

Environmental Impact Statement

UPPER BUNYAN GRAVEL PIT



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EXECUTIVE SUMMARY

This Environmental Impact Statement (EIS) has been prepared by NGH Environmental on behalf of Cooma-Monaro Shire Council (CMSC) to assess the potential environmental impacts associated with the expansion of the Upper Bunyan Gravel Pit. The proposal site is located approximately 12 kilometres north-east of Cooma in the Cooma-Monaro Local Government Area (LGA).

The proposal is classified as a Designated Development under the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and is to be assessed under Part 4 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). The EIS will support a Development Application for the proposal. The Joint Regional Planning Committee is the consent authority.

CMSC owns and operates an existing gravel pit in Lot 159 DP 724552 Bunyan. It is proposed to expand the extraction area into Lot 160 DP 724552, Crown Land. The current gravel pit is nearly exhausted, with an estimated capacity of two years remaining, at current extraction levels. The gravel pit is and will continue to be used by council to source material for road construction and maintenance activities in the LGA.

The objectives of the proposal are:

- To extend the existing Upper Bunyan Gravel Pit to be capable of extracting up to 20,000 tonnes per year over a 20 year life.
- To allow the retention of existing employment of up to 4 full time council staff and 7 contractors when operating.
- Minimise transportation distances of road materials in the LGA area.
- Minimise impacts on the natural and built environment through sensitive design and appropriate environmental management practices.

Environmental impacts were assessed and the following were considered to be high:

- Soil and landforms
- Biodiversity impacts

Specific mitigation measures have been developed to address these impacts:

1. A soil and water management plan to ensure that sediment and erosions controls during extraction are well contained and managed.
2. An offset plan, to offset the vegetation clearing and habitat loss required to expand the gravel pit
3. A rehabilitation plan, to manage the progressive stabilisation of landforms and revegetation to resist erosion and weed infestation.

This EIS contains guidance documents with regard to the offset plan and rehabilitation plan.

Additionally, consultation to upgrade the Monaro Highway intersection and with existing users of the proposal site will be required.

Other impacts are considered low risk and highly manageable with the implementation of standard recommendations provided in this EIS. With the effective implementation of all mitigation measures set out in this document, the proposal is considered justifiable.

Continuing to source materials from Upper Bunyan Gravel Pit to supply the Cooma area would result in fewer vehicle movements and potential safety impacts in comparison to sourcing the material from quarries further from the Cooma area. It would also result in the retention of existing employment opportunities at the site.

1 INTRODUCTION

NGH Environmental has been engaged by Cooma-Monaro Shire Council (CMSC) to prepare an Environmental Impact Statement (EIS) to assess the potential environmental impacts associated with the expansion of the Upper Bunyan Gravel Pit near Bunyan, New South Wales.

1.1 PURPOSE AND SCOPE OF THIS DOCUMENT

The proposal is classified as a Designated Development under the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and is to be assessed under Part 4 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). The EIS will support a Development Application for the proposal, with the Joint Regional Planning Committee being the consent authority.

This EIS:

- Describes the location and nature of activities at the gravel pit;
- Reviews the environmental impacts associated with the construction, operation, decommissioning and rehabilitation of the gravel pit;
- Recommends safeguards to control and mitigate potential impacts;
- Enables the proponent to meet its obligations under relevant legislation and policies; and
- Documents the environmental assessment process of the proposal for the Joint Regional Planning Committee's consideration in providing consent for the proposed works.

Under Section 79C of the EP&A Act, the proposal must be evaluated against a range of considerations including environmental planning instruments, the EP&A Regulation, the likely environmental, social and economic impacts of that development, the suitability of the site, and the public interest.

This EIS takes into account the project objectives and the requirements of the Director-General for Planning and other relevant Government agencies (Director General's Requirements, Appendix B). It involves an analysis of the relevant environmental, economic, physical and social implications of the proposal.

1.2 STAGING AND REHABILITATION

The Director General's Requirements (DGRs) for this proposal require the EIS to include:

'... a detailed description of the proposed management of staging and rehabilitation strategy. This would include justification of the final proposed landform, consideration of the objectives of any relevant strategic land use plans or policies, and measures to ensure financial resources are available for effective implementation of the rehabilitation strategy.'

This EIS provides a Staging Plan, refer section 2.3, and details as recommendations parameters to be included in a Rehabilitation Plan (Rehabilitation Strategy, Appendix A). The Rehabilitation Plan itself is proposed to be prepared after consent.

2 PROPOSAL

2.1 BACKGROUND

2.1.1 Existing gravel pit network

There are a number of active gravel pits that supply road material to the Cooma-Monaro Shire LGA (refer to Figure 2-2) including:

1. Edendale (The Snowy River Way), Lot 27 DP 756848
2. Frogs Hole, Lot 24 DP 47123
3. Jerangle Road, adjoining Lot 36 DP 750550 (road reserve)
4. Little Tinderry, Lot 8 DP 1120414
5. Mirrabinda (Tinderry road reserve), adjoining Lot 4 DP 1134813
6. Strike-a-Light, Lot 7003 DP 1024136
7. Undoo (Numeralla way), Lot 7011 DP 1065141
8. Bunyan Lots 159 and 160 DP 724552

The Upper Bunyan Gravel Pit is part of this network.

2.1.2 Existing operations

CMSC currently operate Upper Bunyan Gravel Pit 12 km north of Cooma, NSW (Lot 159 DP 724552). The annual extraction rates for the gravel pit can be seen in Table 2-1. The gravel pit has potential to have an extraction rate of approximately 20,000 tonnes per year. The site does not operate under an Environmental Protection Licence, being below the 30,000 tonne per year trigger.

Table 2-1 Upper Bunyan Gravel Pit annual extraction rates

Year	Annual extraction (cbm)
2006	2 372
2008	4 213
2009	320
2010	6 906
2011	8 323
2012	8 002
2013	12 858

The gravel extracted from the site is used for road construction and maintenance within the LGA. This pit is one of seven similar sized pits operating in the shire. The extraction of gravel has now reached the western boundary of the site.

2.1.3 Existing land uses and land use interactions

The proposal site is Crown Land, accessed via Monaro Highway. It is currently leased for agricultural grazing.

An exhausted gravel pit is located to the south-west of the current operations. It was utilised by Road and Maritime Services and has not been in use for at least five years. It has been rehabilitated.

The exhausted gravel pit is utilised by a rifle club.

A 132Kv powerline and easement is located through the proposal site. It is parallel to the Monaro Highway, approximately 230 to 300 metres to the west. An underground telecommunication cable also traverses the site. Figure 2-3 shows the location of both services.

Adjacent to the subject site

Lands immediately surrounding the subject site to the east, south and west are predominately used for agriculture (extensive grazing of sheep and cattle). The Bunyan Airfield is immediately north of the subject site. The Murrumbidgee River is 3.8km west of the site.

2.1.4 The proposal

The current gravel pit area is near the end of its life, with a capacity of two years remaining at current extraction rates. With expansion however, the gravel pit would continue to be used by council for road construction and maintenance activities for an additional 20 years. CMSC has determined that aggregate that is suitable for road building is located in areas adjacent to the existing pit. It is proposed to expand further into Lot 160 DP 724552 (the 'subject site'), adjacent to the Monaro Highway, Bunyan.

CMSC propose to purchase 85 hectares of land adjacent to the existing operations. Aggregate would be extracted within 20 hectares of the land parcel. The new extraction area would occur in five stages (refer Figure 2-3 and section 2.3 for further detail). The residual area (65 hectares) would be considered for use as a biodiversity offset area.

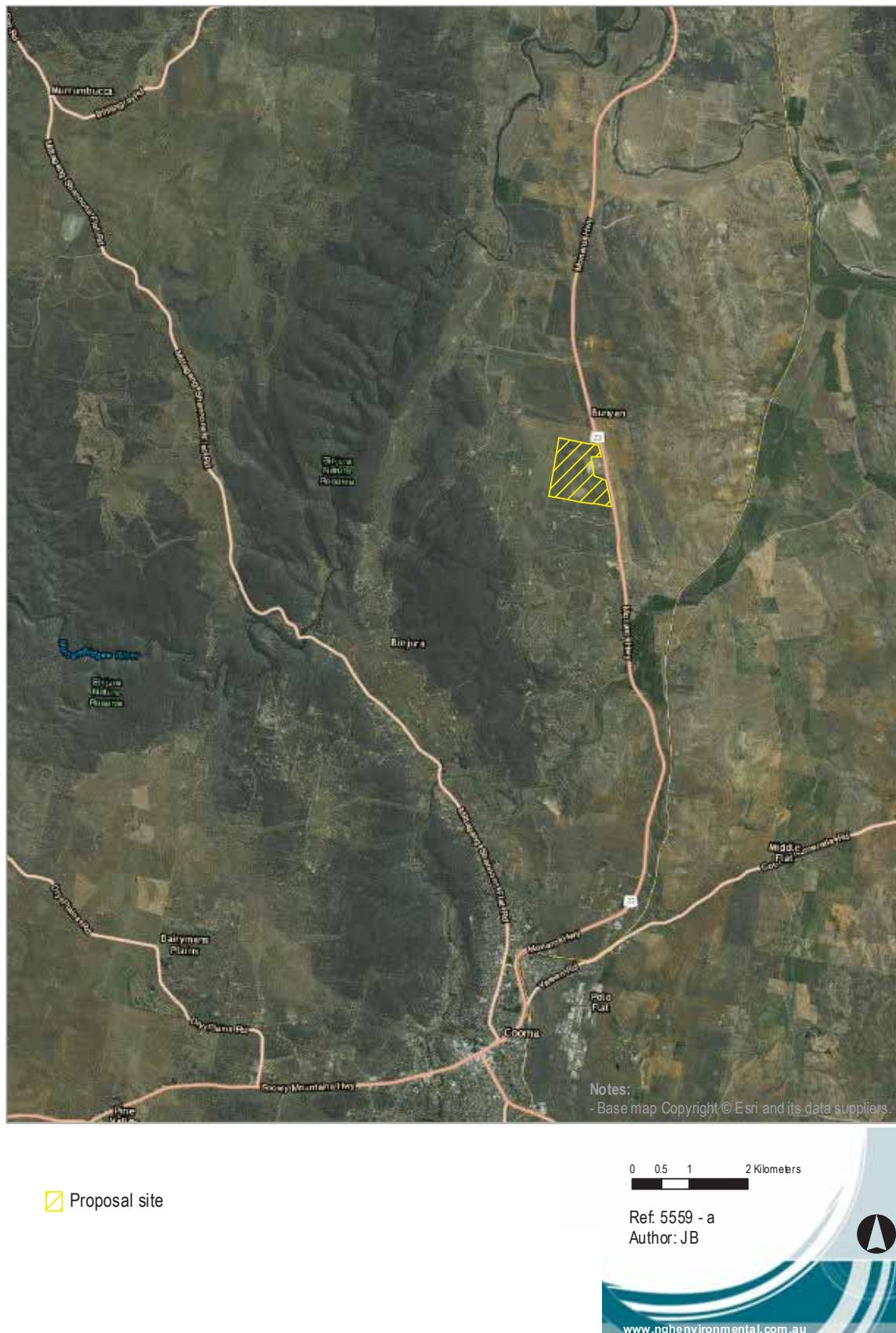
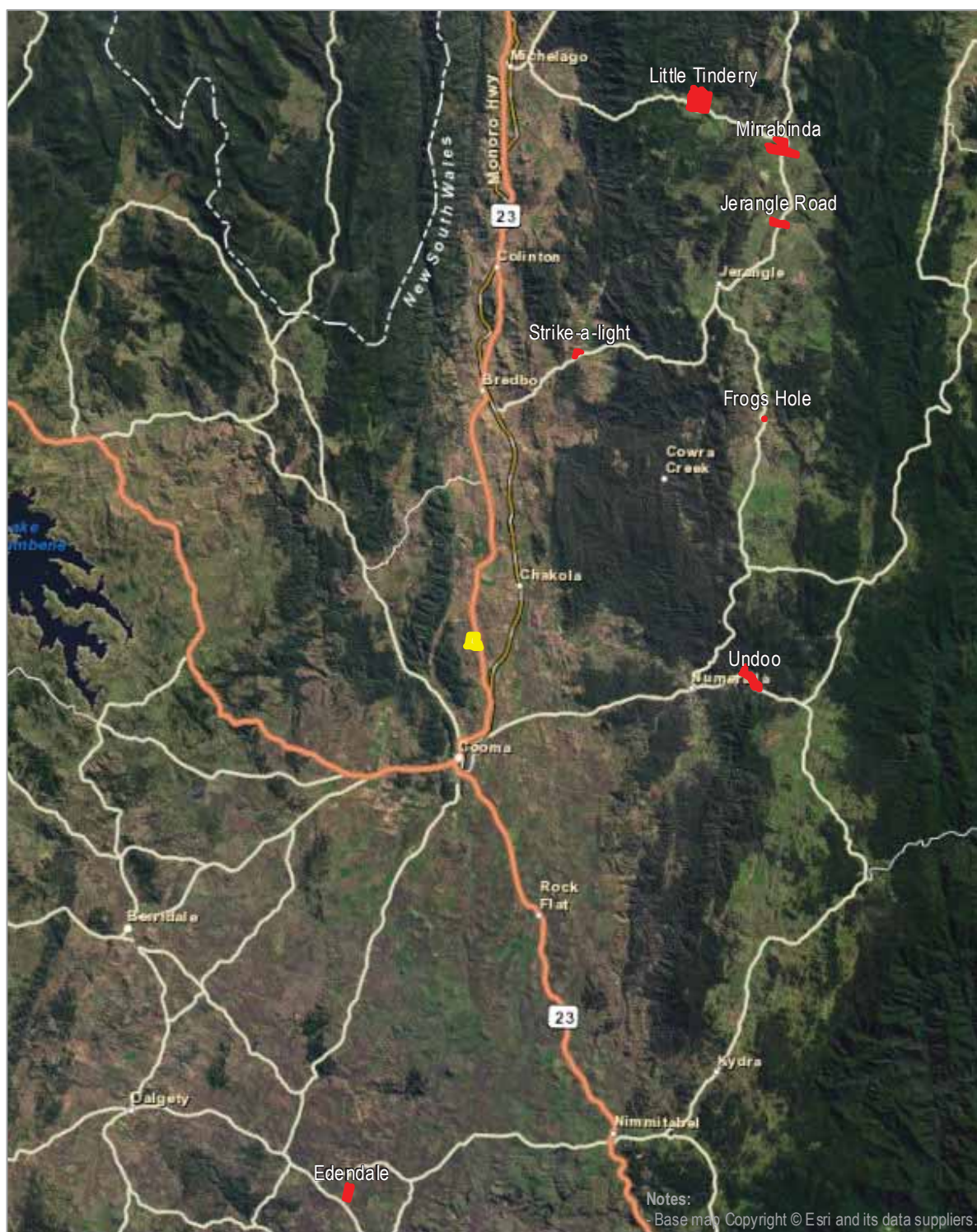


Figure 2-1 Proposal location.



- Proposal site
- Existing quarries in Cooma Monaro Shire

0 2.5 5 10 Kilometers

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Figure 2-2 Gravel pit locations in the Cooma Monaro Shire.

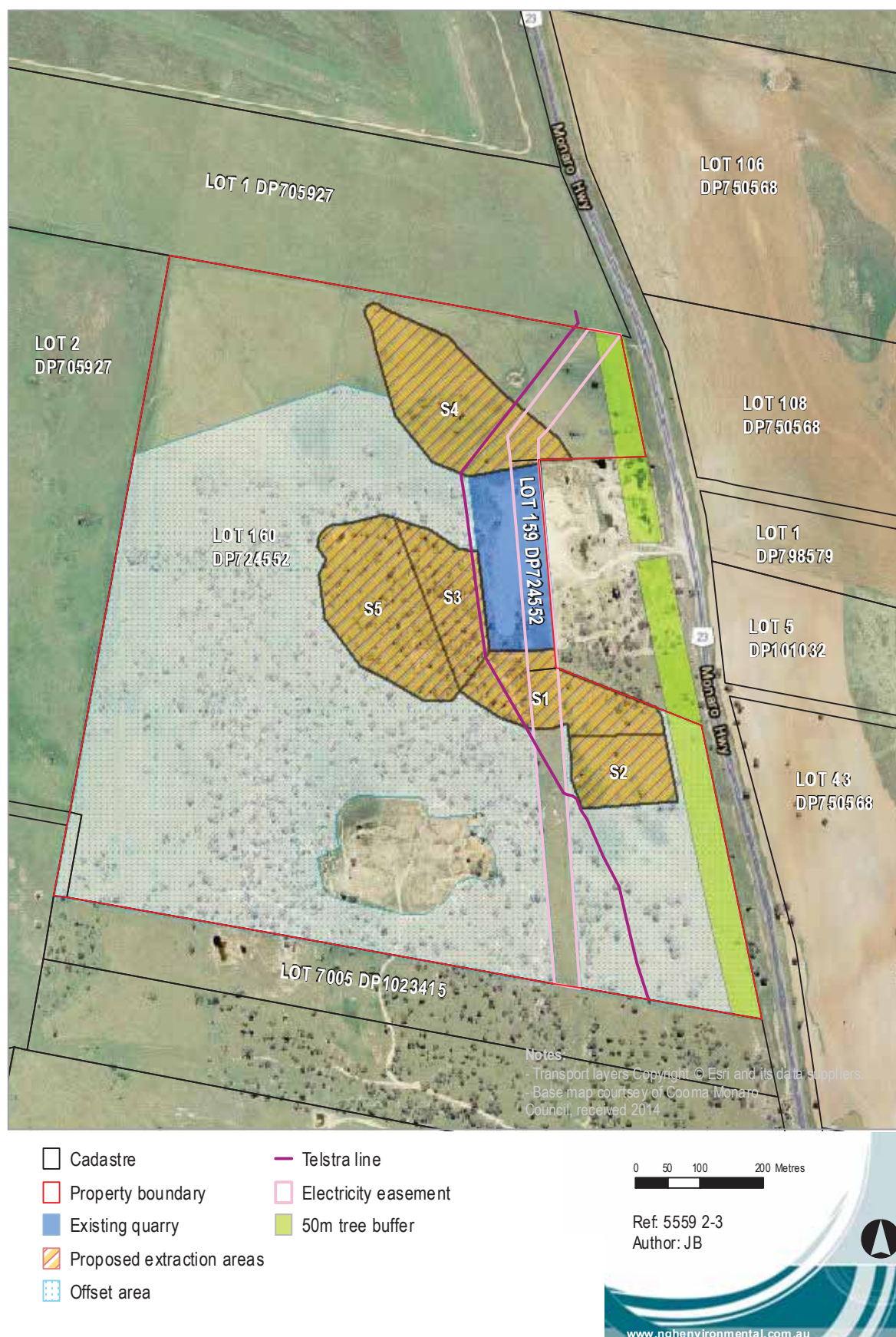


Figure 2-3 Extraction area showing staging and the proposed offset area.

2.2 REASONS FOR THE PROPOSAL AND CONSIDERATION OF ALTERNATIVES

2.2.1 Objectives of the proposal

The objectives of the proposal are:

- To extend the existing Upper Bunyan Gravel Pit to be capable of extracting up to 20,000 tonnes per year over a 20 year life.
- To allow the retention of existing employment of up to 4 full time council staff and 7 contractors when operating.
- Minimise transportation distances of materials to the Cooma area.
- Minimise impacts on the natural and built environment through sensitive design and appropriate environmental management practices.

2.2.2 Consideration of alternatives

Option 1 - Do nothing

The 'do nothing' option would see the Bunyan gravel pit closed in approximately two years.

Option 2 – Develop a new gravel pit

This option would involve identification, purchase and development of a new gravel pit to replace the Upper Bunyan Gravel Pit after resources in the current extraction area have been exhausted. If a new site could be located in the Cooma area, the new pit could continue to supply materials for road construction and maintenance activities in the Cooma area.

Option 3 - Reopen and expand an inactive quarry

Bunyan Lower pit is located on DP606462 and is 1.8 km south of the Upper Bunyan Gravel Pit in a central location within the Cooma-Monaro shire. The quarry is no longer in use as available material has been exhausted. This option would involve reopening the quarry and expanding it beyond the existing development footprint.

Option 4 - Redevelop and expand an existing active quarry

There are eight quarries within the Cooma-Monaro Shire Council area that are currently active, including the Upper Bunyan Gravel Pit. This option would involve redevelopment or expansion of one, or several, of these quarries, for the ongoing supply of materials for road construction and maintenance activities in the Cooma area.

2.2.3 Analysis of options

Option 1 would not meet the proposal objectives. It would place more pressure on the remaining seven quarries to supply the requirements of the shire. This would require CMSC to transport materials from other gravel pits, primarily located in the north-east of the Shire, to the west of Cooma and surrounding Cooma township area for road construction and maintenance activities. This would involve increased transport costs and associated potential traffic and safety impacts as these sites are further away.

Option 2 is not a feasible option due to financial considerations. CMSC do not have the financial resources to identify, purchase and develop a new gravel pit. In addition, the establishment of a new site would create a new disturbance and have environmental impacts and constraints that would need to be managed.

Option 3, reopening and expanding the Lower Bunyan Pit, was considered to be a feasible option for CMSC in the early planning stages. The material is good quality and the quarry is centrally located and would be suitable in terms of operational costs and material haulage costs around the Shire. However, preliminary investigations on the future use of the site identified the following constraints:

- Expansion to the west would require:
 - Purchase of land from the adjacent landowner. This would require agreement from the land owner and subsequent subdivision of land. CMSC does not have the financial resources to undertake this option.
 - Blasting operations as part of the new quarry operations. The material to the west is hard rock and extraction would involve blasting operations. This option would be more costly for CMSC and the site is in close proximity to residences (within 525m) which could result in noise impacts for nearby sensitive receivers.
- Expansion to the south would require clearing of vegetation that is likely to belong to the an *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions*, which is listed as an Endangered Ecological Community (EEC) under the TSC Act. The vegetation appears to be in high quality condition and, based on aerial imagery, appears to provide an important link for wildlife connectivity, being an isolated woodland patch located within an area of cleared farmland.
- Any expansion at the site would result in increased visual impacts from the Monaro Highway.

Option 4 is considered to be a feasible option but only in relation to the Upper Bunyan Gravel Pit. The remaining seven quarries are located in the outer areas of CMSC LGA area and the quality of the material can be variable. These smaller quarries are generally utilised when road works are required in close proximity to them. While some of the quarries can supply good material, the haulage costs from their remote locations would be prohibitive. In addition, development consent conditions for these quarries restrict annual extraction amounts and have placed a time limit on the quarrying operations.

Expansion of the Upper Bunyan Gravel pit is desirable for the following reasons:

- The quality of the material on site is versatile and can be used for most of council construction and maintenance works.
- There is a long term supply of material on site (estimated to be 25 years, dependant on demand).
- It is centrally located within the LGA thus making haulage more cost effective
- Infrastructure at the site is already established. Movement into the new areas of extraction would be achieved using existing road infrastructure.
- Establishment of the quarry would make use of existing access and operational arrangements (staffing and plant requirements).
- The area proposed for expansion is on Crown Land negating the need for Council to purchase the site initially. There may be an option to lease the site until in the short term until CMSC raises the funds to buy the land.
- The Aboriginal Heritage on site has been assessed to be of low potential.

- The offset and rehabilitation on site will improve the biodiversity on site long term.
- The site is located within a rural area with the closest residence over 800 metres away. Disturbance to local residences, either as result of noise or dust is considered manageable.

2.2.4 Justification of the preferred option

The expansion of the Upper Bunyan Gravel Pit into Lot 160 DP 724552 (Option 4) is the preferred option. It provides the most certainty regarding the continuation of the supply of materials for road construction and maintenance activities in the Cooma area and best meets the objectives of the proposal. The quarry contains good quality material and is the most cost effective option in terms of establishment (utilisation of existing infrastructure) and haulage (central location).

Continuing to source materials from Upper Bunyan Gravel Pit to supply the Cooma area would result in fewer vehicle movements and reduce potential safety impacts associated with using existing quarries further from Cooma to supply the Cooma area. There would be logistic advantages from continuation of the existing operations, including staffing and equipment requirements.

Environmental impacts, which are identified in this document, would be addressed by the appropriate use of environmental safeguards, while achieving the proposal objectives.

2.3 PROPOSAL DESCRIPTION

It is proposed that the existing gravel pit on Council land would be expanded in five stages (refer Figure 2-3).

The first two stages, Stage 1 (S1) and Stage 2 (S2) involves expanding the operation to the south. Stage 3 (S3) involves expanding the operation 40 metres west of the existing active area of the quarry and Stage 4 (S4) involves expanding the operation to the north. Stage 5 would join the western boundary of Stage 3 and would expand the quarry further west. Total hectares of each stage is shown in Table 2-2.

Table 2-2 Extraction stages and areas

Stage	Approximate areas (hectares)
Stage 1	2.55
Stage 2	1.44
Stage 3	1.88
Stage 4	4.06
Stage 5	3.87
Total	13.8

Extraction at each area would commence once the resources in each previous stage have been exhausted. While the duration of extraction in each stage depends on demand, Stage 1 and Stage 2 operations are expected to take a minimum of five years each.

No staff amenities or water supply are considered to be required or are proposed.

The operation of the gravel pit in the expanded areas would follow the pattern of existing operations, as follows.

- Current operation of the gravel pit involves a maximum of 5 staff members per day onsite.
- The following machinery are used onsite:
 - Front end loaders
 - Truck & dog
 - Bulldozer
 - Tipper trucks
 - Screening equipment
 - 4WD vehicles for staff

No crushing or blasting is currently undertaken onsite. With the possible exception of blasting, no change is proposed to the methods or rate of extraction. The proposal is simply to follow the resource into adjoining areas.

2.3.1 Production quantities

The proposed Upper Bunyan Gravel Pit expansion would continue to extract 20,000 – 25,000 tonnes per year. Coffey's geotechnical investigations estimate that 630,000 cubic metres of material could be extracted from the site. The estimated life span of the gravel pit is 20 years, although this is subject to demand and the quality and distribution of the resource.

2.3.2 Access and transport

Access to and from the site would be from an existing unsealed entry on the Monaro Highway; no change to the access or haulage traffic is proposed. Truck and dog would transport material to and from site throughout the year. Similar truck movements on site and haulage requirements are expected; 4-5 trucks during operational periods. Operation is in response to road construction and maintenance activities. These are higher after periods of heavy rain when storm damage results on the network of unsealed roads in the shire. Active periods are generally over 1 to 2 weeks.

2.3.3 Work method

The expansion and operation of the gravel pit would involve the following general activities:

- Removal of trees from the extraction area
- Construction of soil and water management devices, including a sediment detention ponds where applicable.
- Extraction of material using a front end loader
- Screening and stockpiling of material onsite
- Loading into haul trucks, prior to use

Once activities are completed in an area, progressive stabilisation and rehabilitation would be carried out for the purpose of:

- Reshaping to achieve stable landforms
- Rehabilitating landforms

A rehabilitation strategy is included in Appendix A. Rehabilitation would include the planting of trees within a 50 metre buffer area adjacent to the Monaro Highway. Two areas have been identified north

and south of the site (refer Figure 2-3). Planting would be undertaken prior to or concurrent with the commencement of the relevant extraction stages:

- The southern area, prior to or concurrent with the development of Stages 1 and 2.
- The northern area, prior to or concurrent with the development of Stage 4.

Currently no blasting and crushing are expected for the operation of the proposed expanded gravel pits. However they may occur in the future, therefore they have been covered in this EIS.

2.3.4 Waste and water requirements

Minimal waste is produced during this process. Any waste materials would remain onsite.

The site has no water supply. The current operation of the gravel pit has no water requirements. The proposed expansion would similarly have no water requirements. If water requirements are identified, such as for dust suppression, water trucks would be brought in to address periodic requirements.

2.3.5 Timing

A truck and dog would transport extractive materials from site throughout the year when required.

2.3.6 Utilities

A 132Kv powerline and a telecommunication cable (Telstra) are located within the proposal site (refer Figure 2-3). This infrastructure would not be impacted by the proposal. Extraction in proximity to these services is likely be avoided due to the prohibitive cost of relocating this infrastructure.

3 STATUTORY REQUIREMENTS

3.1 PLANNING CONTEXT

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and associated regulations and environmental planning instruments provide the framework for assessing environmental impacts and determining planning approvals for developments in NSW.

The proposed works have been assessed under Part 4 of the EP&A Act. The assessment also considers the requirements of the *Threatened Species Conservation Act 1995* (TSC Act) and the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

3.2 ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979 AND ENVIRONMENTAL PLANNING AND ASSESSMENT REGULATION 2000

The Proposal has been assessed under Part 4 of the EP&A Act. Under clause 76A of the EP&A Act Schedule 3 of the *Environmental Planning & Assessment Regulation 2000* lists categories of developments which are designated in New South Wales. Clause 19 of Schedule 3 pertains to extractive industries and triggers for the proposal as include:

- Clause (19)(1)(b)(i) identifies developments 'that disturb or will disturb a total surface area of more than 2 hectares of land by excavating' as being designated.
- Clause (19)(1)(c)(iv) refers to extractive industries located within 500 metres of the site of another extractive industry that has operated during the last 5 years.

The proposed development is not defined as 'integrated development' as it is not proposed to extract, process or store more than 30,000 tonnes of extractive material annually.

As the proposal is a 'designated development', an EIS is required. This EIS has been prepared under Part 4 of the EP&A Act and addresses the obligations of the consent authority under section 79C. (Refer to Section 4.3 for information regarding consultation under the requirements of 'designated development').

3.3 STATE ENVIRONMENTAL PLANNING POLICY (MINING, PETROLEUM PRODUCTION AND EXTRACTIVE INDUSTRIES) 2007

The aims of this Policy are to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources.

Clause 7 of the Mining SEPP states that, 'Development for any of the following purposes may be carried out only with development consent:

(a) *Extractive industry on land on which development for the purposes of agriculture or industry may be carried out.*

Therefore the proposed works require development consent under this SEPP from Cooma-Monaro Council.

In accordance with Part 3 of the Mining SEPP, this EIS has assessed the proposal for it's:

Compatibility with existing land uses	Section 5.11
Impact on surface water and groundwater resources	Section 5.13
Impact on threatened species and biodiversity	Section 5.3
Impact on air quality/greenhouse gas emissions	Section 5.8
Resource recovery efficiency/re-use, recycling, waste	Section 5.9
Transport	Section 5.5
Rehabilitation	Appendix A

3.4 STATE ENVIRONMENTAL PLANNING POLICY NO. 33 – HAZARDOUS AND OFFENSIVE DEVELOPMENT

In this Policy, potentially hazardous industry refers to a development for the purposes of any industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would pose a significant risk to human health, life or property or to the biophysical environment. This includes a hazardous industry and a hazardous storage establishment.

A potentially offensive industry is a development for the purposes of an industry which, if the development were to operate without employing any measures (including, for example, isolation from existing or likely future development on other land) to reduce or minimise its impact in the locality or on the existing or likely future development on other land, would emit a polluting discharge (including for example, noise) in a manner which would have a significant adverse impact in the locality or on the existing or likely future development on other land, and includes an offensive industry and an offensive storage establishment.

The gravel pit would be designed to avoid significant risk to human health, life or property or to the biophysical environment. The potential risks to the environment would be reduced through design measures and it is considered that the proposal does not constitute a potentially hazardous industry. Similarly, the proposal is not considered to emit any potentially offensive discharge (including noise) that would have a significant adverse impact on the locality or the environment. This SEPP is not, therefore considered relevant.

3.5 STATE ENVIRONMENTAL PLANNING POLICY NO. 44 – KOALA HABITAT PROTECTION

The *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44) applies to all LGAs listed on Schedule 1 of the policy, except land dedicated under the *National Parks and Wildlife Act 1974* or the *Forestry Act 1916*. The identification of an area of land as SEPP 44 Potential Koala Habitat is determined by the presence of Koala feed tree species listed within Schedule 2 of the policy.

Potential Koala Habitat is defined as areas where the tree species listed under Schedule 2 constitute at least 15 per cent of the total number of trees in the upper or lower strata of the tree component. An area of land to which the policy applies must be at least one hectare in area (and may include adjoining land in the same ownership). If Potential Koala Habitat is present then it must be further assessed to determine whether it represents Core Koala Habitat. There are specific matters to be taken into consideration before development consent may be granted if Core Koala Habitat is present. Core Koala

Habitat is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females, and recent and historical records of a population.

The proposal is located on land over 1 hectare and is within the Cooma-Monaro local Government Area that is listed in Schedule 1 of the SEPP. Tree species and Koalas are discussed further in Section 5.3.

3.6 STATE ENVIRONMENTAL PLANNING POLICY NO. 55 – REMEDIATION OF LAND

This policy aims to provide for a State wide planning approach to the remediation of contaminated land and to promote the remediation of contaminated land for the purpose of reducing the risk of harm to human health or the environment. Specifically, this policy aims to ensure that:

- Contamination and remediation are considered in zoning or rezoning proposals and development applications
- Remediation works are permissible and only require consent where they have the potential for significant environmental impacts (Category 1). In all other cases no consent is required (Category 2)
- Local government authorities are notified before and after remediation takes place
- Remediation is carried out to appropriate standards

There are no existing occurrences of contaminated land (Section 5.2) within the proposal site and as such remediation is not required.

3.7 PROTECTION OF THE ENVIRONMENT OPERATION ACT 1997

This Act is administered by the Office of Environment and Heritage (OEH), Environment Protection Authority (EPA) branch. Under Schedule 1 of the Act, a licence would be required for:

- land based extractive activities that involve extraction, processing or storage of more than 30,000 tonnes of extractive materials per year (Clause 19)
- the processing of materials (including sand) by crushing, grinding or separating them into different sizes if it has a capacity to process more than 150 tonnes of materials per day or 30,000 tonnes of materials per year (Clause 16)

The gravel pit operations would not exceed either of the above thresholds. Extraction and processing activities would therefore not be considered a scheduled activity under Schedule 1 of the Act and a licence is not required.

3.8 NATIONAL PARKS AND WILDLIFE ACT 1974

The *National Parks and Wildlife Act 1974* (NPW Act) aims to conserve the State's natural and cultural heritage; foster public appreciation, understanding and enjoyment of the State's natural and cultural heritage; and manage any lands reserved for the purposes of conserving and fostering public appreciation and enjoyment of the State's natural and/or cultural heritage.

The NPW Act governs the protection and care of native fauna and flora, and Aboriginal places and objects throughout NSW.

Section 5.3 of this EIS assesses the impact of the proposal on native flora and fauna and the requirement for further assessment and referral.

Section 5.4 of this EIS addresses the impact of the proposal on Indigenous heritage.

3.9 THREATENED SPECIES CONSERVATION ACT 1995

The *Threatened Species Conservation Act 1995* (TSC Act) aims to conserve and protect certain classes of threatened, endangered and vulnerable species, populations and ecological communities.

Section 5A of the EP&A Act lists a number of factors to be taken into account when deciding if there is the likelihood of a significant impact on threatened species, populations and their habitat or on ecological communities. If there is a chance of an impact, then an Assessment of Significance would be required to determine the significance of the impact. If there is likelihood for a significant impact on threatened species, populations and their habitat or on ecological communities then a Species Impact Assessment is required.

Threatened species are discussed in Section 5.3.

3.10 NATIVE VEGETATION ACT 2003

The *Native Vegetation Act 2003* regulates the clearing of native vegetation. Clearing is defined as cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning native vegetation including native grasses and herbage. Permission to clear native vegetation must be obtained for proposals under Part 4 of the EP&A Act. Offsets may be required.

Impacts on native vegetation are discussed in Section 5.3 of this EIS.

3.11 HERITAGE ACT 1977

The NSW Heritage Act 1977 (Heritage Act) aims to protect and preserve items of non-Aboriginal heritage significance. The Heritage Act provides for the protection of items of local, regional and State heritage significance. It establishes a list of State Heritage Items and outlines processes for approval of development which may impact items of heritage significance.

Impacts of the gravel pit proposal on non-Aboriginal heritage are assessed in Section 5.14 of this EIS.

3.12 NOXIOUS WEEDS ACT 1993

This act aims to prevent the establishment, reduce the risk of spread and minimise the extent of noxious weeds. The *Noxious Weeds Act 1993* guides the management of declared noxious weeds within Local Government Areas (LGAs). Five noxious weeds occur within the development footprint including African Lovegrass (**Eragrostis curvula*), Scotch Thistle (**Onopordum acanthium*), Serrated Tussock (**Nasella trichotoma*), St John's Wort (**Hypericum perforatum*) and Sweet Briar (**Rosa rubiginosa*). Impacts are assessed in Biodiversity, Section 5.3.

3.13 FISHERIES MANAGEMENT ACT 1994

The NSW *Fisheries Management Act 1994* (FM Act) provides for the protection of threatened fish and marine vegetation and is administered by the Department of Primary Industries (DPI). The FM Act aims to protect fishery resources and marine species, and conserve habitats and diversity.

No creeks are located within the subject site. Present drainage lines are not mapped as Key Fish Habitat (KFH) on NSW Fisheries' KFH mapping. No impacts to fish passage would occur. A Fisheries permit is not required for these works.

3.14 WATER ACT 1912

The proposal does not require the extraction of water from bores or surface water in the area. Therefore a licence under the Water Act 1912 is not required.

3.15 WATER MANAGEMENT ACT 2000

The *Water Management Act 2000* (Water Management Act) superseded the *Rivers and Foreshores Improvement Act 1948* and protects rivers and foreshores and water resources in NSW by providing for the sustainable management of water resources. The Water Management Act includes provisions to control or permit works within 40m of the top of bank (replaces part of the RFIA). The proposal does not involve works within 40 m of the top of bank of a waterway, therefore the relevant provisions of the Water Management Act are not considered.

3.16 ROADS ACT 1993

The *Roads Act 1993* (Roads Act) provides for the classification of roads and for the declaration of the Roads and Maritime Services (Roads and Maritime) and other public authorities as roads authorities for both classified and unclassified roads. It also regulates the carrying out of various activities in, on and over public roads. Approval from the Roads and Maritime would be required under section 138 of the Roads Act to erect a structure or carry out a work in, on or over a public road.

Proposed and recommended upgrades are required to the access into the gravel pit from the Monaro Highway. Consultation and a Roads Permit would be required from Roads and Maritime.

3.17 ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

Under the Commonwealth EPBC Act a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on Matters of National Environmental Significance (MNES) or the environment of Commonwealth land. These are considered in Section 5.17 of the EIS.

3.18 COOMA MONARO LOCAL ENVIRONMENTAL PLAN 2013

The proposal is located in Cooma Monaro Local Government Area (LGA). Development within the LGA is controlled by the Cooma Monaro Local Environmental Plan 2013 (LEP).

The gravel pit is located on land zoned Primary Production (RU1) zone which states that extractive industries can be developed with consent.

4 CONSULTATION

4.1 LOCAL COMMUNITY ENGAGEMENT

Lessees of the crown land proposed for development and representatives of the rifle club have been contacted by Council, regarding the proposal. The expansion of the gravel pit would impact these land users. Further consultation will occur if required with the progression of the proposed work.

No broad community consultation has been undertaken.

4.2 ABORIGINAL COMMUNITY INVOLVEMENT

A process of Aboriginal community consultation was undertaken as a component of the Aboriginal heritage assessment completed by NSW Archaeology (Appendix E)) and has been conducted in accordance with the guidelines as set out in the OEH's *Aboriginal cultural heritage consultation requirements for proponents* (NSW Department of Environment, Climate Change and Water 2010).

In order to identify, notify and register Aboriginal people who may hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places in the area of the proposed project, the following procedure was implemented:

- Correspondence dated 5 August 2014 was sent to:
 - NSW OEH Queanbeyan office;
 - Merrimans Local Aboriginal Land Council;
 - the Office of the Registrar, Aboriginal Land Rights Act 1983;
 - the National Native Title Tribunal, requesting a list of registered native title claimants, native title holders and registered Indigenous Land Use Agreements;
 - Native Title Services Corporation Limited (NTSCORP Limited);
 - Cooma-Monaro Shire Council.
- An advertisement was placed in Cooma-Monaro Express on 7 August 2014.
- In accordance with NSW OEH list to relevant parties for the area, further correspondence dated 5 August 2014 was sent to the following:
 - Ngunnawal Elders Corp;
 - Ngunnawal Heritage Aboriginal Corporation;
 - Konanggo Aboriginal Cultural Heritage Services;
 - Carl and Tina Brown;
 - Yuwang Aboriginal Cultural Heritage Services;
 - Colleen Dixon;
 - Gunjeewong Cultural Heritage Aboriginal Corporation;
 - Buru Ngunnawal Aboriginal Corporation;
 - Alice Williams;
 - Koomurri Ngunnawal Aboriginal Corporation.

The Office of the Registrar *Aboriginal Land Rights Act 1983* responded (12 August 2014) indicating there does not appear to be registered Aboriginal owners for the project area. NTSCORP responded on 11 August 2014, indicating that they would provide our correspondence to any individuals, groups or organisations that NTSCORP is aware assert traditional interest in the area. The National Native Title Tribunal responded via email dated 7 August 2014 indicating that Native Title had been extinguished over

the area. Cooma Monaro Sire Council provided various lists of people, all of which contained old and out of date information. Further correspondence was written to the following Local Aboriginal Land Councils on the list (Bega, Wagonga, Bodalla, Mogo and Cobowra) to seek names of persons or groups who may wish to register and interest in the process (dated 12 August 2014).

The following groups registered an interest in this project and their involvement and responses to the project are in Table 4-1. The groups were sent the proposed consultation process and assessment methodology 27 August 2014. A draft copy of the report was sent in November 2014.

Table 4-1 Aboriginal Heritage registered groups and involvement in the proposal.

