum Woodland will be removed/disturbed at the site for the proposed activity. Due to the level of disturbance at the site and hence the low potential for occurrence for these species, the notable lack of required habitat features for these species such as tree hollows (with the exception of the Scarlet Robin which does not require hollows), and the limited foraging habitat offered at the site, it is unlikely that the proposal will affect the habitat of these threatened species.

The proposal is unlikely to introduce additional weeds into the site that could degrade the limited threatened species habitat offered at the site as management actions will be prepared detailing the control measures for noxious weeds in accordance with the CEMP. Further, monitoring of weed infestation will be carried out at regular intervals in accordance with the CEMP.

b) ***Does the proposal affect any threatened species or populations that are at the limit of its known distribution?***

There are no listed threatened populations for any of the species in question in the vicinity of the proposed quarry site.

c) ***How is the proposal likely to affect current disturbance regimes?***

Current disturbance regimes at the site include grazing. The proposed activity will require the removal of stock from the works area for the duration of quarrying. Grazing will continue after quarrying operations have ceased and the area has been seeded with a pasture grass mix (non-native) at the request of the landowner. As limited habitat for these threatened species is present at the site, the change in current disturbance regimes is unlikely to have an impact.

d) ***How is the proposal likely to affect habitat connectivity?***

It is not considered that the existing Box-Gum Woodland surrounding the impact zone would become fragmented or isolated from other areas of habitat as a result of the proposed action, creating a barrier to fauna movement. This is due to the remnant Box-Gum Woodland within the quarry area already being modified and fragmented. Past clearing for agriculture and pasture improvement has fragmented the vegetation, and grazing reduces the likelihood of juvenile species developing and thus the likely long-term degradation of this community if such practices continue.

The removal/disturbance of 0.05 ha of regenerating Blakely's Red Gums for the access to Ladysmith Road would not increase the isolation of this remnant as it is already isolated in the landscape. Further, due to the small scale of clearing and the high degree of mobility of these species, it will not significantly fragment this patch of vegetation and create a barrier to fauna movement.

e) How is the proposal likely to affect critical habitat?

Critical habitat has not been declared for the threatened bird species in question in the Wagga Wagga LGA. The proposal requires the removal of one hollow bearing tree. However, due to the small number of hollows, the sub-optimal habitat this single tree offers, and the presence of good quality remnant vegetation on the hill slopes that occur to the direct south-south-east of the project with hollows, which is outside of the area of impact, it is considered that the proposed action will not affect threatened species habitat in the locality.

A limited amount of dead wood and bush rocks are present within the area of proposed impact. However, it is considered that if these are re-instated following the completion of quarrying activities that the proposed action will not affect threatened or common species habitat in the locality.

Evaluation of impacts

The impacts to these species resulting from the proposed activity are not deemed to be significant as the Ladysmith Road Quarry site does not contain areas of high conservation value to these species, and they have a low potential for occurrence. Whilst 7.2 ha of vegetation will be impacted at the site, this is of low conservation value in the area to these species due to the notable absence of required habitat features such as tree hollows for breeding (only 3 hollows present in one tree to be disturbed). A further 0.05ha of vegetation will be removed to create an access from Ladysmith Road, however, given the high degree of mobility of these species, it is not considered that the access would minimise connectivity along this roadside strip for fauna species, particularly since there is already an informal access track established in the area.

No important or threatened populations of these species occur in the Wagga Wagga LGA, and as such, the individual animals which may be affected by the proposal do not play an important role in maintaining the long-term viability of their respective species or populations.

Only one hollow bearing tree is to be relocated for the proposed activity, and small quantities of bush rock and fallen timber will be relocated from the quarry site. These features will be relocated adjacent to the site so that they are retained. These features are sited in a highly disturbed agricultural setting and do not occur in abundance, and as such they play an important role in maintaining the long-term viability of the respective species and their local populations.

The duration of the impacts are not long term as there is no intention to extend quarrying operations outside of the Tarcutta Bypass Project. The impacts in the area to be quarried (2.1ha) will be permanent and irreversible as the topsoil and subsoil will be removed, preventing the regeneration of native plants and habitat in this area. However, as the vegetation is of low conservation value to these species, its removal is not deemed to be significant. The removal of 0.05ha of Box-Gum Woodland for the access from Ladysmith Road will be permanent. However, given the small scale of clearing and the retention of connectivity, this does not constitute a significant impact to these species. Impacts in the stockpiling area will be temporary as material will be removed from site and used for the project.