Group	Involvement and responses
Buru Ngunawal Aboriginal Corporation	No correspondence received.
Ngunawal Heritage Aboriginal Corporation	Comments In relation to the process indicated it is important to be consistent with current protocols, guidelines and requirements and to actively involve Aboriginal Stakeholders when Aboriginal heritage may be impacted by any proposed works. This is to ensure duty of care to all Aboriginal heritage with best practice and provide a positive outcome for all parties.
Koomurri Ngunawal Aboriginal Corporation	Commented the group had no issues with the draft copy of the report (26 November 2014)
Merrimans Local Aboriginal Land Council	Assisted with the field survey.

4.3 AGENCY REQUIREMENTS

As the proposal is a designated development, the Director General's Requirements were requested and were provided on 9 December May 2013 (see Appendix B). The following sections provide a summary of assessment requirements from relevant agencies and a cross reference to where they are addressed within this EIS.

Department of Planning and Infrastructure

Issue/ requirement	Addressed
The Environmental Impact Statement (EIS) must include: - an executive summary - a full/detailed description of the proposal, including: - identification of the resource - description of the site - a history of any previous quarrying operations on the site - the proposed works (including rehabilitation works) - the duration and intensity of extraction operations - any likely interactions between the proposed operations and existing/approved development and land use in the area - a detailed justification for the development - a conclusion justifying the development on economic, social	An executive summary is included at the beginning of this document. A detailed description of the proposal is provided in Section 2.3 and a conclusion is provided in Section 8. A signed declaration by the lead author of the EIS is included in Section 9.

Issue/ requirement	Addressed
and environmental grounds, a signed declaration from the author of the EIS, certifying that the information contained within the document is neither false nor misleading.	
The EIS must also assess the potential impacts of the proposal during the establishment, operation and decommissioning of the proposal. The EIS must describe what measures would be implemented to avoid, minimise, mitigate, offset, manage and/or monitor the potential impacts on:	Addressed in Section 6.
- Land resources including an assessment of the potential impacts on: - soils and land capability - landforms and topography - land use	Addressed in Sections 5.2 and 5.11.
- Water resources including: - identification of any licensing requirements or other approvals under the <i>Water Act 1912</i> and/or <i>Water Management Act 2000</i> - an assessment of potential impacts on the quality and quantity of existing surface and ground water resources - a description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant Water Sharing Plan or water source embargo; - an annual site water balance for representative years of the proposed life of the project; and - a detailed description of the proposed water management system (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts;	Licences and approvals required for the proposal are detailed in Section 7. General impacts on water resources and recommended safeguards and mitigation measures are addressed in Section 5.3.
- Biodiversity including: - accurate predictions of any vegetation clearing on site; - a detailed assessment of the potential impacts of the development on any threatened species or populations or their habitats, endangered ecological communities and groundwater dependent ecosystems; - a detailed description of the measures to maintain or improve the biodiversity values within the site in the medium to long term; and - consideration of a Biodiversity Offset Strategy;	Addressed in Section 5.3. An offset strategy has been developed for the proposal, see Appendix D.
- Heritage - including: - an Aboriginal cultural heritage assessment - a Historic heritage assessment (including archaeology) which must include a statement of heritage impact	Addressed in Sections 5.4 and 5.14.

Issue/ requirement	Addressed
- Traffic and transport including: - an assessment of potential traffic impacts on the capacity, efficiency and safety of the road network; - a description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network along the route over the life of the project	Addressed in Section 5.5.
Noise and vibration particularly any potential noise and vibration impacts on nearby private receptors due to construction operation or road haulage.	Addressed in Section 5.3.
Air quality- particularly any potential dust impacts on nearby private receptors from construction operation or road haulage.	Addressed in Section 5.8.
- Rehabilitation - including: - a detailed description of the proposed rehabilitation measures that would be undertaken during quarry closure; - a detailed rehabilitation strategy; - the measures that would be undertaken to ensure sufficient financial resources are available to implement the proposed rehabilitation strategy	Addressed in Appendix A.
Waste management	Addressed in Section 5.8.
Hazards and risks - paying particular attention to public safety, including bushfires and transport or storage of any dangerous goods	The proposal would not involve the transport or storage of dangerous goods, Section 5.10.
Visual amenity	Addressed in Section 5.7.
Agricultural impacts	Addressed in Section 5.11.
Utilities and services	Addressed in Section 5.14.
Social and economic impacts.	Addressed in Section 5.11.
The EIS must assess the proposal against the relevant environmental planning instruments including (but not limited to):	
<i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007;</i> <i>State Environmental Planning Policy No. 33 - Hazardous and Offensive Development;</i> <i>State Environmental Planning Policy No. 44 - Koala Habitat Protection;</i> <i>State Environmental Planning Policy No. 55 - Remediation of Land;</i> <i>Cooma Monaro Local Environmental Plan 2013;</i> - Relevant development control plans and section 94 plans, strategies and management plans.	Addressed in Section 3. SEPP 44 requirements are addressed in Section 5.3.
The EIS must take into account relevant State Government guidelines, policies and plans.	Policies and guidelines identified in the DGRs have been consulted during the preparation of this

Issue/ requirement	Addressed
	EIS.
During the preparation of the EIS, you should consult with the relevant local, State and Commonwealth government authorities, service providers and community groups, and address any issues they may raise in the EIS. In particular, you should consult surrounding landowners and occupiers that are likely to be impacted by the proposal. Details of the consultations carried out and issues raised must be included in the EIS.	Details of all consultation undertaken are provided in Section 4.

Office of Environment and Heritage

Issue/ requirement	Addressed
In relation to Aboriginal cultural heritage: - a description of the Aboriginal objects and declared Aboriginal places located within the area of the proposed development; - a description of the cultural heritage values, including the significance of the Aboriginal objects and declared Aboriginal places, that exist across the whole area that will be affected by the proposed development and the significance of these values for the Aboriginal people who have a cultural association with the land; - how the requirements for consultation with Aboriginal people have been met (as specified in clause 80C of the <i>National Parks and Wildlife Regulation 2009</i>); - the views of those Aboriginal people regarding the likely impact of the proposed activity on their cultural heritage (if any submissions have been received as a part of the consultation requirements, the report must include a copy of each submission and the response); - actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposed activity, with reference to the cultural heritage values identified; - any practical measures that may be taken to protect and conserve those Aboriginal objects or declared Aboriginal places; - any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm or, if this is not possible, to manage (minimise) harm; and - a specific Statement of Commitment that an Aboriginal Heritage Management Plan (AHMP) will be developed and implemented.	A specialist Aboriginal cultural heritage report has been prepared by NSW Archaeology addressing these requirements summarised in Section 5.4 and included as Appendix E of this EIS.
Assessment of Biodiversity:	A specialist Biodiversity Assessment report has

Issue/ requirement	Addressed
• a location map showing the location and boundary of the study area, superimposed over a satellite or aerial photograph • a detailed vegetation map showing the location and extent of various vegetation types and zones reflecting condition • survey of each vegetation zone with the location of plots or transects identified on the map. Plant lists for these plots/transects, and a condition assessment (using Biometric) should be provided • a list of known and likely threatened species as listed by the <i>Threatened Species Conservation Act 1995</i> which might occur within each vegetation zone should be provided. The report should note which of these are 'species-credit species' • A summary table should be provided that shows for each vegetation zone ○ Area of vegetation zone ○ Vegetation type ○ Conservation Status of Vegetation Type ○ Condition of vegetation (as per Biometric) ○ List of known or likely threatened species • Where a threatened species is known, or likely an Assessment of Significance for this species is required. Additional survey may also be required • An account of the hydrology of the area and any expected impacts to this from the proposed development • Assessment of the importance or otherwise of the location as a corridor, migratory route or drought refuge, in relation to other remnant vegetation, riparian and wetland areas or habitat in the region	been prepared by NGH Environmental addressing these requirements summarised in Section 5.3 and Appendix C included as of this EIS.
Preparation of an offset strategy if required that details: • The location and boundary of the proposed offset • The vegetation types within the proposed offset site • Proposed mechanism for legally securing the offset site in perpetuity • Proposed management actions to be implemented on the offset site	This has been addressed in Appendix D of this EIS
Specifically in regards to flora and fauna: • Assessments should take into account the importance of the Snow Gum Grassy Woodland EEC and its condition in the wider local and	A specialist Biodiversity Assessment report has been prepared by NGH Environmental addressing these requirements summarised in Section 5.3 and Appendix C included as of this

Issue/ requirement	Addressed
regional context given that this ECC is commonly heavily modified and in a degraded condition. If the ECC is in good condition under a biobanking assessment clearing the ECC would be red flagged meaning impacts to it should be avoided. Targeted surveys using appropriate methodology should be undertaken for a range of threatened species identified by OEH as possibly occurring on site. Surveys should be particularly focussed on species that have the potential to significantly affected by the development footprint including grassland fauna.	EIS.
If a significant impact on a threatened species is deemed likely following a threatened species assessment via the "Assessment of Significance", it may be necessary to prepare a Species Impact Statement (SIS).	In consideration of the proposed works, the Biodiversity Assessment, Appendix C of this EIS, concluded that referral on the basis of significant impact was not relevant for any listed entity.

NSW Environment Protection Agency

Issue/ requirement	Addressed
Adequate assessment of: - Baseline conditions that exist at the site of the proposed development; - Potential environmental impacts arising from the development and its ongoing activities including dust, noise and water quality; - Actions that will be taken to avoid or mitigate impacts or compensate for unavoidable impacts identified above.	Section 5.6, 5.8 and 5.13. A specialist noise report has been prepared by Renzo Tonin and Associates addressing these requirements summarised in Section 5.36 and included as Appendix F of this EIS.

Roads and Maritime Services

Issue/ requirement	Addressed
Traffic impact study including: - Existing access arrangements and traffic conditions - Traffic generation rates and distributions associated with the development - Estimate the expected traffic composition - Needs to identify an appropriate access treatment for the junction of the proposed development with the Monaro Highway. Treatments type is to be determined based on the warrants for turn treatments outlined in Figure 4.9 of AUSTRROADS Guide to Traffic Management - Part 4a: Unsignalised and Signalised Intersections (Warrants for turn	A specialist Traffic report has been prepared by Duo Bega Designs addressing these requirements summarised in Section 5.5 and Appendix G included as of this EIS.

Issue/ requirement	Addressed
treatments on the major road at unsignalised intersections). • Demonstrate the access would have Safe Intersection Sight Distance in accordance with AUSTROADS Guide to Road Design – Part 4a:Unsignalised and Signalised Intersections Table 3.2, in both directions. • Concept plans for any works proposed within the road reserve to demonstrate they can be constructed within the road reserve.	

4.4 PUBLIC EXHIBITION AND NOTIFICATION

Section 79(1) of the EP&A Act outlines public participation procedures for designated development which requires that the consent authority must, as soon as practicable after the application is made for consent:

- Place the application and accompanying information on public exhibition for a minimum of 30 days.
- Provide written notice of the application to people as required by the EP&A Act and EP&A Regulations, including adjoining owners and people potentially affected by the proposal.
- Exhibit notice of the application on the land to which the application refers.
- Publish a notice of the application in a locally circulating newspaper on not less than two occasions.
- Invite submissions by any person to the consent authority with respect to the application.

5 ENVIRONMENTAL ASSESSMENT

5.1 SCOPING AND PRIORITISATION OF ISSUES

The purpose of this section of the EIS is to identify and investigate the aspects of the proposal that have the potential to generate significant environmental impacts ('significant aspects').

The risk assessment was informed by desktop research and the site inspection. Risk is identified by considering the **consequence** of an impact, in combination with the **likelihood** of this impact occurring. The risk rating is a factor of likelihood and consequence.

High risk ratings have been investigated by specialist reports, appended to the EIS and summarised in the following chapter. Medium and low risks are considered highly manageable and are investigated by site inspection and desktop review.

Table 5-1 Risk assessment for the proposal.

Aspect	Consequence	Likelihood	Risk rating
Soil and landforms impacts	Moderate	Likely	High
Biodiversity impacts	Moderate	Likely	High
Heritage (Aboriginal) impacts	Moderate	Likely	High
Traffic and transport impacts	Moderate	Likely	High
Noise impacts	Moderate	Likely	High
Visual amenity	Moderate	Possible	Medium
Air quality	Moderate	Possible	Medium
Waste management	Moderate	Possible	Medium
Hazards and risks	Minor	Likely	Medium
Land use	Minor	Likely	Medium
Water Resources	Minor	Likely	Medium
Social and economic impacts	Minor	Likely	Medium
Water resources	Minor	Likely	Medium
Utilities	Minor	Likely	Medium
Heritage (historic) impacts	Minor	Unlikely	Low

5.2 SOIL AND LANDFORMS

5.2.1 Existing environment

Physiography and geology

The subject site is gently undulating to undulating rise at an elevation of 800 to 810 metres Above Sea Level (ASL). The site slopes gently to the north and east. The Bega Murrumbidgee 1:250 000 Geological Sheet indicates that the site is underlain by weathered volcanic rock of the Murrumbidgee Batholith formation including granites, Murrumbidgee Tonalite and biotite tonalite (Lewis and Glen 1995).

Soil landscapes

Based on the *Soil Landscapes of the Cooma 1:100 000 sheet* (Tulau 1994), the soil landscape for the site is Dromore 'dr'. The soils associated with this landscape are shallow well-drained Red Earths and Yellow Earths on crests and upper slopes and shallow, moderately well drained Non-calcic Brown soils on midslopes and lower slopes. Moderately deep, moderately well drained Yellow Earths are present on footslopes and drainage depressions. These soils are highly erodible, infertile soils of low available water-holding capacity with severe gully and sheet erosion hazard.

Investigations undertaken at the subject site found the soils to be clayey gravelly sands. The soils appear to be dense and stiff however are prone to erosion when disturbed (Coffey 2011).

Contaminated land

A search of the NSW OEH Contaminated Sites Register on 13 October 2014 did not identify any sites listed within a one kilometre radius of the study area (NSW Government 2014b). Additionally, the proposed site does not appear on the List of NSW contaminated sites notified to EPA (NSW Government 2014a), as at 13 October 2014.

It is possible that the subject site may contain contaminated material as a result of past agricultural and extractive activities such as pesticides, arsenic and hydrocarbons (EPA 2014). Further, it is located close the highway and historic vehicle collisions may have left contaminated remains in the area. No evidence of contamination was observed from the visual site inspection.

5.2.2 Potential impacts

The expansion of the existing gravel pit and the extraction of aggregate materials would require the removal of vegetation and involve the exposure of soils to erosive forces. Soils would be exposed in extraction areas, for access tracks, stock pile areas, areas of equipment and parking. Stockpiles would be in place for long periods, as material is stored for later use.

The soils have been noted as susceptible to erosion. Stabilisation will be made more difficult by their infertility and low available water-holding capacity. It is likely that stabilisation of stock piles and resultant landforms will require physical strategies to assist replanting, such as land forming swales to trap nutrients and physical barriers to reduce erosion such as jute matting, rock, timber or mulch.

The proposal would result in an alteration to the subject site landform with the excavating activities. The site is gently undulating, with two existing gravel pits. While the new stages would result in further alterations to landforms, a rehabilitation strategy will be implemented to address the final landforms.

Excavation works have potential to uncover unknown contaminated sites such as those relating to past land uses including agricultural waste. Use of fuels and lubricants can result in spills which similarly affect the soil health and its ability to support vegetation. Controls will be required to manage unexpected contaminated land finds, vehicle use and spill risks.

5.2.3 Safeguards and mitigation measures

Operation

The following safeguards and mitigation measures are recommended to ensure that impacts to soils are minimised during extraction activities:

- Establish a Soil and Water Management Plan including the following provisions:
 - Establish soil and water management practices guided by the Best Practice guidelines contained within Soils and Construction Vol. 1 (Landcom 2004).
 - Identify where sediment and erosion controls would be installed, where equipment and materials laydown will be stored.
 - Design of sediment basins to ensure water doesn't leave the site.
 - Designate all areas outside of the works area as 'no go' areas and protect these from indirect impacts. Ensure all vehicles onsite follow established access tracks and minimise onsite movements.
 - Ensure all vehicles onsite follow established access tracks and minimise onsite movements.
- Topsoils would be stockpiled and protected for use in site rehabilitation.
- Subsoil stockpiles and aggregate would be stockpiled in accordance with guidelines contained within Soils and Construction Vol. 1 (Landcom 2004).
- The gravel pit should be designed to have batters no steeper than 1:1 during operations. Permanent batters for completed sections of the gravel port should be not steep than 1:3.
- If signs of contaminated soils are discovered (e.g. smell, discolouration, suspect rubbish), the site would be marked and the soil replaced to cover the contamination. The soil would be analysed without delay to determine the type of contamination and an appropriate management plan would then be developed and followed.
- Implement Cooma-Monaro Shire Council's Chemical Spill procedure. The procedure should be updated for the gravel pit to include the following:
 - Operate and maintain machinery in a manner that minimises risk of hydrocarbon spills.
 - All chemicals used would be stored in within impervious bunded areas, strictly used for their intended purpose as per the manufacturer's instructions.
 - The volume of the chemical storage bunded area would be at least 110% of the volume of all the total of all stored materials.
 - A spill kit would be available onsite at all times. Staff would be trained in its installation.
 - All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills.
 - Any refuelling or washing of machinery would take place within an impervious bunded area.

- Any construction waste would be contained safely on site and removed in a timely manner, and would not be allowed to contaminate the local surface or ground water.

Rehabilitation

- A detailed Rehabilitation Plan would be developed, in accordance with the strategy provided in Appendix A of this EIS, by a person qualified to prepare the plan.
- The Rehabilitation Plan would include input from specialists (such as agronomists) and consent authorities (Council environmental staff, Local Land Services, Office of Environment and Heritage).
- Extraction would not commence in new stages until a detailed rehabilitation plan and sufficient funds (or guarantee of funds) to rehabilitate the new area is in place.

5.3 BIODIVERSITY

5.3.1 Approach

In late 2014, NGH Environmental Pty was engaged by the Cooma-Monaro Shire Council to investigate the biodiversity values of a parcel of Crown land (Lot 160 DP714552) that is proposed to be purchased for the expansion of the Bunyan Quarry and to document the findings in a Biodiversity Assessment report (appended in full, Appendix C of this EIS). The biodiversity assessment provides:

- A description of the biodiversity values of the site and surrounding area including identifying protected and threatened flora and vertebrate fauna species, populations and ecological communities and their habitats.
- Details of the ecological constraints of three possible quarry expansion options.
- Details of the direct and indirect impacts of the possible options on flora and vertebrate fauna species, populations, ecological communities and critical habitat.
- An outline of the requirements of relevant legislation including the *Environmental Planning & Assessment Act 1979*, the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*.
- An assessment of the significance of the impact of the possible options on species, ecological communities and populations listed under the relevant statutes.
- Recommended management measures to avoid, minimise, mitigate and also offset any impacts.

The following sections summarise the key methods and results of the Biodiversity Assessment.

5.3.2 Methodology

A multi-stage approach was used following the below listed structure:

- A desktop assessment incorporating a database search and literature review
- Field surveys to identify threatened flora, fauna and ecological communities
- Reporting on findings and presenting recommendations

A team of ecologists from NGH Environmental and suitable, experienced sub-contractors were engaged to undertake the field work for this project. A summary of the team, their experience and their role(s) is included in Appendix C.

Desktop assessment

Database searches undertaken for the purposes of this assessment included threatened species databases and noxious weed databases as listed in Table 5-2. The results of the database searches are provided in full, in Appendix B of the Biodiversity Assessment.

Table 5-2 Background searches undertaken for threatened entities and noxious weeds.

Resource	Target	Search date	Search area
OEH Wildlife Atlas Database	Threatened flora and fauna and populations.	13/06/14	10 km radius of study area
EPBC Act Protected Matters Search Tool	Threatened flora and fauna, endangered populations and ecological communities and migratory species.	16/06/13	10 km radius of study area
DPI Noxious Weed Database	Noxious weeds declared in the relevant LGA.	13/06/14	Cooma Monaro LGA

In addition, threatened entities identified by the NSW OEH in their response to the DGRs for the project have been considered in this assessment.

Literature relevant to this assessment was also reviewed and included:

- OEH Threatened Species Profiles
- Department of the Environment's EPBC Act Species Profiles and Threats Database (SPRAT)
- Construction methodology and concept designs
- Aerial maps

An evaluation of the likelihood of occurrence of threatened flora and fauna species and ecological communities is provided in full in Appendix G of the biodiversity assessment.

Field survey effort

FLORA

Flora field survey was undertaken by a senior ecologist in August 2014 (preliminary vegetation type) and on two days in October 2014 with two technical assistants (detailed flora survey). The aims of the surveys were to:

1. Determine vegetation communities present within the study area, their condition and extent.
2. Identify potential Endangered Ecological Communities (EECs) within the study area and determine their condition, extent and potential for impact.
3. Identify whether threatened flora species or their habitats are present within the study area and have potential to be impacted by the proposal.
4. Collect data to facilitate offsets according to the NSW OEH BioBanking Methodology should offset be required for the proposal.

Methodologies including random meanders, Biometric plot surveys and targeted threatened species transects were employed. These methodologies are discussed in more detail below. Survey effort is shown on Figure 5-1.



Figure 5-1 Survey effort

Random meander and targeted flora surveys

Floristics at the site were surveyed using the random meander method of Cropper (1993). A random meander was conducted across the entire development and potential offset area over a period of approximately five hours on the 27 August 2014. Particular attention was paid to areas of native dominated vegetation as these were considered possible habitat for threatened flora species.

Highly disturbed or exotic dominated areas were not surveyed in detail, for example areas with a largely exotic understorey with little or no native component such as the treeless areas within the study area were not surveyed in any detail, other than to note the presence of noxious weeds. All identifiable species encountered were recorded for the purposes of characterising vegetation types and habitat values for threatened species and communities. The boundaries of vegetation types were recorded using a handheld GPS for later input into GIS mapping.

Biometric plot surveys

To supplement the random meander surveys and to provide quantifiable data on vegetation condition, Biometric plot surveys were undertaken according to the BioBanking Assessment Methodology (BBAM, OEH 2014) within areas of native vegetation where it was considered that an offset may be required to compensate for its removal. The data collected allows the biodiversity values at the site to be compared to benchmark data held by the NSW OEH and can also be utilised in any subsequent calculations of offsets according to the BBAM should offsets be required for the proposal.

Biometric plot surveys were conducted on the 27 and 28th October. Approximately 10 person hours was spent on this component of the survey.

Targeted threatened species transects

Searches for threatened species to occur at the site were conducted in all areas of vegetation within the proposed development area that exhibited a component of native vegetation within the groundcover. Searches were conducted by two people spaced approximately 10m apart and involved parallel transects through these areas each spaced approximately 20m apart. Approximately 4 person hours was spent on this component of the survey.

All additional species not observed during the Biometric plots or August survey were recorded throughout the transect to supplement the existing random meander data

Vegetation condition was rated according to the two point scale endorsed under the BioBanking Assessment Methodology Guidelines (DECC 2014). These are:

Low condition	For woody vegetation Native over-storey percentage of foliage cover is less than 25% of the lower value of the over-storey percentage of foliage cover benchmark for that vegetation type, and less than 50% of ground cover vegetation is indigenous. Natural native grassland Less than 50% of groundcover vegetation is indigenous species or more than 90% of the groundcover vegetation is cleared.
Moderate to good condition	Any native vegetation not in low condition.

Further details regarding survey effort and limitations is provided in Appendix C of this EIS.

Plant and community nomenclature

Vegetation communities in the study area have been categorised on the basis of their structure and formation using Specht (1970) classification, as well as the floristic composition of the site. The vegetation has been classified using the Plant Communities of the South Eastern Highlands and Australian Alps within the Murrumbidgee Catchment of New South Wales classification (OEH 2011), which provide the most recent and comprehensive classification for the study area. The equivalent Biometric vegetation types are also identified.

Botanical nomenclature follows Harden (1990-2002), with recent name changes provided by the Australian Plant Name Index of the Australian National Herbarium. Noxious weeds identified are those declared for the Cooma – Monaro Shire Council control area under the *Noxious Weeds Act 1993*.

In the body of this report, flora species are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only. Where a species does not have a generally accepted common name, the scientific name is used throughout the body of the report. Common and scientific names are included in the Appendix C of this EIS.

FAUNA

A combination targeted survey methods and opportunistic observations were used to survey for threatened species identified during the desktop assessment. Survey effort is shown on Figure 5-1.

Striped Legless Lizard surveys

Surveys for the Striped Legless Lizard (*Delma impar*) were carried out using the artificial shelter methodology, involving the placement of concrete roof tiles on the ground to create artificial shelter sites. A total of seventeen tile arrays were installed across the site in September 2014 within the quarry development site and the proposed offset site. Tiles were checked for the presence of reptiles during October, November and December 2014. The primary objective of the survey was to determine the presence or absence of the Striped Legless Lizard. The survey methodology was based on a combination of the following:

- Director General's Requirements
- OEH survey guidelines
- EPBC survey guidelines for the Striped Legless Lizard

The specific survey methodology was as follows:

1. A total of seventeen locations were chosen for tile arrays across the site within the most suitable habitat for the Striped Legless Lizard and across a range of vegetation types including grassy woodland and open native grassland. Seven array locations were selected within the development site, five situated in woodland and two within open grassland. Ten array locations were selected within the proposed offset site, with six of these situated in woodland and four in open grassland.
2. Artificial tiles were installed at each of the seventeen chosen locations on the 22nd and 23rd of September 2014. Tiles were installed in rectangular grids of 5 x 10 tiles (50 per array) with a spacing of 5-10m between tiles. A total of 850 tiles were installed across the entire site. (Refer to Appendix C of this EIS).
3. Each of the arrays were surveyed once per week for 10 weeks (10 surveys per array in total), with the first survey occurring on the 15th of October 2014 (approximately 3 weeks after tile installation). The tile surveys generally commenced at approximately 10:00am each morning, or

earlier when possible. Surveys involved lifting each tile and checking for the presence or absence of the Striped Legless Lizard. Other fauna species occurring beneath the tiles (primarily reptiles and amphibians) were identified and recorded.

4. Each tile survey was undertaken by two persons. All surveys were led by an experienced ecologist, who was accompanied by a second assistant ecologist.
5. Surveys were not undertaken during high rainfall, or when the temperature exceeded 28°C (as per the EPBC Act guidelines). See Table 5-3 for the general weather conditions and temperatures during each survey.

Table 5-3: Prevailing weather conditions during each Striped Legless Lizard tile survey

Date	Time	Temperature recorded (min – max)	Cloud range cover	Wind	Rain
15/10/2014	1100 - 1600	8 – 12°C	20 - 80%	Light - moderate	Drizzle
23/10/2014	1012 - 1402	20 – 26°C	Nil	Light	Nil
29/10/2014	1120 - 1431	19.9 – 25.6°C	Nil	Light	Nil
05/11/2014	1055 - 1600	20.9 – 25°C	70 - 100%	Moderate	Nil
10/11/2014	0835 - 1115	16.5 – 23°C	20 - 80%	Light	Nil
20/11/2014	1045 - 1340	24 – 30°C	50%	Light - moderate	Nil
26/11/2014	1040 - 1350	18 – 26°C	20%	Light - moderate	Nil
01/12/2014	0920 - 1200	23.0 – 28.5°C	Nil	Light - moderate	Nil
08/12/2014	0900 - 1200	23.0 – 25°C	10%	Light	Nil
18/12/2014	0920 - 1630	24 – 30°C	Nil	Light	Nil

Pink-tailed Worm-lizard and Little Whip Snake

Surveys for the Pink-tailed Worm-Lizard and the Little Whip Snake were carried out during November and December 2014 within suitable habitat inside the proposed quarry expansion sites. The general methodology for the surveys was as follows:

- Suitable habitats for these species were searched across the development site including rocky outcrops, loose surface rocks, fallen logs, timber and other debris. Searches involved rolling rocks, lifting logs, timber and debris and generally searching through grass tussocks. Searches were carried out by two staff; and experienced field zoologist and supporting ecologist.
- Rocks, timber and logs were carefully placed back into their original position after being searched.
- Any individuals found were identified and recorded.

Total survey effort totalled 6 person hours.

Table 5-4: Prevailing weather conditions during Pink-tailed Worm-lizard and Little Whip Snake surveys

Date	Location description	Time	Temp	Cloud cover	Wind	Rain
15/10/14	Around tile array #1	1545 – 1615	12°C	80%	Moderate	Nil
5/11/14	Around tile array #1 A large area south of	1500 – 1700	24.5°C	60 – 70%	Light - moderate	Nil

	tile array #1					
20/11/14	a) Between tile array #2 and #6 b) Around tile array #1 to the south and east	a) 1015 – 1045 b) 1345 – 1415	a) 23°C b) 30°C	50%	Light – moderate	Nil

Grassland fauna habitat assessment

Grassland fauna habitat assessment (GFHA) was undertaken within the proposed extraction areas according to the draft methodology currently being developed by the NSW OEH. The OEH requested that these assessments be undertaken to better understand the habitats on site that are available for threatened grassland fauna such as the Golden Sun Moth, Striped Legless Lizard, Little Whip Snake and Pink-tailed Worm-lizard. Assessments were undertaken within areas of grassy woodland that were considered to have at least some potential to support threatened grassland fauna. The locations of the GFHA transects are shown on Figure 5-1 (Grassland Flora Transects).

Bird utilisation surveys

Three bird utilisation surveys were undertaken within the quarry development site. The survey method used was a 2ha area survey of 20 minutes duration. One survey was undertaken in each of the following vegetation types occurring on site:

- **Survey site 1:** Ribbon Gum – Snow Gum grassy open forest – grassy (moderate to good quality)
- **Survey site 2:** Ribbon Gum – Snow Gum grassy open forest – shrubby – (moderate to good quality)
- **Survey site 3:** Ribbon Gum – Snow Gum grassy open forest – grassy (low quality)

The general methodology of the surveys was as follows:

- A suitable location was selected within each of the vegetation types.
- Parts of the area were slowly traversed on foot and birds were detected using visual and audible observations.
- Species detected within the 2ha search area, flying overhead and outside the search area were recorded. The number of individuals of each species was recorded, or estimated where exact numbers could not be determined.

Table 5-5: Prevailing weather conditions during bird utilisation surveys

Survey site	Date	Location description	Time	Temp	Cloud cover	Wind	Rain
1	10/11/14	Near tile array #8	0715 - 0730	13.8°C	5%	Nil	Nil
2	10/11/14	West of tile array #1	0740 - 0800	13.8°C	20%	Nil	Nil
3	10/11/14	North of tile array #2	0810 - 0830	13.5°C	50%	Nil	Nil

Nocturnal surveys

Two nocturnal survey sessions were conducted, one on 27 October and one on 9 November 2014. The October survey involved 2 person hours of stag watching and 0.75 person hours of active spotlighting.

This work was undertaken by a team of four ecologists, spread out to observe separate stags. Two ANABAT units were also placed at selected sites and left overnight during the 27 October and 9 November survey occasions (refer Figure 5-1).

Table 5-6: Prevailing weather conditions during nocturnal surveys

Date	Temp	Wind	Relative humidity
27/10/14	11.5°C	Up to 20 km/h	53%
9/11/14	14.5°C	5-10 km/h	80%

Further details regarding survey effort and limitations is provided in Appendix C of this EIS.

Limitations

Flora

Most living flora species encountered at the site were able to be identified, enabling vegetation types and condition to be clearly defined. The spring timing of the survey was considered appropriate for detecting a high species diversity within the study area however, late spring and summer flowering species, and species difficult to identify in their vegetative state, are likely to have been overlooked. For example, late spring or summer flowering orchids would not have been detectable and a number of grasses that typically flower during late spring – summer were also not able to be conclusively identified.

Fauna

Most tile surveys did not commence earlier than 10:00 am due to travel times required for field staff to reach the site. Ideally, surveys would have commenced earlier in the morning to avoid higher temperatures experienced during the early afternoon. Surveys were not undertaken during temperatures exceeding 28°C.

5.3.3 Results

Background search results

Background searches produced a total of six threatened flora species with potential to occur in the study area, with the OEH Wildlife Atlas Database identifying one species and the Commonwealth Protected Matters Search Tool identifying six species. The habitat evaluation identified suitable habitat within the study area for one threatened flora species; the Mauve Burr Daisy (*Calotis glandulosa*). This species is known to occur in degraded habitats including those infested with African Lovegrass. In addition marginal habitat was identified for Creeping Hop-bush (*Dodonaea procumbens*) and Monaro Golden Daisy (*Rutidosis leiolepis*) and Silky Swainson-pea (*Swainsona sericea*).

NSW Wildlife Atlas database searches for threatened species listed on the TSC Act identified seven bird species, one mammal, one reptile and one amphibian species within 10 km of the subject site. The Commonwealth Protected Matters Search Tool identified four bird, three fish, two amphibian, four mammal, three reptile and 11 migratory bird species with the potential to occur within 10 km of the subject site.

Field survey results

Results of the flora and fauna field surveys are shown on Figure 5-2.

FLORA

Ribbon Gum – Snow Gum grassy open forest

A single native vegetation type, Ribbon Gum -Snow Gum tableland flats tall grassy woodland primarily on granitoids in the Kybean-Gourock and Monaro subregions of the South Eastern Highlands Bioregion (p220) (Ribbon Gum - Snow Gum tall open woodland), was found to occur across the broader site. The equivalent Biometric vegetation type is Ribbon Gum - Snow Gum tall open woodland on flats and undulating hills of the eastern tableland, South Eastern Highlands.

The vegetation within the study area is characterised by the dominance of Ribbon Gum (*Eucalyptus viminalis*) in the overstorey with occasional Snow Gum (*E. pauciflora*) on the ridges and upper slopes with Snow Gum becoming co-dominant on the lower slopes and flats. A large proportion of the community across the site on the upper slopes and ridges contains a midstorey of sparse Blackthorn (*Bursaria spinosa* subsp. *lasiophylla*) and isolated Gruggly Bush (*Melicytus dentata*) and *Cassinia longifolia* whereas on the lower slopes shrubs are virtually absent except for scattered occurrences of Sweet Briar (**Rosa rubiginosa*), a declared noxious weed.

The understorey throughout the study area is heavily dominated by African Lovegrass (**Eragrostis curvula*) along with patches and scattered occurrences of Serrated Tussock (**Nassella trichotoma*) and St John's Wort (**Hypericum perforatum*). More common exotic forbs make up the majority of the remaining understorey cover. Native understorey species were generally only detected within the paddock to the west and south of the study area in which the western proposed extraction area occurs. Abundance was generally low and native grass diversity was low however, a moderate diversity of forb species was detected. Native grasses recorded included more disturbance tolerant species such as Weeping Grass (*Microlaena stipoides*), Corkscrew Grass (*Austrostipa scabra* subsp. *falcata*) and Wallaby Grass (*Rytidosperma* sp.) within the intertussock spaces between the Lovegrass. Common forb species observed included Common Woodruff (*Asperula conferta*), Bears Ear (*Cymbonotus preissianus*), Stinking Pennywort (*Hydrocotyle laxiflora*), Behr's Swainson-pea (*Swainsona behriana*), Common Bluebell (*Wahlenbergia communis*), Native Oxalis (*Oxalis perrenans*) and Common Everlasting (*Chrysocephalum apiculatum*). A full species list for the study area is included in Appendix C of this EIS.

This community would meet the definition of the *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions*, which is listed as an EEC under the TSC Act. The majority of the Ribbon Gum - Snow Gum tall open woodland was considered to be in moderate to good condition according to the Biometric definitions based on the percent overstorey cover. In two areas north and south of the existing quarry, there was evidence of clearing which had thinned the overstorey in these areas to the point where it is considered to be in low condition. No areas of native dominated understorey were present.

Non-native grassland

Areas of Lovegrass dominated open grassland occur in the north, west and south-east sections of the study area and is the dominant vegetation within the northern proposed extraction area. It is considered likely that areas of open grassland at the site are naturally treeless and would have once comprised a native grassland community. These grassland areas are now dominated by African Lovegrass, Serrated Tussock and a range of exotic forb species. No native forbs were detected within these areas and native

grasses were restricted to isolated occurrences of Weeping Grass and Wallaby Grass however, these species were not present within the proposed extraction areas. These areas are considered to be degraded to the extent where they no longer comprise native grassland and are considered to be exotic dominated with little to no native component. It is likely that these areas have been subject to pasture improvement practices in the past such as seeding with Clover (**Trifolium* spp.) and fertiliser application.

Native species and weed species

A total of 87 flora species were recorded within the study area. These included 45 native species and 42 introduced species.

Native forest and woodland vegetation within the study area have been cleared and thinned to provide pasture for grazing. Clearing and agriculture has produced a range of direct and indirect impacts to native flora habitats, including altered microclimate, loss of pollinator and dispersal fauna and the introduction of invasive species.

Agricultural activities within the study area and the locality have resulted in the colonisation of a range of introduced plant species, with greatest displacement of natives. In pasture areas, grazing is likely to have reduced or eliminated selectively grazed or grazing sensitive species, such as Kangaroo Grass (*Themeda australis*), terrestrial orchids, wattles and pea shrubs.

Minor pasture weed species were common across the majority of the study area. Several noxious weeds declared for the Cooma - Monaro Shire Council Area under the *Noxious Weeds Act 1993* were recorded within the study area:

- African Lovegrass **Eragrostis curvula*
- Scotch Thistle **Onopordum acanthium*
- Serrated Tussock **Nassella trichotoma*
- St John's Wort **Hypericum perforatum*
- Sweet Briar **Rosa rubiginosa*

All of the recorded noxious weeds are listed as Class 4 weeds, meaning that the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.

Targeted surveys failed to detect any of the threatened species with potential to occur within the study area (Mauve Burr Daisy (*Calotis glandulosa*), Creeping Hop-bush (*Dodonaea procumbens*), Monaro Golden Daisy (*Rutidosia leiolepis*) and Silky Swainson-pea (*Swainsona sericea*). The assessment concluded that no other threatened species were considered likely to occur within the study area due to the:

1. Absence of required abiotic habitat features
2. Absence of associated vegetation communities or flora species
3. Highly restricted nature or lack of nearby (within 10 km) records of the species

Groundwater dependent ecosystems

Groundwater dependent ecosystems are not considered to occur within the study area.



Figure 5-2 Survey results

FAUNA

Fauna habitat features

The proposal site contains a predominantly woodland ecosystem, inter-mixed with isolated rocky outcrops, sections of open grassland and habitat features including man-made dams. Mature Snow Gums (*E. pauciflora*) are the dominant overstorey species. Two stick nests were observed within the tree canopy. Fallen timber is common within the proposal site, and likely provides habitat for a range of fauna, including skinks, snakes, birds, and ground-dwelling mammals. The flat and sloping drainage areas and dams are scattered throughout study area and likely provide habitat for a number of common and widespread frog species. In general, fauna habitat quality within the proposal site is considered to be moderate to high, given the presence of mature hollow-bearing trees, fallen timber, and native ground cover.

34 hollow bearing trees (HBTs) were recorded during the surveys (refer Figure 5-2) within the subject site and surrounds; 11 trees occur within the proposed expansion area, 2 occur in the existing quarry footprint and 18 in the surrounding area being considered as an offset site. Three trees are located to the north of the site and would not be impacted by the development. These trees provided a variety of hollow sizes suitable for use by a number of fauna species including microbats and birds.

Four Grassland fauna habitat assessment (GFHA's) were conducted within the proposed extraction areas (refer Figure 5-1). The full results of the GFHA's are included as Appendix C of this EIS. The results indicated that the site is unlikely to contain quality habitat for species such as the Golden Sun Moth, Striped Legless Lizard, Little Whip Snake and Pink-tailed Worm Lizard. Tile plot surveys and an additional 6 person hours reptile survey failed to detect any of these species.

The study area does not contain any areas that have been declared as critical habitat under either the TSC Act or EPBC Act.

Fauna species

47 fauna species were recorded during the field survey including:

- Five amphibians
- 20 birds
- Four mammals and one monotreme
- Nine microbats
- Eight reptiles

A complete fauna species list is provided in Appendix C of this EIS. The species records include a mix of native and non-native common species. Of these recorded species, one species, the Eastern Bentwing-bat (*Miniopterus schreibersii*) is listed as vulnerable under the TSC Act.

One stick nest was observed during the site inspection (refer Figure 5-2 for location) and subsequent visits to the site by CMSC environmental representative recorded a second nest, approximately 50 metres south-west. Whilst no individuals were recorded utilising the nests, it has been assumed they belong to a breeding pair of the threatened Little Eagle (*Hieraetus morphnoides*) given the nests open shape and form. New green leaves were observed in one nest, indicating the nest is active.

Exotic species such as European Rabbits and European Red Foxes are considered likely to be common across the landscape. Noisy Miners were observed in the southern section of the study area adjacent to an old NSW Roads and Traffic Authority (now Roads and Maritime Services) quarry. Aggressive exclusion

of birds from woodland and forest habitat by abundant Noisy Miners is a Key Threatening Process (KTP) listed under the TSC Act.

Threatened terrestrial fauna with the potential to occur

NSW Wildlife Atlas database searches for threatened species listed on the TSC Act identified seven bird species, one mammal, one reptile and one amphibian species within 10 km of the subject site (Appendix C of this EIS). The Commonwealth Protected Matters Search Tool identified four bird, three fish, two amphibian, four mammal, three reptile and 11 migratory bird species with the potential to occur within 10 km of the subject site.

An assessment of each of these species and their likelihood of utilising the study area was undertaken and is included as Appendix G of the Biodiversity Assessment.

For the majority of other species it was considered that, based on a preliminary assessment of the habitat present within the study area and each species habitat requirements, significant impacts were not likely. For other species however, such as the Striped Legless Lizard, further field surveys were undertaken (as described above) to inform the assessment.

The majority of threatened species identified during the database searches are highly mobile and are most likely to utilise the site for foraging only. The threatened species habitat evaluations (presented in full in Appendix C of this EIS) determined that a low risk of impact exists for these threatened fauna (excepting the Little Eagle) as a result of the proposed works. This is a result of the:

1. Small number of hollows at the site
2. Disturbed nature of much of the understorey
3. Reduced connectivity to other areas of habitat which makes the site less than ideal habitat for any threatened species.

While threatened species may utilise the site on occasion, they are unlikely to rely on the site, particularly for breeding, and are therefore highly unlikely to be adversely affected by the proposed works. The exception to this is the Little Eagle. Breeding habitat may be removed. An Assessment of Significance (AoS) was completed (refer Appendix C of this EIS).

For potential threatened fauna not likely to be able to easily disperse from the proposal site, such as threatened reptiles like the Striped Legless Lizard, additional surveys were implemented to determine whether these species were present. These additional targeted surveys failed to locate any of the identified threatened fauna included in the database searches.

Migratory species

No EPBC-listed migratory species were recorded during the field surveys. Habitat evaluations (Appendix C of this EIS) however, identified that there is potential for six species to occur within the study area on occasion:

- Fork-tailed Swift (*Apus pacificus*)
- White-throated Needletail (*Hirundapus caudacutus*)
- Rainbow Bee-eater (*Merops ornatus*)
- Black-faced Monarch (*Monarcha melanopsis*)
- Satin Flycatcher (*Myiagra cyanoleuca*)
- Rufous Fantail (*Rhipidura rufifrons*)

These species are all widespread and have broad habitat requirements. The Fork-tailed Swift and White-throated Needletail do not breed in Australia and are almost exclusively aerial. Important breeding sites

for the Cattle Egret occur further north (between Newcastle and Bundaberg). The Black-faced Monarch and Satin Flycatcher prefer dense habitats (rainforest or heavily vegetated gullies) and would only occur at the site very occasionally to forage. The Rainbow Bee-eater is distributed across much of mainland Australia and occurs in a wide range of habitats.

While these species may utilise the site on occasion, they are unlikely to rely on the site, particularly for breeding, and there is an abundance of good quality and contiguous habitat in the nearby national parks. For these reasons, these species are highly unlikely to be adversely impacted by the proposed works and an assessment under the EPBC Act significant impact criteria is not required.

Wildlife corridors

Wildlife corridors are generally defined as a link of habitat between two or more larger areas of wildlife habitat. Corridors are critical for the maintenance of ecological processes. They allow for the movement of animals and the continuation of viable populations. For example, they may facilitate genetic exchange between local populations and thereby protect populations from inbreeding or events such as disease, bushfire, or other events that could threaten an isolated population with localised extinction. The width and structure of corridors is specific to the species utilising them. Corridors are less important for wide-ranging, highly mobile species; and more important for species such as frogs, reptiles and small mammals.

There is limited woodland or midstorey connectivity to other areas of habitat from the proposed development and adjoining offset area as cleared agricultural land is prevalent throughout the surrounding landscape. The proposal area is located within a patch approximately 110 hectares in size which has no connectivity to the east, north or west and limited connectivity to the south through a narrow (approximately 200 metres wide) thinned woodland corridor which links to more extensive habitat to the west. The proposal would not impact on this corridor and given the extensive clearing on the other sides of the proposal, would not further fragment or isolate areas of habitat.

Species that would currently utilise the study area must already be tolerant of a level of fragmentation and are more likely to be highly mobile, wide ranging species.

5.3.4 Potential impacts

The expansion of the Bunyan Quarry would have a number of impacts on the vegetation and habitat values of the study area. The most substantial of these is the removal of native vegetation and its associated habitat values provided (mainly) from mature trees. These trees provide foraging habitat and refuges (e.g. hollows) for native fauna. Native vegetation clearing and loss of hollows are listed as a Key Threatening Processes in NSW.

The proposal may also impact upon the abundance and distribution of weeds, in particular the four noxious species, recorded within the study area. Specifically, the proposal has the potential to spread environmental weeds to and from the study area.

There is also potential for the spread of pests and pathogens. Creating suitable habitat for introduced fauna species to occupy and dominate, and introducing fungal spores (such as in mud on tyres of machinery) may result in detrimental effects on the local biodiversity.

These potential impacts are discussed in more detail below.

Loss of native vegetation and habitat

Direct impacts to native vegetation and habitat will result from the clearing of areas to facilitate the extraction of the underlying material. The extent and estimated loss of habitat within the subject site is summarised in Table 5-7. This is the total amount of vegetation required to be cleared, including access tracks.

Table 5-7: Extent and estimated loss of vegetation communities and habitat features within the study area

Vegetation community	Threatened Ecological Community?	Condition	Area of vegetation estimated to be removed (ha)
Disturbed	No		3.07
Exotic grassland	No		4.29
Ribbon Gum - Snow Gum tall open woodland - grassy - low	Yes	Low	5.15
Ribbon Gum - Snow Gum tall open woodland - grassy - moderate to good	Yes	Moderate to good	0
Ribbon Gum - Snow Gum tall open woodland - shrubby - moderate to good	Yes	Moderate to good	6.73
Total area (ha) of native vegetation to be removed in the development area			11.88

IMPACTS TO VEGETATION OF CONSERVATION SIGNIFICANCE

As discussed above, the Ribbon Gum – Snow Gum grassy open forest to be impacted meets the definition of the *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions*, EEC listed under the TSC Act. An assessment of significance (seven – part test) was carried out for this community to determine the significance of the impacts (refer to Appendix C of this EIS and summary below). This assessment concluded that the proposal will result in the clearing of up to 11.88 hectares of the EEC, all of which is heavily infested with African Lovegrass and 5.15 hectares is in low condition. The remaining 6.73 hectares is in moderate to good condition on the basis of overstorey cover only. The proposal would reduce the size of the patch but would not result in substantial additional local fragmentation or isolation of habitat for the EEC as the works would represent an extension of the existing quarry into nearby surrounding agricultural areas. The habitat to be removed is not considered important to the long-term survival of the community in the locality given the high levels of degradation and that approximately 96 hectares of the local occurrence will remain, 45 hectares of which exhibits a degree of native understorey diversity similar to the moderate to good condition vegetation within the proposal area. Furthermore, 65 hectares of this remaining area will be protected as an offset for the proposal.

With the implementation of the mitigations measures recommended in this assessment, the proposal is not expected to significantly contribute to any KTPs relevant to the EEC.

A significant impact to the *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions* EEC is considered unlikely as a result of the proposal.

IMPACTS TO FAUNA OF CONSERVATION SIGNIFICANCE

The proposal would result in the removal of two nest trees which are currently assumed to be being used by the Little Eagle. An assessment of significance (seven – part test) was carried out for this species to determine the significance of the impacts (refer to Appendix C of this EIS and summary below). This assessment concluded that the proposal will result in the clearing of up to 11.88 hectares of the woodland vegetation that provides suitable breeding and foraging habitat to the species. Connectivity of habitat patches in the landscape would not be greatly altered by the works, as the works would represent an extension of the existing quarry into nearby surrounding agricultural areas. The ability of the some native fauna to utilise the study area as a ‘stepping stone’ to move between such patches may, however, be removed. Species that would currently use the corridor must already be tolerant of a level of fragmentation and are more likely to be highly mobile, wide ranging species. As such, the removal of habitat is unlikely to significantly isolate or fragment the site from other areas of habitat to the extent that species currently using the corridor, including the Little Eagle, would be adversely affected.

The habitat to be removed is not considered important to the long-term survival of the local population in the locality given the high mobility of the Little Eagle and the ability of the species to use different nest sites over successive years. Approximately 96 hectares of the local occurrence of woodland vegetation will remain, with 65 hectares of this remaining area to be protected as an offset for the proposal. Mitigation measures have been included in this report to further minimise risks to this species.

With the implementation of the mitigations measures recommended in this assessment, the proposal is not expected to significantly contribute to any KTPs relevant to the species. A significant impact to the Little Eagle is considered unlikely as a result of the proposal.

The Eastern Bent-wing bat utilises caves, derelict mines, storm-water tunnels, buildings and other man-made structures for roosting habitat. At non-breeding times, it is known to disperse within about 300 kilometre range of their maternity cave and generally prefers foraging in forest habitat. There are no other records of the Eastern Bent-wing bat within 10 km of the subject site. Potential impact of the proposal on this species is low, given there is no breeding habitat for this species present at the site, marginal foraging habitat and their large home range. No assessment of significance was prepared for this species. A generic hollow bearing tree removal protocol is provided that would reduce risks to roosting

ASSESSMENTS OF SIGNIFICANCE – SUMMARY

An AoS was conducted for the following communities and species:

- *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions*
- Little Eagle

The assessments were conducted to characterise the significance of potential impacts on this community and species and determine whether impacts could be mitigated sufficiently or whether a Species Impact Statement (SIS) and further assessment may be required. The results of the assessment are summarised in Table 5-8 and provided in full in Appendix C of this EIS.

Table 5-8: Summary of Assessments of Significance (AoS)

TSC Act significance assessments								
Threatened species, or communities	Significance assessment question ¹							Likely significant impact?
	a	b	c	d	e	f	g	
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions	NA	NA	N	N	NA	NA	N	No. A species impact statement is not considered to be required for this community
Little Eagle	N	NA	NA	N	NA	NA	N	

Notes: Y= Yes (negative impact), N= No (no or positive impact), NA= not applicable, ?= unknown impact.

- Significance Assessment Questions as set out in the *Threatened Species Conservation Act 1995/ Environmental Planning and Assessment Act 1979*.
 - in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,
 - in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,
 - in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
 - is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
 - is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,
 - in relation to the habitat of a threatened species, population or ecological community:
 - the extent to which habitat is likely to be removed or modified as a result of the action proposed, and
 - whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
 - the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,
 - whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),
 - whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,
 - whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Loss of Hollow-bearing trees

A total of 34 hollow-bearing trees were recorded within the subject site and surrounds, most of which were large, mature trees. Up to 11 of these trees will be removed to facilitate the quarry expansion. The location of the identified HBT's is shown in Figure 5-2. A HBT inventory is included in Appendix C of this EIS.

No threatened hollow-dependant fauna species were observed during the field survey. Species including the common Brushtail Possum (*Trichosurus vulpecula*) were observed during the spotlighting survey, however they were not observed in any of the trees within the subject site. Hollow-dependant avifauna and microbats may also be utilising these hollow-bearing trees. No hollow-dependant threatened species were found during the field survey. The loss of up to 11 hollow-bearing trees within the development area is therefore not considered to be a significant impact as:

- a) No hollow-dependant threatened fauna were identified during the field survey, and
- b) A large number of hollow-bearing trees are present and would remain untouched in the offset area.

Wildlife Connectivity and Habitat fragmentation

Given the proposal area is already somewhat isolated from surrounding areas of intact woodland/grassland habitats, additional impacts to wildlife connectivity and habitat fragmentation as a consequence of this proposal are not anticipated.

Injury and mortality

The proposal considered in this BA does have the potential to increase the risk of injury and mortality to fauna during construction, specifically as a result of vegetation removal. Many smaller and more common species such as skinks and frogs are difficult to locate or remove during pre-clearing surveys. It is likely there will be some loss of individuals from these populations. There is also the potential for hidden hollows to be present in the forks of large trees, in which bats or birds may occur. Injuries or fatalities to native fauna during the clearing process may arise from such situations.

Included in this report are mitigation measures that would avoid where possible and reduce injury and mortality to native fauna.

Weeds, pests and pathogens

Spread of the five Class 4 noxious weed species observed in the study area may occur during vegetation removal and movement of vehicles and machinery into or out of the site. Weeds are easily transported as seeds and propagules on machinery brought to the site. Equally, they can be carried away to other areas from this site. Given the high levels of infestation of African Lovegrass and Serrated Tussock at the site, there is a high potential for these species to be spread to offsite areas. Strict weed control protocols have been recommended to minimise this risk.

The removal of vegetation as a result of clearing has the potential to attract European Rabbits (*Oryctolagus cuniculus*) to the study area and increase soil erosion. Competition and grazing by the feral European Rabbit is listed as a KTP under the TSC and EPBC Acts. Regeneration and revegetation with native vegetation in disturbed areas following extraction activities is important in minimising these impacts and has been recommended.

Several pathogens in NSW have the potential to impact on the environment and biodiversity. These may be introduced and spread on machinery that are used for earthworks and extraction activities. Pathogens that have the potential to be introduced and spread during the proposed works include but are not limited to:

- Phytophthora (*Phytophthora cinnamomi*)
- Fusarium wilt/Panama disease (*Fusarium oxysporum*)

Infection of native plants by Phytophthora is listed as a KTP under both the TSC Act and EPBC Act and is discussed further below.

Impact on relevant key threatening processes

Eight key threatening processes have been identified as relevant to the possible works and are outlined below.

Table 5-9: Relevant key threatening processes

Key Threatening Processes (KTPs)		
TSC Act	EPBC Act	Relevance
Clearing of native vegetation	Land clearance	The proposal will involve clearing of native vegetation, but this is not considered to contribute significantly to the operation of clearing as a threatening process at the local or regional level, relative to the extensive clearing that has already taken place in the locality. Aside from the direct habitat loss of approximately 11.88 hectares of degraded habitat that is considered unlikely to provide important habitat for threatened species (aside from the Little Eagle, which has been separately assessed), the proposal will not result in habitat fragmentation or isolation and is unlikely to disrupt gene flow or have offsite impacts. An offset commitment would ensure nearby areas retain and increase habitat in the locality.
Loss of hollow-bearing trees		Up to 11 hollow-bearing trees may be removed as a result of the proposal. Clear boundary demarcations, an exclusion zone and tree protective zones have been recommended to be put in place prior to construction to ensure that over-clearing does not occur.
Removal of dead wood and dead trees		Dead wood not overly abundant within the proposal area given the open woodland nature of the landscape. All dead wood and fallen timber therefore is important and should be collected and placed within the offset area.
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Infection of amphibians with chytrid fungus resulting in chytridiomycosis	The inadvertent transport of infected material between sites is known to spread chytrid fungus. Whilst no threatened frogs were identified during the field survey, five species of native frogs were.
Invasion of native plant communities by exotic perennial grasses		A number of exotic perennial grasses were recorded across the site. African Love Grass and Serrated Tussock are dominant across the site. Other species such as Chilean Needle Grass, Parramatta Grass, Paspalum and Phalaris could be introduced on vehicles and machinery used on the site during construction and operation but given the current dominance of African Lovegrass, this is would be unlikely to exacerbate this process within the study area. There is a high potential for exotic perennial grasses that occur within the study area to be spread off site to other areas containing native plant communities. Strict weed control measures have been recommended as part of this assessment and if followed this risk is considered to be manageable.
Competition and grazing by the feral European Rabbit (<i>Oryctolagus cuniculus</i>)	Competition and land degradation by rabbits	Disturbance to vegetation and any earthworks may provide suitable habitat and attract this species to or increase its abundance within the study area.

Key Threatening Processes (KTPs)		
TSC Act	EPBC Act	Relevance
Infection of native plants by <i>Phytophthora cinnamomi</i>		No evidence of <i>Phytophthora cinnamomi</i> was observed during the field survey but the pathogen is well established in higher rainfall areas; therefore, there is the potential for its introduction. With adherence to the machinery hygiene protocols recommended in this assessment, it is considered unlikely that the proposal would contribute to this KTP.
Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners <i>Manorina melanocephala</i>		Noisy Miners were observed in the south of the study area and it is likely this KTP is already in operation at the site. Given the existing high levels of clearing and disturbance, the proposal is unlikely to create any additional edge habitat that is favoured by this species. Noisy Miners are unlikely to increase at the site as a result of the proposal.

Cumulative impacts

As the study area is located in a predominately rural region, with agriculture, national parks and nature reserves as dominant land uses, the number of developments currently occurring in the local area surrounding the site is relatively low. There are no other known large scale developments occurring in the region that are considered relevant to the proposed expansion of the quarry in terms of cumulative environmental impacts. The clearing of native vegetation, which is a key threatening process at both State and Commonwealth level, is considered a major factor in the loss of biological diversity. At least 61% of the native vegetation in NSW has been cleared or highly modified since European settlement, and the removal of vegetation for this proposal is contributing to this process, although that contribution is relatively minor relative to the extent of clearing that has occurred in the surrounding landscape. The loss of large habitat trees or hollow-bearing trees is a long-term environmental cost of such projects, as these features of the environment can take well over 100 years to form (Mackowski 1984; Wormington & Lamb 1999). Up to 11 such trees may be removed for this project.

In summary, the proposed expansion of the Bunyan Quarry has potential for the following biodiversity impacts:

- Direct and permanent impacts to native vegetation and habitat will result from the clearing approximately 11.88 hectares to facilitate the extraction of the underlying material.
- An estimated 11.88 hectares of the endangered ecological community known as Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions will be cleared. Evaluation using Significance Assessment Questions as set out in the *Threatened Species Conservation Act 1995/ Environmental Planning and Assessment Act 1979* suggested that a significant impact is not likely for this EEC.
- Up to 11 hollow-bearing trees would be removed.
- The removal of vegetation cover as a result of clearing could attract European Rabbits (*Oryctolagus cuniculus*) to the Crown land area and may also increase soil erosion.
- Plant pathogens such as *Phytophthora* (*Phytophthora cinnamomi*) might be introduced to the immediate and surrounding area from machinery that is transport in and used for expansion activities.

- Animal diseases such as Chytrid fungus which is believed be causing the decline and disappearance of some frogs species might inadvertently be introduced to the quarry area from imported material associated with expansion activities.
- Invasive exotic perennial grasses might be introduced to the immediate and surrounding area from machinery that is transport in and used for expansion activities.

5.3.5 Safeguards and mitigation measures

Recommendations are listed below to ensure that the potential biodiversity impacts identified are adequately managed; that impacts are avoided first, minimised only where avoidance is not possible, and that residual impacts are offset.

- Vegetation clearing and soil impacts
 - Prior to the commencement of clearing, a physical vegetation clearing boundary at the approved clearing limit is to be demarcated and implemented. The delineation of such a boundary may include the use of temporary fencing, flagging tape, parawebbing or similar.
 - Areas of vegetation would be progressively cleared as extraction progresses up to a maximum of 2 hectares at a time.
 - The vegetation clearing guidelines (including as in the biodiversity assessment, Appendix C) would be adhered to during clearing activities, including the removal of hollow bearing trees.
 - Avoid clearing identified nest tree during breeding season unless surveys demonstrate the tree is not part of breeding habitat for the Little Eagle at the time of clearing. A 50m buffer would be placed on an active Little Eagle nest, with a restriction of all quarry activities in this buffer.
 - Stockpiling of extracted material and the parking of equipment and vehicles would be restricted to extraction areas only.
 - Removal of hollow bearing trees would be avoided where possible.
 - Hollow-bearing trees that must be removed would be removed according to the vegetation clearing guidelines included as Appendix C of this EIS.
 - Erosion controls would be put in place on the upslope of works to prevent soil and debris travelling downslope (refer to safeguards in Section 5.2.3).
 - Any fallen timber, dead wood and bush rock (if present) encountered within extraction area would be relocated to a suitable place nearby outside of proposed extraction areas.
- Weed management and pathogen management
 - A Weed Management Plan would be developed for the site to prevent/minimise the introduction of additional weeds to the site and particularly, the spread of weeds offsite. This may require a treatment phase prior to export from the site.
 - Declared noxious weeds would be managed according to the requirements stipulated by the *Noxious Weeds Act 1993*, and any weed removal activities would be in accordance with CMSC control plans for each noxious weed.
 - Regular targeted control of all noxious weeds would take place during construction and operation to manage noxious weeds. CMSC would routinely spray a 20 metre buffer area around internal tracks and stockpiled sites to prevent weed spread.

- All plant material containing seed heads, weeds that have allopathic properties, and weeds that are able to reproduce vegetatively (e.g. Wandering Jew and Willows), including topsoil containing weed propagules, would be disposed of at an appropriate waste management facility or otherwise properly treated to prevent weed growth and reused in rehabilitation activities on site.
- All pesticides would be used in accordance with the requirements on the label. Any person undertaking pesticide (including herbicide) application would be trained to do so and have the proper certificate of completion/competency or statement of attainment issued by a registered training organisation.
- Establish a machinery hygiene plan to ensure vehicles and machinery are free of organic matter or soil that may contain fungal pathogens pre- and post-site access.
- Offsetting
 - Offset all permanent removal of native vegetation in perpetuity, prior to impacts occurring. A preliminary offset strategy to offset the impacts from the proposal on local biodiversity has been prepared and is included in Appendix D of this EIS. The preliminary strategy outlines the landscape and habitat values present in the proposed offset area that surrounds the proposal and indicates that there is potential for the proposed offset area to satisfy the requirements, with active improvements such as weed control. Consultation with OEH to confirm the suitability of the offset site has been undertaken.
- Post operation rehabilitation
 - Following the operational phase of the project, a rehabilitation plan would be implemented to stabilise the site and ensure that ongoing impacts to biodiversity are prevented or minimised. The plan would aim to provide a stable land form resistant to erosion and weed infestation. A strategy for rehabilitation is included in Appendix A of this EIS.

5.4 ABORIGINAL HERITAGE

5.4.1 Approach

NSW Archaeology Pty Ltd was engaged to prepare an Aboriginal Cultural Heritage Assessment relating to the proposed gravel pit expansion. The assessment documents the proposed impact areas, the assessment process, findings, interpretation of results and recommendations and is provided in full, as Appendix E of this EIS, and summarised below, specific to the indigenous heritage impacts of the proposed gravel pit expansion.

Aboriginal community consultation was undertaken in accordance with the OEH's guidelines, as discussed in Section 4.2. The field survey was conducted by Julie Dibden of NSW Archaeology Pty Ltd and representatives of the Merrimans Local Aboriginal Land Council. The content and format of the heritage report is in accordance with the NSW OEH (2011) *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* document. The report documents:

- The Aboriginal objects and declared Aboriginal places (as relevant) located within the area of the proposed activity.
- The cultural heritage values, including the significance of the Aboriginal objects and declared Aboriginal places that exist across the whole area that will be affected by the

proposed activity, and the significance of these values for the Aboriginal people who have a cultural association with the land.

- How the requirements for consultation with Aboriginal people have been met (as specified in clause 80C of the *NPW Regulation*).
- The views of those Aboriginal people regarding the likely impact of the proposed activity on their cultural heritage (if any submissions have been received as a part of the consultation requirements).
- The actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposed activity, with reference to the cultural heritage values identified.
- Any practical measures that may be taken to protect and conserve those Aboriginal objects or declared Aboriginal places.
- Any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm, or, if this is not possible, to manage (minimise) harm.

5.4.2 Existing environment

In terms of the broader-scale landscape, the subject site comprises of a broad, amorphous and undulating ridge crest. The ground surface over the site generally falls at a gentle slope to both the north and east. It is situated approximately midway between two water courses, Cooma Creek three kilometres to the east, and the Murrumbidgee River c. four kilometres to the west. There is no reliable water near the site although first order open depressions commence drainage at the site.

Aborigines have lived in the Cooma-Monaro district and its environs for at least 21,000 years (Flood *et. al* 1987). At the time of European contact, the major part of what is now called the Monaro was inhabited by at least 500 Ngarigo speaking Aborigines (Helms 1895: 388). This group exploited the resources of the riverine, grassland and open forests of the region, including those located in the environs of the study area. Their choice of camp-site was influenced by several factors, and from archaeological evidence, Flood (1980: 158) indicates that in this region camp-sites will be typically found within one kilometre of reliable water sources, most usually within 100 metres from water, though never at the water's edge.

Aboriginal Heritage Management Information System results

A search of the NSW OEH Aboriginal Heritage Information Management System (AHIMS) was conducted on 29th July 2014 (AHIMS client service ID: 142928). The search area measures 36 square kilometres, with a buffer of 50 meters, and is encompassed by the following co-ordinates at Datum GDA, Zone 55 - Eastings: 690000 - 696000, Northings: 5995000 - 6001000.

Some 10 Aboriginal object sites are located in the AHIMS search area (Table 1; Figure 2). Searches have been conducted of the NSW State Heritage Inventory and the Australian Heritage database. No Aboriginal heritage sites are listed on these as being in the activity area.

Field survey results

In accordance with the OEH *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*, the purpose of a field survey is to record the material traces and evidence of Aboriginal land use that are:

- Visible at or on the ground surface, or
- Exposed in section or visible as features (e.g. rock shelters with rock-art),

- and to identify those areas where it can be inferred that, although not visible, material traces have a high likelihood of being present under the ground surface (DECCW 2010a: 12).

Six survey units were identified. The units are predicted to contain very low to negligible artefact density. No stone artefacts were found in the proposal area.

5.4.3 Potential impacts

Excavation and the use of machinery can disturb and damage Aboriginal artefacts present within the soil profile.

No Aboriginal cultural heritage places or objects were identified within the activity area. It is unlikely that Aboriginal cultural heritage will be harmed or impacted by the activity. However, an Aboriginal Heritage Management Plan (AHMP) will be prepared in consultation with a qualified archaeologist, in conjunction with Registered Aboriginal Parties and OEH prior to commencement of any development activities within the proposed area.

5.4.4 Safeguards and mitigation measures

The following safeguards and mitigation measures are recommended to ensure that impacts to Aboriginal heritage are minimised during extraction activities:

- An Aboriginal Heritage Management Plan (AHMP) would be prepared in consultation with a qualified archaeologist, in conjunction with Registered Aboriginal Parties and OEH prior to commencement of any development activities within the proposed area. The AHMP would include:
 - Specifically detail the procedures to be followed if Aboriginal objects are found at any stage during the life of the development works and allow for the formulation of appropriate measures to manage any unforeseen impacts to Aboriginal heritage values
 - Specifically detail the procedures to be followed if any Aboriginal skeletal material is uncovered during the development works and allow for the development of appropriate measures to manage this material
 - Outline of the process that will be followed for continuing consultation with the Aboriginal stakeholders and OEH, where required
 - Outline of the process for how the AHMP procedures will be managed and adhered to during the operational life of the development activities
- All site workers and contractors would be provided with induction training on the identification of Aboriginal objects, Aboriginal cultural awareness and procedures that must be followed in the event of discovery of Aboriginal objects
- If any Aboriginal objects are uncovered during the proposed extraction activity; all works must stop and the relevant OEH office contacted for advice. An Aboriginal Heritage Impact Permit (AHIP) will be required if Aboriginal objects cannot subsequently be avoided as part of the extraction works
- In the unlikely event that skeletal remains be discovered during earthworks, all works should cease and protocols consistent with Requirement 25 in the Code of Practise for Archaeological Investigation of Aboriginal Objects in New South Wales be implemented

5.5 TRAFFIC AND TRANSPORT

5.5.1 Approach

A traffic and transport study was prepared by Rodger Ubrihien, a road design consultant with Bega Duo Designs. The full report is included as Appendix G of this EIS. The following section includes a summary of the findings of this report.

5.5.2 Existing traffic conditions

The gravel pit site is located on the western side of the Monaro Highway approximately 12 km north of Cooma. The Monaro Highway is a relatively high standard route linking the Southern Monaro area and the snowfields to Canberra. At the entrance of the gravel pit, the highway is a single carriageway public road with a speed limit of 100 km/hr.

The entry to the gravel pit is near a crest on the Monaro Highway and is currently unsealed. There are no overtaking opportunities along this section of the highway due to a crest north of the site. The location and form of the existing access provides adequate sightlines when entering and exiting the site in both directions (safe intersection sight distance of 248m minimum, as per Austroads Guide to Road Design Part 4A Table 3.2, Austroads 2010). Sight distances measured on the site were 330m to the south and 370m to the north.

Hourly traffic counts indicate Monday to Friday peak hourly averages of 231 vehicles per hour southbound and 290 vehicles per hour northbound (RMS permanent traffic counter, Bunyan, for the working week commencing 8th September 2014). The existing gravel pit traffic volumes contribute less than 5 vehicles per day averaged over a year (refer Appendix G of this EIS) with peak hourly volumes estimated to be no more than six vehicles per hour.

Roads and Maritime Services records indicate that there were two injury and two non-injury accidents in the vicinity of the gravel pit. All were single vehicle accidents attributed to wet conditions, excessive speed and fatigue.

Employee parking is available within the existing gravel pit. At present, three vehicles may be present at the site during operation as well as the haul trucks and machinery including loaders and dozers.

5.5.3 Potential impacts

There are no expected adverse impacts to traffic and access as a result of the expanded gravel pit operations. Site access would remain in the existing location and no change to the number of haulage vehicles or the route of haulage traffic is proposed.

Access to and from the site would be at the location of the existing unsealed entry on the Monaro Highway. The traffic study (refer Appendix G of this EIS) considers the most significant traffic impact for the proposal to result from the conflict between the slow speed, heavy vehicles entering and leaving the gravel pit and the high speed vehicles on Monaro Highway. While traffic movements in and out of the site is expected to be similar to present, upgrading the intersection in accordance with the preferred treatments outlined in the traffic and transport study (refer Appendix G of this EIS) is proposed to reduce any safety issues at the entrance. The suggested treatments within the traffic and transport study (refer Appendix G) include widening and sealing the eastern road shoulder at the junction in accordance with

“BAR” (Basic right turn) treatment and provision of a sealed auxiliary left turn treatment on the south western approach to the gravel pit in accordance with “AUL(S)” treatment.

Any road widening that may be required by upgrading the intersection can be contained within the existing road reserve. There would be no requirement for land acquisition at the site. Consultation with the Roads and Maritime Network Safety Manager regarding the intersection upgrade would be required. Consultation would include discussion on the need for a concept plan to be developed as required by the Roads and Maritime Services in their response to the proposal.

In addition to an intersection upgrade, truck turning warning signs in advance of the gravel pit in both directions is also proposed to reduce impacts associated with trucks entering and leaving the site.

During operational periods at the gravel pit, traffic generated generally includes transportation of plant and machinery to the site, the once daily movement in and out of the site for staff vehicles and four to five haulage truck movements per day. Plant and machinery are kept at the site for the duration of the extraction operation. This would not change as a result of the proposal. Occasional exceptions occur which increase gravel pit operating hours and subsequently increase truck movements. For example, after a significant rain event where damage to roads (mostly unsealed roads) require immediate attention. This emergency response would continue to happen into the future as required.

Safety issues on the road network would not be exacerbated by the development. No changes to existing haulage routes, haulage distances or number of vehicles on the road is proposed as part of the expanded operation. The capacity and efficiency of the road network would not be impacted as a result of the proposal. Risks of vehicle collisions with other vehicles, pedestrians, stock and wildlife would therefore not increase and there would be no adverse impacts to road surface. The proposal would not generate any additional impacts on public transport schedules such as school bus movements and tourist buses.

5.5.4 Safeguards and mitigation measures

Safeguards and mitigation measures to manage road traffic and safety impacts include:

- Consultation with Roads and Maritime would be undertaken regarding the proposed Monaro Highway intersection upgrade and the requirement for the development of a concept plan.
- The entry to the gravel pit would be sealed to the road reserve boundary.
- “Truck turning” warning signs would be installed in accordance with Australian Standard AS1742.3.

5.6 NOISE

5.6.1 Approach

Renzo Tonin & Associates undertook a noise assessment for the proposed expansion of Bunyan Gravel Pit. Operational noise and road traffic noise impacts on nearby private receptors were investigated using background noise loggers and modelling based on the type of the equipment that would be used. The noise impacts were assessed in accordance with the *NSW Industrial Noise Policy* (EPA 2000) and *NSW Road Noise Policy* (DECCW 2011).

The investigation is summarised in this section below and provided in full in Appendix F of this EIS.

5.6.2 Existing environment

Background

The proposal is located in a rural environment adjacent to the Monaro Highway. The noise environment is characterised by existing gravel pit activities, agricultural activities including machinery and animals and traffic noise from the Monaro Highway.

The location of potential sensitive receivers with regards to the proposed gravel pit expansion is shown in Figure 5-3. The seven receivers are all residential properties with Receiver R4 the closest to the proposed expansion area, at 810 metres south.



Figure 5-3 Proposal area, sensitive receivers and monitoring locations (Renzo Tonin & Associates 2014).

Existing noise environment

Noise monitoring was undertaken between Thursday 23rd October and Monday 3rd November 2014 in the south-western section of the subject site (Figure 5-3). This location considered to represent the nearest or potentially most affected residential locations.

The occurrence of high winds are known to occur in the area, in accordance with the *NSW Industrial Noise Policy* (EPA 2000), periods of wind affected data were excluded from the monitoring results. This resulted in seven days out of the 12 days of monitoring to be excluded. The five acceptable day periods were considered to be representative of the noise environment of the areas surrounding the proposal.

The existing background and ambient noise levels are presented in Table 5-10. The identified potential sensitive receivers surrounding the proposal are all classified as rural under the *NSW Industrial Noise Policy* (EPA 2000). It was found that the background noise levels are representative of residences in a rural environment with a day time, evening and night time background noise levels at 30dB(A) and under.

Table 5-10 Measured Existing Background (L_{90}) & Ambient (L_{eq}) Noise Levels, dB(A)

Location	L_{90} Background Noise Levels			L_{eq} Ambient Noise Levels		
	Day	Evening	Night	Day	Evening	Night
Location M1	30	29	29	44	40	41

The operations will occur within day time hours, therefore only the day time L_{90} background noise level will be considered for the operation and traffic noise impact assessments, provided below.

5.6.3 Potential impacts

Operational noise

Operational noise would be generated by the use of onsite machinery and vehicle movements. The *NSW Industrial Noise Policy* (EPA 2000) specifies noise criteria to protect the community from excessive intrusiveness noise. Intrusiveness of an industrial noise source may generally be considered acceptable if the predicted noise level from the source does not exceed the background noise level measured in the absence of the source by more than 5dB(A). The intrusiveness Noise Criteria for the operation of the gravel pit is in Table 5-11 below.

Table 5-11 Intrusiveness Noise Criteria, dB(A)

Receiver	Intrusiveness Criteria L_{Aeq} , 15 min Day
All receivers	30 + 5 = 35

Amenity noise criteria is to limit continuing increases in noise levels. The maximum ambient noise level within an area from industrial noise should not normally exceed the specified acceptable noise levels. The applicable Amenity Noise Criteria to be applied for the operation of the gravel pit is in Table 5-12.

Table 5-12 Applicable Amenity Noise Criteria, dB(A)

Receiver type	Indicative Noise amenity area	Time of Day	Recommended L_{Aeq} Noise Level dB(A)	
			Acceptable	Recommended Maximum
All residences	Rural	Day	50	55

The operational noise emissions for the gravel pit were predicted by modelling the noise sources, receiver locations, topographical features of the intervening area and possible noise control treatments. The modelling calculates the contribution of each noise sources at each specified receptor point and allows for the predictions of the total noise from a site. The modelling has taken into account to meteorological conditions, calm and isothermal conditions and slight to gentle breeze. Due to the operations to only occur during the day, temperature inversion affects were not assessed. The predicted noise levels for the worst case scenario based on the description of the operation of the gravel plan is present in Table 5-13.

Table 5-13 Predicted $L_{Aeq\ 15\ min}$ Operational Noise Levels at receiver locations, dB(A).

Receiver location	Intrusiveness Criteria	Predicted Operational Noise Levels, $L_{Aeq\ 15\ min}$		Comply with criteria?
		Calm & isothermal conditions	Slight to gentle breeze	
R1	35	30	34	Yes
R2		31	35	Yes
R3		30	35	Yes
R4		26	30	Yes
R5		30	35	Yes
R6		20	25	Yes
R7		24	29	Yes

The results presented above indicate that the noise emissions from the operational phase of the gravel pit expansion will comply with the nominated noise criteria at all sensitive receiver locations.

Road traffic noise

The predicted road traffic noise is provided in Table 5-14. These predicted noise levels are based on the worst case scenario of truck movements in a one hour period. Traffic information is provided in Section 5.5. Road traffic noise criteria is identified according to road category, project type and period of day within the *NSW Road Noise Policy* (DECCW 2011). The criteria, provided in the table are based on the requirement of additional traffic during the day on existing highways and local roads for land use developments.

Table 5-14 Predicted road traffic noise contribution levels along public roads, dB(A).

Receiver	Criteria	Truck traffic movements	Car traffic movements	Speed (km/h)	Distance to road (metres)	Predicted noise level	Exceed criteria?
Freeway/arterial/sub-arterial roads	$L_{Aeq(15\ hour)}$ 60	8 per day	4 per day	100	90	34	No
Local roads	$L_{Aeq(1\ hour)}$ 55	4 per hour	2 per hour	50	10	53	No

It can be seen from the table that the traffic generated by the proposed gravel pit expansion would not adversely contribute to the existing traffic noise levels at the most affected residences along the surrounding roads.

5.6.4 Safeguards and mitigation measures

Safeguards and mitigation measures required to minimise noise emissions of the proposal include:

- All equipment used on site would be in good condition and good working order.
- Vehicles would be kept properly serviced and fitted with appropriate mufflers.
- Where reasonable and feasible, activities that generate high noise levels would be substituted with alternative processes that generate less noise.

5.7 VISUAL AMENITY

5.7.1 Existing environment

The subject site is located on the Monaro Plains which is characterised by undulating topography and mosaic of cleared plains and sparsely wooded slopes and more densely wooded ridge tops. The plains and lower slopes are most utilised for agriculture and evidence of medium to large scale cropping and extensive grazing is present in the landscape. The visual values of the area to receivers, including locals and motorists, would be open paddocks with the backdrop of mountains.

The existing gravel pit is close the Monaro Highway and lowers the visual aesthetic of the surroundings. Broad access tracks, sediment detention ponds, piles of materials (rocks, aggregate, timber), construction equipment and rubbish are present in the active gravel pit area.

The subject site has been previously disturbed by agricultural activities including grazing, dam construction and some clearing (for powerline easement and access) and past extractive activities. It is also visible from the Monaro Highway when travelling in both directions but is not prominent in the landscape due mostly to the existing gravel pit layout which results in excavation below ground level and has provided for a vegetation buffer of at least 30 metres between the road and existing pits. Scattered regrowth of Eucalypt trees and poplars occur along the roadside boundary of the gravel pit and woodland vegetation is present within the adjoining land to the south and north.

An exhausted gravel pit is located on the western side of the Monaro Highway 1.7km to the south. This gravel pit is much more obvious within the landscape than the subject gravel pit from the road. The locality of Bunyan, consisting mostly of rural residences, is located 2.5km south of the site. The Bunyan Airfield is immediately north of the subject site.

Due to the topography of the land and trees present across the site, the visibility from the closest receivers would be limited.

5.7.2 Potential impacts

The proposal would expand an existing industrial view that lessens the visual character of the area. The degree to which it is visible to nearby residents however, and the duration that it would be viewed by passing motorists is expected to be relatively low. Screening can be undertaken to lessen visual impacts.

Expansion of the gravel pit south of the site during Stages 1 and 2 would increase visibility from the Monaro Highway. Stages 3, 4 and 5 are unlikely to be visible from the Monaro Highway. It is proposed, therefore, to include a 50 metre buffer zone between the Monaro Highway and the eastern boundary of the gravel pit that would be planted with trees. Once mature, the vegetation buffer is likely to screen the Stages 1 and 2 of the development to the south and most of the northern expansion area. Planting trees within the buffer zone as soon as practical after approval is granted would assist in reducing visual

impacts. It is proposed that the vegetation buffer is planted in stages to correspond with the staged expansion areas. This vegetation screen would reduce any adverse impacts associated with tree removal works which would occur during the extraction process.

The northern cell may be visible for passengers in vehicles travelling south along the Monaro Highway but impact to views would be minimal due to the nature of gravel pit activities and the formation of pits below ground surface level.

Proposed expansion to the west, south and north is unlikely to increase visibility of the site to nearby residences. Topography between residences is flat to gently undulating and woodland vegetation is likely to screen the residences from each extraction area.

Machinery for gravel pit operations and stockpiles of material could reduce visual amenity of the rural landscape if parked in areas of high visibility. Impacts resulting from machinery and equipment present at the site for any extended periods would be reduced by parking within existing pits and extraction areas.

5.7.3 Safeguards and mitigation measures

Safeguards and mitigation measures to address visual impacts include:

- A vegetation buffer would be planted in stages to correspond with the staged expansion areas. The trees are to be planted in conjunction with extraction Stages 1 and 2.
- Native tree species appropriate to the local area would be used.
- Removal of trees to be minimised.
- All machinery and equipment associated with gravel pit operations would be parked within the existing pits and extraction areas.
- Rapid implementation of rehabilitation actions (refer to Section 6.1), for areas where extraction has ceased. New areas should not be expanded until funds and planning for exhausted areas can be demonstrated.

5.8 AIR QUALITY

5.8.1 Existing environment

Climate

The closest Bureau of Metrology weather monitoring site in the vicinity of the subject site is the Cooma Visitors Centre. According to Weatherzone (2015) the recorded mean maximum temperature in the area vary from 11.4 °C to 27.3 °C and the recorded mean minimum temperature vary from -2.7 °C to 10.7 °C. The area has an annual rainfall of 540.7mm.