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Appendix B

Aboriginal heritage assessment

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Herbert's Quarry Site : Cultural Heritage Assessment Report

Tarcutta Bypass

Submitted to: Tarcutta Hume Alliance & RTA (NSW)

WATERS CONSULTANCY

HISTORY CULTURE HERITAGE

Herbert's Quarry Site : Cultural Heritage Assessment Report

Tarcutta Bypass

Please Note: This report is provided for the internal use of the Tarcutta Hume Alliance and RTA (NSW) and presentation to the Department of Planning only. The information included has not been cleared by the knowledge holders for public display.

Publication: 19th March, 2010
Client: Tarcutta Hume Alliance & Roads and Traffic Authority (NSW)

Waters Consultancy Pty Limited
28 Govett Street
Katoomba, NSW, 2780
T & F: 02 4782 7556
M: 0417 438146
E: waters.consult@bigpond.com
ACN: 134 852 314

Methodology

This is a supplementary specialist report to be considered in relation to the Environmental Assessment for the proposed quarry at Herbert's on Tumbarumba Road (Tarcutta). This Aboriginal cultural heritage assessment for the proposed Herbert's Quarry (Tarcutta) has been undertaken by Waters Consultancy through consultation with the identified Aboriginal knowledge holders for the location. The knowledge holders were identified in a 2009 report produced for the RTA (NSW) during the Tarcutta Bypass Project.

This assessment has been undertaken through site visits with the identified knowledge holders on the 19th and 20th of October involving the identification, mapping and assessment of the items and locations holding cultural heritage value within and adjacent to the proposed quarry. A follow-up site visit was undertaken by the knowledge holder, with the assistance of Kelleher Nightingale Consulting Pty Ltd, on the 9th of March, 2010.

The following section provides a summary of the cultural places identified, their assessed level of significance and recommendations for management.

Identified Aboriginal Cultural Heritage Places & Items

Place Sheet Legend

Place Number and Name: This field provides the listed places number and referral name.

Location: This field provides a brief text description of the location of the listed place.

Description: This field provides a brief description of the nature of the place and its Aboriginal cultural heritage values.

Significance: This field provides a ranking of the significance of the places. They are ranked as Very High, High, or Medium. This ranking has been developed in consultation with key knowledge holders. All listed places hold Aboriginal cultural heritage significance and this field provides a relative ranking only in order to assist in future planning.

Impact: This field identifies if the listed places lie within the potential impact zone of the development and summarizes any potential impact of the development on the listed places.

Impact Mitigation and Management: This field details the views of the knowledge holders on the actions required to limit the impact of the development on listed places within the potential impact zone and summarizes the views of the knowledge holders in relation to future management of potential impacts on the listed place.

Knowledge Holders: This field lists the Aboriginal knowledge holders who have provided the information regarding the listed place and its cultural significance for this project. It is not a comprehensive listing of knowledge holders for that place and there is likely to be further knowledge holders for each place that have either not been identified during this project or have chosen not to formally record their information at this point.

Place 1: Cultural Gendered Ceremonial Area

Location: Lying adjacent to the proposed quarry area, as shown in the plan included in this report, on the north-eastern side of Tumbarumba Road.

Description: An area associated with aspects of men's ceremonial business marked by the presence of a substantial number of rock formations holding cultural significance and meaning and the presence of medicinal plant species. The area is connected with the *Muring* ceremonial pathways.

Significance: Very High Significance. This is based on consultation with the key knowledge holder.

Impact: There is no identified impact in the proposed Herbert Quarry development plans as the item lies to the east of the footprint.

Impact Mitigation and Management: Exclusion zone barrier fencing providing a one metre buffer zone to be constructed along that part of the Cultural Place lying adjacent to the proposed quarry area. No impact to occur within the Cultural Place as indicated on the attached map. The Knowledge Holder requests that they be present during the construction of the barrier fencing due to the high cultural sensitivity of the area.

Knowledge Holder: Lindsay Connolly.

Place 2: Cultural Feature

Location: Lying within the proposed quarry area on the north eastern boundary, as shown in the plan included in this report.

Description: A rock formation holding cultural significance and associated with Place 1.

Significance: High Significance. This is based on consultation with the key knowledge holder.

Impact: The cultural feature lies within the proposed quarry area footprint.

Impact Mitigation and Management: Exclusion zone barrier fencing providing a one metre buffer zone to be constructed around the perimeter of the Cultural Place. No impact to occur within the Cultural Place as indicated on the attached map. The Knowledge Holder requests that they be present during the construction of the barrier fencing due to the high cultural sensitivity of the area.

Knowledge Holder: Lindsay Connolly.

Place 3: Cultural Feature

Location: Lying within the proposed quarry area at a point adjacent to the most north western point of Cultural Place 1, as shown in the plan included in this report.

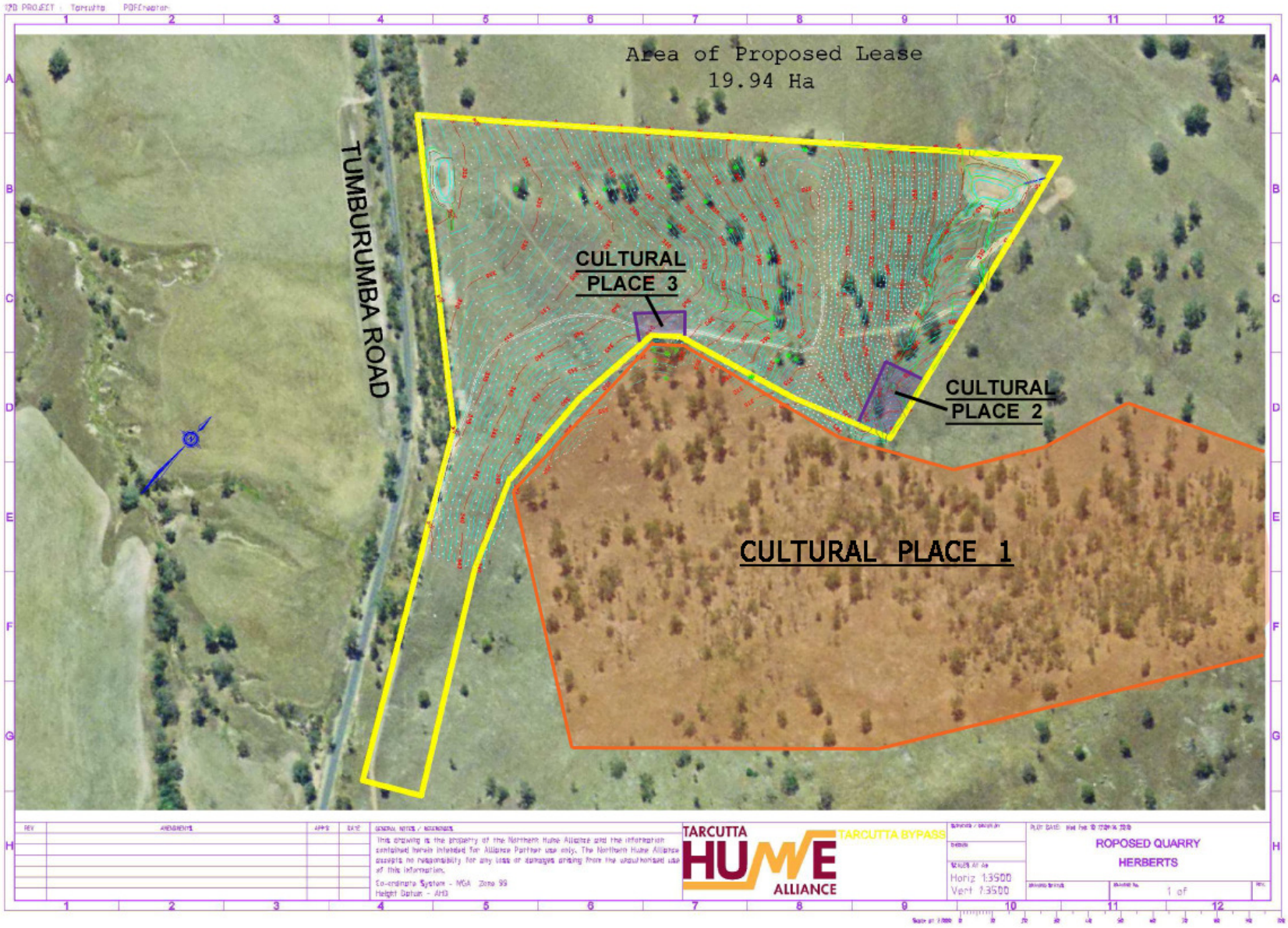
Description: A rock formation (formed of two distinct rock clusters) holding cultural significance and associated with Place 1.

Significance: High Significance. This is based on consultation with the key knowledge holder.

Impact: The cultural feature lies within the proposed quarry area footprint.

Impact Mitigation and Management: Exclusion zone barrier fencing providing a one metre buffer zone to be constructed around the perimeter of the Cultural Place. No impact to occur within the Cultural Place as indicated on the attached map. The Knowledge Holder requests that they be present during the construction of the barrier fencing due to the high cultural sensitivity of the area.

Knowledge Holder: Lindsay Connolly.