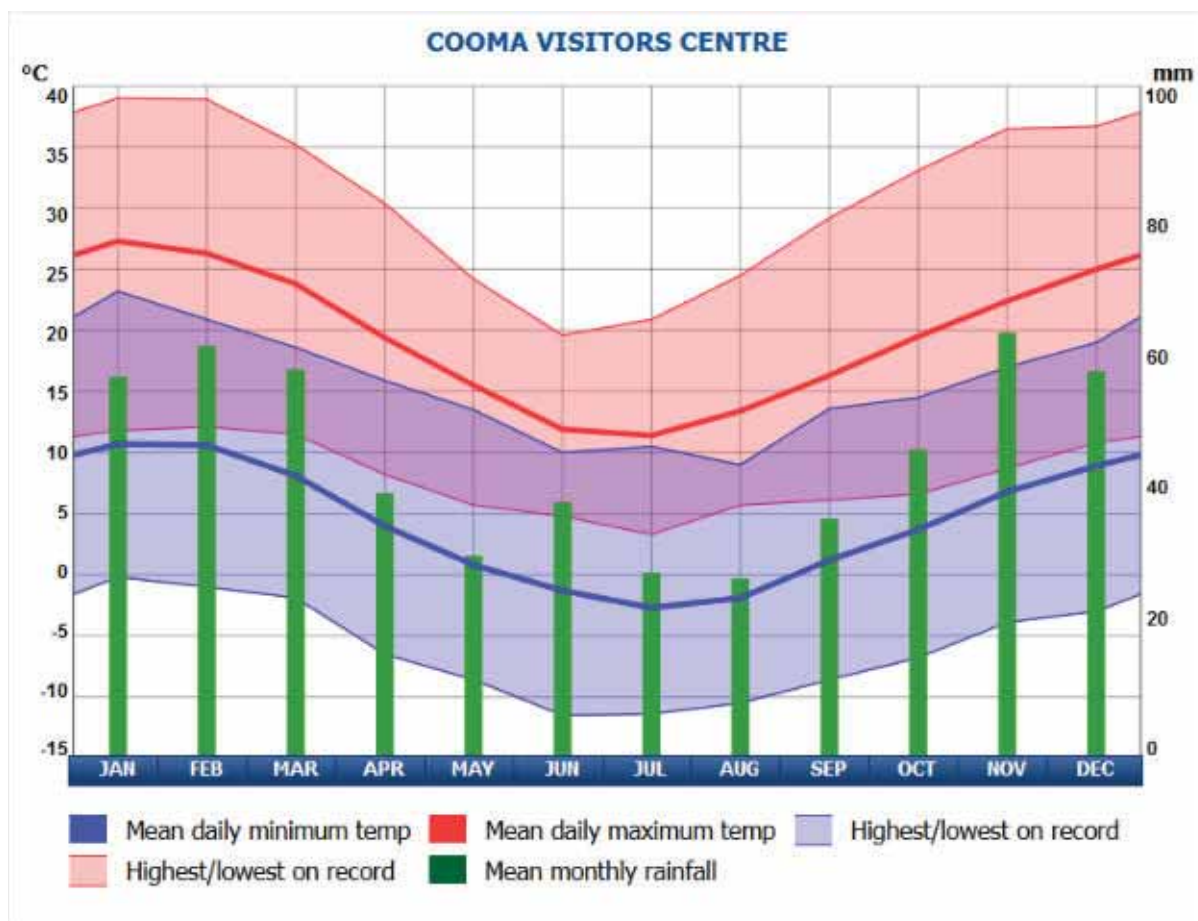


Figure 5-4 Climate chart for Cooma (Weatherzone 2015).

The annual mean 9am wind speed is 6.1km/h, with the highest wind speeds in October and lowest in May. The annual mean 3pm wind speed is 10.8km/h, with the highest wind speeds in September and lowest wind speed in April. The high September 3pm winds come from a north west, west and south west direction (BOM 2015).

Air quality

The air quality in Bunyan is generally good, and is typical of that found in a rural setting in NSW due to the relatively low population and distance from industrial pollution sources. Local air quality can be affected by traffic fumes (Monaro Highway), agricultural practices (ploughing, vehicles and plant traveling on unsealed roads) and the operation of the existing gravel pit (vehicles and plant traveling on unsealed roads, excavation and stockpiling). During colder months, there is a minimal increase in air contaminants due to smoke from the operation of solid fuel heating.

Three major polluters occur in the local regions, Centrel Pty Ltd, Jemena Eastern Gas Pipelines Pty Ltd and Snowy Hydro Limited. These are located over 11 kilometres from the proposal area. Emissions from these facilities include total volatile organic compounds, benzene, cyclohexane, ethyl benzene, n-hexane total nitrogen and total phosphorus (Department of the Environment 2014).

There are seven nearby receivers within 1.3 kilometres of the site. The closest, Receiver R4 at 885 metres from the proposal. Other receivers include traffic on the Monaro Highway and users of the Bunyan Airfield, both are adjacent to the gravel pit.

5.8.2 Potential impacts

Dust is generated from existing gravel pit operations including extraction operations and vehicle movements. Additional dust would be generated at the new proposed extraction areas from the following proposed activities:

- Soil stripping and stockpiling.
- Extraction of material with excavator.
- Loading of material.
- Haulage to existing gravel pit area to be processed (vehicle movements).

Other sources of air emissions would be exhaust fumes from mobile plant, machinery and vehicles.

Dust and emissions have a higher potential to travel and spread during periods of high winds. Based on weather data, the highest mean wind speeds are recorded in the afternoons (3pm) during spring months. This is when dust and emissions are more likely to potentially impact on adjacent receivers including visibility for traffic of the Monaro Highway and users of Bunyan Airfield.

Due to the relatively large distance to residences, landscape characteristics and considering the low frequency of the activity relative to existing operations, these impacts are unlikely to be noticeable to any local residents and would have a minimal impact on the surrounding area, with any impact mainly restricted to the immediate vicinity of the works.

5.8.3 Safeguards and mitigation measures

Mitigation measures are currently in place for existing gravel pit operations, to minimise air quality related impacts. These are also considered applicable to this current proposal and include:

- During dry, windy periods a water cart shall be made available and used to dampen unsealed sections of the haul routes.
- A speed limit of 25km/h shall be adhered to for any unsealed section of the haulage route.
- Vehicles and motorised equipment would be maintained so that emissions are minimised.

Note, measures to manage stockpiles, which can also contribute to air borne dust, have been specified in Section 5.2 and are not duplicated here.

5.9 WASTE MANAGEMENT

5.9.1 Existing environment

Legal requirements for the management of waste are established under the POEO Act and the *Protection of the Environment Operations (Waste) Regulation 2005*. Unlawful transportation and deposition of waste is an offence under Section 134 of the POEO Act. Littering is an offence under Section 145 of the POEO Act.

The *Waste Avoidance and Resource Recovery Act 2001* includes resource management hierarchy principles to encourage the most efficient use of resources and to reduce environmental harm. The proposal's resource management options would be considered against a hierarchy of the following order:

- Avoidance of unnecessary resource consumption.
- Resource recovery (including reuse, reprocessing, recycling and energy recovery).
- Disposal.

Adopting the above principles would encourage the most efficient use of resources, and reduce costs and environmental harm in accordance with the principles of ecologically sustainable development.

5.9.2 Potential impacts

Solid waste is one of the major pollutants caused by operation of the gravel pit. Solid waste generation is expected to be relatively minor during operation of the gravel pit as any unsuitable material would be returned to the gravel pit. Impacts include:

- Limited vegetation clearing.
- Litter from construction workers.

It is noted that the large areas available for stock piling may encourage Council to use these areas to stockpile rubbish or materials from other Council projects. There is evidence of rubbish dumping on the existing site. This practice should be discouraged.

5.9.3 Safeguards and mitigation measures

Safeguards and mitigation measures include:

- Staff and contractors to take any waste with them offsite. No waste disposal available onsite.
- Waste would be disposed of at a facility licensed to accept the waste.
- Provide toilet facilities for onsite workers and dispose of sillage from contractor's pump out toilet facilities at the local sewage treatment plants or other suitable facility agreed to by CMC or other relevant authority.
- Provide signage to discourage dumping of rubbish.

5.10 HAZARDS AND RISKS

5.10.1 Potential impacts

Gravel pits, by their nature are hazardous, due to the activities that are required to occur on site during operations. Hazards associated with the proposed expansion of the Upper Bunyan Gravel Pit include the following:

- Risk of injury to workers through the operation of heavy machinery
- Risk of landslide and collapse of gravel pit walls
- Risk of ignition as a result of gravel pit activities
- Environmental hazards
- Risks to public travelling on the road network (this has been addressed in Section 5.7 and is not discussed again in this section)

The operation of plant machinery runs an inherent risk of injury to the operators and any personnel that may be present at the site. Risks to workers are, and would continue, to be managed by the Cooma-Monaro Shire Council's Gravel Pit Emergency Response Procedure which includes processes such as site inductions, appropriate training and procedures specific to the gravel pit operations.

The risk of landslide or collapse of gravel pit walls is low but may be heightened during periods of wet weather. Battering of slopes and benching vertical walls where necessary and as is currently the

procedure would reduce the risk of this occurring. The risks are managed under Cooma-Monaro Shire Council's Integrated Quarry Management Plan, which is currently being updated.

There is a low potential for the activities at the gravel pit to cause wildfire and the proposal to expand the gravel pit would not increase this risk. Bushfire risks are currently managed by the Cooma-Monaro Shire Council's Gravel Pit Emergency Response Procedure. Fire hazards are limited at the site. Heavy machinery has ignition risks through heat sources such as energised wiring and turbochargers which could spark fire. Fuels and lubricant for plant and equipment are flammable substances. The risk is increased when these materials are stored onsite. No hot works would take place on site. Firefighting equipment would continue to be present within all earthmoving machinery and vehicles that would be on site.

Environmental hazards as a result of the gravel pit expansion mostly relate to the risk of hydrocarbon spills and leaks and their leaching into the soils, groundwater or nearby drainage courses. Current management of spills and oils is documented in the Cooma-Monaro Shire Council's Chemical Spill Procedure. Continued implementation of this plan would reduce any impacts that may occur as a result of hydrocarbon spills and leaks. Other environmental hazards, such as noise and air pollution may be generated. Impacts associated with these aspects are discussed in Sections 5.8 and 5.9 respectively.

None of the above mentioned hazards would be newly introduced to the gravel pit, given they are already occurring at the existing gravel pit operation. There are not expected to be any new hazards, nor are any of the hazards currently operating likely to increase in severity.

5.10.2 Safeguards and mitigation measures

Safeguards and mitigation measures include:

- No flammable liquids to be stored onsite
- No hot works to be undertaken onsite
- All equipment used on site would be in good condition and good working order.

5.11 LAND USE

5.11.1 Existing environment

The land that would be affected by the proposal is Crown Reserve, Lot 160 DP 724552. The site is zoned RU1 Primary production under the Cooma-Monaro Local Environmental Plan 2013. The land is currently utilised for two different land uses, extractive industry in the eastern part of the lot and sheep and cattle grazing (rotational) in the west. An exhausted gravel pit is present in the central southern part of the site. This redundant pit is currently being used by a rifle club.

Land use surrounding the site is mostly agricultural or large rural residences. The paddock immediately south of the proposal is part of the NSW Travelling Stock Reserve network. To the north of the proposal, Bunyan Airfield where the Canberra Gliding Club has a facility for launching gliders.

5.11.2 Potential impacts

The key impact with regard to land use is related to grazing activities. The proposal would reduce the area available for grazing as stock would be excluded from each extraction area, both during operations and in the post operation phase extraction when rehabilitation is occurring. Grazing would continue to occur in all other areas in the long term, including the proposed offset area. However, the grazing would

be controlled for biodiversity management objectives and not grazing income and therefore grazing intensity would be reduced and may be excluded in specific circumstances.

Consultation with the current lessee concerning the proposal has begun to mitigate any impacts. Stock were removed from the site to allow for the biodiversity field surveys to be undertaken (tile surveys for reptiles).

The rifle club would not be impacted by the proposed gravel pit expansion due to the location from the proposed expansion areas. The rifle club is situated in the old extraction area which is 250 metres west of proposed extraction areas. Operation of the rifle club would be able to continue with no changes to access. CMSC will continue to consult with the rifle club on proposed extraction and offset areas and their impact on the rifle club's activities.

Other land uses surrounding the site would not be impacted by the proposal.

5.11.3 Safeguards and mitigation measures

Safeguards and mitigation measures include:

- Ongoing consultation with the current grazing lease holder and the Rifle club to keep all parties informed of the planning and approval process and the impacts to these activities.

5.12 SOCIAL AND ECONOMIC IMPACTS

5.12.1 Existing environment

Cooma-Monaro Shire Council is responsible for maintaining a road network that is 1,126.7km in length and valued at \$235.6 million (in terms of replacement cost). The road network is Council's major physical asset. Gravel for road maintenance activities is supplied from material extracted from seven operating quarries within the shire.

The Upper Bunyan Gravel Pit is the most centrally located gravel pit within the shire and is generally the most convenient source of material. The gravel pit is owned and operated by Cooma Monaro Shire Council. Its central location minimises the distance material must be hauled which ultimately reduces the costs of Council's road construction projects.

The gravel pit employs five full time staff members.

5.12.2 Potential impacts

The primary socio-economic impacts relate to economic benefits for Cooma-Monaro Shire Council and those sourcing the material (e.g. roads management authorities). Haulage of material costs are generally the most significant costs in terms of supplying material for road construction projects. Expansion of the gravel pit would allow material to continue to be sourced from the central gravel pit thus reducing costs. In this context, the proposal would have benefits for the local economy.

Closure of the existing gravel pit post exhaustion of material may result in job losses or staff may be relocated to other quarries. Increased costs of road works resulting from sourcing material from further afield would decrease the number of projects that Council would be able to undertake within its annual road maintenance budget. Poorly maintained roads has safety implications for all road users.

Impacts to grazing leases have been discussed in Section 5.11.

5.12.3 Safeguards and mitigation measures

There are no additional safeguards and mitigation measures relating to socio-economic impacts

5.13 WATER RESOURCES

5.13.1 Existing environment

The subject site is located in the South East Local Land Services region (formerly known as Murrumbidgee Catchment Management Authority). The Murrumbidgee River is approximately 3.8 kilometres west and Cooma Creek is three kilometres east of the site. An unnamed tributary of the Murrumbidgee River is the closet water source to the subject site approximately 1.4 kilometres west of the site.

The subject site contains a number of minor drainage lines that contained no water during the site inspection, but would hold water during rainfall events (Figure 5-5). They are not mapped on topographic maps. These drainage lines are shallow vegetated drains that direct flows to small constructed farm dam. There are approximately nine existing dams onsite (Figure 5-5). An existing drainage line occurs within each three proposed excavation areas. These will be utilised for drainage within these area during operation. The water quality within the drainage lines and dams are expected to be poor due to little to no flow and runoff from surrounding land uses including agriculture, the highway and existing operational gravel pit.



Figure 5-5 A dam within the proposal site and dried up drainage lines.

Boreholes within the subject site undertaken during investigations for site materials, encounter no groundwater (Coffey 2011). A private stock and domestic bore (GW403215) located approximately 1.1 km north-west of the subject site has a standing water level of 12.00 metres (NSW Government 2014c).

The subject site is not located on flood prone land.

5.13.2 Potential impacts

The gravel pit operations would not require a water source. Staff water requirements would be met by offsite facilities. Water carts would be brought to site periodically, as required for dust control (refer to Section 5.2). Potential impacts include effects on local water quality, due to the introduction of pollutants such as sediment or fuels, and affects to local hydrology, due to landform impacts.

Three drainage lines within the proposed excavation areas would be directly impacted. These would be used for sediment control onsite. Other waterways and drainage lines with the subject site have potential to be indirectly impacted. Vegetation clearing and excavations within the drainage lines and subject site has potential to reduce water quality with sediment laden water. Chemical and fuel spills also have

potential to enter drainage lines. The topography of the area would ensure all water remains within the subject site.

Water would not be sourced or extracted from site. Therefore, no water sharing plans or other water source embargos are relevant to the proposal. If water is required for dust suppression it would be transported to site.

5.13.3 Safeguards and mitigation measures

The safeguards regarding stockpiling material in Section 5.2.3 would mitigate the impact on water quality.

- Establish a Soil and Water Plan as described in Section 5.2.2. The aim of this plan would be to ensure that 'clean water' is diverted around areas of the gravel pit activity and that 'dirty water' is contained on site and directed to a sediment detention basin.
- Implement Chemical Spill Procedure as described in Section 5.2.2.

5.14 UTILITIES AND SERVICES

5.14.1 Existing environment

A 132Kv powerline and telecommunication cables (Telstra) are located within subject site. No other utilities or services are within the site.

5.14.2 Potential impacts

The powerline and telecommunication cables would not be impacted by the proposal. Extraction in proximity to these services would be avoided due to the prohibitive cost of relocating this infrastructure.

5.14.3 Safeguards and mitigation measures

The following safeguards and mitigation measures are recommended to ensure that impacts to Utilities and services are minimised during extraction activities:

- Consultation with Essential Energy, Telstra and any other service provide that owns infrastructure within the subject site if required.

5.15 HISTORIC HERITAGE

5.15.1 Existing environment

Australian Heritage Database

This database contains information about more than 20 000 natural, historic and Indigenous places including places in:

- The World Heritage List
- The National Heritage List
- The Commonwealth Heritage list

- The Register of the National Estate
- Places under consideration for any one of these lists.

A search of this database revealed that there is one item located near to but not within the proposal area. A summary of the search results is provided below in Table 5-15.

Table 5-15 Australian Heritage Database search results.

Heritage Item	Location	Register and Status
Dromore Homestead Group, Numarella Rd	Chakola, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)

State Heritage Inventory

The *NSW heritage databases* contain over 20,000 statutorily-listed heritage items in New South Wales. This includes items protected by heritage schedules to local environmental plans (LEPs), regional environmental plans (REPs) or by the State Heritage Register. The information is supplied by local councils and State agencies and includes basic identification details and listing information. Consequently listings should be confirmed with the responsible agency.

A search of this database revealed that there is 127 items near the proposal area, these are provided in Appendix H of this EIS. No items listed are present within the subject site.

National Trust of Australia (NSW) Register

The National Trust of Australia (NSW) is a non-government Community Organisation which promotes the conservation of both the built and natural heritage (for example, buildings, bushland, cemeteries, scenic landscapes, rare and endangered flora and fauna, and steam engines may all have heritage value). The Trust has approximately 30,000 members in New South Wales.

Following its survey and assessment of the natural and cultural environment, the Trust maintains a Register of landscapes, townscapes, buildings, industrial sites, cemeteries and other items or places which the Trust determines to have heritage significance and are worthy of conservation. Currently there are some 11,000 items listed on the Trust's Register. They are said to be 'Classified'.

The Trust's Register is intended to perform an advisory and educational role. The listing in the Register has no legal force. However, it is widely recognised as an authoritative statement of the heritage significance of a place. The Trust does not have any control over the development or demolition of the Classified Places or Items in its Register.

While the National Trust Register does not provide any statutory obligations for protection of a site as such, the acknowledgment of a place being listed on the Register as a significant site lends weight to its heritage value. Also, the fact that the actual data for sites may be minimal does not diminish the significance of a place. In fact, many sites were listed with only basic data added, especially in the early developmental stages of the Register.

The Trust, over the last few years has been upgrading the information for places listed, with criteria for assessment for listing based on the Australian Heritage Commission Criteria of assessment for entry to the Register of the National Estate.

A search of the National Trust of Australia (NSW) Register revealed that there are 6 items that are near to the proposal area (Table 5-16). It should be noted that there are no items listed as being present within areas of direct impacts.

Table 5-16 National Trust of Australia search results

Item name	Address
Bredbo Rail Bridge Group	Goulburn-Bombala railway, Bredbo
Cooma railway Station and yard group	Bradley Street, Cooma
Currango Homestead	Kosciuszko National Park
Michelago rail bridge over Ingalara Creek	Goulburn-Bombala railway, Michelago
Michelago Railway Station group	Goulburn-Bombala railway, Michelago
Royal Hotel & Outbuildings	59-61 Lambie Street, Cooma

Survey results

No non-Aboriginal heritage items were recorded in the area during the 2014 site survey.

5.15.2 Potential impacts

There were no non-Aboriginal heritage items recorded on the site, therefore no potential impacts have been identified.

5.15.3 Safeguards and mitigation measures

The following safeguards and mitigation measures are recommended to ensure that impacts to historic heritage are minimised during extraction activities:

- In the event of an item of heritage significance being uncovered, works should cease in the vicinity of the find and the site manager contacted immediately. Works should not recommence until an investigation has been completed by suitably qualified persons in accordance with NSW Heritage Branch guidelines.

5.16 CUMULATIVE IMPACTS

5.16.1 Existing environment

Cumulative impacts, for the purpose of this assessment, relate to the combined potential effects of different impact areas of the proposal as well as the potential interaction with other activities in the local area.

In addition to the existing operation of the Upper Bunyan Gravel Pit, seven other gravel pits operate in the Cooma-Monaro Shire. The closest to the subject site is Undoo, 23 kilometres east of the proposal site. There are no other heavy industries known to operate in the surrounding area.

The proposal site is however adjacent to Bunyan Airstrip and the old Roads and Maritime gravel pit within the proposal area is used by rifle club.

5.16.2 Potential impacts

Given the relative isolation of the existing gravel pit and proposed works area from other similar enterprises and heavy industries, the cumulative impacts resulting from the proposal are likely to be minimal. As discussed under their relative sections above, there is unlikely to be any noticeable increase in noise, visual or air quality impacts. There will be no increase in traffic on local roads. Native vegetation would be cleared and contribute to cumulative loss of woodland in the local area, which is also under pressure from agricultural and residential activities. Considering the context of the site however, this is not anticipated to be a high impact.

5.16.3 Safeguards and mitigation measures

Cumulative impacts are considered to be best managed by dealing with each component individually, as detailed in the relevant sections of this report. No further safeguards or mitigation measures are considered to be required for cumulative impacts.

5.17 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC Act Protected Matters Report was generated for a 10km radius around the site on the 13 June 2014 to identify Matters of National Environmental Significance (MNES) that may be impacted by the proposed works. This report is provided in full in Appendix H and summarised below.

5.17.1 Summary of MNES searches

MNES searches	Results of search
World Heritage Places	None
National Heritage Places	None
Wetlands of International Importance	3
Great barrier Reef Marine Park	None
Commonwealth Marine Areas	None
Listed Threatened Ecological Communities	4
Listed Threatened Species	22
Listed Migratory Species	11

5.17.2 Potential impacts

Based on the results of the Protected Matters Search, the only MNES that may occur within proximity to the works are listed threatened Ecological communities and listed threatened and migratory species. The potential for the proposed works to impact on these species was assessed in Section 5.3 and Appendix C of this EIS report. No impacts to listed threatened or migratory species are considered likely. The wetlands of international importance are downstream on the site within South Australia. Due to no waterways and distance from the subject site is considered unlikely these would be impacted.

5.17.3 Safeguards and mitigation measures

No additional safeguards and mitigation measures are considered to be required for MNES.

5.18 PRINCIPLES OF ECOLOGICALLY SUSTAINABLE DEVELOPMENT

The *Protection of the Environment Administration Act 1991* outlines a number of principles of ecologically sustainable development (ESD). These are presented below and discussed in relation to the proposal.

5.18.1 The precautionary principle

According to the precautionary principle, if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be seen as a reason not to protect the environment. The use of the precautionary principle implies that proposals should be carefully evaluated to identify possible impacts and assess the risk of potential consequences.

The precautionary principle has been applied in assessing conservation values and environmental threats and impacts associated with works proposed throughout this EIS. Assessments have been precautionary with respect to threatened entities. The development of mitigation measures and safeguards to manage impacts aims to reduce the risk of serious and irreversible impacts on the environment.

Generally, throughout this assessment, there has been found to be a low level of uncertainty in regard to all factors assessed.

5.18.2 Inter-generational equity

The principle of inter-generational equity requires the present generation to ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.

The impacts of the proposed works would be highly localised and would not significantly diminish resources and nature conservation values available for use by future generations.

5.18.3 Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity are a fundamental consideration of ESD.

An assessment of the existing local environment has been undertaken in order to identify and manage any potential impacts of the proposal on local biodiversity. The impacts of the proposal on local populations of threatened species, threatened communities and their habitats have been assessed in detail in Section 5.3. The proposal is not considered likely to have a significant impact on biological diversity and ecological integrity.

5.18.4 Appropriate valuation of environmental factors

This principle requires that “costs to the environment should be factored into the economic costs of a project”. This EIS has examined the environmental consequences of the proposal and identified mitigation measures for factors which have the potential to experience adverse impacts. Requirements imposed in terms of implementation of these mitigation measures would increase both the capital and operating costs of the proposal. This signifies that environmental resources have been given appropriate valuation.

6 SUMMARY OF MITIGATION MEASURES

No.	Mitigation measure
1	Establish a Soil and Water Management Plan including the following provisions: • Establish soil and water management practices guided by the Best Practice guidelines contained within Soils and Construction Vol. 1 (Landcom 2004). • Identify where sediment and erosion controls would be installed, where equipment and materials laydown will be stored. • Design of sediment basins to ensure water doesn't leave the site. • Designate all areas outside of the works area as 'no go' areas and protect these from indirect impacts. Ensure all vehicles onsite follow established access tracks and minimise onsite movements. • Ensure all vehicles onsite follow established access tracks and minimise onsite movements.
2	Topsoils would be stockpiled and protected for use in site rehabilitation.
3	Subsoil stockpiles and aggregate would be stockpiled in accordance with guidelines contained within Soils and Construction Vol. 1 (Landcom 2004).
4	The gravel pit should be designed to have batters no steeper than 1:1 during operations. Permanent batters for completed sections of the gravel port should be not steep than 1:3.
5	If signs of contaminated soils are discovered (e.g. smell, discolouration, suspect rubbish), the site would be marked and the soil replaced to cover the contamination. The soil would be analysed without delay to determine the type of contamination and an appropriate management plan would then be developed and followed.
6	Implement Cooma-Monaro Shire Council's Chemical Spill procedure. The procedure should be updated for the gravel pit to include the following: • Operate and maintain machinery in a manner that minimises risk of hydrocarbon spills. • All chemicals used would be stored in within impervious bunded areas, strictly used for their intended purpose as per the manufacturer's instructions. • The volume of the chemical storage bunded area would be at least 110% of the volume of all the total of all stored materials. • A spill kit would be available onsite at all times. Staff would be trained in its installation. • All staff would be appropriately trained through toolbox talks for the minimisation and management of accidental spills. • Any refuelling or washing of machinery would take place within an impervious bunded area. • Any construction waste would be contained safely on site and removed in a timely manner, and would not be allowed to contaminate the local surface or ground water.

7	A detailed Rehabilitation Plan would be developed, in accordance with the strategy provided in Appendix A of this EIS, by a person qualified to prepare the plan.
8	The Rehabilitation Plan would include input from specialists (such as agronomists) and consent authorities (Council environmental staff, Local Land Services, Office of Environment and Heritage).
9	Extraction would not commence in new stages until a detailed rehabilitation plan and sufficient funds (or guarantee of funds) to rehabilitate the new area is in place.
10	Vegetation clearing and soil impacts • Prior to the commencement of clearing, a physical vegetation clearing boundary at the approved clearing limit is to be demarcated and implemented. The delineation of such a boundary may include the use of temporary fencing, flagging tape, parawebbing or similar. • Areas of vegetation would be progressively cleared as extraction progresses up to a maximum of 2 hectares at a time. • The vegetation clearing guidelines (included in the biodiversity assessment, Appendix I) would be adhered to during clearing activities, including the removal of hollow bearing trees. • Avoid clearing identified Little Eagle nest tree during breeding season unless surveys demonstrate the tree is not part of breeding habitat for the Little Eagle at the time of clearing. A 50m buffer would be placed on an active Little Eagle nest, with a restriction of all quarry activities in this buffer during the breeding season. • Stockpiling of extracted material and the parking of equipment and vehicles would be restricted to extraction areas only. • Removal of hollow bearing trees would be avoided where possible. • Hollow-bearing trees that must be removed would be removed according to the vegetation clearing guidelines included as Appendix C of this EIS. • Erosion controls would be put in place on the upslope of works to prevent soil and debris travelling downslope (refer to safeguards in Section 5.2.3). • Any fallen timber, dead wood and bush rock (if present) encountered within extraction area would be relocated to a suitable place nearby outside of proposed extraction areas. Offset Strategy
11	Weed management and pathogen management • A Weed Management Plan would be developed for the site to prevent/minimise the introduction of additional weeds to the site and particularly, the spread of weeds offsite. This may require a treatment phase prior to export from the site. • Declared noxious weeds would be managed according to the requirements stipulated by the <i>Noxious Weeds Act 1993</i>, and any weed removal activities would be in accordance with CMSC control plans for each noxious weed. Eradication of African lovegrass will not be attempted as it is deemed impractical and not achievable. • Regular targeted control of all noxious weeds would take place during construction and operation to manage noxious weeds. CMSC would routinely spray a 20 metre buffer area around internal tracks and stockpiled sites to prevent weed spread.

	• All plant material containing seed heads, weeds that have allopathic properties, and weeds that are able to reproduce vegetatively (e.g. Wandering Jew and Willows), including topsoil containing weed propagules, would be disposed of at an appropriate waste management facility or otherwise properly treated to prevent weed growth and reused in rehabilitation activities on site. • All pesticides would be used in accordance with the requirements on the label. Any person undertaking pesticide (including herbicide) application would be trained to do so and have the proper certificate of completion/competency or statement of attainment issued by a registered training organisation. • Establish a machinery hygiene plan to ensure vehicles and machinery are free of organic matter or soil that may contain fungal pathogens pre- and post-site access.
12	Offsetting • Offset all permanent removal of native vegetation in perpetuity, prior to impacts occurring. A preliminary offset strategy to offset the impacts from the proposal on local biodiversity has been prepared and is included in Appendix D of this EIS. The preliminary strategy outlines the landscape and habitat values present in the proposed offset area that surrounds the proposal and indicates that there is potential for the proposed offset area to satisfy the requirements, with active improvements such as weed control. Consultation with OEH to confirm the suitability of the offset site has been undertaken.
13	Post operation rehabilitation • Following the operational phase of the project, a rehabilitation plan would be implemented to stabilise the site and ensure that ongoing impacts to biodiversity are prevented or minimised. The plan would aim to provide a stable land form resistant to erosion and weed infestation. A preliminary rehabilitation plan post operation has been prepared and is outlined in Appendix A of this EIS.
14	An Aboriginal Heritage Management Plan (AHMP) would be prepared in consultation with a qualified archaeologist, in conjunction with Registered Aboriginal Parties and Office of Environment and Heritage (OEH), prior to commencement of any development activities within the proposed area. The AHMP would include: • Specifically detail the procedures to be followed if Aboriginal objects are found at any stage during the life of the development works and allow for the formulation of appropriate measures to manage any unforeseen impacts to Aboriginal heritage values • Specifically detail the procedures to be followed if any Aboriginal skeletal material is uncovered during the development works and allow for the development of appropriate measures to manage this material • Outline of the process that will be followed for continuing consultation with the Aboriginal stakeholders and OEH, where required • Outline of the process for how the AHMP procedures will be managed and adhered to during the operational life of the development activities.
15	• All site workers and contractors would be provided with induction training on the identification of Aboriginal objects, Aboriginal cultural awareness and procedures

	that must be followed in the event of discovery of Aboriginal objects
16	If any Aboriginal objects are uncovered during the proposed extraction activity; all works must stop and the relevant OEH office contacted for advice. An Aboriginal Heritage Impact Permit (AHIP) will be required if Aboriginal objects cannot subsequently be avoided as part of the extraction works
17	In the unlikely event that skeletal remains be discovered during earthworks, all works should cease and protocols consistent with Requirement 25 in the Code of Practise for Archaeological Investigation of Aboriginal Objects in New South Wales be implemented.
16	Consultation with Roads and Maritime would be undertaken regarding the proposed Monaro Highway intersection upgrade and the requirement for the development of a concept plan.
17	The entry to the gravel pit would be sealed to the road reserve boundary.
18	“Truck turning” warning signs would be installed in accordance with Australian Standard AS1742.3.
19	All equipment used on site would be in good condition and good working order.
20	Vehicles would be kept properly serviced and fitted with appropriate mufflers.
21	Where reasonable and feasible, activities that generate high noise levels would be substituted with alternative processes that generate less noise.
22	A vegetation buffer would be planted in stages to correspond with the staged expansion areas. The trees are to be planted before extraction begins for each stage.
23	Native tree species appropriate to the local area would be used.
24	Removal of trees to be minimised.
25	All machinery and equipment associated with gravel pit operations would be parked within the existing pits and extraction areas.
26	Rapid implementation of rehabilitation actions (refer to Section 6.1), for areas where extraction has ceased. New areas should not be expanded until funds and planning for exhausted areas can be demonstrated.
27	During dry, windy periods a water cart shall be made available and used to dampen unsealed sections of the haul routes.
28	A speed limit of 25km/h shall be adhered to for any unsealed section of the haulage route.
29	Vehicles and motorised equipment would be maintained so that emissions are minimised.
30	Staff and contractors to take any waste with them offsite. No waste disposal available onsite.

31	Waste would be disposed of at a facility licensed to accept the waste.
32	Provide toilet facilities for onsite workers and dispose of sullage from contractor's pump out toilet facilities at the local sewage treatment plants or other suitable facility agreed to by CMC or other relevant authority.
33	Provide signage to discourage dumping of rubbish.
34	No flammable liquids to be stored onsite.
35	No hot works to be undertaken onsite.
36	All equipment used on site would be in good condition and good working order.
37	Ongoing consultation with the current grazing lease holder and the Rifle club to keep all parties informed of the planning and approval process and the impacts to these activities.
38	Consultation with Essential Energy, Telstra and any other service provide that owns infrastructure within the subject site if removal or relocation is required.
39	In the event of an item of heritage significance being uncovered, works should cease in the vicinity of the find and the site manager contacted immediately. Works should not recommence until an investigation has been completed by suitably qualified persons in accordance with NSW Heritage Branch guidelines.

7 LIST OF APPROVALS AND LICENCES

The following licences and approvals would be required to carry out the works proposed:

- Roads Permit and consultation with Roads and Maritime Services

8 JUSTIFICATION AND CONCLUSION

The CMSC proposal to expand the existing Upper Bunyan Gravel Pit is to be assessed under EP&A Act, with the Joint Regional Planning Committee being the consent authority. The proposal is a designated development and this EIS has been completed to address the proposal specific DGRs.

This EIS reviews the environmental impacts associated with the expansion of the Upper Bunyan Gravel Pit and assessed and the following impacts to be high:

- Soil and landforms
- Biodiversity impacts

Specific mitigation measures have been committed to as part of the approval of the project to address these impacts:

1. A soil and water management plan to ensure that sediment and erosions controls during extraction are well contained and managed.
2. An offset plan, to offset the vegetation clearing and habitat loss required to expand the gravel pit
3. A rehabilitation plan, to manage the progressive stabilisation of landforms and revegetation to resist erosion and weed infestation.

Outlines of the offset plan and rehabilitation plan are included in this EIS to provide certainty regarding their scope. Additionally, consultation to upgrade the Monaro Highway intersection and with existing users of the subject site will be required.

Other impacts are considered low risk and highly manageable with the implementation of standard recommendations provided in this EIS.

Continuing to source materials from the Upper Bunyan Gravel Pit to supply the Cooma area would result in fewer vehicle movements and potential safety impacts associated with transported it from other gravel pits in the LGA. It would also result in the retention of existing employment at the site. Further development of this site, as an alternative to developing new gravel pit sites, keeps impacts concentrated in areas that have been previously disturbed and have a good track record regarding management of impacts.

The proposal is considered justified and its impacts acceptable, with the implementation of the recommendations provided in this EIS.

9 DECLARATION

This Environmental Impact Statement provides a true and fair assessment of the proposed expansion of Upper Bunyan Gravel Pit in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposal. This statement has been prepared in accordance with clauses 72 and 73 and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

Environmental Impact Statement prepared by

Name: Jane Blomfield, NGH Environmental

Qualifications: Bachelor of Environmental Science (land and water)

Address: Suite 1, 216 Carp Street (PO Box 470) Bega NSW 2550

Proponent

Applicant name: Cooma Monaro Shire Council

Applicant address: 81 Commissioner Street (PO Box 714) Cooma NSW 2630

Land to be developed: As shown in the Environmental Impact Statement (Section 2.1.4).

Environmental Impact Statement

An Environmental Impact Statement is attached.

Certificate

I certify that I have prepared the contents of this Environmental Impact Statement and to the best of my knowledge:

- (i) the statement has been prepared in accordance with Schedule 2 of the NSW *Environmental Planning and Assessment Regulation 2000*;
- (ii) the statement contains all available information that is relevant to the environmental assessment of the development, activity or infrastructure to which the statement relates; and
- (iii) that the information contained in the statement is neither false nor misleading.

Name: Jane Blomfield, primary author



Date: 28/04/2015

Name: Brooke Marshall, senior review, including changes in response to submissions.



Date: 7/12/2015

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11 GLOSSARY

AHIMS	Aboriginal heritage information management system
ASL	Above sea level
BOM	Bureau of Meteorology
CMSC	Cooma-Monaro Shire Council
Cwth	Commonwealth
DECCW	Refer to OEH
DP&I	(NSW) Department of Planning and Infrastructure
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i> (Cwth)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
ESD	Ecologically Sustainable Development
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
ha	hectares
Heritage Act	<i>Heritage Act 1977</i> (NSW)
ISEPP	<i>State Environmental Planning Policy (Infrastructure) 2007</i> (NSW)
km	kilometres
LEP	Local Environment Plan
m	Metres
NES	Matters of National environmental significance under the EPBC Act (<i>c.f.</i>)
Noxious Weeds Act	<i>Noxious Weeds Act 1993</i> (NSW)
NPW Act	<i>National Parks And Wildlife Act 1974</i> (NSW)
NSW	New South Wales
NV Act	<i>Native Vegetation Act 2003</i> (NSW)
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy (NSW)
SEWPAC	(Cwth) Department of Sustainability, Environment, Water, Population and Communities
SIS	Species Impact Statement
sp/spp	Species/multiple species
TSC Act	<i>Threatened Species Conservation Act 1995</i> (NSW)

APPENDIX A REHABILITATION STRATEGY

A detailed Rehabilitation Plan would be developed, in accordance with this strategy. The plan would be prepared by a qualified person, with input from specialists (such as agronomists) and consent authorities (Council environmental staff, Local Land Services, Office of Environment and Heritage).

Aim

The key threats to the site have been identified as soil erosion, due to bare and steep landforms, and infestation by noxious weeds, well established on the site and immediate surrounding land.

Therefore the aim of the rehabilitation is to provide a landform resistant to erosion and weed infestation as much as possible.

Additionally, this plan incorporates the planting of a visual screen adjacent to the Monaro Highway. The primary purpose of this screen is to mitigate visual amenity and dust impacts to the highway.

Extraction areas

Once activities are completed in an extraction stage, progressive stabilisation and rehabilitation would be carried out to:

- Reshape to achieve stable landforms
- Rehabilitate landforms

Progressive rehabilitation ensures that disturbed landforms are quickly stabilised to resist erosion and weed infestation and return to productive ecological function. Rehabilitation would commence within three months of completion of a stage. All planting would be completed within the following 24 month period with ongoing site monitoring undertaken to determine success rate and the need for re-planting.

Extraction should not commence in new stages until a detailed rehabilitation plan and sufficient funds (or guarantee of funds) to rehabilitate the new area is in place. This will assist in rapid, progressive rehabilitation.

Landforms

The landforms must be designed to be:

- Stable, resisting landslips and erosion.

The soils have been noted as susceptible to erosion. Stabilisation will be made more difficult by their infertility and low available water-holding capacity. It is likely that stabilisation will require physical strategies to assist replanting, such as land forming swales to trap nutrients and physical barriers to reduce erosion such as jute matting, rock, timber or mulch.

- Suited to their intended end land use: revegetation.

The site and surrounds are densely infested with the noxious weed African Lovegrass and are unlikely to offer quality grazing pasture, as a long-term plan for the site. It is proposed that the aim of the final landform should reflect the need to control erosion and assist in preventing the proliferation of African Lovegrass. Tree and shrub plantings would provide resistance to weed infestation. Landforms should contain swales that trap water and nutrient in order to 'feed' new plantings. Topsoil is expected to be limited and will need to be managed carefully to create a soil surface that will encourage native regeneration. Inputs of soil and mulch may be required to assist restoration of soil fertility. It is noted that African Lovegrass has a particular advantage over native species in poor soil conditions.

Species

Species to be used for rehabilitation would be consistent with those that naturally occur within the Snow Gum – Candle bark woodland community and would be in line with the scientific determination for the community. Species may include Ribbon Gum, Snow Gum, Bursaria¹, Silver Wattle (*A. dealbata*) and Australian Blackwood (*A. melanoxydon*).

Planting of sterile cover crops may also be considered as a short term stabilisation strategy, depending on the timing of the works. This would assist in stabilisation and introducing additional nutrients to the soil.

Replanting

- Native trees, shrubs and understorey plantings would reflect the current site species list, set out above.
- Preparation would be required prior to replanting. Additional top soils may be required to be sourced. Tube stock may be required to be ordered in advance. Plantings should be watered until established.

Visual screening

Planting of trees within a 50 metre buffer area adjacent to the Monaro Highway would be undertaken prior to or concurrent with the commencement of the relevant extraction stages (stages adjacent to the screen areas are Stages 1, 2 and 4 as well as the current extraction area). Two areas have been identified for the planting of screens; north and south of the site (refer Figure 2-3 of EIS):

- The southern area, prior to or concurrent with the development of Stages 1 and 2.
- The northern area, prior to or concurrent with the development of Stage 4

Initial plantings would include fast growing species such as wattles. This would be followed by planting of overstorey species appropriate to the Snow gum woodland vegetation type, set out above.