Area of Proposed Lease
19.94 Ha
TUMBURUMBA ROAD
CULTURAL PLACE 3
CULTURAL PLACE 2
CULTURAL PLACE 1
TARCUTTA HUME ALLIANCE
TARCUTTA BYPASS
ROPOSED QUARRY
HERBERTS
Horiz 1:3500
Vert 1:3500
1 of

Appendix C

Noise and vibration assessment

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TARCUTTA BYPASS
LADYSMITH ROAD QUARRY
CONSTRUCTION NOISE AND VIBRATION IMPACT STATEMENT

ACOUSTICS AND AIR

REPORT NO. 08344-QL
VERSION A

WILKINSON MURRAY

TARCUTTA BYPASS
LADYSMITH ROAD QUARRY
CONSTRUCTION NOISE AND VIBRATION IMPACT STATEMENT

REPORT NO. 08344-QL
VERSION A

FEBRUARY 2010

PREPARED FOR

TARCUTTA HUME ALLIANCE
84-88 MURRAY ST
WAGGA WAGGA 2650

Wilkinson Murray (Sydney) Pty Limited · ABN 39 139 833 060
Level 2, 123 Willoughby Road, Crows Nest NSW 2065, Australia • **Offices in SE Qld & Hong Kong**
t +61 2 9437 4611 • **f** +61 2 9437 4393 • **e** acoustics@wilkinsonmurray.com.au • **w** www.wilkinsonmurray.com.au

TABLE OF CONTENTS

1 INTRODUCTION

This Construction Noise and Vibration Impact Statement (CNVIS) deals with proposed quarry operations associated with the Tarcutta Bypass Project. It was originally proposed in the concept design that material required for the construction of the Tarcutta Bypass Project be sourced from existing commercial quarry operators. However, this has been recently revised and it is proposed to commence a quarry operation. Accordingly, a modification to the Project Approval is required.

The quarry will operate continuously for the duration of 18 months. Operations of the quarry will provide a variety of material for the Tarcutta Bypass.

The assessment addresses the production phase that involves all quarry activities which assist the construction of the Tarcutta Bypass. The quarry will operate continuously for the duration of 18 months. Operations of the quarry will provide select zone material, drainage rock and rock rip rap for the Tarcutta Bypass.

The assessment addresses noise and vibration from winning, processing and transport of material, and also from blasting.

2 DESCRIPTION OF THE QUARRY

The Ladysmith Road Quarry approximately 20km south of Tarcutta.

Figure 2-1 shows the approximate location of the quarry and indicates the two noise sensitive receivers. More detail is shown on Figure 2-2, which shows the proposed location of the Ladysmith Road Quarry and the nearest noise sensitive receiver (Receiver 1 – 500mm from the quarry). Note that this receiver is the landowner for the quarry site. Receiver 2 is approximately 1.4km to the southeast and is shielded by a line of hills from the site.