Weed control – all areas

Noxious weed control would be undertaken during the establishment of plantings to reduce the incursion and spread of new weeds in the immediate planting areas. Weed control would be in accordance with CMSC control plans for each noxious weed and would involve spot spraying of weeds so that new plantings are not impeded. Noxious weed control would take place annually in spring/early summer during the establishment phase and as required thereafter.

Monitoring success

- Success indicators would be established for plantings. That is, dead plants would be replaced in accordance with a pre-set success criteria (suggested 80% alive after 2 years).

Ongoing management

- Stock would be restricted during rehabilitation and possibly reintroduced, under a managed grazing regime that protects biomass, once the site is stable and plantings are protected.
- Weed management is not likely to be successful if eradication is the aim. Given the surrounding infestations, creating dense tree and shrub plantings is considered a more realistic objective. Spot spraying around plantings to assist their establishment should be considered.

¹ It is noted this species is not in the determination.

APPENDIX B DIRECTOR GENERAL'S REQUIREMENTS



Ms Pam Vipond
Cooma-Monaro Shire Council
PO Box 714
COOMA NSW 2630

Dear Ms Vipond

**Bunyan Gravel Pit (DGR 792)
Director-General's Requirements**

I refer to your request for the Director-General's Requirements (DGRs) for the above development, which is designated local development under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). I have attached a copy of the DGRs for the Environmental Impact Statement (EIS) required for this development. These requirements have been prepared in consultation with relevant State agencies and are based on the information your company has provided to date. I have also attached the agencies' input into the formation of the DGRs, which you are also advised to consider closely during your preparation of the EIS.

In your request for DGRs, it was indicated that the proposal will require approval under the *Protection of the Environment Operations Act 1997*. Accordingly, the proposal is classified as integrated development under section 91 of the EP&A Act. If further integrated approvals are identified, you must undertake your own consultation with the relevant public authorities, and address their requirements in the EIS.

When you lodge your DA with the consent authority, you must provide:

- one hard and one electronic copy of the EIS to the Department;
- one hard and one electronic copy of the EIS to each identified integrated approval authority; and
- a cheque for \$320 to each identified integrated approval authority, to offset costs involved in the review of the DA and EIS. No cheque is required for the Department of Planning and Infrastructure as it is not an approval authority.

If your proposal contains any actions that could have a significant impact on matters of National Environmental Significance, then it will require an additional approval under the Commonwealth's *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act). This approval is in addition to any approvals required under NSW legislation. If you have any questions about the application of the EPBC Act to your proposal, you should contact the Department of Sustainability, Environment, Water, Population and Communities in Canberra (6274 1111 or www.environment.gov.au).

Should the consent authority approve the proposal, then under section 22 of the *Mine Health and Safety Act 2004*, the owner or general manager of a mine or quarry must not undertake mining or quarrying operations without first nominating a person as the operator of the mine or quarry to the Chief Inspector of Mines. The Applicant should contact the local Mine Safety Operations Branch of the Division of Resources and Energy within the Department of Trade, Investment, Regional Infrastructure and Services in regard to this and other matters relating to compliance with the *Mine Health and Safety Act 2004*.

If you have any enquiries about these requirements, please contact Matthew Di Maggio.

Yours sincerely

 9/12/13

David Kitto
Director
Mining & Industry Projects
as delegate for the Director-General

Director-General's Requirements

Section 78A(8) of the *Environmental Planning and Assessment Act 1979* and Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*.

Designated Development

DGR Number	792
Proposal	Continued operation of a gravel pit, to extract up to 23,000 tonnes per annum, for a period of up to 10 years.
Location	Lots 159, 160 DP 724552, Monaro Highway, approximately 6 kilometres north east of Cooma
Applicant	Cooma-Monaro Shire Council
Date of Expiry	4 December 2015
General Requirements (refer Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i>)	The Environmental Impact Statement (EIS) must include: • an executive summary; • a full/detailed description of the proposal, including: - identification of the resource; - description of the site; - a history of any previous quarrying operations on the site; - the proposed works (including rehabilitation works); - the duration and intensity of extraction operations; - any likely interactions between the proposed operations and existing/approved development and land use in the area; and - a detailed justification for the development; • a conclusion justifying the development on economic, social and environmental grounds, taking into consideration whether the proposal is consistent with the objects of the <i>Environmental Planning & Assessment Act 1979</i>; and • a signed declaration from the author of the EIS, certifying that the information contained within the document is neither false nor misleading.
Key Issues	The EIS must also assess the potential impacts of the proposal during the establishment, operation and decommissioning of the proposal. The EIS must describe what measures would be implemented to avoid, minimise, mitigate, offset, manage and/or monitor the potential impacts on: • Land Resources – including a assessment of the potential impacts on: - soils and land capability, including an assessment of activities that would cause erosion and the measures proposed to minimise erosion and sedimentation; - landforms and topography, including cliffs, rock formations, landforms, steep slopes, etc; and - land use, including agricultural, forestry and conservation lands; • Water Resources – including: - identification of any licensing requirements or other approvals under the <i>Water Act 1912</i> and/or <i>Water Management Act 2000</i>; - an assessment of potential impacts on the quality and quantity of existing surface and ground water resources; - a description of the measures proposed to ensure the development can operate in accordance with the requirements of any relevant Water Sharing Plan or water source embargo; - an annual site water balance for representative years of the proposed life of the project; and - a detailed description of the proposed water management system (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts; • Biodiversity – including: - accurate predictions of any vegetation clearing on site or for any road upgrades; - a detailed assessment of the potential impacts of the development on any threatened species or populations or their habitats, endangered ecological communities and groundwater dependent ecosystems;

	- a detailed description of the measures to maintain or improve the biodiversity values within the site in the medium to long term; and - consideration of a Biodiversity Offset Strategy; • Heritage – including: - an Aboriginal cultural heritage assessment (addressing both cultural and archaeological significance) which must demonstrate effective consultation with Aboriginal communities in determining and assessing impacts, and developing and selecting mitigation options and measures; and - a Historic heritage assessment (including archaeology) which must include a statement of heritage impact (including significance assessment) for any State significant or locally significant historic heritage items; • Traffic and Transport – including: - an assessment of potential traffic impacts on the capacity, efficiency and safety of the road network, in particular the assessment must include a Road Safety Audit to review the condition of the proposed routes and identify any safety issues which may exacerbated by the development; and - a description of the measures that would be implemented to maintain and/or improve the capacity, efficiency and safety of the road network in the surrounding area over the life of the project; • Noise and Vibration - particularly any potential noise and vibration impacts on any nearby private receptors due to construction, operation or road haulage; • Air Quality – particularly any potential dust impacts on any nearby private receptors from construction, operation or road haulage; • Rehabilitation – including: - a detailed description of the proposed rehabilitation measures that would be undertaken during quarry closure; - a detailed rehabilitation strategy, including justification for the proposed final land form and consideration of the objectives of any relevant strategic land use plans or policies; and - the measures that would be undertaken to ensure sufficient financial resources are available to implement the proposed rehabilitation strategy; • Waste Management – including importation of any waste material to the site; • Hazards and Risks – paying particular attention to public safety, including bushfires and transport or storage of any dangerous goods; • Visual Amenity; • Agricultural Impacts; • Utilities and Services; and • Social and Economic Impacts.
Environmental Planning Instruments	The EIS must assess the proposal against the relevant environmental planning instruments, including (but not limited to): • <i>State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007;</i> • <i>State Environmental Planning Policy No. 33 – Hazardous and Offensive Development;</i> • <i>State Environmental Planning Policy No. 44 – Koala Habitat Protection;</i> • <i>State Environmental Planning Policy No. 55 – Remediation of Land;</i> • <i>Cooma Monaro Local Environmental Plan 2013;</i> and • relevant development control plans and section 94 plans, strategies and management plans.

Guidelines	The EIS must take into account relevant State Government policies and guidelines, in particular the <i>Industrial Noise Policy</i> (EPA 2001), <i>Aquifer Interference Policy</i> (DPI 2012), <i>Soils and Construction: Managing Urban Stormwater</i> (Landcom 2004), <i>Guidelines for Fresh and Marine Water Quality and Guidelines for Water Quality Monitoring and Reporting</i> (ANZECC), <i>Using the ANZECC Guideline and Water Quality Objectives in NSW</i> (DEC), <i>Approved Methods for the Modelling and Assessment of Air Pollutants</i> (DEC), <i>Approved Methods for Sampling and Analysis of Air Pollutants</i> (DEC), <i>Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities – Working Draft</i> (DECC 2004), <i>The Threatened Species Assessment Guideline – The Assessment of Significance</i> (DECC 2007), <i>Draft Guidelines for the Assessment of Aquatic Ecology in EIA</i> (DUAP 1998), <i>Guide to investigation, assessing and reporting on Aboriginal cultural heritage in NSW</i> (OEH 2011), <i>Code of Practice of the Archaeological Investigation of Aboriginal Objects in New South Wales</i> (DECCW 2010), <i>Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010</i> (DECCW 2010), <i>Draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation</i> (DEC 2005), <i>Guide to Traffic Generating Development</i> (RTA), <i>Road Design Guide</i> (RTA) or latest versions. During the preparation of the EIS you must consult the Department's EIS Guideline – Extractive Industries – Quarries. This guideline is available for purchase from the Department's Information Centre, 23-33 Bridge Street, Sydney or by calling 1300 305 695.
Consultation	During the preparation of the EIS, you should consult with the relevant local, State and Commonwealth government authorities, service providers and community groups, and address any issues they may raise in the EIS. In particular, you should consult surrounding landowners and occupiers that are likely to be impacted by the proposal. Details of the consultations carried out and issues raised must be included in the EIS.

Mining Projects
Department of Planning & Infrastructure
GPO Box 39
Sydney NSW 2001

Attention: Mathew Di Maggio

**EXPANSION OF BUNYAN GRAVEL QUARRY (DGR ID NO. 792)
NO. 1107 MONARO HIGHWAY, BUNYAN**

Dear Sir

Reference is made to your email dated 18 November 2013 requesting Roads and Maritime Services (RMS) requirements for Environmental Impact Statement (EIS) for the above local designated development.

RMS has reviewed the information provided and considers that the following information should be addressed in the Environmental Impact Statement (EIS).

A traffic impact study (TIS) is required as part of the EIS. As a guide Table 2.1 of the RTA Guide to Traffic Generating Developments outlines the key issues that may be considered in preparing a TIS. The TIS should include, but not be limited to include the following:

- The TIS should describe existing access arrangements and traffic conditions.
- The study should identify likely traffic generation rates and distributions associated with the development, to determine the likely peak hour movements at the intersection of the development and the Monaro Highway. The traffic generation rates need to be clearly justified using first principles traffic analysis.
- The study should estimate the expected traffic composition including the percentage of light and heavy vehicles, and should identify whether over sized or over mass vehicles will be used as part of the development.
- The study needs to identify an appropriate access treatment for the junction of the proposed development with the Monaro Highway. In this regard, the following need to be undertaken: The treatment type is to be determined based on the warrants for turn treatments outlined in Figure 4.9 of AUSTROADS *Guide to Traffic Management – Part 4a: Unsignalised and Signalised Intersections (Warrants for turn treatments on the major road at unsignalised intersections)*.
- The study needs to demonstrate that the access would have Safe Intersection Sight Distance in accordance with AUSTROADS *Guide to Road Design – Part 4a: Unsignalised and Signalised Intersections* Table 3.2, in both directions, i.e. 248m in both directions for a design speed of 100km/h.

Roads & Maritime Services

- The study should include concept plans for any works proposed within the road reserve to demonstrate that they can be constructed within the road reserve. If the works could not be constructed within the road reserve, RMS would not support the proposal unless appropriate legally binding arrangements were in place to ensure that the appropriate land required to construct the works could be obtained.

The Environmental Impact Study needs to consider the environmental impacts of any roadworks within the road reserve that are required to manage the impacts of the development. These impacts include traffic and road safety impacts as well as other impacts such noise, flora and fauna, heritage and impact to community.

RMS will commence its detailed assessment once the aforementioned information is provided to its satisfaction. Should you require any clarification on this matter please call Hala Sattouf on 4221 2769.

Yours faithfully

A handwritten signature in blue ink, appearing to read 'Robert Reynolds', with a stylized flourish at the end.

Robert Reynolds
Network & Safety Manager
Network Management, Southern Region

2 DEC 2013



The Executive Director
Major Project Assessments
Department of Planning & Infrastructure
SYDNEY NSW 2001

Attention: Mr Matthew Di Maggio, Student Planner - Mining Projects
cc: mathew.dimaggio@planning.nsw.gov.au

Notice Number 1518599
File Number EF/13/5006, DOC13/83658-01
Date 02-Dec-2013

RE: Requirements for EIS, Bunyan Gravel Quarry, DGR ID No. 792, Cooma-Monaro LGA

I refer to your request for the Environment Protection Authority (EPA) requirements for the Environmental Impact Statement (EIS) for the above proposal received by the EPA on 18 November 2013.

The EPA has considered the details of the proposal as provided by Cooma-Monaro Shire Council and has identified the information it requires to assess the project and if appropriate issue its general terms of approval in **Attachment A**.

The proponent should ensure that the EIS is sufficiently comprehensive to enable the EPA to determine the extent of the impact(s) of the proposal. If the necessary information is not adequately provided in the EIS then delays in the development application process may occur as a result of this.

In summary, the EPA's key information requirements for the proposal include an adequate assessment of:

1. Baseline conditions that exist at the site of the proposed development;
2. Potential environmental impacts arising from the development and its ongoing activities, including dust, odour, noise and water quality; and
3. Actions that will be taken to avoid or mitigate impacts or compensate for unavoidable impacts identified in paragraph 2 above.

In carrying out the preparation of the EIS the proponent should refer to the relevant legislation and guidelines as listed in **Attachment B** and any relevant industry codes of practice and best practice management guidelines.

Based on the information provided to the EPA, the proponent may require an environment protection licence (EPL) under the *Protection of the Environment Operation Act 1997*.

The proponent should be aware that any commitments made in the EIS may be formalised as approval conditions. Consequently pollution control measures should not be proposed if they are impractical,



unrealistic or beyond the financial viability of the development. It is important that all conclusions are supported by adequate data.

To assist the EPA in assessing the EIS it is requested that the EIS follow the format of Department of Planning and Infrastructure's EIS guidelines and addresses the EPA's specific EIS requirements as outlined in the following attachments.

The EPA also requests that the proponent is provided with the EPA's assessment requirements and guidelines as set out in **Attachments A and B**.

If you have any queries regarding this matter please contact Regional Operations Officer Tristan Johnston on (02) 6229 7002 or via email at queanbeyan@epa.nsw.gov.au.

Yours sincerely



Janine Goodwin
Acting Unit Head
South East - Queanbeyan
(by Delegation)

ATTACHMENT A: EIS REQUIREMENTS FOR Bunyan Gravel Quarry - DGR ID No. 792

How to use these requirements

The EPA requirements have been structured in accordance with the Department of Planning and Infrastructure EIS Guidelines, as follows. It is suggested that the EIS follow the same structure:

- A. Executive summary
- B. The proposal
- C. The location
- D. Identification and prioritisation of issues
- E. The environmental issues
- F. List of approvals and licences
- G. Compilation of mitigation measures
- H. Justification for the proposal



A Executive summary

The executive summary should include a brief discussion of the extent to which the proposal achieves identified environmental outcomes.

B The proposal

1. Objectives of the proposal

- The objectives of the proposal should be clearly stated and refer to:
 - a) the size and type of the operation, the nature of the processes and the products, by-products and wastes produced
 - b) a life cycle approach to the production, use or disposal of products
 - c) the anticipated level of performance in meeting required environmental standards and cleaner production principles
 - d) the staging and timing of the proposal and any plans for future expansion
 - e) the proposal's relationship to any other industry or facility.

2. Description of the proposal

General

- Outline the production process including:
 - a) the environmental "mass balance" for the process – quantify in-flow and out-flow of materials, any points of discharge to the environment and their respective destinations (sewer, stormwater, atmosphere, recycling, landfill etc)
 - b) any life-cycle strategies for the products.
- Outline cleaner production actions, including:
 - a) measures to minimise waste (typically through addressing source reduction)
 - b) proposals for use or recycling of by-products
 - c) proposed disposal methods for solid and liquid waste
 - d) air management systems including all potential sources of air emissions, proposals to re-use or treat emissions, emission levels relative to relevant standards in regulations, discharge points
 - e) water management system including all potential sources of water pollution, proposals for re-use, treatment etc, emission levels of any wastewater discharged, discharge points, summary of options explored to avoid a discharge, reduce its frequency or reduce its impacts, and rationale for selection of option to discharge.
 - f) soil contamination treatment and prevention systems.
- Outline construction works including:
 - a) actions to address any existing soil contamination
 - b) any earthworks or site clearing; re-use and disposal of cleared material (including use of spoil on-site)
 - c) construction timetable and staging; hours of construction; proposed construction methods

- d) environment protection measures, including noise mitigation measures, dust control measures and erosion and sediment control measures.

Air

- Identify all sources of air emissions from the development.

Note: emissions can be classed as either:

- *point (e.g emissions from stack or vent) or*
- *fugitive (from wind erosion, leakages or spillage, associated with loading or unloading, conveyors, storage facilities, plant and yard operation, vehicle movements (dust from road, exhausts, loss from load), land clearing and construction works).*
- Provide details of the project that are essential for predicting and assessing air impacts including:
 - a) the quantities and physiochemical parameters (e.g concentration, moisture content, bulk density, particle sizes etc) of materials to be used, transported, produced or stored
 - b) an outline of procedures for handling, transport, production and storage
 - c) the management of solid, liquid and gaseous waste streams with potential for significant air impacts.

Noise and vibration

- Identify all noise sources from the development (including both construction and operation phases). Detail all potentially noisy activities including ancillary activities such as transport of goods and raw materials.
- Specify the times of operation for all phases of the development and for all noise producing activities.
- For projects with a significant potential traffic noise impact provide details of road alignment (include gradients, road surface, topography, bridges, culverts etc), and land use along the proposed road and measurement locations – diagrams should be to a scale sufficient to delineate individual residential blocks.

Water

- Provide details of the project that are essential for predicting and assessing impacts to waters:
 - a) including the quantity and physiochemical properties of all potential water pollutants and the risks they pose to the environment and human health, including the risks they pose to Water Quality Objectives in the ambient waters (as defined on www.environment.nsw.gov.au/leo, using technical criteria derived from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality, ANZECC 2000)
 - b) the management of discharges with potential for water impacts
 - c) drainage works and associated infrastructure; land-forming and excavations; working capacity of structures; and water resource requirements of the proposal.



- Outline site layout, demonstrating efforts to avoid proximity to water resources (especially for activities with significant potential impacts e.g effluent ponds) and showing potential areas of modification of contours, drainage etc.
- Outline how total water cycle considerations are to be addressed showing total water balances for the development (with the objective of minimising demands and impacts on water resources). Include water requirements (quantity, quality and source(s)) and proposed storm and wastewater disposal, including type, volumes, proposed treatment and management methods and re-use options.

Waste and chemicals

- Provide details of the quantity and type of both liquid waste and non-liquid waste generated, handled, processed or disposed of at the premises. Waste must be classified according to the *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes* (NSW EPA, 1999).
- Provide details of liquid waste and non-liquid waste management at the facility, including:
 - a) the transportation, assessment and handling of waste arriving at or generated at the site
 - b) any stockpiling of wastes or recovered materials at the site
 - c) any waste processing related to the facility, including reuse, recycling, reprocessing (including composting) or treatment both on- and off-site
 - d) the method for disposing of all wastes or recovered materials at the facility
 - e) the emissions arising from the handling, storage, processing and reprocessing of waste at the facility
 - f) the proposed controls for managing the environmental impacts of these activities.
- Provide details of spoil disposal with particular attention to:
 - a) the quantity of spoil material likely to be generated
 - b) proposed strategies for the handling, stockpiling, reuse/recycling and disposal of spoil
 - c) the need to maximise reuse of spoil material in the construction industry
 - d) identification of the history of spoil material and whether there is any likelihood of contaminated material, and if so, measures for the management of any contaminated material
 - e) designation of transportation routes for transport of spoil.
- Provide details of procedures for the assessment, handling, storage, transport and disposal of all hazardous and dangerous materials used, stored, processed or disposed of at the site, in addition to the requirements for liquid and non-liquid wastes.
- Provide details of the type and quantity of any chemical substances to be used or stored and describe arrangements for their safe use and storage.
- Reference should be made to the guidelines: *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes* (NSW EPA, 1999).

ESD

- Demonstrate that the planning process and any subsequent development incorporates objectives and mechanisms for achieving ESD, including:
 - f) proper valuation and pricing of environmental resources
 - g) identification of who will bear the environmental costs of the proposal.
- an assessment of a range of options available for use of the resource, including the benefits of each option to future generations

3. Rehabilitation

- Outline considerations of site maintenance, and proposed plans for the final condition of the site (ensuring its suitability for future uses).

4. Consideration of alternatives and justification for the proposal

- Consider the environmental consequences of adopting alternatives, including alternative:
 - a) sites and site layouts
 - b) access modes and routes
 - c) materials handling and production processes
 - d) waste and water management
 - e) impact mitigation measures
 - f) energy sources
- Selection of the preferred option should be justified in terms of:
 - a) ability to satisfy the objectives of the proposal
 - b) relative environmental and other costs of each alternative
 - c) acceptability of environmental impacts and contribution to identified environmental objectives
 - d) acceptability of any environmental risks or uncertainties
 - e) reliability of proposed environmental impact mitigation measures
 - f) efficient use (including maximising re-use) of land, raw materials, energy and other resources.

C The location

1. General

- Provide an overview of the affected environment to place the proposal in its local and regional environmental context including:
 - a) meteorological data (e.g rainfall, temperature and evaporation, wind speed and direction)
 - b) topography (landform element, slope type, gradient and length)
 - c) surrounding land uses (potential synergies and conflicts)
 - d) geomorphology (rates of landform change and current erosion and deposition processes)
 - e) soil types and properties (including erodibility; engineering and structural properties; dispersibility; permeability; presence of acid sulfate soils and potential acid sulfate soils)
 - f) ecological information (water system habitat, vegetation, fauna)
 - g) availability of services and the accessibility of the site for passenger and freight transport.

2. Air

- Describe the topography and surrounding land uses. Provide details of the exact locations of dwellings, schools and hospitals. Where appropriate provide a perspective view of the study area such as the terrain file used in dispersion models.
- Describe surrounding buildings that may effect plume dispersion.
- Provide and analyse site representative data on following meteorological parameters:
 - a) temperature and humidity
 - b) rainfall, evaporation and cloud cover
 - c) wind speed and direction
 - d) atmospheric stability class
 - e) mixing height (the height that emissions will be ultimately mixed in the atmosphere)
 - f) katabatic air drainage
 - g) air re-circulation.

3. Noise and vibration

- Identify any noise sensitive locations likely to be affected by activities at the site, such as residential properties, schools, churches, and hospitals. Typically the location of any noise sensitive locations in relation to the site should be included on a map of the locality.
- Identify the land use zoning of the site and the immediate vicinity and the potentially affected areas.

4. Water

- Describe the catchment including proximity of the development to any waterways and provide an assessment of their sensitivity/significance from a public health, ecological and/or economic perspective. The Water Quality and River Flow Objectives on the website: www.environment.nsw.gov.au/ieo should be used to identify the agreed environmental values and human uses for any affected waterways. This will help with the description of the local and regional area.

5. Soil Contamination Issues

- Provide details of site history – if earthworks are proposed, this needs to be considered with regard to possible soil contamination, for example if the site was previously a landfill site or if irrigation of effluent has occurred.

D Identification and prioritisation of issues / scoping of impact assessment

- Provide an overview of the methodology used to identify and prioritise issues. The methodology should take into account:
 - a) relevant NSW government guidelines
 - b) industry guidelines
 - c) EISs for similar projects
 - d) relevant research and reference material
 - e) relevant preliminary studies or reports for the proposal
 - f) consultation with stakeholders.
- Provide a summary of the outcomes of the process including:
 - a) all issues identified including local, regional and global impacts (e.g increased/ decreased greenhouse emissions)
 - b) key issues which will require a full analysis (including comprehensive baseline assessment)
 - c) issues not needing full analysis though they may be addressed in the mitigation strategy
 - d) justification for the level of analysis proposed (the capacity of the proposal to give rise to high concentrations of pollution compared with the ambient environment or environmental outcomes is an important factor in setting the level of assessment).

E The environmental issues

1. General

- The potential impacts identified in the scoping study need to be assessed to determine their significance, particularly in terms of achieving environmental outcomes, and minimising environmental pollution.
- Identify gaps in information and data relevant to significant impacts of the proposal and any actions proposed to fill those information gaps so as to enable development of appropriate management and mitigation measures. This is in accordance with ESD requirements.

Note: The level of detail should match the level of importance of the issue in decision making which is dependent on the environmental risk.

Describe baseline conditions

- Provide a description of existing environmental conditions for any potential impacts.

Assess impacts

- For any potential impacts relevant for the assessment of the proposal provide a detailed analysis of the impacts of the proposal on the environment including the cumulative impact of the proposal on the receiving environment especially where there are sensitive receivers.
- Describe the methodology used and assumptions made in undertaking this analysis (including any modelling or monitoring undertaken) and indicate the level of confidence in the predicted outcomes and the resilience of the environment to cope with the predicted impacts.
- The analysis should also make linkages between different areas of assessment where necessary to enable a full assessment of environmental impacts e.g assessment of impacts on air quality will often need to draw on the analysis of traffic, health, social, soil and/or ecological systems impacts; etc.
- The assessment needs to consider impacts at all phases of the project cycle including: exploration (if relevant or significant), construction, routine operation, start-up operations, upset operations and decommissioning if relevant.
- The level of assessment should be commensurate with the risk to the environment.

Describe management and mitigation measures

- Describe any mitigation measures and management options proposed to prevent, control, abate or mitigate identified environmental impacts associated with the proposal and to reduce risks to human health and prevent the degradation of the environment. This should include an assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.
- Proponents are expected to implement a 'reasonable level of performance' to minimise environmental impacts. The proponent must indicate how the proposal meets reasonable levels of performance. For example, reference technology based criteria if available, or identify good practice for this type of activity or development. A 'reasonable level of performance' involves adopting and implementing

technology and management practices to achieve certain pollutant emissions levels in economically viable operations. Technology-based criteria evolve gradually over time as technologies and practices change.

- Use environmental impacts as key criteria in selecting between alternative sites, designs and technologies, and to avoid options having the highest environmental impacts.
- Outline any proposed approach (such as an Environmental Management Plan) that will demonstrate how commitments made in the EIS will be implemented. Areas that should be described include:
 - a) operational procedures to manage environmental impacts
 - b) monitoring procedures
 - c) training programs
 - d) community consultation
 - e) complaint mechanisms including site contacts
 - f) strategies to use monitoring information to improve performance
 - g) strategies to achieve acceptable environmental impacts and to respond in event of exceedences.

4. Air

Describe baseline conditions

- Provide a description of existing air quality and meteorology, using existing information and site representative ambient monitoring data.

Assess impacts

- Identify all pollutants of concern and estimate emissions by quantity (and size for particles), source and discharge point.
- Estimate the resulting ground level concentrations of all pollutants. Where necessary (e.g potentially significant impacts and complex terrain effects), use an appropriate dispersion model to estimate ambient pollutant concentrations. Discuss choice of model and parameters with the EPA.

Describe the effects and significance of pollutant concentration on the environment, human health, amenity and regional ambient air quality standards or goals.

- Describe the contribution that the development will make to regional and global pollution, particularly in sensitive locations.
- For potentially odorous emissions provide the emission rates in terms of odour units (determined by techniques compatible with EPA procedures). Use sampling and analysis techniques for individual or complex odours and for point or diffuse sources, as appropriate.

Note: With dust and odour, it may be possible to use data from existing similar activities to generate emission rates.

- Reference should be made to *Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW* (EPA, 2001) and *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (EPA, 2001).

Describe management and mitigation measures

- Outline specifications of pollution control equipment (including manufacturer's performance guarantees where available) and management protocols for both point and fugitive emissions. Where possible, this should include cleaner production processes.

5. Noise and vibration

Describe baseline conditions

- Determine the existing background (LA90) and ambient (LAeq) noise levels in accordance with the *NSW Industrial Noise Policy*.
- Determine the existing road traffic noise levels in accordance with the *NSW Environmental Criteria for Road Traffic Noise*, where road traffic noise impacts may occur.
- The noise impact assessment report should provide details of all monitoring of existing ambient noise levels including:
 - a) details of equipment used for the measurements
 - b) a brief description of where the equipment was positioned
 - c) a statement justifying the choice of monitoring site, including the procedure used to choose the site, having regards to the definition of 'noise sensitive locations(s)' and 'most affected locations(s)' described in Section 3.1.2 of the *NSW Industrial Noise Policy*
 - d) details of the exact location of the monitoring site and a description of land uses in surrounding areas
 - e) a description of the dominant and background noise sources at the site
 - f) day, evening and night assessment background levels for each day of the monitoring period
 - g) the final Rating Background Level (RBL) value
 - h) graphs of the measured noise levels for each day should be provided
 - i) a record of periods of affected data (due to adverse weather and extraneous noise), methods used to exclude invalid data and a statement indicating the need for any re-monitoring under Step 1 in Section B1.3 of the *NSW Industrial Noise Policy*
 - j) determination of LAeq noise levels from existing industry.

Assess impacts

- Determine the project specific noise levels for the site. For each identified potentially affected receiver, this should include:

- a) determination of the intrusive criterion for each identified potentially affected receiver
- b) selection and justification of the appropriate amenity category for each identified potentially affected receiver
- c) determination of the amenity criterion for each receiver
- d) determination of the appropriate sleep disturbance limit.
- Maximum noise levels during night-time period (10pm-7am) should be assessed to analyse possible affects on sleep. Where LA1(1min) noise levels from the site are less than 15 dB above the background LA90 noise level, sleep disturbance impacts are unlikely. Where this is not the case, further analysis is required. Additional guidance is provided in Appendix B of the *NSW Environmental Criteria for Road Traffic Noise*.
- Determine expected noise level and noise character (e.g tonality, impulsiveness, vibration, etc) likely to be generated from noise sources during:
 - a) site establishment
 - b) construction
 - c) operational phases
 - d) transport including traffic noise generated by the proposal
 - e) other services.

Note: The noise impact assessment report should include noise source data for each source in 1/1 or 1/3 octave band frequencies including methods for references used to determine noise source levels. Noise source levels and characteristics can be sourced from direct measurement of similar activities or from literature (if full references are provided).

- Determine the noise levels likely to be received at the most sensitive locations (these may vary for different activities at each phase of the development). Potential impacts should be determined for any identified significant adverse meteorological conditions. Predicted noise levels under calm conditions may also aid in quantifying the extent of impact where this is not the most adverse condition.
- The noise impact assessment report should include:
 - a) a plan showing the assumed location of each noise source for each prediction scenario
 - b) a list of the number and type of noise sources used in each prediction scenario to simulate all potential significant operating conditions on the site
 - c) any assumptions made in the predictions in terms of source heights, directivity effects, shielding from topography, buildings or barriers, etc
 - d) methods used to predict noise impacts including identification of any noise models used. Where modelling approaches other than the use of the ENM or SoundPlan computer models are adopted, the approach should be appropriately justified and validated
 - e) an assessment of appropriate weather conditions for the noise predictions including reference to any weather data used to justify the assumed conditions
 - f) the predicted noise impacts from each noise source as well as the combined noise level for each prediction scenario under any identified significant adverse weather conditions as well as calm conditions where appropriate
 - g) for developments where a significant level of noise impact is likely to occur, noise contours for the key prediction scenarios should be derived

- h) an assessment of the need to include modification factors as detailed in Section 4 of the *NSW Industrial Noise Policy*.
- Discuss the findings from the predictive modelling and, where relevant noise criteria have not been met, recommend additional mitigation measures.
- The noise impact assessment report should include details of any mitigation proposed including the attenuation that will be achieved and the revised noise impact predictions following mitigation.
- Where relevant noise/vibration criteria cannot be met after application of all feasible and cost effective mitigation measures the residual level of noise impact needs to be quantified by identifying:
 - a) locations where the noise level exceeds the criteria and extent of exceedence
 - b) numbers of people (or areas) affected
 - c) times when criteria will be exceeded
 - d) likely impact on activities (speech, sleep, relaxation, listening, etc)
 - e) change on ambient conditions
 - f) the result of any community consultation or negotiated agreement.
- For the assessment of existing and future traffic noise, details of data for the road should be included such as assumed traffic volume; percentage heavy vehicles by time of day; and details of the calculation process. These details should be consistent with any traffic study carried out in the EIS.
- Where blasting is intended an assessment in accordance with the *Technical Basis for Guidelines to Minimise Annoyance due to Blasting Overpressure and Ground Vibration* (ANZECC, 1990) should be undertaken. The following details of the blast design should be included in the noise assessment:
 - a) bench height, burden spacing, spacing burden ratio
 - b) blast hole diameter, inclination and spacing
 - c) type of explosive, maximum instantaneous charge, initiation, blast block size, blast frequency.

Describe management and mitigation measures

- Determine the most appropriate noise mitigation measures and expected noise reduction including both noise controls and management of impacts for both construction and operational noise. This will include selecting quiet equipment and construction methods, noise barriers or acoustic screens, location of stockpiles, temporary offices, compounds and vehicle routes, scheduling of activities, etc.
- For traffic noise impacts, provide a description of the ameliorative measures considered (if required), reasons for inclusion or exclusion, and procedures for calculation of noise levels including ameliorative measures. Also include, where necessary, a discussion of any potential problems associated with the proposed ameliorative measures, such as overshadowing effects from barriers. Appropriate ameliorative measures may include:
 - a) use of alternative transportation modes, alternative routes, or other methods of avoiding the new road usage
 - b) control of traffic (e.g: limiting times of access or speed limitations)
 - c) resurfacing of the road using a quiet surface
 - d) use of (additional) noise barriers or bunds

- e) treatment of the facade to reduce internal noise levels buildings where the night-time criteria is a major concern
- f) more stringent limits for noise emission from vehicles (i.e. using specially designed 'quite' trucks and/or trucks to use air bag suspension
- g) driver education
- h) appropriate truck routes
- i) limit usage of exhaust breaks
- j) use of premium muffles on trucks
- k) reducing speed limits for trucks
- l) ongoing community liaison and monitoring of complaints
- m) phasing in the increased road use.

4. Water

Describe baseline conditions

- Describe existing surface and groundwater quality – an assessment needs to be undertaken for any water resource likely to be affected by the proposal and for all conditions (e.g. a wet weather sampling program is needed if runoff events may cause impacts).
Note: Methods of sampling and analysis need to conform with an accepted standard (e.g. Approved Methods for the Sampling and Analysis of Water Pollutants in NSW (DECCW 2004) or be approved and analyses undertaken by accredited laboratories).
- Provide site drainage details and surface runoff yield.
- State the ambient Water Quality and River Flow Objectives for the receiving waters. These refer to the community's agreed environmental values and human uses endorsed by the Government as goals for the ambient waters. These environmental values are published on the website: www.environment.nsw.gov.au/ieo. The EIS should state the environmental values listed for the catchment and waterway type relevant to your proposal. NB: A consolidated and approved list of environmental values are not available for groundwater resources. Where groundwater may be affected the EIS should identify appropriate groundwater environmental values and justify the choice.
- State the indicators and associated trigger values or criteria for the identified environmental values. This information should be sourced from the ANZECC 2000 *Guidelines for Fresh and Marine Water Quality* (<http://www.deh.gov.au/water/quality/nwqms/volume1.html>) (Note that, as at 2004, the NSW Water Quality Objectives booklets and website contain technical criteria derived from the 1992 version of the ANZECC Guidelines. The Water Quality Objectives remain as Government Policy, reflecting the community's environmental values and long-term goals, but the technical criteria are replaced by the more recent ANZECC 2000 Guidelines). NB: While specific guidelines for groundwater are not available, the ANZECC 2000 Guidelines endorse the application of the trigger values and decision trees as a tool to assess risk to environmental values in groundwater.
- State any locally specific objectives, criteria or targets, which have been endorsed by the government e.g. the Healthy Rivers Commission Inquiries (www.hrc.nsw.gov.au) or the NSW Salinity Strategy (DLWC, 2000) (www.dlwc.nsw.gov.au/care/salinity/#Strategy).

- Where site specific studies are proposed to revise the trigger values supporting the ambient Water Quality and River Flow Objectives, and the results are to be used for regulatory purposes (e.g. to assess whether a licensed discharge impacts on water quality objectives), then prior agreement from the DECCW on the approach and study design must be obtained.
- Describe the state of the receiving waters and relate this to the relevant Water Quality and River Flow Objectives (i.e. are Water Quality and River Flow Objectives being achieved?). Proponents are generally only expected to source available data and information. However, proponents of large or high risk developments may be required to collect some ambient water quality / river flow / groundwater data to enable a suitable level of impact assessment. Issues to include in the description of the receiving waters could include:
 - a) lake or estuary flushing characteristics
 - b) specific human uses (e.g. exact location of drinking water offtake)
 - c) sensitive ecosystems or species conservation values
 - d) a description of the condition of the local catchment e.g. erosion levels, soils, vegetation cover, etc
 - e) an outline of baseline groundwater information, including, but not restricted to, depth to water table, flow direction and gradient, groundwater quality, reliance on groundwater by surrounding users and by the environment
 - f) historic river flow data where available for the catchment.

Assess impacts

- No proposal should breach clause 120 of the *Protection of the Environment Operations Act 1997* (i.e. pollution of waters is prohibited unless undertaken in accordance with relevant regulations).
- Identify and estimate the quantity of all pollutants that may be introduced into the water cycle by source and discharge point including residual discharges after mitigation measures are implemented.
- Include a rationale, along with relevant calculations, supporting the prediction of the discharges.
- Describe the effects and significance of any pollutant loads on the receiving environment. This should include impacts of residual discharges through modelling, monitoring or both, depending on the scale of the proposal. Determine changes to hydrology (including drainage patterns, surface runoff yield, flow regimes, wetland hydrologic regimes and groundwater).
- Describe water quality impacts resulting from changes to hydrologic flow regimes (such as nutrient enrichment or turbidity resulting from changes in frequency and magnitude of stream flow).
- Identify any potential impacts on quality or quantity of groundwater describing their source.
- Identify potential impacts associated with geomorphological activities with potential to increase surface water and sediment runoff or to reduce surface runoff and sediment transport. Also consider possible impacts such as bed lowering, bank lowering, instream siltation, floodplain erosion and floodplain siltation.
- Identify impacts associated with the disturbance of acid sulfate soils and potential acid sulfate soils.
- Containment of spills and leaks shall be in accordance with the technical guidelines section 'Bunding and Spill Management' of the *Authorised Officers Manual* (EPA, 1995) (<http://www.environment.nsw.gov.au/mao/bundingspill.htm>) and the most recent versions of the Australian Standards referred to in the Guidelines. Containment should be designed for no-discharge.



- The significance of the impacts listed above should be predicted. When doing this it is important to predict the ambient water quality and river flow outcomes associated with the proposal and to demonstrate whether these are acceptable in terms of achieving protection of the Water Quality and River Flow Objectives. In particular the following questions should be answered:
 - a) will the proposal protect Water Quality and River Flow Objectives where they are currently achieved in the ambient waters; and
 - b) will the proposal contribute towards the achievement of Water Quality and River Flow Objectives over time, where they are not currently achieved in the ambient waters.
- Consult with the DECCW as soon as possible if a mixing zone is proposed (a mixing zone could exist where effluent is discharged into a receiving water body, where the quality of the water being discharged does not immediately meet water quality objectives. The mixing zone could result in dilution, assimilation and decay of the effluent to allow water quality objectives to be met further downstream, at the edge of the mixing zone). The DECCW will advise the proponent under what conditions a mixing zone will and will not be acceptable, as well as the information and modelling requirements for assessment.

Note: The assessment of water quality impacts needs to be undertaken in a total catchment management context to provide a wide perspective on development impacts, in particular cumulative impacts.

- Where a licensed discharge is proposed, provide the rationale as to why it cannot be avoided through application of a reasonable level of performance, using available technology, management practice and industry guidelines.
- Where a licensed discharge is proposed, provide the rationale as to why it represents the best environmental outcome and what measures can be taken to reduce its environmental impact.
- Reference should be made to *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004), *Managing Urban Stormwater: Soils and Construction - Volume 2E Mines and quarries* (2008) and *Guidelines for Fresh and Marine Water Quality* ANZECC 2000).

Describe management and mitigation measures

- Outline stormwater management to control pollutants at the source and contain them within the site. Also describe measures for maintaining and monitoring any stormwater controls.
- Outline erosion and sediment control measures directed at minimising disturbance of land, minimising water flow through the site and filtering, trapping or detaining sediment. Also include measures to maintain and monitor controls as well as rehabilitation strategies.
- Describe waste water treatment measures that are appropriate to the type and volume of waste water and are based on a hierarchy of avoiding generation of waste water; capturing all contaminated water (including stormwater) on the site; reusing/recycling waste water; and treating any unavoidable discharge from the site to meet specified water quality requirements.
- Outline pollution control measures relating to storage of materials, possibility of accidental spills (e.g preparation of contingency plans), appropriate disposal methods, and generation of leachate.
- Describe hydrological impact mitigation measures including:
 - a) site selection (avoiding sites prone to flooding and water logging, actively eroding or affected by deposition)

- b) minimising runoff
 - c) minimising reductions or modifications to flow regimes
 - d) avoiding modifications to groundwater.
- Describe groundwater impact mitigation measures including:
 - a) site selection
 - b) retention of native vegetation and revegetation
 - c) artificial recharge
 - d) providing surface storages with impervious linings
 - e) monitoring program.
- Describe geomorphological impact mitigation measures including:
 - a) site selection
 - b) erosion and sediment controls
 - c) minimising instream works
 - d) treating existing accelerated erosion and deposition
 - e) monitoring program.
- Any proposed monitoring should be undertaken in accordance with the *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DECCW 2004).

5. Soils and contamination

Describe baseline conditions

- Provide any details (in addition to those provided in the location description - Section C) that are needed to describe the existing situation in terms of soil types and properties and soil contamination.

Assess impacts

- Identify any likely impacts resulting from the construction or operation of the proposal, including the likelihood of:
 - a) disturbing any existing contaminated soil
 - b) contamination of soil by operation of the activity
 - c) subsidence or instability
 - d) soil erosion
 - e) disturbing acid sulfate or potential acid sulfate soils.
- Reference should be made to *Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites* (EPA, 1997) and *Contaminated Sites – Guidelines on Significant Risk of Harm and Duty to Report* (EPA, 1999).

Describe management and mitigation measures

- Describe and assess the effectiveness or adequacy of any soil management and mitigation measures during construction and operation of the proposal including:
 - a) erosion and sediment control measures
 - b) proposals for site remediation – see *Managing Land Contamination, Planning Guidelines SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning and Environment Protection Authority, 1998)
 - c) proposals for the management of these soils – see *Assessing and Managing Acid Sulfate Soils*, Environment Protection Authority, 1995 (note that this is the only methodology accepted by the EPA).

6. Waste and chemicals

Describe baseline conditions

- Describe any existing waste or chemicals operations related to the proposal.

Assess impacts

- Assess the adequacy of proposed measures to minimise natural resource consumption and minimise impacts from the handling, transporting, storage, processing and reprocessing of waste and/or chemicals.
- Reference should be made to *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes* (EPA, 1999) >.

Describe management and mitigation measures

- Outline measures to minimise the consumption of natural resources.
- Outline measures to avoid the generation of waste and promote the re-use and recycling and re-processing of any waste.
- Outline measures to support any approved regional or industry waste plans.

7. Cumulative impacts

- Identify the extent that the receiving environment is already stressed by existing development and background levels of emissions to which this proposal will contribute.
- Assess the impact of the proposal against the long term air, noise and water quality objectives for the area or region.
- Identify infrastructure requirements flowing from the proposal (e.g water and sewerage services, transport infrastructure upgrades).



- Assess likely impacts from such additional infrastructure and measures reasonably available to the proponent to contain such requirements or mitigate their impacts (e.g travel demand management strategies).



F. List of approvals and licences

- Identify all approvals and licences required under environment protection legislation including details of all scheduled activities, types of ancillary activities and types of discharges (to air, land, water).

G. Compilation of mitigation measures

- Outline how the proposal and its environmental protection measures would be implemented and managed in an integrated manner so as to demonstrate that the proposal is capable of complying with statutory obligations under EPA licences or approvals (e.g outline of an environmental management plan).
- The mitigation strategy should include the environmental management and cleaner production principles which would be followed when planning, designing, establishing and operating the proposal. It should include two sections, one setting out the program for managing the proposal and the other outlining the monitoring program with a feedback loop to the management program.

H. Justification for the Proposal

Reasons should be included which justify undertaking the proposal in the manner proposed, having regard to the potential environmental impacts.

ATTACHMENT B

Title	Web Address
Relevant Legislation	
<i>Contaminated Land Management Act 1997</i>	http://www.legislation.nsw.gov.au/maintop/view/info/rce/act+140+1997+cd+0+N
<i>Environmental Planning and Assessment Act 1979</i>	http://www.legislation.nsw.gov.au/maintop/view/info/rce/act+203+1979+cd+0+N
<i>Protection of the Environment Operations Act 1997</i>	http://www.legislation.nsw.gov.au/maintop/view/info/rce/act+156+1997+cd+0+N
Licensing	
Guide to Licensing	http://www.epa.nsw.gov.au/licensing/licenceguide.htm
Air Quality	
Approved methods for modelling and assessment of air pollutants in NSW (2005)	http://www.epa.nsw.gov.au/resources/air/ammodell/ing05361.pdf
Approved Methods for the Sampling and Analysis of Air Pollutants in NSW (DEC, 2007)	http://www.epa.nsw.gov.au/resources/air/ammodell/ing05361.pdf
Technical Framework, Assessment and Management of Odour from Stationery Sources in NSW (DEC, 2006)	http://www.epa.nsw.gov.au/aqms/index.htm
Technical Notes, Assessment and Management of Odour from Stationery Sources in NSW (DEC, 2006)	http://www.epa.nsw.gov.au/air/odour.htm
<i>Protection of the Environment Operations (Clean Air) Regulation 2010</i>	http://www.legislation.nsw.gov.au/maintop/view/info/rce/subordleg+428+2010+cd+0+N
Noise and Vibration	
NSW Industrial Noise Policy	http://www.epa.nsw.gov.au/noise/industrial.htm
Industrial Noise Policy Application Notes	http://www.epa.nsw.gov.au/noise/applicnotesindustnoise.htm
Interim Construction Noise Guideline (DECC, 2009)	http://www.epa.nsw.gov.au/resources/noise/09265cng.pdf
Assessing Vibration: A technical Guideline (DECC, 2006)	http://www.epa.nsw.gov.au/noise/VIBRATIONGUIDE.htm
Australian and New Zealand Environment Council – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration (ANZEC, 1990)	http://www.epa.nsw.gov.au/noise/blasting.htm
NSW Road Noise Policy	http://www.epa.nsw.gov.au/noise/traffic.htm
Waste	
Waste Classification Guidelines (EPA, 2008)	http://www.epa.nsw.gov.au/waste/envguidlins/index.htm
<i>Protection of the Environment Operations (Waste) Regulation 2005</i>	http://www.legislation.nsw.gov.au/maintop/view/info/rce/subordleg+497+2005+cd+0+N
The NSW Waste Avoidance and Resource	http://www.epa.nsw.gov.au/warr/WARRStrategy20

Recovery Strategy 2007 (DECC, 2007)	07.htm
Environmental Guidelines: Solid Waste Landfills (EPA 1996)	http://www.environment.nsw.gov.au/resources/waste/envguidlns/solidlandfill.pdf
Soils	
Contaminated Sites Assessment and Remediation	
Managing land contamination: Planning Guidelines – SEPP 55 Remediation of Land	http://www.planning.nsw.gov.au/DevelopmentAssessments/RegisterofDevelopmentAssessmentGuidelines/tabid/207/language/en-US/Default.aspx
Guidelines for Consultants Reporting on Contaminated Sites (EPA, 2000)	http://www.epa.nsw.gov.au/resources/clm/20110650consultantsqlines.pdf
Contaminated Sites – Guidelines on Significant Risk of Harm and Duty to Report (EPA, 1999)	http://www.epa.nsw.gov.au/resources/clm/09438gl dutycontclma.pdf
Soils – general	
Soil and Landscape Issues in Environmental Impact Assessment (DLWC 2000)	http://www.dnr.nsw.gov.au/care/soil/soil_pubs/pdfs/tech_rep_34_new.pdf
Managing urban stormwater: soils and construction, vol. 1 (Landcom 2004)	Vol 1 - Available for purchase at: http://www.landcom.com.au/whats-new/publications-reports/the-blue-book.aspx
Water	
Water Quality Objectives	http://www.environment.nsw.gov.au/ieo/index.htm http://www.environment.gov.au/water/publications/quality/pubs/nwqms-guidelines-4-vol1.pdf
ANZECC (2000) Guidelines for Fresh and Marine Water Quality	http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality http://www.environment.gov.au/water/publications/quality/nwqms-guidelines-4-vol1.html http://www.environment.gov.au/water/publications/quality/pubs/nwqms-guidelines-4-vol1.pdf
Approved Methods for the Sampling and Analysis of Water Pollutant in NSW (2004)	http://www.environment.nsw.gov.au/resources/legislation/approvedmethods-water.pdf
National Water Quality Management Strategy: Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000)	http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality



Office of Environment & Heritage

Your reference : DGR No. 792
Our reference : DOC13/84626
Contact : Martin Henery (02) 6229 7062

Matthew Di Maggio
Student Planner
Mining Projects
Department of Planning & Infrastructure
GPO Box 39 SYDNEY 2001

Dear Mr Di Maggio,

RE: Request for Director General Requirements for proposed Bunyan Gravel Quarry DGR NO. 792

Thank you for your email to the Office of Environment and Heritage (OEH) on 18 November 2013. Your email requested our information requirements for the Environmental Impact Statement (EIS) which is to be prepared for the proposed Bunyan Gravel Quarry designated development, located within the Cooma-Monaro Shire local government area. OEH advises the Applicant should ensure that the Environmental Impact Statement is sufficiently comprehensive and detailed to allow a determination of the extent of the impacts of the proposal including potential impacts on Aboriginal Cultural Heritage values.

OEH has considered the details of the proposal as provided in Form A. OEH has identified some of the outstanding issues that may be relevant to the environmental assessment of this proposal.

Issues relating to Biodiversity

Requirements for the Environmental Assessment (EA)

OEH notes that, contrary to the claims by the proponent in Form A, Section 3 that "the land parcel is already highly modified", inspection of satellite imagery reveals that the areas of previous quarrying activities are restricted to a small part of the involved lots. In addition, regardless of the groundcover composition, outside the aforementioned areas of disturbance the canopy species present on the site fit the scientific committees determination of *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions Endangered Ecological Community Tablelands* (shortened to Snow Gum Grassy Woodland EEC) and the site is therefore likely dominated by the EEC. Any areas without canopy trees are either grassland derived from some clearing of the EEC or if dominated by native species would likely satisfy the definition of *Natural Temperate Grassland* (a commonwealth EPBC listed community) that also has high conservation value.

OEH has the following key requirements for the EA:

- 1) The site should be assessed and described as per the recommendations for site assessment provided in Attachment A.
- 2) OEH considers that, although the development footprint for the quarry is relatively small, there are threatened species and endangered ecological communities (EEC) that should be considered in the Environmental Assessment as they may be directly affected by this type of development. Whilst OEH does not mandate that an Assessment of Significance is required for all these species, the EA should consider the likelihood of these species using the habitat on site, and,

where there is a likelihood of this, that an Assessment of Significance be conducted for these species. These species are listed in Attachment A.

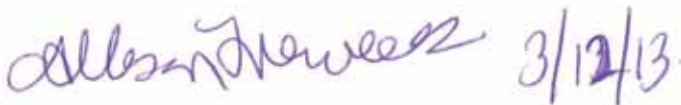
3) If there is clearing of native vegetation then the EA should demonstrate that an appropriate offset is to be secured. If this is the within the site, the EA should state how it is to be secured, the management actions that are to be implemented, that the offset meets 'like for like' criteria and is large enough to fully offset the loss of the habitat. The offset package should be developed and agreed to by OEH prior to impact.

Issues relating to Aboriginal Cultural Heritage

In relation to Aboriginal Cultural Heritage issues; OEH has a statutory role in the protection and preservation of Aboriginal objects and Aboriginal places. OEH therefore advises that a number of Aboriginal objects have been recorded within the surrounding Bunyan area as a result of previous archaeological surveys and investigations conducted for both academic research and development projects. As such, the development site should be assessed and consideration given to potential impacts of the development proposal on Aboriginal Cultural Heritage values. Further details regarding the legislative requirements and new guidance material for assessing Aboriginal cultural heritage values is outlined in the Attachments C and D.

Should you require any additional assistance or wish to discuss the matter further please contact Martin Henery on (02) 6229 7062 in relation to Biodiversity issues and Jackie Taylor on (02) 6229 7089 for issues relating to Aboriginal Cultural Heritage.

Yours sincerely



ALLISON TREWEEK
Senior Team Leader Planning - South East
Regional Operations Group
Office of Environment and Heritage

ATTACHMENT A : Assessment of Biodiversity

Recommendations for site assessment

OEH recommends that the Consent Authority(s) requests that the following details be included in the EIS to be prepared by the proponent:

- a location map showing the location and boundary of the study area, super-imposed over a satellite image or aerial photograph.
- a detailed vegetation map showing the location and extent of the various vegetation types. This must be based on the vegetation types contained within the NSW Vegetation Types Database
- Within each of these vegetation types, vegetation zones (representing areas of the same vegetation type but with significant differences in vegetation condition) should be identified.
- Each vegetation zone should be surveyed, and the location of plots or transects identified on the map. Plant lists for these plots / transects, and a condition assessment (using Biometric) should be provided.
- a list of known and likely threatened species as listed by the *Threatened Species Conservation Act* which might occur within each vegetation zone should be provided. The report should note which of these are 'species-credit species' (as per the OEH Threatened Species Profile Database).
- A summary table should be provided that shows, for each vegetation zone
 - Area of Vegetation Zone
 - Vegetation Type
 - Conservation Status of Vegetation Type (e.g., whether an EEC or Overcleared Vegetation Type) and whether the vegetation type is adequately reserved.
 - Condition of vegetation (as per Biometric)
 - List of known or likely threatened species.
- Where a threatened species is known, or likely, an Assessment of Significance for this species is required. This may necessitate additional survey, as set out in Attachment B.
- an account of the hydrology of the area and any impacts to this from the proposed development.
- assessment of the importance or otherwise of the location as a corridor, migratory route or drought refuge, in relation to other remnant vegetation, riparian and wetland areas or habitat in the region.

If required an offset strategy should also be prepared that details:

- The location and boundary of the proposed offset.
- The vegetation types within the proposed offset site (as per requirements for the summary table, above)
- Proposed mechanism for legally securing the offset site in perpetuity.
- Proposed management actions to be implemented on the offset site.

It is the responsibility of the proponent (and subsequently the Consent and/or Determining Authorities) to determine the detail and comprehensiveness of assessment required to form legally defensible conclusions regarding the impact of the proposal. The scale and intensity of the proposed development should dictate the detail of investigation. It is important that all conclusions are supported by adequate data and that these data are clearly presented in the EIS.

OEH has produced a set of draft *Threatened Biodiversity Survey and Assessment: Guidelines for Developments Activities* on how to conduct a satisfactory flora and fauna assessment survey, available from

<http://www.environment.nsw.gov.au/surveys/BiodiversitySurveyGuidelinesDraft.htm>

Detailed comment for Director General's Requirements

The *Environmental Planning and Assessment Act (1979) (EP&A Act)* requires that proponents of a development/activity and the Consent/Determining Authorities adequately assess the impact on flora and fauna by a development or activity. If, during a flora or fauna assessment or survey, threatened species, populations or ecological communities, or their habitats are found or are likely to occur in the area, the proponents must undertake an 'Assessment of Significance' as outlined in section 5A of the *EP&A Act*.

The results from other recent (less than five years old) surveys and assessments may be used in the Assessment of Significance, however, surveys should only be used if they have been undertaken at the appropriate time with suitable methodology to determine the presence/absence of threatened species likely to occur on site.

Specifically, in regards to flora and fauna:

- Assessments should take into account the importance of the Snow Gum Grassy Woodland EEC and its condition in the wider local and regional context given that this EEC is commonly heavily modified and in a degraded condition. If the EEC is in good condition under a biobanking assessment clearing the EEC would be "red flagged" meaning impacts to it should be avoided.
- Targeted surveys using appropriate methodology should be undertaken for a range of threatened species identified by OEH as possibly occurring on site. OEH has listed the survey requirements for threatened species with the potential to occur in Attachment B. Surveys should be particularly focussed on species that have the potential to significantly affected by the development footprint including grassland fauna.

The results of the vegetation community mapping and the targeted surveys should be used to assist with the identification of suitable areas for offsetting the impacts of this proposal. The BioBanking Assessment Methodology (BBAM DECC 2008) may be used to assess the quantum of offset and whether the offset site matches the species and ecosystem credits present within the development footprint. Regardless of which methodology is used to determine the offset it must be agreed to prior to the impact occurring.

Threatened Species and the 'Assessment of Significance'

The guidelines for performing an assessment of significance are available at:

<http://www.environment.nsw.gov.au/resources/threatenedspecies/tsaguide07393.pdf>

OEH considers that the following species of threatened flora, fauna and endangered ecological communities have known distribution and/or habitat preferences that could potentially match the subject site. This list is not exhaustive and other entities may need to be assessed on the basis of desktop and habitat analyses and the outcomes of fieldwork. Consequently, an assessment of significance for the proposal might include, but not be limited to, the following:

Threatened Flora

<i>Calotis glandulosa</i>	Mauve Burr-daisy	Vulnerable
<i>Swainsona sericea</i>	Silky Swainson-pea	Vulnerable
<i>Dodonaea procumbens</i>	Creeping Hop-bush	Vulnerable
<i>Rutidosia leiolepis</i>	Monaro Golden Daisy	Vulnerable
<i>Rutidosia leptorrhynchoides</i>	Button Wrinklewort	Endangered

Threatened Fauna

<i>Circus assimilis</i>	Spotted Harrier	Vulnerable
<i>Hieraaetus morphnoides</i>	Little Eagle	Vulnerable
<i>Epthianura albifrons</i>	White-fronted Chat	Vulnerable
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	Vulnerable
<i>Petroica boobang</i>	Scarlet Robin	Vulnerable

<i>Petroica phoenicea</i>	Flame Robin	Vulnerable
<i>Stagonopleura guttata</i>	Diamond Firetail	Vulnerable
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	Vulnerable
<i>Chthonicola sagittata</i>	Speckled Warbler	Vulnerable
<i>Daphoenositta chrysoptera</i>	Varied Sittella	Vulnerable
<i>Aprasia parapulchella</i>	Pink-tailed Legless	Vulnerable
<i>Suta flagellum</i>	Little Whip Snake	Vulnerable
<i>Delma impar</i>	Striped Legless Lizard	Vulnerable
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	Vulnerable
<i>Tympanocryptis pinguicollis</i>	Grassland Earless Dragon	Endangered
<i>Falsistrellis tasmaniensis</i>	Eastern False pipistrelle	Vulnerable
<i>Myotis macropus</i>	Large-footed Myotis or Southern Myotis	Vulnerable
<i>Synemon plana</i>	Golden Sun Moth	Endangered

Endangered Ecological Communities

Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions
White Box Yellow Box Blakely's Red Gum Woodland

Species Impact Statements

If a significant impact on a threatened species is deemed likely following a threatened species assessment via the 'Assessment of Significance', it may be necessary to prepare a Species Impact Statement (SIS) in accordance with the *TSC Act*. If a SIS is required, the applicant for the development consent or the proponent of the activity must request from the Director-General of OEHS, the requirements concerning the form and content of the SIS.

ATTACHMENT B: Survey methods for Threatened Species with potential to occur on site

Fauna Survey Requirements

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
<i>Circus assimilis</i>	Spotted Harrier	A small site less than < 2 ha a survey should be conducted for a 10 min point counts with a radius of 50 m, a site that is between 2 - 100 ha, a 2 ha 20 min survey should be conducted for every 10 ha (Barret et al. 2003), a long linear transect with 10 min point counts for a radius of 50 m every 500 m are for remnants less than 100m wide.	All year (breeding usually in Spring)	Open habitats, including the edge of wetlands
<i>Hieraaetus morphnoides</i>	Little Eagle		All year (breeding in spring and summer)	Occupies open eucalypt forest, woodland or open woodland and riparian forest
<i>Epthianura albigrons</i>	White-fronted Chat		All year (breeding Jul – Dec)	Saltmarshes, wetlands, open grassy areas
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)		All year (breeding Sep-Jan)	Eucalypt woodland with dead fallen woody debris
<i>Petroica boobang</i>	Scarlet Robin		All year (breeding Jul-Jan)	Eucalypt forest and woodland
<i>Petroica phoenicea</i>	Flame Robin		Autumn and Winter (altitudinal migrant)	Eucalypt forest and woodland
<i>Stagnopleura guttata</i>	Diamond Firetail		All year. Appears to be sedentary, though some populations move locally, especially those in the south. Commonly occurs in flocks.	Eucalypt woodland and derived grasslands, Natural temperate grasslands
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)		All year	Eucalypt forest and woodland
<i>Chthonicola sagittata</i>	Speckled Warbler		All year	
<i>Daphoenositta chrysoptera</i>	Varied Sittella		All year (breeding Aug-Feb)	Eucalypt forest and woodland
<i>Aprasia parapulchella</i>	Pink-tailed Legless Lizard	Sample all habitat by rock rolling and searching under logs and debris. Rocks, logs and debris should be replaced carefully in their original position to avoid injuring animals and to maintain habitat integrity. The areas surveyed must be shown on a map and the number of rocks turned, time spent searching and weather conditions during survey recorded.	Mid-August – October inclusive, preferably after rain. The daily maximum temperature should not exceed 25°C on the days of survey.	Native grassland or grassy woodland with rock that can be turned.
<i>Suta flagellum</i>	Little Whip Snake			

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
<i>Delma impar</i>	Striped Legless Lizard	Sample the habitat with roof tiles placed on the ground as artificial shelter sites with 100 tiles per site, or for sites greater than 5ha, a rate of at least 50 tiles per 3 ha of habitat (pro rata). The layout of the tiles can be varied to suit the site, with a spacing of 5-10m between tiles laid in transects or grids. Tiles should be installed a minimum of 2 weeks, but preferably a month before the first check. Tiles can be checked up to twice a week (non-consecutive days) with a minimum of 10 checks over the survey period.	September-December inclusive.	Native grassland or exotic grassland with a native component.
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	Record the number of termite mounds in the subject site, study area and locality as part of other surveys being undertaken. This data will provide context to the potential breeding habitat affected by the action proposed.	All year	Woodland and open forest
<i>Tympanocryptis pinguicolla</i>	Grassland Earless Dragon	Sample the habitat with Spider-tubes (PVC artificial arthropod burrows) with 50 tubes per site, or for sites greater than 5ha, a rate of at least 20 tubes per 3 ha of habitat (pro rata). The layout of the tubes can be varied to suit the site, with a spacing of 10m between tubes laid in transects or grids. Tubes should be installed a minimum of 2 weeks before the first check. Tubes can be checked up to twice a week (non-consecutive days) with a minimum of 10 checks over the survey period.	January – April inclusive	Native grassland
<i>Falsisirellis tasmaniensis</i>	Eastern False pipistrelle	Surveys using anabat recorders and stag watching should aim to identify the number and location of roost and identify important foraging habitat in the study area and the locality. If required, OEH can provide further advice on bat survey techniques to acquire this information.	Spring, Summer, Autumn	Prefers moist habitats, with trees taller than 20 m. Generally roosts in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hunts beetles, moths, weevils and other flying insects above or just below the tree canopy.
<i>Myotis macropus</i>	Large-footed Myotis Southern Myotis	Surveys using anabat recorders and stag watching should aim to identify the number and location of roost and identify important foraging habitat in the study area and the locality. If required, OEH can provide further advice on bat survey techniques to acquire this information.	Spring, Summer, Autumn	Forage over streams and pools. Roost close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage
<i>Synemon plana</i>	Golden Sun Moth	Survey the habitat by walking transects or a random meander across the site looking for flying sun moths. These surveys should target areas with high (>30%) <i>Austrodanthonia</i> cover and must be conducted under appropriate weather conditions: ■ warm to hot day (above 20 degrees celcius by 1000 hrs) ■ warmest part the day (that is, 1000 to 1500 hrs) ■ clear or mostly cloudless sky ■ still or relatively still wind conditions during the survey period As the timing of the flight season varies annually and geographically, the best indicator of key survey period is the presence of flying males at known local sites. Reference sites should be monitored during the	November – early January	Native grassland particularly areas with high (>30%) <i>Austrodanthonia</i> cover.

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
		expected flying period and used to guide survey timing at the target site. The transects or route surveyed must be shown on a map and the time spent searching and weather conditions during survey recorded.		

Flora Survey Requirements

Scientific Name	Common Name	Survey Requirements	Survey Season	Habitat
Endangered ecological communities (EEC)	Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions. White Box Yellow Box Blakely's Red Gum Woodland	Surveys shall identify the extent and condition of these ecological communities in the <i>subject site</i> , <i>study area</i> and <i>locality</i> . This shall involve the use of vegetation surveys in the <i>subject site</i> and the <i>study area</i> . The use of existing datasets held by DECCW in combination with ground-truthing of selected sites within areas mapped by DECCW as the ecological community is recommended for surveys of the <i>locality</i> . The sites sampled shall be used to provide context to the ecological community affected by the action proposed.	Surveys can be undertaken at any time of the year under varied seasonal conditions.	n/a
<i>Calotis glandulosa</i>	Mauve Burr-daisy	Transects and/or quadrats in suitable habitat combined with random meander surveys.	Any time though may not be detectable if heavily grazed or during dry periods	Grassland and grassy woodland
<i>Swainsona sericea</i>	Silky Swainson-pea	Transects and/or quadrats in suitable habitat combined with random meander surveys.	Between mid-October and mid-November	Grassland and grassy woodland
<i>Dodonaea procumbens</i>	Creeping Hop-bush	Transects and/or quadrats in suitable habitat combined with random meander surveys.	All year	Dry areas of the Monaro, between Michelago and Dalgely in Natural Temperate Grassland or Snow Gum Woodland
<i>Rutidosis leiocarpis</i>	Monaro Golden Daisy	Transects and/or quadrats in suitable habitat combined with random meander surveys.	Flowers December - March	Found in Natural Temperate Grassland on the Monaro
<i>Rutidosis leptorhynchoidea</i>	Button Wrinklewort	Transects and/or quadrats in suitable habitat combined with random meander surveys.	Flowers December - March	Occurs in Box-Gum Woodland, secondary grassland derived from Box-Gum Woodland or in Natural Temperate Grassland; and often in the ecotone between the two communities

ATTACHMENT C : Aboriginal Cultural Heritage assessment requirements for Bunyan Quarry

Aboriginal cultural heritage comments in regard to Director General Requirements

The *Environmental Planning and Assessment Act 1979* requires that proponents of a development/activity, and the determining authority, adequately assess the impact of a development or activity on Aboriginal cultural heritage values.

The *National Parks and Wildlife Act 1974* (NPW Act) protects Aboriginal objects and Aboriginal places in NSW. Under the NPW Act, it is an offence to do any of the following things without an exemption or defence provided for under the NPW Act (penalties apply):

- knowingly harm or desecrate an Aboriginal object (the 'knowing' offence); and
- harm or desecrate an Aboriginal object or Aboriginal place (the 'strict liability' offence).

The NPW Act provides a number of exemptions and defences to these offences and also excludes certain acts and omissions from the definition of harm. Further information about the regulation of Aboriginal cultural heritage is available from the OEH website at: www.environment.nsw.gov.au/licences/achregulation.htm.

As such, it is in the interest of proponents to ensure that all reasonable precautions are taken to prevent the occurrence of harm to Aboriginal objects. The proponent should assess and document information on Aboriginal cultural heritage issues that OEH consider standard, specifically the following:

1. A description of the Aboriginal objects and declared Aboriginal places located within the area of the proposed development. This should include surface survey, undertaken by a qualified archaeologist, and should consider the use of subsurface archaeological testing in areas that are identified to contain potential for subsurface Aboriginal objects.

Currently there are no known Aboriginal sites recorded on the OEH Aboriginal Heritage Information Management System (AHIMS) within the project area. Please note however, that surveys for Aboriginal objects have not been undertaken systematically in many parts of NSW. Aboriginal objects may therefore exist on a parcel of land even though they have not been recorded in AHIMS.

A search of AHIMS, undertaken by OEH on 29 November 2013, records that fifty Aboriginal sites have been located on the Cooma 1:25,000 topographical mapsheet as a result of previous archaeological surveys and investigations conducted for both academic research and development projects within the surrounding Bunyan area.

Therefore; within the local area it is predicted that stone artefacts may be distributed across the landscape in a low density which can be expected to vary in relation to local availability of water, resources and the nature of the terrain. Aboriginal scarred trees may occur in areas of remnant native vegetation of sufficient age. Lithic quarry and stone procurement sites may occur wherever rock types occur that are suitable for stone tool manufacture and several quarry sites have been recorded in the greater Monaro region.

2. A description of the Aboriginal cultural heritage values, including the significance of the Aboriginal objects and declared Aboriginal places, that exist across the whole area that will be affected by the proposed development, and the significance of these values for the Aboriginal people who have a cultural association with the land.
3. A description of how the requirements for consultation with Aboriginal people as specified in clause 80C of the *National Parks and Wildlife Regulation 2009* have been met.

4. The views of those Aboriginal people regarding the likely impact of the proposed development on their cultural heritage. If any submissions have been received as a part of the consultation requirements, then the report must include a copy of each submission and your response.
5. A description of the actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposed activity, with reference to the cultural heritage values identified.
6. A description of any practical measures that may be taken to protect and conserve those Aboriginal objects, particularly to Aboriginal skeletal remains, or declared Aboriginal places.
7. A description of any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm or, if this is not possible, to manage (minimise) harm.
8. A specific Statement of Commitment that the proponent will develop and implement an Aboriginal Heritage Management Plan (AHMP) that will detail:
 - (a) the procedures to be followed if Aboriginal objects are found at any stage during the life of the development works to allow for the formulation of appropriate measures to manage any unforeseen impacts to Aboriginal heritage values;
 - (b) the procedures to be followed in the event any Aboriginal burials or skeletal material is uncovered during the development works and allow for the development of appropriate measures to manage this material;
 - (c) the process that will be followed for continuing consultation with the Aboriginal stakeholders and OEH, where required; and
 - (d) the process for how the AHMP procedures will be managed and adhered to during the proposed operational life of the development.

In addressing the requirements above, the proponent must refer to the following documents:

- a) *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011). This document provides guidance on the process for investigating and assessing Aboriginal cultural heritage in NSW and can be accessed at:
<http://www.environment.nsw.gov.au/resources/cultureheritage/20110263ACHguide.pdf>.
- b) *Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010). The process described in this Code should be followed and documented where the assessment of Aboriginal cultural heritage requires an archaeological investigation to be undertaken. A copy of the Code can be obtained at:
<http://www.environment.nsw.gov.au/licences/archinvestigations.htm>
- c) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW, 2010). This document further explains the consultation requirements that are set out in clause 80C of the *National Parks and Wildlife Regulation 2009*. The process set out in this document must be followed and documented in the EIS. A copy of the document can be obtained at:
<http://www.environment.nsw.gov.au/licences/consultation.htm>.
- d) *Applying for an Aboriginal Heritage Impact Permit: Guide for applicants* (OEH, May 2011). The aim of this guide is to assist in the preparation an AHIP application. It should be read in conjunction with the *National Parks and Wildlife Act 1974* and the *National Parks and Wildlife Regulation 2009*. A copy of the Guide can be obtained at:
<http://www.environment.nsw.gov.au/licences/applyforahip.htm>

If Aboriginal objects are found to be directly or indirectly adversely affected by the proposed development, the proponent will need to apply for, and be issued, an Aboriginal Heritage Impact Permit (AHIP) by OEH to comply with the NPW Act. Details on how to apply for an AHIP can be obtained from the OEH website at:

<http://www.environment.nsw.gov.au/resources/cultureheritage/20110280AHIPguideforapplicants.pdf>

Note: Under section 89A of the *National Parks and Wildlife Act 1974*, it is an offence for a person not to notify OEH of the location of any Aboriginal object the person becomes aware of, not already recorded on the Aboriginal Heritage Information Management System (AHIMS). An AHIMS Site Recording Form should be completed and submitted to the AHIMS Registrar for each Aboriginal site found during investigations. The forms can be downloaded at:

<http://www.environment.nsw.gov.au/licences/DECCAHMSSiteRecordingForm.htm>.

ATTACHMENT D : Guidance Material

Assessing Threatened Species Impacts

- Principles for the use of biodiversity offsets in NSW
www.environment.nsw.gov.au/biocertification/offsets.htm
- Biobanking Assessment Tools
www.environment.nsw.gov.au/biobanking/tools.htm
- Threatened species assessment guidelines (OEH, 2007)
www.environment.nsw.gov.au/threatenedspecies/tsaguide.htm

Aboriginal Cultural Heritage Impacts

- Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011).
<http://www.environment.nsw.gov.au/resources/cultureheritage/20110263ACHguide.pdf>
- Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010)
<http://www.environment.nsw.gov.au/licences/consultation.htm>
- Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010)
<http://www.environment.nsw.gov.au/licences/archinvestigations.htm>
- Aboriginal Heritage Impact Permit (AHIP) application forms
<http://www.environment.nsw.gov.au/licences/AHIPforms.htm>
- Applying for an Aboriginal Heritage Impact Permit: Guide for applicants (OEH 2011)
<http://www.environment.nsw.gov.au/resources/cultureheritage/20110280AHIPguideforapplicants.pdf>
- OEH Aboriginal Site Recording Form (section 89A NPW Act)
<http://www.environment.nsw.gov.au/licences/DECCAHIMSSiteRecordingForm.htm>
- Aboriginal Heritage Information Management System (AHIMS) Registrar
<http://www.environment.nsw.gov.au/licences/WhatInformationCanYouObtainFromAHIMS.htm>

APPENDIX C BIODIVERSITY ASSESSMENT

Biodiversity Assessment

UPPER BUNYAN GRAVEL PIT



DECEMBER 2015

Document Verification



Project Title:

Upper Bunyan gravel pit

Project Number: #5559

Project File Name: Bunyan Quarry BA Final v2.2

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ACRONYMS AND ABBREVIATIONS

ASL	Above sea level
BA	Biodiversity Assessment
BBAM	BioBanking Assessment Methodology
CMA	Catchment Management Authority
CMSC	Cooma Monaro Shire Council
Cwth	Commonwealth
DBH	Diameter at Breast Height
DECC	Refer to OEH
DECCW	Refer to OEH
DoE	(Cwth) Department of Environment
DP&I	(NSW) Department of Planning and Infrastructure
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EA	Environmental Assessment
EIA	Environmental impact assessment
EPBC Act	<i>Environmental Protection and Biodiversity Conservation Act 1999</i> (Cwth)
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i> (NSW)
FM Act	<i>Fisheries Management Act 1994</i> (NSW)
KFH	Key Fish Habitat
GDE	Groundwater Dependent Ecosystem
GFHA	Grassland fauna Habitat Assessment
GPS	Global Positioning System
HBT	Hollow-Bearing Tree
LGA	Local Government Area
MNES	Matters of National environmental significance under the EPBC Act (<i>c.f.</i>)
NW Act	<i>Noxious Weeds Act 1993</i> (NSW)
NP&W	(NSW) National Parks and Wildlife
NPW Act	<i>National Parks And Wildlife Act 1974</i> (NSW)
NSW	New South Wales
NV Act	<i>Native Vegetation Act 2003</i> (NSW)
OEH	(NSW) Office of Environment and Heritage, formerly Department of Environment, Climate Change and Water
SEPP	State Environmental Planning Policy (NSW)
SIS	Species Impact Statement
sp/spp	Species/multiple species
SPRAT	Species Profile and Threats Database (C'wth)
TSC Act	<i>Threatened Species Conservation Act 1995</i> (NSW)
WoNS	Weed of National Significance

EXECUTIVE SUMMARY

The Cooma-Monaro Shire Council currently operates a gravel pit known as the Bunyan Quarry approximately 12 km north of Cooma, adjacent to the Monaro Highway, and from this quarry around 20,000 tonnes of material is extracted each year. At present, this land-based extraction activity does not operate under an Environmental Protection Licence because the extraction involves less than 30,000 tonnes per year.

Adjoining the quarry is 85 hectare of Crown land parcel (Lot 160 DP 724552) which the Cooma-Monaro Shire Council propose to purchase to allow the quarry to expand. Approximately 20 hectares of this Crown land is expected to be directly impacted with the residual 65 hectares being assigned to offset this impact. It is envisaged that the quarry expansion onto the new parcel of land would be in five stages. Stage 1 and 2 would involve an expansion towards the south, Stage 3 would be to the west and Stage 4 to the north. Stage 5 would take place west of Stage 3. Each stage would commence once the material from the previous stage is completely extracted.

As part of the requirements of Part 4 of the *Environmental Planning and Assessment Act 1979*, this Biodiversity Assessment report, prepared by NGH Environmental Pty Ltd for the Cooma-Monaro Shire Council as part of the suite of documents that will be used by the relevant authority to decide whether or not to approve the proposed quarry expansion. This report includes the following:

- A description of the biodiversity values of the site and surrounding area including identifying protected and threatened flora and vertebrate fauna species, populations and ecological communities and their habitats.
- Details of the ecological constraints of the quarry expansion (over two stages).
- Details of the direct and indirect impacts on flora and fauna species, populations, ecological communities and critical habitat.
- An outline of the requirements of relevant legislation including the *Environmental Planning & Assessment Act 1979*, the *Threatened Species Conservation Act 1995* and the *Environment Protection and Biodiversity Conservation Act 1999*.
- An assessment of the significance of the impact of the expansion of the quarry on species, ecological communities and populations listed under the relevant statutes.
- Recommended management measures to avoid, minimise, mitigate and also offset any impacts.

Between August to December 2014, field work was undertaken by qualified and experienced environmental professionals to investigate and quantify the biodiversity values of the 85 hectares of Crown land to be purchased. This investigation found that the Crown land contained a listed threatened ecological community namely, *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions*. This community is listed as endangered under the *NSW Threatened Species Conservation Act 1995* (TSC Act) and the majority of this woodland is in moderate to good condition. The investigation also recorded a stick nest, assumed to belong to the Little Eagle (*Hieraetus morphnoides*), a species listed as vulnerable under the TSC Act. The survey work found that pasture weed species were common across much of the Crown land with several being declared noxious weeds. A total of 11 hollow-bearing trees were identified within areas proposed to be developed (an additional 23 are located in adjacent areas, including the proposed offset site and existing extraction area).

In considering the configuration of the proposed quarry expansion, it is expected that the expansion works will result in the eventual clearing of up to 11.88 hectares of Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland, all of which is infested with a noxious weed; African Lovegrass.

A seven part assessment of the significance of the impact of clearing this quantity of woodland has been completed in accordance with the NSW TSC Act guidelines and from this, it was considered that a species impact statement (SIS) was not necessary.

A seven part assessment of significance of impacts on the Little Eagle has also been completed and concluded that a significant impact is highly unlikely; an SIS is not considered to be required.

To manage the direct and indirect impacts of the proposed quarry expansion, a suite of measures have been recommended and are included within this report. One of these measures includes a strategy to offset the impacts on local biodiversity. In addition to these measures, it is envisaged that the Cooma-Monaro Shire Council will need to revise the rehabilitation plan for the existing quarry to ensure that biodiversity conservation and management is considered as part of the decommissioning of the quarry through to the eventual relinquishment of the land.

1 INTRODUCTION

Cooma Monaro Shire Council (CMSC) is proposing to expand an existing gravel pit adjacent to the Monaro Highway at Bunyan, approximately 12 km north east of Cooma (Figure 1-1). The existing gravel pit is owned and operated by CMSC. It is proposed to expand the gravel pit into adjacent land, Lot 160 DP 724552 (the study area). Extraction would occur within a 20 hectare area over five stages. A proposed offset area of 65 hectares is also proposed in this adjacent lot.

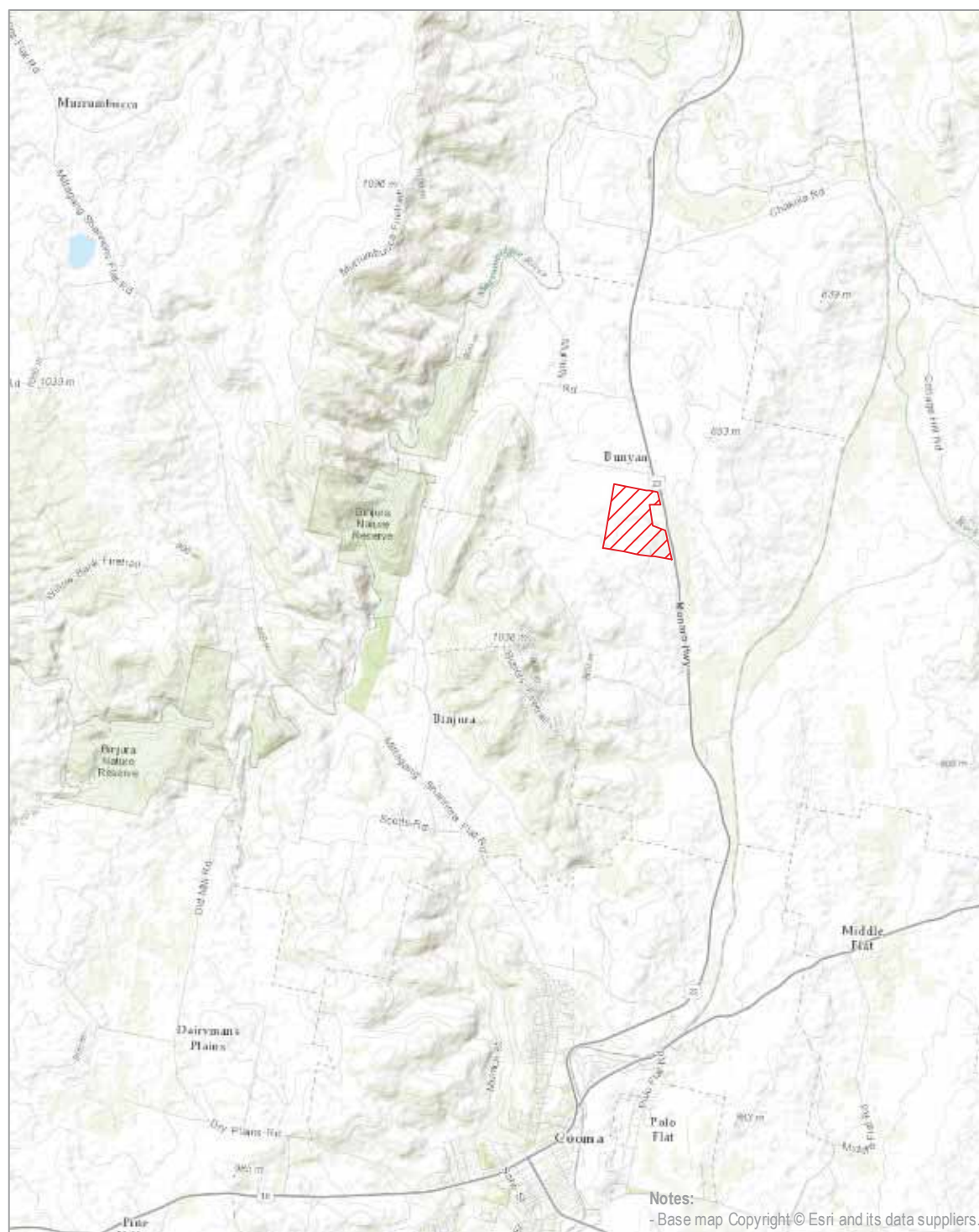
The proposal is classified as a Designated Development under the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) and is to be assessed under Part 4 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). This assessment requires the preparation of an Environmental Impact Statement (EIS) to support a Development Application for the proposal, with the Joint Regional Planning Committee being the consent authority.