Figure 2-1 Quarry and Sensitive Receiver Locations

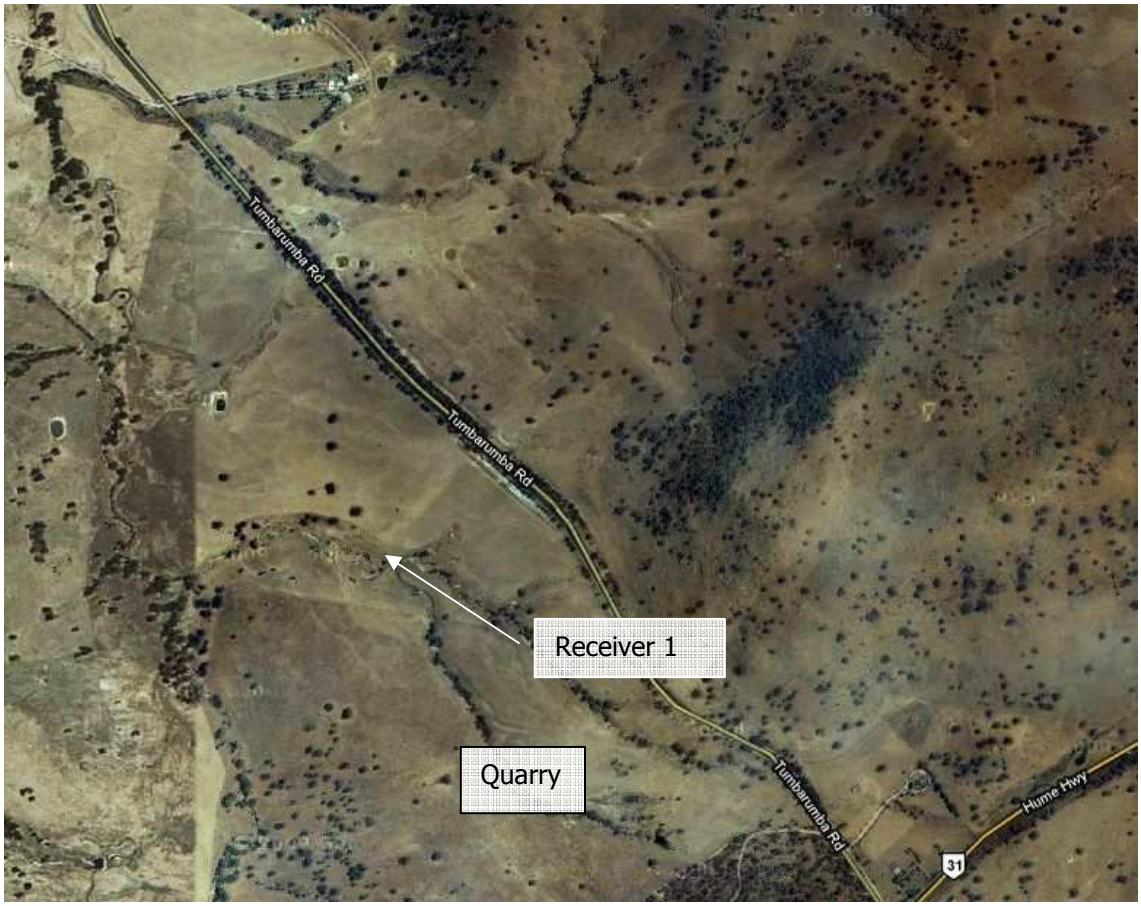
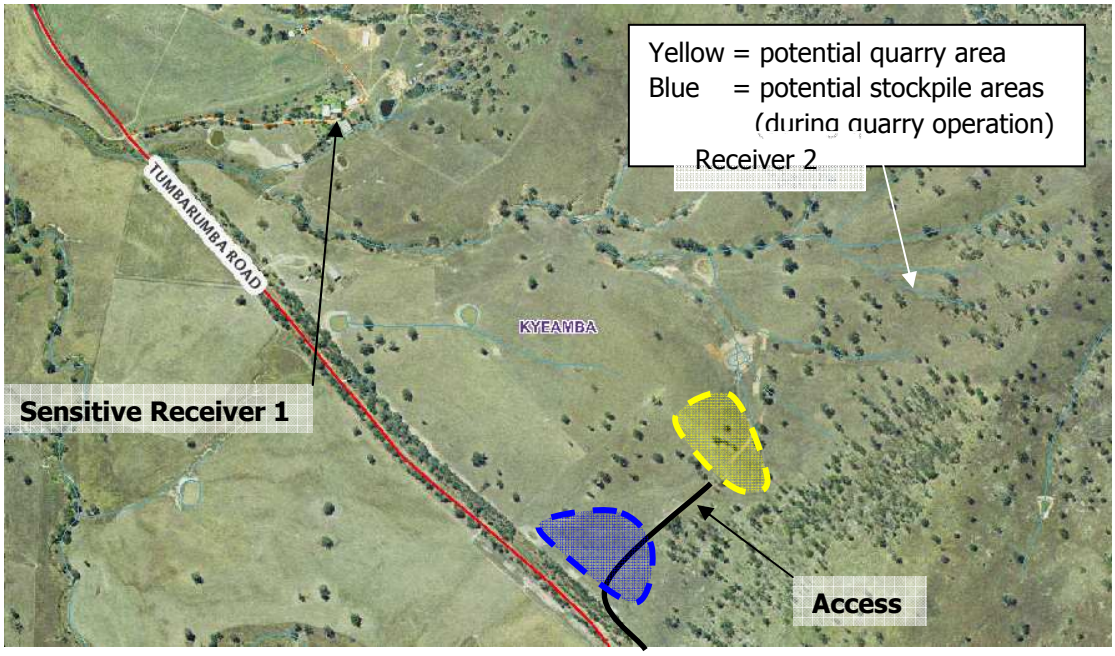


Figure 2-2 Ladysmith Road Quarry Location



2.1 Hours of Operation

The hours of operation for the quarry are:

- 7am to 6pm Monday to Friday
- 8am to 1pm Saturday
- No work on Sunday or Public Holidays

Blasting hours are:

- 9am to 5pm Monday to Friday
- 9am to 1pm Saturday
- No blasting on Sunday or Public Holidays

2.2 Production Methodology

Production works can be divided into 2 activities:

Activity 1: Material Winning: This consists of mobile plant breaking the rock face and shifting spoil into stockpiles ready for processing. This scenario also includes the use of rock drill in order prepare blasting.

Activity 2: Processing & Loading: This consists of plant crushing and screening the material acquired from the 'material winning' phase, and mobile plant shifting the processed material into dump trucks. Trucks delivering materials arriving and leaving are also expected during this scenario.

2.3 Equipment to be Used

Machinery used during operations at the quarry will be similar and is listed below.

For winning material:

- Dozer (D10)
- 2 x 45T excavator
- 40T articulated dump truck
- 18,000 litre water cart
- 2 x Cat 988 loaders
- Air track drill for the blasts (Blasting of hard rock is only anticipated 2 or 3 times and not more than once per day).