1.1 AIM OF THIS ASSESSMENT

This Biodiversity Assessment (BA) forms part of the environmental assessment required to fulfil the requirements of Part 4 of the *Environmental Planning and Assessment Act 1979*.

Specifically, the aims of this report are to:

- Describe the biodiversity values of the site and surrounding area including identifying protected and threatened flora and fauna species, populations and ecological communities and their habitats.
- Identify the ecological constraints of the quarry expansion area.
- Identify the direct and indirect impacts of the expansion on flora and fauna species, populations, ecological communities and critical habitat.
- Address the requirements of relevant legislation including the *Environmental Planning & Assessment Act 1979* (EP&A Act), the *Threatened Species Conservation Act 1995* (TSC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Assess the significance of the impact of the expansion on species, ecological communities and populations listed under the TSC Act and EPBC Act.
- Propose environmental management measures to avoid, minimise, mitigate and, if necessary, offset any impacts.



 Study area

0 0.5 1 2 Kilometers

Ref: 5559 - a
Author: JB



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Figure 1-1: Location of the study area

1.2 PROJECT DESCRIPTION

CMSC currently operate a gravel pit approximately 12 km north of Cooma, NSW (Lot 159 DP 724552). The annual extraction rate for the gravel pit in 2013 was 12 858 m³. The gravel pit has potential to have an extraction rate of approximately 20,000 tonnes per year. The site does not operate under an Environmental Protection License, being below the 30,000 tonne per year trigger. The gravel extracted from the site is used for road construction and maintenance within the LGA.

CMSC proposes to purchase an 85 hectare adjoining Crown land parcel (Lot 160 DP 724552). CMSC would use approximately 20 hectares of this purchased land to expand the existing CMSC gravel pit. The residual 65 hectare area would be available for use as offsets to the clearing required.

It is proposed that the existing gravel pit on Council land would be expanded onto the new parcel in five stages (refer Figure 1-2). The first two stages, Stage 1 (S1) and Stage 1 (S2) involve expanding the operation to the south. Stage 3 (S3) involves expanding the operation 40 metres west of the existing active area of the quarry and Stage 4 (S4) involves expanding the operation to the north. Stage 5 would join the western boundary of Stage 3 and would expand the quarry further west. Extraction at each area would commence once the resources in each previous stage have been exhausted. Total hectares of each stage is shown in Table 1-1.

Table 1-1 Extraction stages and areas

Stage	Areas (hectares)
Stage 1	2.55
Stage 2	1.44
Stage 3	1.88
Stage 4	4.06
Stage 5	3.87
Total	13.8

The current operation of the gravel pit involves a maximum 5 staff members per day onsite and the following machinery:

- Front-end loaders
- Truck & dog
- Bulldozer
- Tipper trucks
- Screening equipment
- 4WD vehicles for staff

No amenities or water supply are proposed.

No crushing or blasting is currently undertaken onsite. With the possible exception of blasting, no change is proposed to the methods or rate of extraction. The proposal is simply to follow the resource into adjoining areas.

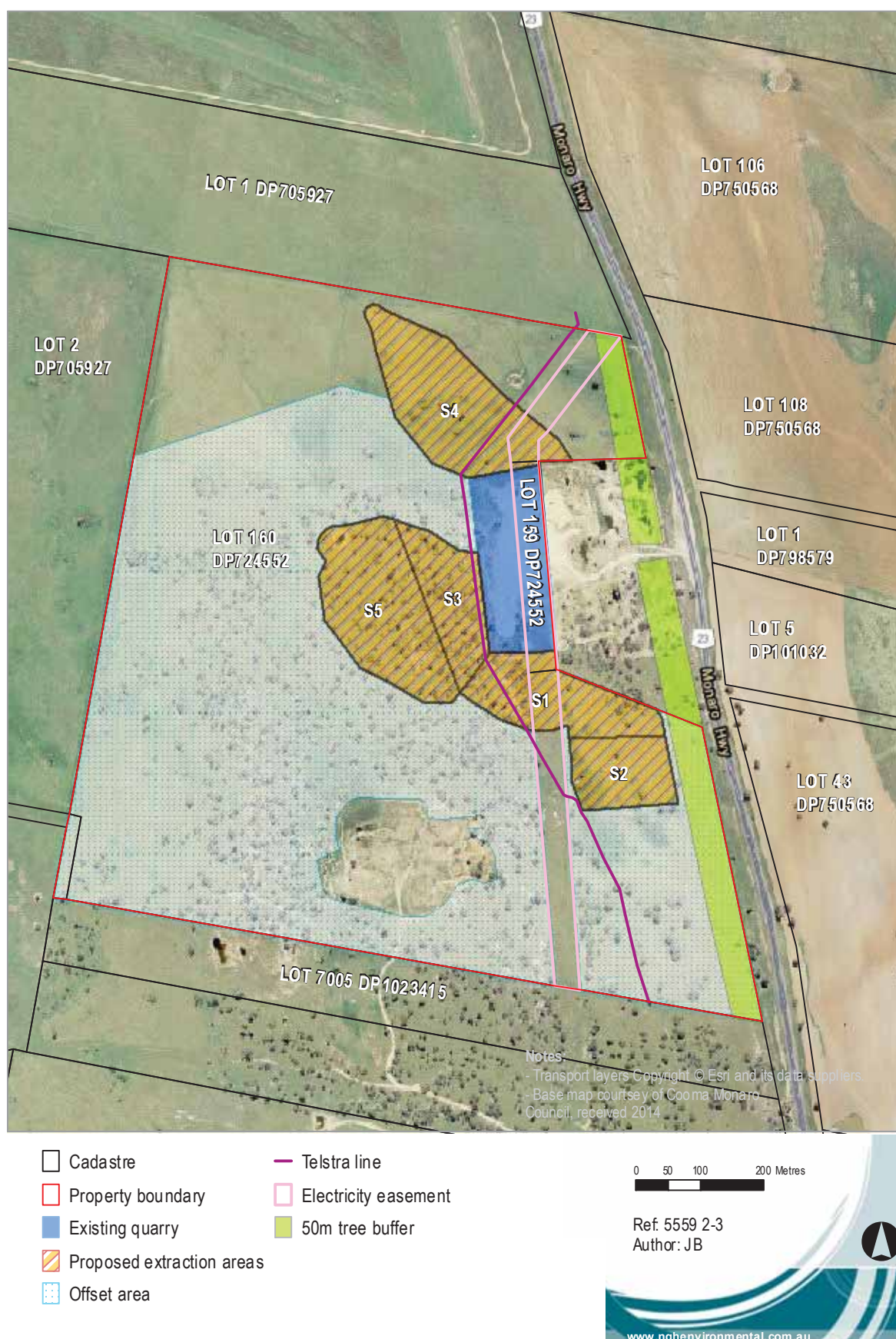


Figure 1-2 Staging plan for proposed quarry extraction

1.3 LEGISLATIVE REQUIREMENTS

1.3.1 *Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)*

The *Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)* protects nationally and internationally important flora, fauna, ecological communities and heritage places, which are defined in the *EPBC Act* as matters of national environmental significance. Matters of national environmental significance relevant to biodiversity are:

- Wetlands of international importance
- Nationally listed threatened species and ecological communities
- Migratory species
- Commonwealth marine areas

Significance of impacts is determined in accordance with the *Significance impact guidelines 1.1 – matters of national environmental significance* (Department of Environment, Water, Heritage and the Arts, 2006).

The referral process involves a decision on whether or not the proposal is a 'controlled action'. When a proposal is declared a controlled action, approval from the Minister is required. Further information on the referral and approval process is available at [Assessment and approval process - EPBC Act](#).

This assessment has considered whether any matters of national environmental significance would be affected by the works. This assessment concludes there would be no impact to:

- Wetlands of international importance
- Nationally listed threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- Nationally threatened species and ecological communities

Where a proposal is likely to have a significant impact on a matter of national environmental significance, the proposal is referred to the Commonwealth Environment Minister via the Department of the Environment (DoE). The Minister then determines whether the proposal is a 'controlled action'. If a proposal is declared a controlled action, an assessment of the action is carried out and the Minister makes a decision to approve, approve with conditions, or not approve the proposed action. Further information on the referral and approval process is available at [Assessment and approval process - EPBC Act](#).

Specific Draft EPBC Act referral guidelines have been prepared for the Koala (DoE 2013) which defines what constitutes Koala habitat and provides a consistent and transparent approach for proponents deciding whether to refer an action to the DoE for approval and assessment of significant impacts on the koala. This assessment considers these guidelines in assessing the potential for impacts to the Koala.

1.3.2 *NSW Native Vegetation Act 2003*

The *Native Vegetation (NV) Act 2003* regulates the clearing of native vegetation. Clearing is defined as cutting down, felling, thinning, logging, removing, killing, destroying, poisoning, ringbarking, uprooting or burning native vegetation including native grasses and herbage. Under section 19 of the NV Act, clearing of native vegetation that is non-protected regrowth is permitted. Regrowth is defined as native vegetation that has regrown since 1 January 1983 in the Western Division of NSW or 1 January 1990 in other parts of the state, which includes the study area. The woodland vegetation at the site is considered

to partly comprise remnant native vegetation. Offsetting is proposed to account for vegetation clearing required for the expansion of the quarry.

1.3.3 NSW Noxious Weeds Act 1993

This Act aims to prevent the establishment, reduce the risk of spread and minimise the extent of noxious weeds. The *Noxious Weeds (NW) Act 1993* guides the management of declared noxious weeds within Local Government Areas (LGAs). The Act distinguishes between five classes of noxious weeds, which are separated based on their distributions and the level of threat that each species poses to the environment, human health, or primary production (Table 1-2). Noxious weeds that are classified as Class 1, 2 or 5 are also considered 'notifiable weeds', which simply means that the Local Control Authority (e.g. Council) must be informed about the presence of the weed on land within 24 hours of becoming aware or suspecting that the weed is on the land. Individual land holders and managers are required under the NW Act to control noxious weeds declared for their area according to their classification. Declared noxious weeds in NSW are plants that have been proclaimed under the NW Act. The legislation requires that these species be controlled or eradicated.

Table 1-2: Noxious weed classes and their characteristics as listed under the Noxious Weeds Act 1993.

Noxious Weed Class	Class Characteristics
Class 1 State Prohibited Weeds	Plants that pose a potentially serious threat to primary production or the environment and are not present in the State or are present only to a limited extent.
Class 2 Regionally Prohibited Weeds	Plants that pose a potentially serious threat to primary production or the environment of a region to which the order applies and are not present in the region or are present only to a limited extent.
Class 3 Regionally Controlled Weeds	Plants that pose a serious threat to primary production or the environment of an area to which the order applies, are not widely distributed in the area and are likely to spread in the area or to another area.
Class 4 Locally Controlled Weeds	Plants that pose a threat to primary production, the environment or human health, are widely distributed in an area to which the order applies and are likely to spread in the area or to another area.
Class 5 Restricted Plants	Plants that are likely, by their sale or the sale of their seeds or movement within the State or an area of the State, to spread in the State or outside the State.

1.3.4 NSW Environmental Planning and Assessment Act 1979 (EP&A Act)

The *Environmental Planning and Assessment Act 1979* (EP&A Act) provides the framework for assessing environmental impacts and determining planning approvals for developments in NSW. This proposal would be assessed under Part 4 of the EP&A Act. Clause 5A and 5C of the EP&A Act requires that the significance of the impact on terrestrial and aquatic threatened species, populations and endangered ecological communities is assessed. In accordance with this Act, an assessment has been undertaken to characterise the significance of the potential impact on threatened flora, fauna and ecological communities that may be present within the study area.

Ecologically Sustainable Development Principles

The precautionary principle – This assessment has been prepared utilising the precautionary principle. That is, if threats are perceived as possibly leading to serious or irreversible environmental damage, then either the proposal would not occur, or the development would be modified to ensure that such threats are addressed.

Inter-generational equity – This assessment considers the potential for the proposal to impact on natural or cultural features to a level that would compromise the health, diversity or productivity of the environment to a level that would impact on future generations.

Conservation of biological diversity and ecological integrity – The proposal considered in this BA would require vegetation removal. The assessment has considered potential to impact notably on the biological diversity and ecological integrity of the region.

Improved valuation of pricing of environmental resources – The assessment has been undertaken in recognition of the value of the environment.

Mitigation measures have been developed that would assist in protecting important habitat features at the site.

1.3.5 NSW National Parks and Wildlife (NPW) Act 1974

This act aims to conserve nature, habitat, ecosystems, ecosystem processes and biological diversity at the community, species and genetic levels. Under this act all native fauna is protected, threatened or otherwise. Schedule 13 of the act lists protected plants which shall not be harmed or picked on any land either on or off National Park estate.

With regard to threatened species a person must not:

- a) harm any animal that is of, or is part of, a threatened species, an endangered population or an endangered ecological community, or
- b) use any substance, animal, firearm, explosive, net, trap, hunting device or instrument or means whatever for the purpose of harming any such animal.

Mitigation measures have been developed within this assessment to address risks to threatened species, endangered populations and endangered ecological communities.

1.3.6 NSW Threatened Species Conservation Act 1995 (TSC Act)

This act aims to conserve biological diversity, protect critical habitat, prevent extinctions and promote the recovery of threatened entities. It also aims to promote ecologically sustainable development, assess the impacts of actions on threatened entities, and encourage their conservation.

If the works proposed are considered likely to impact on a listed (threatened) species or ecological community, section 5A of the EP&A Act contains seven factors that are to be used to determine whether the impact on the entity will be significant or not. Where a significant impact is likely to occur a Species Impact Statement (SIS) must be prepared for projects assessed under Part 4 and Part 5 of the EP&A Act. The content of a SIS is outlined in sections 110 – 112 of the TSC Act and must be prepared in accordance with the Director-General's requirements.

In accordance with this Act, an assessment has been undertaken to characterise the significance of the potential impact on listed species and ecological communities.

1.3.7 NSW Fisheries Management Act 1994 (FM Act)

This Act sets out to conserve fish stocks and key fish habitats, threatened species, populations and ecological communities of fish and marine vegetation and biological diversity. Further, it aims to promote viable commercial fishing, aquaculture industries and recreational fishing opportunities.

Part 7 of the FM Act provides for the protection of aquatic habitats. A Part 7 Fisheries Management Act permit is required for:

- Activities involving dredging and reclamation work
- Activities temporarily or permanently obstructing fish passage
- Using explosives and other dangerous substances (where it may impact on aquatic habitat)
- Harming marine vegetation

Shallow drainage lines are common throughout the study area. None of these drainage lines are identified as key fish habitat (KFH) on the Department of Primary Industry's KFH maps although the Murrumbidgee River to the west of the subject site is identified as KFH. The proposed works would not involve any of the activities identified above and a Part 7 permit is not considered to be required.

1.3.8 SEPP 44 – Koala Habitat Protection

SEPP 44 encourages the conservation and management of natural vegetation areas that provide habitat for Koalas to ensure that permanent free living populations will be maintained over their present range.

SEPP 44 aims to identify areas of *potential* and *core* Koala Habitat. These are described as follows:

- *Core Koala Habitat* is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females, and recent and historical records of a population.
- *Potential Koala Habitat* is defined as areas of native vegetation where the trees listed in Schedule 2 of SEPP 44 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component.

The Cooma Monaro LGA is listed on Schedule 1 of SEPP 44, therefore the field surveys completed for this assessment considered the presence of core and potential koala habitat at the site.

1.3.9 Cooma Monaro LEP 2013

The proposal site is zoned as RU1 (Primary Production). The RU1 zone is aimed at maintaining and enhancing the region's natural resource base, and the intent of RU1 is for rural land to be used for primary industry production activities, including:

- Extensive agriculture
- Horticulture
- Intensive livestock agriculture
- Mining
- Forestry
- Extractive industries

The proposal is for an extractive industry, which is permitted with consent in this land zone.

2 METHODOLOGY

A multi-stage approach was used following the below listed structure:

- A desktop assessment incorporating a database search and literature review
- Field surveys to identify threatened flora, fauna and ecological communities
- Reporting on findings and presenting recommendations

2.1 PROJECT TEAM

A team of ecologists from NGH Environmental and suitable, experienced sub-contractors were engaged to undertake the field work for this project. A summary of the team, their experience and their role(s) is included in Appendix A.

2.2 DESKTOP ASSESSMENT

Database searches undertaken for the purposes of this assessment included threatened species databases and noxious weed databases as listed in Table 2-1. The results of the database searches are provided in full, in Appendix B.

Table 2-1: Background searches undertaken for threatened entities and noxious weeds.

Resource	Target	Search date	Search area
OEH Wildlife Atlas Database	Threatened flora and fauna and populations.	13/06/14	10 km radius of study area
EPBC Act Protected Matters Search Tool	Threatened flora and fauna, endangered populations and ecological communities and migratory species.	16/06/13	10 km radius of study area
DPI Noxious Weed Database	Noxious weeds declared in the relevant LGA.	13/06/14	Cooma Monaro LGA

In addition, threatened entities identified by the NSW OEH in their response to the DGRs for the project have been considered in this assessment.

Literature relevant to this assessment was also reviewed and included:

- OEH Threatened Species Profiles
- Department of the Environment's EPBC Act Species Profiles and Threats Database (SPRAT)
- Construction methodology and concept designs
- Aerial maps

An evaluation of the likelihood of occurrence of threatened flora and fauna species and ecological communities is provided in full in Appendix G.

2.3 FIELD SURVEYS

2.3.1 Flora

The aims of the flora surveys were to:

1. Determine vegetation communities present within the study area, their condition and extent.
2. Identify potential Endangered Ecological Communities (EECs) within the study area and determine their condition, extent and potential for impact.
3. Identify whether threatened flora species or their habitats are present within the study area and have potential to be impacted by the proposal.
4. Collect data to facilitate offsets according to the NSW OEH BioBanking Methodology should offset be required for the proposal.

Fieldwork was undertaken by Senior Ecologist Dave Maynard on the 27 August 2014 and on the 27 and 28 October 2014 with two technical assistants. Methodologies including Random Meanders, Biometric plot surveys and targeted threatened species transects were employed. These methodologies are discussed in more detail below. Survey effort is shown on the maps in Appendix J.

Random meander and targeted flora surveys

Floristics at the site were surveyed using the random meander method of Cropper (1993). A random meander was conducted across the entire development and potential offset area over a period of approximately five hours on the 27 August 2014. Particular attention was paid to areas of native dominated vegetation as these were considered possible habitat for threatened flora species.

Highly disturbed or exotic dominated areas were not surveyed in detail, for example areas with a largely exotic understorey with little or no native component such as the treeless areas within the study area were not surveyed in any detail, other than to note the presence of noxious weeds. All identifiable species encountered were recorded for the purposes of characterising vegetation types and habitat values for threatened species and communities. The boundaries of vegetation types were recorded using a handheld GPS for later input into GIS mapping.

Biometric plot surveys

To supplement the random meander surveys and to provide quantifiable data on vegetation condition, Biometric plot surveys were undertaken according to the BioBanking Assessment Methodology (BBAM, OEH 2014) within areas of native vegetation where it was considered that an offset may be required to compensate for its removal. The data collected allows the biodiversity values at the site to be compared to benchmark data held by the NSW OEH and can also be utilised in any subsequent calculations of offsets according to the BBAM should offsets be required for the proposal.

Biometric plot surveys were conducted on the 27 and 28th October. Approximately 10 person hours was spent on this component of the survey.

Targeted threatened species transects

Searches for threatened species to occur at the site were conducted in all areas of vegetation within the proposed development area that exhibited a component of native vegetation within the groundcover. Searches were conducted by two people spaced approximately 10m apart and involved parallel transects

through these areas each spaced approximately 20m apart. Approximately 4 person hours was spent on this component of the survey.

All additional species not observed during the Biometric plots or August survey were recorded throughout the transect to supplement the existing random meander data.

Flora and vegetation condition assessment

Vegetation condition was rated according to the two point scale endorsed under the BioBanking Assessment Methodology Guidelines (DECC 2014). These are:

Low condition	For woody vegetation Native over-storey percentage of foliage cover is less than 25% of the lower value of the over-storey percentage of foliage cover benchmark for that vegetation type, and less than 50% of ground cover vegetation is indigenous. Natural native grassland Less than 50% of groundcover vegetation is indigenous species or more than 90% of the groundcover vegetation is cleared.
Moderate to good condition	Any native vegetation not in low condition.

Plant and community nomenclature

Vegetation communities in the study area have been categorised on the basis of their structure and formation using Specht (1970) classification, as well as the floristic composition of the site. The vegetation has been classified using the Plant Communities of the South Eastern Highlands and Australian Alps within the Murrumbidgee Catchment of New south Wales classification (OEH 2011), which provide the most recent and comprehensive classification for the study area. The equivalent Biometric vegetation types are also identified.

Botanical nomenclature follows Harden (1990-2002), with recent name changes provided by the Australian Plant Name Index of the Australian National Herbarium. Noxious weeds identified are those declared for the Cooma – Monaro Shire Council control area under the *Noxious Weeds Act 1993*.

In the body of this report, flora species are referred to by both their common and scientific names when first mentioned. Subsequent references to these species cite the common name only. Where a species does not have a generally accepted common name, the scientific name is used throughout the body of the report. Common and scientific names are included in the Appendices.

2.3.2 Fauna

A combination of targeted survey methods and opportunistic observations were used to survey for threatened species identified during the desktop assessment.

Striped Legless Lizard surveys

Surveys for the Striped Legless Lizard (*Delma impar*) were carried out using the artificial shelter methodology, involving the placement of concrete roof tiles on the ground to create artificial shelter sites. A total of seventeen tile arrays were installed across the site in September 2014 within the quarry development site and the proposed offset site. Tiles were checked for the presence of reptiles during

October, November and December 2014. The primary objective of the survey was to determine the presence or absence of the Striped Legless Lizard. The survey methodology was based on a combination of the following:

- Director General's Requirements
- OEH survey guidelines
- EPBC survey guidelines for the Striped Legless Lizard

The specific survey methodology was as follows:

1. A total of seventeen locations were chosen for tile arrays across the site within the most suitable habitat for the Striped Legless Lizard and across a range of vegetation types including grassy woodland and open native grassland. Seven array locations were selected within the development site, five situated in woodland and two within open grassland. Ten array locations were selected within the proposed offset site, with six of these situated in woodland and four in open grassland.
2. Artificial tiles were installed at each of the seventeen chosen locations on the 22nd and 23rd of September 2014. Tiles were installed in rectangular grids of 5 x 10 tiles (50 per array) with a spacing of 5-10m between tiles. A total of 850 tiles were installed across the entire site. (Refer to Appendix J for map of locations).
3. Each of the arrays were surveyed once per week for 10 weeks (10 surveys per array in total), with the first survey occurring on the 15th of October 2014 (approximately 3 weeks after tile installation). The tile surveys generally commenced at approximately 10:00am each morning, or earlier when possible. Surveys involved lifting each tile and checking for the presence or absence of the Striped Legless Lizard. Other fauna species occurring beneath the tiles (primarily reptiles and amphibians) were identified and recorded.
4. Each tile survey was undertaken by two persons. All surveys were led by an experienced ecologist, who was accompanied by a second assistant ecologist.
5. Surveys were not undertaken during high rainfall, or when the temperature exceeded 28°C (as per the EPBC Act guidelines). See Table 2-2 for the general weather conditions and temperatures during each survey.

Table 2-2: Prevailing weather conditions during each Striped Legless Lizard tile survey

Date	Time	Temperature recorded (min – max)	Cloud range	cover	Wind	Rain
15/10/2014	1100 - 1600	8 – 12°C	20 - 80%		Light - moderate	Drizzle
23/10/2014	1012 - 1402	20 – 26°C	Nil		Light	Nil
29/10/2014	1120 - 1431	19.9 – 25.6°C	Nil		Light	Nil
05/11/2014	1055 - 1600	20.9 – 25°C	70 - 100%		Moderate	Nil
10/11/2014	0835 - 1115	16.5 – 23°C	20 - 80%		Light	Nil
20/11/2014	1045 - 1340	24 – 30°C	50%		Light - moderate	Nil
26/11/2014	1040 - 1350	18 – 26°C	20%		Light - moderate	Nil
01/12/2014	0920 - 1200	23.0 – 28.5°C	Nil		Light - moderate	Nil
08/12/2014	0900 - 1200	23.0 – 25°C	10%		Light	Nil
18/12/2014	0920 - 1630	24 – 30°C	Nil		Light	Nil

Pink-tailed Worm-lizard and Little Whip Snake

Surveys for the Pink-tailed Worm-Lizard and the Little Whip Snake were carried out during November and December 2014 within suitable habitat inside the proposed quarry expansion sites. The general methodology for the surveys was as follows:

- Suitable habitats for these species were searched across the development site including rocky outcrops, loose surface rocks, fallen logs, timber and other debris. Searches involved rolling rocks, lifting logs, timber and debris and generally searching through grass tussocks. Searches were carried out by two staff; and experienced field zoologist and supporting ecologist.
- Rocks, timber and logs were carefully placed back into their original position after being searched.
- Any individuals found were identified and recorded.

Total survey effort totalled 6 person hours.

Table 2-3: Prevailing weather conditions during Pink-tailed Worm-lizard and Little Whip Snake surveys

Date	Location description	Time	Temp	Cloud cover	Wind	Rain
15/10/14	Around tile array #1	1545 – 1615	12°C	80%	Moderate	Nil
5/11/14	Around tile array #1 A large area south of tile array #1	1500 – 1700	24.5°C	60 – 70%	Light - moderate	Nil
20/11/14	a) Between tile array #2 and #6 b) Around tile array #1 to the south and east	a) 1015 – 1045 b) 1345 – 1415	a) 23°C b) 30°C	50%	Light - moderate	Nil

Grassland fauna habitat assessment

Grassland fauna habitat assessment (GFHA) was undertaken within the proposed extraction areas according to the draft methodology currently being developed by the NSW OEH. The OEH requested that these assessments be undertaken to better understand the habitats on site that are available for threatened grassland fauna such as the Golden Sun Moth, Striped Legless Lizard, Little Whip Snake and Pink-tailed Worm-lizard. Assessments were undertaken within areas of grassy woodland that were considered to have at least some potential to support threatened grassland fauna. The locations of the GFHA transects are shown on the biodiversity survey effort mapping in Appendix J (Grassland Flora Transects).

Bird utilisation surveys

Three bird utilisation surveys were undertaken within the quarry development site. The survey method used was a 2ha area survey of 20 minutes duration. One survey was undertaken in each of the following vegetation types occurring on site:

- **Survey site 1:** Ribbon Gum – Snow Gum grassy open forest – grassy (moderate to good quality)
- **Survey site 2:** Ribbon Gum – Snow Gum grassy open forest – shrubby – (moderate to good quality)
- **Survey site 3:** Ribbon Gum – Snow Gum grassy open forest – grassy (low quality)

The general methodology of the surveys was as follows:

- A suitable location was selected within each of the vegetation types.
- Parts of the area were slowly traversed on foot and birds were detected using visual and audible observations.
- Species detected within the 2ha search area, flying overhead and outside the search area were recorded. The number of individuals of each species was recorded, or estimated where exact numbers could not be determined.

Table 2-4: Prevailing weather conditions during bird utilisation surveys

Survey site	Date	Location description	Time	Temp	Cloud cover	Wind	Rain
1	10/11/14	Near tile array #8	0715 - 0730	13.8°C	5%	Nil	Nil
2	10/11/14	West of tile array #1	0740 - 0800	13.8°C	20%	Nil	Nil
3	10/11/14	North of tile array #2	0810 - 0830	13.5°C	50%	Nil	Nil

2.3.3 Nocturnal surveys

Two nocturnal survey sessions were conducted, one on 27 October and one on 9 November 2014. The October survey involved 2 person hours of stag watching and 0.75 person hours of active spotlighting. This work was undertaken by a team of four ecologists, spread out to observe separate stags (refer Appendix J). Two ANABAT units were also placed at selected sites and left overnight during the 27 October and 9 November survey occasions.

Table 2-5: Prevailing weather conditions during nocturnal surveys

Date	Temp	Wind	Relative humidity
27/10/14	11.5°C	Up to 20 km/h	53%
9/11/14	14.5°C	5-10 km/h	80%

2.4 LIMITATIONS

2.4.1 Flora

Most living flora species encountered at the site were able to be identified, enabling vegetation types and condition to be clearly defined. The spring timing of the survey was considered appropriate for detecting a high species diversity within the study area however, late spring and summer flowering species, and species difficult to identify in their vegetative state, are likely to have been overlooked. For example, late spring or summer flowering orchids would not have been detectable and a number of grasses that typically flower during late spring – summer were also not able to be conclusively identified.

2.4.2 Fauna

Most tile surveys did not commence earlier than 10:00 am due to travel times required for field staff to reach the site. Ideally, surveys would have commenced earlier in the morning to avoid higher

temperatures experienced during the early afternoon. Surveys were not undertaken during temperatures exceeding 28°C.

2.5 SPATIAL DATA COLLECTION

Hand-held Garmin GPS units were used to record spatial features during the survey such as hollow bearing trees and tile array locations. Data were plotted over aerial imagery (sourced from Esri and its distributors) using Esri's ArcGIS software for mapping, planning and presentation. Vegetation boundaries were extrapolated from field data. All map references are based on the GDA 94 datum MGA Zone 55.

The accuracy of GPS units is about three metres, but may be less in dense forest or on overcast days (both of which reduce satellite coverage). Therefore, the location of mapped hollow-bearing trees is approximate, showing the general vicinity where the tree was marked in the field.

3 RESULTS

3.1 SUMMARY OF THE LANDSCAPE CONTEXT

The proposal site is located approximately 12 km north of Cooma, on the western side of the Monaro Highway. The existing Bunyan Quarry sits centrally along the eastern edge of the study area. A smaller quarry is located within the proposed offset area.

The Murrumbidgee River, at its nearest point, is approximately 2 km to the west of the study area. No named or unnamed drainage lines occur within the development area or the offset area.

The study area is located within Residual Dromore soils of the Cooma landscape (Tulau, 1994). Land uses in the area are typically grazing and cropping with some farms utilising water from the Murrumbidgee River for irrigation. Grazing was observed in the offset area during field surveys. The paddock immediately south of the proposal is part of the NSW Travelling Stock Reserve network. To the north of the proposal, is the Canberra Gliding Club's facility.

3.2 LAND USE

The study area is zoned Rural and is dominated by rural residential properties and agricultural land uses. This includes sheep and cattle grazing; on multiple occasions sheep were observed within the proposed offset area.

3.3 VEGETATION COMMUNITIES AND HABITAT

3.3.1 Vegetation communities

Ribbon Gum – Snow Gum grassy open forest

A single native vegetation type, Ribbon Gum - Snow Gum tableland flats tall grassy woodland primarily on granitoids in the Kybean-Gourock and Monaro subregions of the South Eastern Highlands Bioregion (p220) (Ribbon Gum - Snow Gum tall open woodland), was found to occur across the broader site (refer to map in Appendix J and Figure 3-1). The equivalent Biometric vegetation type is Ribbon Gum - Snow Gum tall open woodland on flats and undulating hills of the eastern tableland, South Eastern Highlands.

The vegetation within the study area is characterised by the dominance of Ribbon Gum (*Eucalyptus viminalis*) in the overstorey with occasional Snow Gum (*E. pauciflora*) on the ridges and upper slopes with Snow Gum becoming co-dominant on the lower slopes and flats. A large proportion of the community across the site on the upper slopes and ridges contains a midstorey of sparse Native Blackthorn (*Bursaria spinosa* subsp. *lasiophylla*) and isolated Gruggly Bush (*Melicactus dentata*) and *Cassinia longifolia* whereas on the lower slopes shrubs are virtually absent except for scattered occurrences of Sweet Briar (*Rosa rubiginosa*), a declared noxious weed. These areas have been mapped separately on the maps in Appendix J.

The understorey throughout the study area is heavily dominated by African Lovegrass (*Eragrostis curvula*) along with patches and scattered occurrences of Serrated Tussock (*Nassella trichotoma*) and St John's Wort (*Hypericum perforatum*). More common exotic forbs make up the majority of the remaining understorey cover. Native understorey species were generally only detected within the paddock to the

west and south of the study area in which the western proposed extraction area occurs. Abundance of native grasses was generally low and native grass diversity was low however, a moderate diversity of forb species was detected in the western parts of the study area (Figure 3-2). Native grasses recorded included more disturbance tolerant species such as Weeping Grass (*Microlaena stipoides*), Corkscrew Grass (*Austrostipa scabra* subsp. *falcata*) and Wallaby Grass (*Rytidosperma* sp.) within the intertussock spaces between the Lovegrass. Common forb species observed included Common Woodruff (*Asperula conferta*), Bears Ear (*Cymbonotus preissianus*), Stinking Pennywort (*Hydrocotyle laxiflora*), Behr's Swainson-pea (*Swainsona behriana*), Common Bluebell (*Wahlenbergia communis*), Native Oxalis (*Oxalis perrenans*) and Common Everlasting (*Chrysocephalum apiculatum*). A full species list for the study area is included as Appendix C.

This community would meet the definition of the *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions*, which is listed as an EEC under the TSC Act.



Figure 3-1: Ribbon Gum – Snow Gum grassy open forest at the site



Figure 3-2: Native forbs (Common Woodruff, Clustered Everlasting and Behr's Swainson-pea) observed within the study area to the west of the existing quarry.

Vegetation condition

The majority of the Ribbon Gum - Snow Gum tall open woodland was considered to be in moderate to good condition according to the Biometric definitions based on the percent overstorey cover (refer to map Survey results in Appendix J of the Biodiversity Assessment Report). In two areas north and south of the existing quarry, there was evidence of clearing which had thinned the overstorey in these areas to the

point where it is considered to be in low condition. No areas of native dominated understorey were present.

Non-native grassland

Areas of Lovegrass dominated open grassland occur in the north, west and south-east sections of the study area (Figure 3-3) and is the dominant vegetation within the northern proposed extraction area. It is considered likely that areas of open grassland at the site are naturally treeless and would have once comprised a native grassland community. These grassland areas are now dominated by African Lovegrass, Serrated Tussock and a range of exotic forb species. No native forbs were detected within these areas and native grasses were restricted to isolated occurrences of Weeping Grass and Wallaby Grass however, these species were not present within the proposed extraction areas. These areas are considered to be degraded to the extent where they no longer comprise native grassland and are considered to be exotic dominated grasslands with little to no native component. It is likely that these areas have been subject to pasture improvement practices in the past such as seeding with Clover (**Trifolium* spp.) and fertiliser application.



Figure 3-3: Exotic dominated grassland within the study area

3.3.2 Flora species

A total of 87 flora species were recorded within the study area. These included 45 native species and 42 introduced species. A full species list of all flora species recorded during the field survey is provided in Appendix C of this report.

3.3.3 BioBanking plots

The results of the BioBanking plots are included in Appendix D of the Biodiversity Assessment Report. These results reflect the poor quality and disturbance history of the vegetation with the majority of the variables outside of the benchmark values¹ for the community within the study area. Abundance scores for species recorded within each plot are included in Appendix C of the Biodiversity Assessment Report.

¹ Benchmark values are provided by the NSW OEH and reflect the BioBanking variables that are expected to be obtained in a particular vegetation type that is in near natural condition.

3.3.4 Weeds and disturbance

Native forest and woodland vegetation within the study area have been cleared and thinned to provide pasture for grazing. Clearing and agriculture has produced a range of direct and indirect impacts to native flora habitats, including altered microclimate, loss of pollinator and dispersal fauna and the introduction of invasive species.

Agricultural activities within the study area and the locality have resulted in the colonisation of a range of introduced plant species, with greatest displacement of natives. In pasture areas, grazing is likely to have reduced or eliminated selectively grazed or grazing sensitive species, such as Kangaroo Grass (*Themeda australis*), terrestrial orchids, wattles and pea shrubs.

Minor pasture weed species were common across the majority of the study area. Several noxious weeds declared for the Cooma - Monaro Shire Council Area under the *Noxious Weeds Act 1993* were recorded within the study area. The status and distribution of these weeds at the site are summarised in Table 3-1.

All of the recorded noxious weeds are listed as Class 4 weeds, meaning that the growth and spread of the plant must be controlled according to the measures specified in a management plan published by the local control authority.

Table 3-1: Noxious weeds at the subject site

Weed species	Status	Abundance and distribution
African Lovegrass * <i>Eragrostis curvula</i>	Class 4	Extensive across the study area
Scotch Thistle * <i>Onopordum acanthium</i>	Class 4	Scattered within the low condition Ribbon Gum – Snow Gum grassy open forest
Serrated Tussock * <i>Nassella trichotoma</i>	Class 4	Scattered across the study area with occasional denser patches
St John's Wort * <i>Hypericum perforatum</i>	Class 4	Scattered across the study area but more common to the south of the existing quarry
Sweet Briar * <i>Rosa rubiginosa</i>	Class 4	Scattered individuals across the study area



Figure 3-4: Serrated Tussock, African Lovegrass and St John's Wort (dying off) within the study area

3.3.5 Threatened ecological communities

Background searches revealed a total of seven threatened ecological communities that may have the potential to occur in the study area, with five communities highlighted by OEH Wildlife Atlas Database,

and four communities highlighted by the Commonwealth Protected Matters Search Tool (noting that some communities are listed under both the TSC Act and the EPBC Act).

A single threatened ecological community listed under the TSC Act was identified within the study area, the above-mentioned *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions*. (This community is not listed under the EPBC Act. The NSW Scientific Committees determination for this EEC is not clear on the levels of degradation required for the community and while a native understorey is virtually absent across the site, there are areas containing a native shrub layer and isolated patches of native groundcover species. The vegetation at the site is therefore considered to comprise the EEC in a highly degraded state.

As discussed above, areas of grassland at the site are likely to be naturally occurring and was once native dominated but have since been degraded through grazing and weed invasion to the extent that they are now exotic dominated with little to no native component. Natural Temperate Grassland is listed as an EEC under the EPBC Act, however, sites that are considered to comprise the EEC are sites that clearly demonstrate the natural ecological functions of grasslands, or which can recover these functions. As stated in the Department of Environment Species Profile and Threats Database for this EEC “*The listed Natural Temperate Grassland ecological community does not include grassland where 50% or more of the total plant cover is dominated by perennial exotic species and there is a low diversity of native forbs or the native forb component (including soil seed reserves) is not sufficient to re-establish the characteristic native groundcover*”. The exotic dominated grassland at the site is therefore not considered to comprise the listed community.

3.3.6 Threatened flora species

Background searches produced a total of six threatened flora species with potential to occur in the study area, with the OEH Wildlife Atlas Database identifying one species and the Commonwealth Protected Matters Search Tool identifying six species.

The habitat evaluation included as Appendix G identified suitable habitat within the study area for one threatened flora species; the Mauve Burr Daisy (*Calotis glandulosa*). This species is known to occur in degraded habitats including those infested with African Lovegrass. In addition marginal habitat was identified for Creeping Hop-bush (*Dodonaea procumbens*) and Monaro Golden Daisy (*Rutidosia leiolepis*) and Silky Swainson-pea (*Swainsona sericea*). Targeted surveys failed to detect any of these species within the study area.

The habitat evaluation concluded that no other threatened species are considered likely to occur within the study area due to the:

1. Absence of required abiotic habitat features
2. Absence of associated vegetation communities or flora species
3. Highly restricted nature or lack of nearby (within 10 km) records of the species

3.3.7 Groundwater dependant ecosystems

Groundwater dependent ecosystems (GDEs) are ecosystems which have their species composition and their natural ecological process determined by groundwater (NOW 2002). There are several types of GDE with six types conventionally recognised in Australia (NWC 2013):

- Terrestrial vegetation that relies on the availability of shallow groundwater

- Wetlands such as paperbark swamp forests and mound springs ecosystems
- River base flow systems where a groundwater discharge provides a base flow component to the rivers discharge
- Aquifer and cave ecosystems where life exists independent of sunlight
- Terrestrial fauna, both native and introduced, that rely on groundwater as a source of drinking water
- Estuarine and near shore marine systems, such as some coastal mangroves, salt marshes and sea grass beds, which rely on the submarine discharge of groundwater.

It is unlikely that the terrestrial vegetation within the study area depends on groundwater resources. The vegetation across the study area is widespread at higher elevations remote from water courses and persists in dry environments.

There are no wetlands, estuarine or nearshore systems within the study area and it is considered unlikely that aquifer or cave systems occur that support life independent of sunlight. There are no watering points for fauna within the study area that are dependent on groundwater.

Given the above, groundwater dependent ecosystems are not considered to occur within the study area.