For processing:

- 3 crushers or screeners.

For haulage:

- Vehicle movements (haulage trucks) at peak production will be approximately 16 haulage truck movements per hour (200 per day during peak production).

2.4 Duration of works

The quarry would be operational for 18 months for the construction of Tarcutta Bypass Project.

3 NOISE ASSESSMENT

3.1 Noise Criteria

Construction noise criteria were developed for the Environmental Assessment of the Tarcutta Bypass. Since then the DECCW has released the *Interim Construction Noise Guideline*. (ICNG). From this guideline the appropriate noise goal would be that construction noise should not exceed the existing background noise level by more than 10dBA.

For construction of the Tarcutta Bypass a noise goal was established for a "daytime" period of 6.00am to 7.00pm (the normal DECCW daytime period is 7.00am to 6.00pm). The noise criteria developed for this period are considered suitable for the quarry.

The background noise levels, established for rural residences around Tarcutta, and construction noise goals are given in Table 3-1.

Table 3-1 L_{Aeq} Noise Criteria

	L_{Aeq} Noise Criteria (dBA)
	Daytime
	(7.00am – 6.00pm)
RBL Background Noise Level	32
Noise Goal	42

3.2 Noise Levels of Equipment

Sound power levels of typical equipment to be used at the quarry are given in Table 3-2. The middle column of the table gives the maximum sound power level of the equipment – the constant level at high load. The final column gives the estimated L_{Aeq} level for 15 minutes – that is the level that would be measured during operation of the equipment. These $L_{Aeq,15min}$ levels can be added and compared to the L_{Aeq} noise goal. The total site noise is estimated at L_{Aeq} 122 dBA.

Table 3-2 Sound Levels of Equipment

Equipment	Maximum Sound Power Level, dBA	Estimated L_{Aeq} operational Sound Power Level (15 minutes)
Dozer D10	118	115
2 x Excavator 45T	107 each	110
40T dump truck	113	109
2 x CAT 988 loaders	111 each	111
Track Drill	118	114
Haul Trucks (4 in 15 minutes)	113	111
Screens and crushing	115	115
Total Site Noise		122

3.3 Predicted Noise Levels

Noise levels were predicted using the CadnaA modelling software which takes into account attenuation due to distance and also the shielding provided by topography. Noise was predicted assuming maximum production of both the winning material and processing plant, and including movements of haul trucks.

Noise from haul trucks on the road between the quarry and the public road network is assessed as operational noise, and has been included in the noise prediction.

At Receiver 1 the predicted noise level with all equipment operating above ground level is 39dBA. This complies with the noise criterion..

At Receiver 2, more than 1.4km more distant and shielded by topography, the predicted noise levels of quarry operations is 25dBA which complies with the criterion.

4 CONSTRUCTION TRAFFIC NOISE

Construction traffic will result in up to 32 extra movements per hour on the Hume Highway (16 trucks per hour to the quarry). The existing daytime traffic flow on the Hume Highway is 108 heavy vehicles per hour, and 201 light vehicles per hour (from traffic volumes used in the Environmental Assessment).

The movements on the access road were considered as part of the quarry operational noise and were included in the noise prediction. Noise on the public road network should be assessed according to the DECCW's *Environmental Criteria for Road Traffic Noise (ECRTN)*.

The criterion for a proposed change in land use with potential to create additional traffic on existing freeways is $L_{Aeq,15hr}$ 60dBA for daytime, and $L_{Aeq,9hr}$ 55dBA night time.

If the criteria are already exceeded noise levels should be mitigated where reasonable and feasible. In all cases, traffic arising from the development should not lead to an increase in existing noise levels of more than 2dBA.

Receiver 1 will not be exposed to traffic noise from the quarry.

Receiver 2 is exposed to traffic noise from the Hume Highway. Using the *Calculation of Road Traffic Noise* (CoRTN) algorithms, the predicted noise at Receiver 2 is:

At southern façade:

- From Hume Highway: LAeq,15hr = 59dBA; and
- From Quarry Traffic: LAeq,15hr = 49dBA.
- Total traffic noise = 49dBA.

Hence it is predicted that the quarry noise would not increase the 15hour traffic noise at the most exposed façade. The noise of 59dBA complies with the daytime criterion of 60dBA.

At other houses along the Hume Highway that might be subject to noise from the quarry traffic, the increase in heavy vehicles from 108 per hour to 140 per hour would increase traffic noise by less than 0.5dBA. This is within the criterion of the DECCW and no additional noise impact is predicted.

5 ASSESSMENT OF CONSTRUCTION VIBRATION

5.1 Vibration Criteria (Excluding Blasting)

Impacts from vibration can be considered both in terms of effects on building occupants (human comfort) and the effects on the building structure (building damage).

5.1.1 Human Comfort

The DECCW's *Assessing Vibration: A Technical Guideline* provides acceptable values for continuous and impulsive vibration in the range 1-80Hz. Both preferred and maximum vibration limits are defined for various locations and are shown in Table 5-1.

Table 5-1 Preferred and Maximum Peak Particle Velocity (PPV) values for Continuous and Impulsive Vibration

Location	Assessment period [1]	Preferred values, mm/s	Maximum Values, mm/s
	Continuous vibration		
Critical areas [2]	Day or night time	0.14	0.28
Residences	Daytime	0.28	0.56
	Night time	0.20	0.40
Offices, schools, educational institutions and places of worship	Day or night time	0.56	1.1
Workshops	Day or night time	1.1	2.2
	Impulsive vibration		
Critical areas [2]	Day or night time	0.14	0.28
Residences	Daytime	8.6	17.0
	Night time	2.8	5.6
Offices, schools, educational institutions and places of worship	Day or night time	18.0	36.0
Workshops	Day or night time	18.0	36.0

Note: 1) Daytime is 7.00am to 10.00pm and night time is 10.00pm to 7.00am.
2) Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas. Source BS 6472-1992.

5.1.2 Building Damage

In regard to potential building damage, German Standard DIN 4150-3 gives guideline values for short term vibration for commercial buildings, houses and heritage buildings which are dependent on the frequency of vibration. The recommended vibration level for dwellings is 5 to 20mm/s.

5.1.3 Controlling Criterion for Dwellings

The most stringent criterion is for human comfort. *Assessing Vibration: A Technical Guideline* provides as the worst case human comfort objective within residences during daytime 0.28mm/s peak particle velocity (PPV) in the vertical axis (z-direction).

If these goal levels are satisfied so too will building damage criteria be satisfied.

5.2 Source Levels of Vibration

Table 5-2 provides some estimated vibration levels at a range of distances from an excavator using a hydraulic hammer. This would cause the most vibration of any plant at the quarriy (excluding blasting).

Table 5-2 Typical Vibration Emission Levels from Mining Plant

Activity	PPV Vibration Level (mm/s) at Distance		
	10m	**20m**	**30m**
Hydraulic Hammer (30t)	3	1.5	1.0

5.3 Vibration Levels at Residences

The closest residence to wither quarry is more than 500m from the quarry. Vibration would not be detectable at these distances and no impact is predicted.

6 BLASTING

6.1 Blasting Frequency

Occasional blasting will be required. There would be less than 10 blasts at the quarry over the 18 month period. There would not be more than one blast per day.

6.2 Assessment Criteria

6.2.1 Annoyance & Discomfort

For assessment of annoyance due to blasting, the DECCW (and most similar authorities in Australia) has adopted guidelines produced by the Australian and New Zealand Environment and Conservation Council (ANZECC). The fundamental criteria are that at any residence or other sensitive location:

- The maximum overpressure due to blasting should not exceed 115dB for more than 5% of blasts in any year, and should not exceed 120dB for any blast; and
- The maximum peak particle ground velocity should not exceed 5mm/sec for more than 5% of blasts in any year, and should not exceed 10mm/sec for any blast.

6.2.2 Structural Damage

At sufficiently high levels, blast overpressure may in itself cause structural damage to some building elements such as windows. However, this occurs at peak overpressure levels of about 133dB and above, well in excess of criteria for annoyance.

For assessment of damage due to ground vibration, Australian Standard *AS2187.2-1993 Explosives – Storage, Transport and Use* contains an appendix specifying recommended levels for peak particle vibration velocity to protect typical buildings from damage. These are:

- "Structures that may be particularly susceptible to ground vibration" – 5mm/sec
- "Houses and low-rise residential buildings; commercial buildings not included below" – 10mm/sec
- "Commercial and industrial buildings or structures of reinforced concrete or steel construction" – 25mm/sec

6.3 Definition of "Scaled Distance"

Airblast overpressure and ground vibration levels from blasting are related to the "scaled distance" from the blast, which is defined as

Scaled distance = $D/W^{(1/3)}$ for airblast overpressure, and
Scaled distance = $D/W^{(1/2)}$ for ground vibration,

where D is the distance from the blast in metres and W is the maximum instantaneous charge (MIC) of explosive, in kg Ammonium Nitrate Fuel Oil (ANFO) equivalent.

6.4 Prediction of Overpressure

Peak overpressure levels are predicted as:

$$L = A - B \log(D/W^{1/3})$$

where B depends on the site characteristics and A depends on both site characteristics and blasting practice.

Wilkinson Murray have analysed blast monitoring from Prospect Quarry and Bayswater No 3 Mine. The "best fit" of that data has values of B = 22.4 and A = 158 in the above equation. However, to ensure that 95% of blasts are within a criterion, a value of A = 171 is required to predict the 95th percentile of overpressures.

While mine blasts are typically much larger than those expected on the Tarcutta Bypass Quarry, experience suggests that the overpressure values would meet the criterion for 95% of blasts if best practice blasting procedures are adopted.

6.5 Prediction of Vibration Levels

Peak particle velocity is predicted as

$$PPV = K \ (D/W^{1/2})^{-a}$$

where 'a' depends on the ground characteristics and K depends on both site characteristics and blasting practice.

Australian Standard 2187.2 gives recommended values K and 'a' for cases where site data are not available, the relevant values being:

Blasting to a free face, hard rock : K = 500, a = 1.6

Blasting to a free face, average rock: K = 1140, a = 1.6

These values were used to calculate recommended MIC for the quarry.

6.6 Recommendations for Blasting

Table 6-1 shows the recommended MIC for each the quarry. The MIC shown would give predicted overpressure and vibration levels at the residences that comply with the criteria.

Table 6-1 Recommended MIC to Achieve Criteria

Receiver	Quarry	Distance to Quarry	MIC to meet Vibration Criterion	MIC to meet Overpressure Criterion
1	Ladysmith Road	500	240	218

7 CONCLUSION

Noise and vibration from the proposed Ladysmith Road Quarry was assessed.

For the Ladysmith Road Quarry noise is predicted to comply with the recommendations of the Interim Construction Noise Guidelines at all receivers.

Vibration levels from operations at the quarry, with the exception of blasting, are predicted to be imperceptible at the surrounding receivers.

Construction traffic on the Hume Highway will comply with the relevant criterion for traffic noise.

Recommendations for blasting have been given to ensure compliance with overpressure and vibration criteria.

Version	Status	Date	Prepared by	Checked by
A	Final	18 February 2010	George Jenner	Adam Bioletti

APPENDIX A

GLOSSARY OF TERMS

GLOSSARY

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph overleaf, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

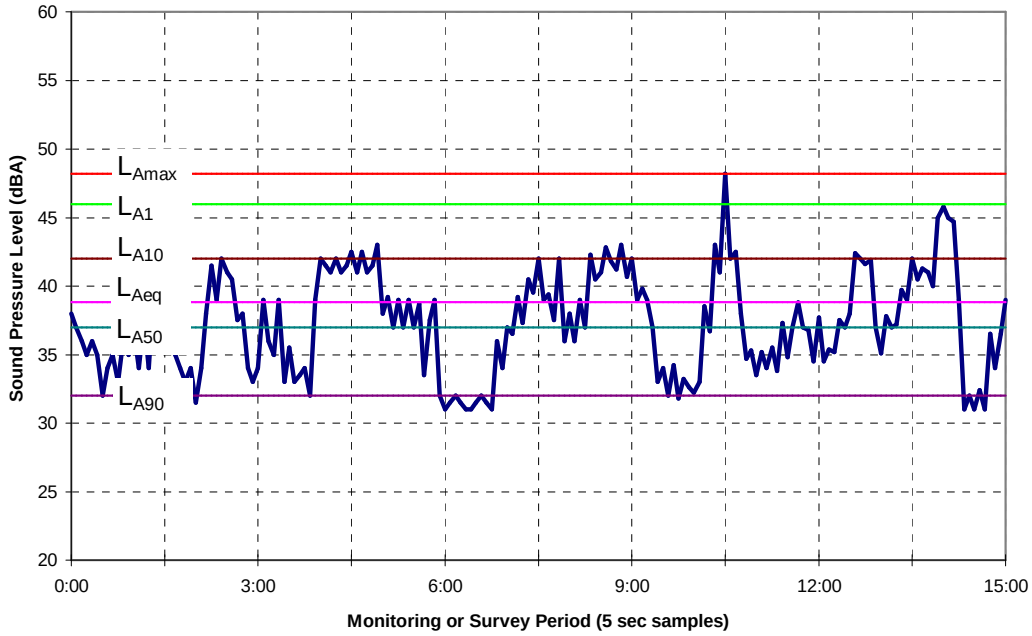
L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

L_{A50} – The L_{A50} level is the noise level which is exceeded for 50% of the sample period. During the sample period, the noise level is below the L_{A50} level for 50% of the time.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10^{th} percentile (lowest 10^{th} percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.


60
55
50
45
40
35
30
25
20
Sound Pressure Level (dBA)
LAmax
LA1
LA10
LAeq
LA50
LA90
0:00
3:00
6:00
9:00
12:00
15:00
Monitoring or Survey Period (5 sec samples)