3.4 FAUNA

3.4.1 Fauna species recorded

47 fauna species were recorded during the field survey including:

- Five amphibians
- 20 birds
- Four mammals and one monotreme
- Nine microbats
- Eight reptiles

A complete fauna species list is provided in Appendix E of the Biodiversity Assessment Report. The species records include a mix of native and non-native common species. Of these recorded species, one species, the Eastern Bentwing-bat (*Miniopterus schreibersii*) is listed as vulnerable under the TSC Act.

Exotic species such as European Rabbits and European Red Foxes are likely to be common across the landscape. Noisy Miners were observed in the southern section of the study area adjacent to an old NSW Roads and Traffic Authority (now Roads and Maritime Services) quarry (refer to survey results map in Appendix J). Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners is a Key Threatening Process (KTP) listed under the TSC Act.

3.4.2 Fauna habitat

The proposal site contains a predominantly woodland ecosystem, inter-mixed with isolated rocky outcrops, sections of open grassland and habitat features including man-made dams. Mature Snow Gums (*E. pauciflora*) are the dominant overstorey species. Two stick nests were observed within the tree canopy. Fallen timber is common within the proposal site, and likely provides habitat for a range of fauna, including skinks, snakes, birds, and ground-dwelling mammals. The flat and sloping drainage areas and dams are scattered throughout study area and likely provide habitat for a number of common and widespread frog species. In general, fauna habitat quality within the proposal site is considered to be

moderate to high, given the presence of mature hollow-bearing trees, fallen timber, and native ground cover.

3.4.3 Hollow-bearing trees

34 hollow bearing trees (HBTs) were recorded during the surveys within the subject site and surrounds; 11 trees occur within the proposed expansion area, 2 occur in the existing quarry footprint and 18 in the surrounding area being considered as an offset site. Three trees are located to the north of the site and would not be impacted by the development (Refer Appendix J of the Biodiversity Assessment Report)

The trees inspected provided a variety of hollow sizes suitable for use by a number of fauna species including microbats and birds. A hollow-bearing tree inventory is included in Appendix K of the Biodiversity Assessment Report.

3.4.4 Grassland fauna habitat assessment

Four GFHA's were conducted within the proposed extraction areas (refer to map in Appendix J of the Biodiversity Assessment Report). The full results of the GFHA's are included as Appendix F of the Biodiversity Assessment Report. The results indicated that the site is unlikely to contain quality habitat for species such as the Golden Sun Moth, Striped Legless Lizard, Little Whip Snake and Pink-tailed Worm Lizard. Tile plot surveys and an additional 6 person hours reptile survey failed to detect any of these species.

3.4.5 Threatened fauna species recorded

The Eastern Bentwing-Bat was detected at the site during the time of the ANABAT surveys.

One stick nest was observed during the site inspection (refer Appendix J of the Biodiversity Assessment Report for location) and subsequent visits to the site by CMSC environmental representative recorded a second nest, approximately 50 metres south-west. Whilst not observed onsite, the nests are assumed to belong to a breeding pair of the Little Eagle (*Hieraaetus morphnoides*) given their open shape and form. New green leaves were observed in one nest, indicating the nest is active.

No other threatened fauna species, listed under either of the TSC Act or the EPBC Act were recorded during field surveys within either the proposed development area or offset area. This included from targeted Striped Legless Lizard surveys.

Threatened terrestrial fauna with the potential to occur

NSW Wildlife Atlas database searches for threatened species listed on the TSC Act identified seven bird species, one mammal, one reptile and one amphibian species within 10 km of the subject site (Appendix B of the Biodiversity Assessment Report). The Commonwealth Protected Matters Search Tool identified four bird, three fish, two amphibian, four mammal, three reptile and 11 migratory bird species with the potential to occur within 10 km of the subject site.

An assessment of each of these species and their likelihood of utilising the study area was undertaken and is included as Appendix G of the Biodiversity Assessment Report.

For the majority of species it was considered that, based on a preliminary assessment of the habitat present within the study area and each species habitat requirements, significant impacts were not likely.

For other species however, such as the Striped Legless Lizard, further field surveys were undertaken (as described in Section 2.3.2) to inform the assessment.

The majority of threatened species identified during the database searches are highly mobile and are most likely to utilise the site for foraging only. The threatened species habitat evaluations (presented in full in Appendix G of the Biodiversity Assessment) determined that a low risk of impact exists for these threatened fauna (excepting the Little Eagle) as a result of the proposed works. This is a result of the:

1. Small number of hollows at the site
2. Disturbed nature of much of the understorey
3. Reduced connectivity to other areas of habitat which makes the site less than ideal habitat for any threatened species.

While threatened species may utilise the site on occasion, they are unlikely to rely on the site, particularly for breeding, and are therefore highly unlikely to be adversely affected by the proposed works. The exception to this is the Little Eagle. Breeding habitat may be removed. An Assessment of Significance (AoS) was completed (Appendix H of the Biodiversity Assessment).

3.4.6 Migratory species

No EPBC-listed migratory species were recorded during the field surveys. Habitat evaluations (Appendix G of the Biodiversity Assessment) however, identified that there is potential for six species to occur within the study area on occasion:

- Fork-tailed Swift (*Apus pacificus*)
- White-throated Needletail (*Hirundapus caudacutus*)
- Rainbow Bee-eater (*Merops ornatus*)
- Black-faced Monarch (*Monarcha melanopsis*)
- Satin Flycatcher (*Myiagra cyanoleuca*)
- Rufous Fantail (*Rhipidura rufifrons*)

These species are all widespread and have broad habitat requirements. The Fork-tailed Swift and White-throated Needletail do not breed in Australia and are almost exclusively aerial. Important breeding sites for the Cattle Egret occur further north (between Newcastle and Bundaberg). The Black-faced Monarch and Satin Flycatcher prefer dense habitats (rainforest or heavily vegetated gullies) and would only occur at the site very occasionally to forage. The Rainbow Bee-eater is distributed across much of mainland Australia and occurs in a wide range of habitats.

While these species may utilise the site on occasion, they are unlikely to rely on the site, particularly for breeding, and there is an abundance of good quality and contiguous habitat in the nearby national parks. For these reasons, these species are highly unlikely to be adversely impacted by the proposed works and an assessment under the EPBC Act significant impact criteria is not required.

3.5 CRITICAL HABITAT

The study area does not contain any areas that have been declared as critical habitat under either the TSC Act or EPBC Act.

3.6 WILDLIFE CONNECTIVITY CORRIDORS

Wildlife corridors are generally defined as a link of habitat between two or more larger areas of wildlife habitat. Corridors are critical for the maintenance of ecological processes. They allow for the movement of animals and the continuation of viable populations. For example, they may facilitate genetic exchange between local populations and thereby protect populations from inbreeding or events such as disease, bushfire, or other events that could threaten an isolated population with localised extinction. The width and structure of corridors is specific to the species utilising them. Corridors are less important for wide-ranging, highly mobile species; and more important for species such as frogs, reptiles and small mammals.

There is limited woodland or midstorey connectivity to other areas of habitat from the proposed development and adjoining offset area because of the cleared agricultural land that is prevalent throughout the surrounding landscape. The proposal area is located within a patch approximately 110 hectares in size which has no connectivity to the east, north or west and only limited connectivity to the south through a narrow (approximately 200 metres wide) thinned woodland corridor which links to more extensive habitat to the west. The proposal would not impact on this corridor and given the extensive clearing on the other sides of the proposal, would not further fragment or isolate areas of habitat.

Species that would currently utilise the study area must already be tolerant of a level of habitat fragmentation and are more likely to be highly mobile, wide ranging species.

3.7 SEPP 44 - KOALA HABITAT PROTECTION

A single species of Koala feed tree listed under Schedule 2 of SEPP 44 was recorded within the subject site; Ribbon Gum (*Eucalyptus viminalis*). The Ribbon Gum is also considered a primary feed species in the Recovery plan for the Koala (DECC 2008). This species was relatively common throughout the proposal site, including the offset area.

There are scattered records of Koalas in the Southern Tablelands, including some north-east of Cooma (DECC 2008). No signs of Koala, either actual observations, scratching or scats, were observed during the field survey. Given the open and isolated nature of the proposal site, it was considered unlikely that Koalas are present in the proposal area or nearby surrounds.

4 POTENTIAL IMPACTS

The expansion of the Bunyan Quarry would have a number of impacts on the vegetation and habitat values of the study area. The most substantial of these is the removal of native vegetation and its associated habitat values provided (mainly) from mature trees. These trees provide foraging habitat and refuges (e.g. hollows) for native fauna. Native vegetation clearing and loss of hollows are listed as a Key Threatening Processes in NSW.

The proposal may also impact upon the abundance and distribution of weeds, in particular the four noxious species, recorded within the study area. Specifically, the proposal has the potential to spread environmental weeds to and from the study area.

There is also potential for the spread of pests and pathogens. Creating suitable habitat for introduced fauna species to occupy and dominate, and introducing fungal spores (such as in mud on tyres of machinery) may result in detrimental effects on the local biodiversity.

These potential impacts are discussed in more detail below.

4.1 LOSS OF NATIVE VEGETATION AND HABITAT

Direct impacts to native vegetation and habitat will result from the clearing of areas to facilitate the extraction of the underlying material. The extent and estimated loss of habitat within the subject site is summarised in Table 4-1. This is the total amount of vegetation required to be cleared, including access tracks.

Table 4-1: Extent and estimated loss of vegetation communities and habitat features within the study area

Vegetation community	Threatened Ecological Community?	Condition	Area of vegetation estimated to be removed (ha)
Disturbed	No		3.07
Exotic grassland	No		4.29
Ribbon Gum - Snow Gum tall open woodland - grassy - low	Yes	Low	5.15
Ribbon Gum - Snow Gum tall open woodland - grassy - moderate to good	Yes	Moderate to good	0
Ribbon Gum - Snow Gum tall open woodland - shrubby - moderate to good	Yes	Moderate to good	6.73
Total area (ha) of native vegetation to be removed in the development area			11.88

4.1.1 Impacts to vegetation of conservation significance

As discussed above, the Ribbon Gum – Snow Gum grassy open forest to be impacted meets the definition of the *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions*, EEC listed under the TSC Act. An assessment of significance (seven – part test) was carried out for this community to determine the significance of the impacts (refer to Appendix H of the Biodiversity Assessment Report and

summary in Section 5). This assessment concluded that the proposal will result in the clearing of up to 11.88 hectares of the EEC, all of which is heavily infested with African Lovegrass and 5.15 hectares is in low condition. The remaining 6.73 hectares is in moderate to good condition on the basis of overstorey cover only. The proposal would reduce the size of the patch but would not result in any substantial additional local fragmentation or isolation of habitat for the EEC as the works would represent an extension of the existing quarry into nearby surrounding agricultural areas. The habitat to be removed is not considered important to the long-term survival of the community in the locality given the high levels of degradation and that approximately 96 hectares of the local occurrence will remain, 45 hectares of which exhibits a degree of native understorey diversity similar to the moderate to good condition vegetation within the proposal area. Furthermore, 65 hectares of this remaining area will be protected as an offset for the proposal.

With the implementation of the mitigations measures recommended in this assessment, the proposal is not expected to significantly contribute to any KTPs relevant to the EEC.

A significant impact to the *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions* EEC is considered unlikely as a result of the proposal.

4.1.2 Impacts to fauna of conservation significance

The proposal would result in the removal of two nest trees which are currently assumed to be being used by the Little Eagle. An assessment of significance (seven – part test) was carried out for this species to determine the significance of the impacts (refer to Appendix H of the Biodiversity Assessment Report and summary in Section 5). This assessment concluded that the proposal will result in the clearing of up to 11.88 hectares of the woodland vegetation that provides suitable breeding and foraging habitat to the species. Connectivity of habitat patches in the landscape would not be greatly altered by the works for this species, as the works would represent an extension of the existing quarry into nearby surrounding agricultural areas. The ability of the some native fauna to utilise the study area as a ‘stepping stone’ to move between such patches may, however, be removed. Species that would currently use the corridor must already be tolerant of a level of fragmentation and are more likely to be highly mobile, wide ranging species. As such, the removal of habitat is unlikely to significantly isolate or fragment the site from other areas of habitat to the extent that species currently using the corridor, including the Little Eagle, would be adversely affected. The proposal would not result in any substantial additional fragmentation or isolation of habitat for the species.

The habitat to be removed is not considered important to the long-term survival of the local population in the locality given the high mobility of the species and the ability of the species to use different nest sites over successive years. Approximately 96 hectares of the local occurrence of woodland vegetation will remain, with 65 hectares of this remaining area to be protected as an offset for the proposal. Mitigation measures have been included in this report to further minimise risks to this species.

With the implementation of the mitigations measures recommended in this assessment, the proposal is not expected to significantly contribute to any KTPs relevant to the species. A significant impact to the Little Eagle is considered unlikely as a result of the proposal.

The Eastern Bent-wing bat utilises caves, derelict mines, storm-water tunnels, buildings and other man-made structures for roosting habitat. At non-breeding times, it is known to disperse within about 300 kilometre range of their maternity cave and generally prefers foraging in forest habitat. There are no other records of the Eastern Bent-wing bat within 10 km of the subject site. Potential impact of the

proposal on this species is low, given there is no breeding habitat for this species present at the site, marginal foraging habitat and their large home range. No assessment of significance was prepared for this species. A generic hollow bearing tree removal protocol is provided that would reduce risks to roosting

4.2 LOSS OF HOLLOW-BEARING TREES

A total of 34 hollow-bearing trees were recorded within the subject site and surrounds, most of which were large, mature trees. Up to 11 of these trees will be removed to facilitate the quarry expansion. This number is a reduction on the previously proposed 21 hollow-bearing trees for removal. The location of the identified HBT's is shown in the Survey Results map at Appendix J. A HBT inventory is included in Appendix K of the Biodiversity Assessment Report.

No threatened hollow-dependant fauna species were observed during the field survey. Species including the common Brushtail Possum (*Trichosurus vulpecula*) were observed during the spotlighting survey, however they were not observed in any of the trees within the subject site. Hollow-dependant avifauna and microbats may also be utilising these hollow-bearing trees. No hollow-dependant threatened species were found during the field survey. The loss of up to 11 hollow-bearing trees within the development area is therefore not considered to be a significant impact as:

- a) No hollow-dependant threatened fauna were identified during the field survey, and
- b) A large number of hollow-bearing trees are present and would remain untouched in the offset area.

4.3 WILDLIFE CONNECTIVITY AND HABITAT FRAGMENTATION

Given the proposal area is already somewhat isolated from surrounding areas of intact woodland/grassland habitats, additional impacts to wildlife connectivity and habitat fragmentation as a consequence of this proposal are not anticipated.

4.4 INJURY AND MORTALITY

The proposal considered in this BA does have the potential to increase the risk of injury and mortality to fauna during construction, specifically as a result of vegetation removal. Many smaller and more common species such as skinks and frogs are difficult to locate or remove during pre-clearing surveys. It is likely there will be some loss of individuals from these populations. There is also the potential for hidden hollows to be present in the forks of large trees, in which bats or birds may occur. Injuries or fatalities to native fauna during the clearing process may arise from such situations.

Included in this report are mitigation measures in section 6.1 that would avoid where possible and reduce injury and mortality to native fauna.

4.5 WEEDS, PESTS AND PATHOGENS

Spread of the five Class 4 noxious weed species observed in the study area may occur during vegetation removal and movement of vehicles and machinery into or out of the site. Weeds are easily transported as seeds and propagules on machinery brought to the site. Equally, they can be carried away to other areas from this site. Given the high levels of infestation of African Lovegrass and Serrated Tussock at the site,

there is a high potential for these species to be spread to offsite areas. Strict weed control protocols have been recommended in Section 6 to minimise this risk.

The removal of vegetation as a result of clearing has the potential to attract European Rabbits (*Oryctolagus cuniculus*) to the study area and increase soil erosion. Competition and grazing by the feral European Rabbit is listed as a KTP under the TSC and EPBC Acts. Regeneration and revegetation with native vegetation in disturbed areas following extraction activities is important in minimising these impacts and has been recommended (refer to Chapter 6 for further details).

Several pathogens in NSW have the potential to impact on the environment and biodiversity. These may be introduced and spread on machinery that are used for earthworks and extraction activities. Pathogens that have the potential to be introduced and spread during the proposed works include but are not limited to:

- Phytophthora (*Phytophthora cinnamomi*)
- Fusarium wilt/Panama disease (*Fusarium oxysporum*)

Infection of native plants by Phytophthora is listed as a KTP under both the TSC Act and EPBC Act and is discussed further below.

4.6 IMPACT ON RELEVANT KEY THREATENING PROCESSES

Eight key threatening processes have been identified as relevant to the possible works and are outlined below.

Table 4-2: Relevant key threatening processes

Key Threatening Processes (KTPs)		
TSC Act	EPBC Act	Relevance
Clearing of native vegetation	Land clearance	The proposal will involve clearing of native vegetation, but this is not considered to contribute significantly to the operation of clearing as a threatening process at the local or regional level, relative to the extensive clearing that has already taken place in the locality. Aside from the direct habitat loss of approximately 11.88 hectares of degraded habitat that is considered unlikely to provide important habitat for threatened species (aside from the Little Eagle, which has been separately assessed), the proposal will not result in habitat fragmentation or isolation and is unlikely to disrupt gene flow or have offsite impacts. An offset commitment would ensure nearby areas retain and increase habitat in the locality.
Loss of hollow-bearing trees		Up to 11 hollow-bearing trees may be removed as a result of the proposal. Clear boundary demarcations, an exclusion zone and tree protective zones have been recommended to be put in place prior to construction to ensure that over-clearing does not occur.
Removal of dead wood and dead trees		Dead wood not overly abundant within the proposal area given the open woodland nature of the landscape. All dead wood and fallen timber therefore is important and should be collected and placed within the offset area.
Infection of frogs by amphibian chytrid causing the disease chytridiomycosis	Infection of amphibians with chytrid fungus resulting in chytridiomycosis	The inadvertent transport of infected material between sites is known to spread chytrid fungus. Whilst no threatened frogs were identified during the field survey, five species of native frogs were.

Key Threatening Processes (KTPs)		
TSC Act	EPBC Act	Relevance
Invasion of native plant communities by exotic perennial grasses		A number of exotic perennial grasses were recorded across the site. African Love Grass and Serrated Tussock are dominant across the site. Other species such as Chilean Needle Grass, Parramatta Grass, Paspalum and Phalaris could be introduced on vehicles and machinery used on the site during construction and operation but given the current dominance of African Lovegrass, this is would be unlikely to exacerbate this process within the study area. There is a high potential for exotic perennial grasses that occur within the study area to be spread off site to other areas containing native plant communities. Strict weed control measures have been recommended as part of this assessment and if followed this risk is considered to be manageable.
Competition and grazing by the feral European Rabbit (<i>Oryctolagus cuniculus</i>)	Competition and land degradation by rabbits	Disturbance to vegetation and any earthworks may provide suitable habitat and attract this species to or increase its abundance within the study area.
Infection of native plants by <i>Phytophthora cinnamomi</i>		No evidence of <i>Phytophthora cinnamomi</i> was observed during the field survey but the pathogen is well established in higher rainfall areas; therefore, there is the potential for its introduction. With adherence to the machinery hygiene protocols recommended in this assessment, it is considered unlikely that the proposal would contribute to this KTP.
Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners <i>Manorina melanocephala</i>		Noisy Miners were observed in the south of the study area and it is likely this KTP is already in operation at the site. Given the existing high levels of clearing and disturbance, the proposal is unlikely to create any additional edge habitat that is favoured by this species. Noisy Miners are unlikely to increase at the site as a result of the proposal.

4.7 CUMULATIVE IMPACTS

As the study area is located in a predominately rural region, with agriculture, national parks and nature reserves as dominant land uses, the number of developments currently occurring in the local area surrounding the site is relatively low. There are no other known large scale developments occurring in the region that are considered relevant to the proposed expansion of the quarry in terms of cumulative environmental impacts. The clearing of native vegetation, which is a key threatening process at both State and Commonwealth level, is considered a major factor in the loss of biological diversity. At least 61% of the native vegetation in NSW has been cleared or highly modified since European settlement, and the removal of vegetation for this proposal is contributing to this process, although that contribution is relatively minor relative to the extent of clearing that has occurred in the surrounding landscape. The loss of large habitat trees or hollow-bearing trees is a long-term environmental cost of such projects, as these features of the environment can take well over 100 years to form (Mackowski 1984; Wormington & Lamb 1999). Up to 21 such trees may be removed for this project as discussed in Section 4.1.2.

5 ASSESSMENTS OF SIGNIFICANCE (AOS)

An AoS was conducted for the following communities and species:

- *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions*
- Little Eagle

The assessments were conducted to characterise the significance of potential impacts on this community and species and determine whether impacts could be mitigated sufficiently or whether a Species Impact Statement (SIS) and further assessment may be required. The results of the assessment are summarised in Table 5-1 and provided in full in Appendix H of the Biodiversity Assessment Report.

Table 5-1: Summary of Assessments of Significance (AoS)

TSC Act significance assessments								
Threatened species, or communities	Significance assessment question ¹							Likely significant impact?
	a	b	c	d	e	f	g	
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions	NA	NA	N	N	NA	NA	N	No. A species impact statement is not considered to be required for this community
Little Eagle	N	NA	NA	N	NA	NA	N	

Notes: Y= Yes (negative impact), N= No (no or positive impact), NA= not applicable, ?= unknown impact.

1. Significance Assessment Questions as set out in the *Threatened Species Conservation Act 1995/ Environmental Planning and Assessment Act 1979*.
 - a in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,
 - b in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction,
 - c in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:
 - (i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
 - (ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,
 - d in relation to the habitat of a threatened species, population or ecological community:
 - (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, and
 - (ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and
 - (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality,
 - e whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly),
 - f whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,
 - g whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

6 MANAGING POTENTIAL IMPACTS UPON BIODIVERSITY

6.1 MITIGATION MEASURES

A number of recommendations are listed below (Table 6-1) ensure that the potential impacts identified in this assessment are adequately managed (that impacts are avoided, or minimised wherever possible).

Table 6-1: Mitigation measures designed to minimise environmental damage during construction

Impact	Mitigation measures	Responsibility	Timing
Clearing and prevention of over-clearing	- Prior to the commencement of clearing, a physical vegetation clearing boundary at the approved clearing limit is to be demarcated and implemented. The delineation of such a boundary may include the use of temporary fencing, flagging tape, parawebbing or similar - Areas of vegetation would be progressively cleared as extraction progresses up to a maximum of 2 hectares at a time. - The vegetation clearing guidelines included as Appendix I would be adhered to during clearing activities. - Avoid clearing identified Little Eagle nest tree during breeding season unless surveys demonstrate the tree is not part of breeding habitat for the Little Eagle at the time of clearing. A 50m buffer would be placed on an active Little Eagle nest, with a restriction of all quarry activities in this buffer during the breeding season.	CMSC	Construction and operation
Damage to native vegetation outside of impact zone	Stockpiling of extracted material and the parking of equipment and vehicles would be restricted to extraction areas only.	CMSC	
Removal of hollow-bearing trees	- Removal of hollow bearing trees would be avoided where possible. - Hollow-bearing trees that must be removed would be removed according to the vegetation clearing guidelines included as Appendix I.	CMSC	Construction and operation
Erosion	Erosion controls would be put in place on the upslope of works to prevent soil and debris travelling downslope.	CMSC	Construction and operation

Impact	Mitigation measures	Responsibility	Timing
Introduction and spread of noxious weeds and pathogens	- A Weed Management Plan would be developed for the sites to prevent/minimise the introduction of additional weeds to the site and the spread of weeds offsite. - Declared noxious weeds would be managed according to the requirements stipulated by the <i>Noxious Weeds Act 1993</i>, and any weed removal activities would be in accordance with CMSC control plans for each noxious weed. - Regular targeted control of all noxious weeds would take place during construction and operation to manage noxious weeds. CMSC would routinely spray a 20 metre buffer area around internal tracks and stockpiled sites to prevent weed spread. - All plant material containing seed heads, weeds that have allopathic properties, and weeds that are able to reproduce vegetatively (e.g. Wandering Jew and Willows), including topsoil containing weed propagules, would be disposed of at an appropriate waste management facility or otherwise properly treated to prevent weed growth and reused in rehabilitation activities on site. - All pesticides would be used in accordance with the requirements on the label. Any person undertaking pesticide (including herbicide) application would be trained to do so and have the proper certificate of completion/competency or statement of attainment issued by a registered training organisation. - Establish a machinery hygiene plan to ensure vehicles and machinery are free of organic matter or soil that may contain fungal pathogens pre- and post-site access.	CMSC	Construction and operation
Disturbance to fallen timber, dead wood and bush rock	Any fallen timber, dead wood and bush rock (if present) encountered within extraction area would be relocated to a suitable place nearby outside of proposed extraction areas.	CMSC	Construction and operation

6.2 OFFSET STRATEGY

The proponent should offset all permanent removal of native vegetation in perpetuity, prior to impacts occurring. A preliminary offset strategy to offset the impacts from the proposal on local biodiversity has been prepared and is included in Appendix D of the Environmental Impact Statement. The preliminary strategy outlines the landscape and habitat values present in the proposed offset area that surrounds the proposal and indicates that there is potential for the proposed offset area to largely satisfy the requirements, however active improvements such as weed control would be required. Consultation with OEH has confirmed of the suitability of the proposed offset site.

6.3 POST-OPERATION REHABILITATION

Following the operational phase of the project, a rehabilitation plan would be implemented to stabilise the site and ensure that ongoing impacts to biodiversity are prevented or minimised. The plan would aim to provide a stable land form resistant to erosion and weed infestation. A preliminary rehabilitation plan post operation has been prepared and is outlined in Appendix A of the Environmental Impact Statement.

7 CONCLUSION

Cooma Monaro Shire Council are proposing to expand their extraction areas at the existing upper Bunyan gravel pit to secure source material for the ongoing maintenance and upkeep of local road infrastructure.

A field survey to assess the biodiversity values of the study area identified a single native vegetation community; Ribbon Gum - Snow Gum tall open woodland which covers the majority of the study area along with large areas of exotic dominated grassland. The woodland within the study area is highly degraded being heavily infested with the noxious weed African Lovegrass however, is considered a threatened ecological community under the TSC Act. An assessment of significance concluded that a significant impact to this community is unlikely. No individual threatened flora species were recorded within the study area nor are any considered likely to occur.

The field survey recorded the presence of the threatened Eastern Bentwing-bat and assumed presence of the Little Eagle. Potential impact to the bat is considered low given the lack of suitable breeding habitat at the site, marginal foraging habitat and large home range. An assessment of significance was not deemed necessary for this species. An assessment of significance was prepared for the Little Eagle and concluded a significant impact on the species is unlikely. Mitigation measures have been developed to reduce risks however, to threatened species and habitat, where possible.

While other threatened and migratory fauna species may utilise the site on occasion, they are unlikely to rely on the site, particularly for breeding, and there is an abundance of higher quality and more contiguous habitat in the nearby national parks. A comprehensive field survey to identify threatened reptiles did not locate any threatened species.

Connectivity of habitat patches in the landscape would not be greatly altered by the works, as the works would represent an extension of the existing quarry into nearby surrounding agricultural areas. The ability of some native fauna to utilise the study area as a 'stepping stone' to move between such patches may be removed. Species that would currently use the corridor must already be tolerant of a level of fragmentation and are more likely to be highly mobile, wide ranging species. As such, the removal of habitat is unlikely to significantly isolate or fragment the site from other areas of habitat to the extent that species currently using the corridor would be adversely affected.

A number of mitigation measures have been provided in the report to prevent undue damage to the surrounding environment, and include strategies to manage noxious weeds, prevent over-clearing, prevent excessive disturbance to habitat features, and revegetate the road reserve after construction activities. Considering that a large proportion of the impact area includes exotic species, post works vegetation restoration provides an opportunity to improve the overall quality of native vegetation on the site over the longer term.

8 REFERENCES

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APPENDIX A ASSESSMENT PERSONNEL

Alana Gordijn – Field support fauna ecologist: Alana is an experienced environmental professional who has participated in numerous targeted species surveys relevant to this biodiversity assessment. Alana holds a Bachelor of Science from the Australian National University.

Brooke Marshall – Project manager and senior review: Brooke is the manager of NGH Environmental South East NSW and ACT. She has extensive experience in organising, conducting and managing biodiversity assessments.

Chris Jolly – Fauna ecologist (sub-contractor): Chris is an experienced fauna ecologist currently undertaking post-graduate studies at the University of NSW.

Dave Maynard – Botanist, senior consultant and author: Dave is a senior ecologist specialising in botany. He has extensive experience conducting botanical surveys throughout NSW. Dave holds a Bachelor of Science from the University of NSW. Dave has prepared the botanical portions of this biodiversity assessment.

George Madani – Senior fauna ecologist (sub-contractor): George is a senior wildlife ecologist with an extensive background in wildlife ecology with ten years of field survey skills and practical research and applied management experience. Holds Bachelor and Master level qualifications in zoology from the University of NSW.

Jane Blomfield – Field support fauna ecologist and GIS: Jane has a Bachelor of Environmental Science from Charles Sturt University and is currently completing a Master of Environmental Management. She has prepared a number of biodiversity assessments and environmental impact assessment projects.

Nathaniel O'Rourke – Fauna ecologist and biodiversity assessment author: Nathaniel holds a bachelor degree in Environmental Science and a Master of GIS and Remote Sensing. He has worked on a number of biodiversity assessments involving fauna surveys and targeted species searches.

Richard Sharp, FEIANZ, CEnvP – Senior Ecologist: Richard is a Certified Environmental Practitioner with over 25 years of professional experience in impact assessment and his role in this project was to prepare the executive summary.

APPENDIX B DATABASE SEARCH RESULTS

OEH BIONET WILDLIFE ATLAS AND EPBC PROTECTED MATTERS SEARCH TOOL

Numbers in parentheses indicate number of species records within search area from relevant database.

OEH Bionet Wildlife Atlas: Lists records of threatened species on the schedule of the TSC Act within 10 km of the study area

EPBC Protected Matters Search tool: Lists items/species on the Schedules of the EPBC Act with the potential to occur within 10 km of the study area

Acronyms

EPBC: Environment Protection and Biodiversity Conservation Act

FM: Fisheries Management Act

TSC: Threatened Species Conservation Act

E: Endangered

V: Vulnerable

CE: Critically Endangered

EEC: Endangered Ecological Community

CEEC: Critically Endangered Ecological Community

EP: Endangered Population

Species	Common Name	OEH Wildlife Atlas 10 km search (13/6/2014)	EPBC Protected Matters 10 km search (3/6/2014)
FAUNA			
Amphibians			
<i>Litoria castanea</i>	Yellow-spotted Tree Frog	TSC-E	EPBC-E
<i>Litoria raniformis</i>	Growling Grass Frog		EPBC-V
Birds			
<i>Anthochaera phrygia</i>	Regent Honeyeater	TSC-CE	EPBC-E, Migratory
<i>Botaurus poiciloptilus</i>	Australasian Bittern	TSC-E	EPBC-E
<i>Circus assimilis</i>	Spotted Harrier	TSC-V	
<i>Chthonicola sagittata</i>	Speckled Warbler	TSC-V	
<i>Epthianura albifrons</i>	White-fronted Chat	TSC-V	
<i>Hieraaetus morphnoides</i>	Little Eagle	TSC-V	
<i>Lathamus discolor</i>	Swift Parrot	TSC-E	EPBC-E
<i>Melanodryas cucullata</i>	Hooded Robin (south-eastern form)	TSC-V	

Species	Common Name	OEH Wildlife Atlas 10 km search (13/6/2014)	EPBC Protected Matters 10 km search (3/6/2014)
<i>Petroica boodang</i>	Scarlet Robin	TSC-V	
<i>Petroica phoenicea</i>	Flame Robin	TSC-V	
<i>Rostratula australis</i>	Australian Painted Snipe	TSC-E	EPBC-V, Migratory
Fish			
<i>Bidyanus bidyanus</i>	Silver Perch		EPBC-CE
<i>Maccullochella peelii</i>	Murray Cod		EPBC-V
<i>Macquaria australasica</i>	Macquarie Perch	TSC-E	EPBC-E
Mammals			
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	TSC-V	EPBC-E
<i>Petaurus norfolcensis</i>	Squirrel Glider	TSC-V	
<i>Phascolarctos cinereus</i>	Koala	TSC-V	EPBC-V
<i>Potorous tridactylus</i>	Long-nosed Potoroo	TSC-V	EPBC-V
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	TSC-V	EPBC-V
Reptiles			
<i>Aprasia parapulchella</i>	Pink-tailed Worm Lizard	TSC-E	EPBC-V
<i>Delma impar</i>	Striped Legless Lizard		EPBC-V
<i>Tympanocryptis pinguicolla</i>	Grassland Earless Dragon	TSC-E	EPBC-E
<i>Varanus rosenbergi</i>	Rosenberg's Goanna	TSC-V	
FLORA			
<i>Calotis glandulosa</i>	Mauve Burr-daisy		EPBC-V
<i>Dodonaea procumbens</i>	Creeping Hop-bush	TSC-V	EPBC-V
<i>Eucalyptus pulverulenta</i>	Silver-leaved Mountain Gum		EPBC-V
<i>Pelargonium sp. striatellum</i> (G.W.Carr 10345)	Omeo Stork's-bill		EPBC-E
<i>Rutidosia leiolepis</i>	Monaro Golden Daisy		EPBC-V
<i>Thesium australe</i>	Austral Toadflax		EPBC-V
THREATENED ECOLOGICAL COMMUNITIES			
<i>Alpine Sphagnum Bogs and Associated Fens</i>			EPBC-E
<i>Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions</i>		TSC-EEC	
<i>Natural Temperate Grassland of the Southern Tablelands</i>		TSC-EEC	EPBC-E

Species	Common Name	OEH Wildlife Atlas 10 km search (13/6/2014)	EPBC Protected Matters 10 km search (3/6/2014)
<i>and the Australian Capital Territory</i>			
<i>Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions</i>		TSC-EEC	
<i>Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions</i>		TSC-EEC	
<i>Upland Wetlands of the New England Tablelands and the Monaro Plateau</i>			EPBC-E
<i>White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland</i>		TSC-EEC	EPBC-CE
MIGRATORY SPECIES			
<i>Apus pacificus</i>	Fork-tailed Swift		Species or species habitat likely to occur within area
<i>Hirundapus caudacutus</i>	White-throated Needletail		Species or species habitat known to occur within area
<i>Merops ornatus</i>	Rainbow Bee-eater		Species or species habitat may occur within area
<i>Monarcha melanopsis</i>	Black-faced Monarch		Species or species habitat known to occur within area
<i>Myiagra cyanoleuca</i>	Satin Flycatcher		Species or species habitat known to occur within area
<i>Rhipidura rufifrons</i>	Rufous Fantail		Species or species habitat known to occur within area

Noxious weed declarations for Cooma-Monaro City Council

Weed	Class	Legal requirements
* African boxthorn [<i>Lycium ferocissimum</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
African feathergrass [<i>Pennisetum macrourum</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
African lovegrass [<i>Eragrostis curvula</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed.
African turnip weed [<i>Sisymbrium runcinatum</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
African turnip weed [<i>Sisymbrium thellungii</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
* Alligator weed [<i>Alternanthera philoxeroides</i>]	2	The plant must be eradicated from the land and that land must be kept free of the plant
Anchored water hyacinth [<i>Eichhornia azurea</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Annual ragweed [<i>Ambrosia artemisiifolia</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Arrowhead [<i>Sagittaria calycina</i> variety <i>calycina</i>]	4	The plant must not be sold, propagated or knowingly distributed
Artichoke thistle [<i>Cynara cardunculus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Asparagus [Asparagus species]; except <i>A.aethiopicus</i> <i>A.africanus</i> <i>A.asparagoides</i> <i>A.declinatus</i> <i>A.falcatus</i> <i>A.macowanii</i> var. <i>zuluensis</i> <i>A.officinalis</i> <i>A.plumosus</i> <i>A.racemosus</i> <i>A.virgatus</i>	4	The plant must not be sold, propagated or knowingly distributed
* Athel tree / Athel pine [<i>Tamarix aphylla</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Bathurst/Noogoora/Hunter/South American/Californian/cockle burrs [<i>Xanthium</i> species]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread.

Weed	Class	Legal requirements
Bear-skin fescue [<i>Festuca gautieri</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Black knapweed [<i>Centaurea xmoncktonii</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
* Black willow [<i>Salix nigra</i>]	2	The plant must be eradicated from the land and that land must be kept free of the plant
Blackberry [<i>Rubus fruticosus</i> aggregate species]; except cultivars Black satin Chehalem Chester Thornless Dirksen Thornless Loch Ness Murrindindi Silvan Smooth stem Thornfree	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed. This is an All of NSW declaration.
* Boneseed [<i>Chrysanthemoides monilifera</i> subspecies <i>monilifera</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
* Bridal creeper [<i>Asparagus asparagoides</i>]	4	The plant must not be sold, propagated or knowingly distributed
* Bridal veil creeper [<i>Asparagus declinatus</i> (syn. <i>Asparagus crispus</i> , <i>Myrsiphyllum declinatum</i>)]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Broomrapes [<i>Orobanch</i> species except the native <i>O. cernua</i> variety <i>australiana</i> and <i>O. minor</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Burr ragweed [<i>Ambrosia confertiflora</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
* Cabomba [All Cabomba species except <i>C. furcata</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Cayenne snakeweed [<i>Stachytarpheta cayennensis</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
* Chilean needle grass [<i>Nassella neesiana</i>]	3	The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed
Chinese violet [<i>Asystasia gangetica</i> subspecies <i>micrantha</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
* Climbing asparagus fern [<i>Asparagus plumosus</i> (syn. <i>Protasparagus plumosus</i>)]	4	The plant must not be sold, propagated or knowingly distributed

Weed	Class	Legal requirements
Clockweed [<i>Gaura parviflora</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Corn sowthistle [<i>Sonchus arvensis</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Dodder [All <i>Cuscuta</i> species except the native species <i>C. australis</i> , <i>C. tasmanica</i> and <i>C. victoriana</i>]; Includes All <i>Cuscuta</i> species except the native species <i>C. australis</i> , <i>C. tasmanica</i> and <i>C. victoriana</i> .	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Espartillo [<i>Amelichloa brachychaeta</i> , <i>Amelichloa caudata</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Eurasian water milfoil [<i>Myriophyllum spicatum</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Fine-bristled burr grass [<i>Cenchrus brownii</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
* Fireweed [<i>Senecio madagascariensis</i>]	3	The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed
* Flax-leaf broom [<i>Genista linifolia</i>]	4	The plant must not be sold, propagated or knowingly distributed
Fountain grass [<i>Cenchrus setaceus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Frogbit / Spongeplant [<i>Limnobium laevigatum</i> and <i>L. spongia</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Gallon's curse [<i>Cenchrus biflorus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
* Gamba grass [<i>Andropogon gayanus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Giant reed / Elephant grass [<i>Arundo donax</i>]	4	The plant must not be sold, propagated or knowingly distributed
Glaucous star thistle [<i>Carthamus glaucus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.

Weed	Class	Legal requirements
Golden dodder [<i>Cuscuta campestris</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Golden thistle [<i>Scolymus hispanicus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
* Gorse [<i>Ulex europaeus</i>]	3	The plant must be fully and continuously suppressed and destroyed
Green cestrum [<i>Cestrum parqui</i>]	3	The plant must be fully and continuously suppressed and destroyed
* Grey willow [<i>Salix cinerea</i>]	2	The plant must be eradicated from the land and that land must be kept free of the plant
Ground asparagus [<i>Asparagus aethiopicus</i> (syn. <i>Protasparagus aethiopicus</i>)]	4	The plant must not be sold, propagated or knowingly distributed
Groundsel bush [<i>Baccharis halimifolia</i>]	2	The plant must be eradicated from the land and that land must be kept free of the plant
Harrisia cactus [<i>Harrisia</i> species]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Hawkweed [<i>Hieracium</i> species]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Heteranthera / Kidneyleaf mud plantain [<i>Heteranthera reniformis</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Horehound [<i>Marrubium vulgare</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Horsetail [<i>Equisetum</i> species]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Hydrocotyl / Water pennywort [<i>Hydrocotyl ranunculoides</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
* Hymenachne [<i>Hymenachne amplexicaulis</i> and hybrids]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Karoo thorn [<i>Acacia karroo</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.

Weed	Class	Legal requirements
Kochia [<i>Bassia scoparia</i>]; except <i>Bassia scoparia</i> subspecies <i>trichophylla</i>	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Koster's curse / Clidemia [<i>Clidemia hirta</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Lagarosiphon [<i>Lagarosiphon major</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Leafy elodea / Dense waterweed / Egeria [<i>Egeria densa</i>]	4	The plant must not be sold, propagated or knowingly distributed. This is an All of NSW declaration.
Lippia [<i>Phyla canescens</i>]	4	The plant must not be sold, propagated or knowingly distributed except incidentally in hay or lucerne. This is an All of NSW declaration.
Long-leaf willow primrose [<i>Ludwigia longifolia</i>]	3	The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed
Mexican feather grass [<i>Nassella tenuissima</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Mexican poppy [<i>Argemone mexicana</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Miconia [<i>Miconia</i> species]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Mikania vine [<i>Mikania micrantha</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
* Mimosa [<i>Mimosa pigra</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
* Montpellier broom / Cape broom [<i>Genista monspessulana</i>]	3	The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed
Mossman River grass [<i>Cenchrus echinatus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.

Weed	Class	Legal requirements
Nodding thistle [<i>Carduus nutans subsp. nutans</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Pampas grass [<i>Cortaderia species</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed.
* Parthenium weed [<i>Parthenium hysterophorus</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Paterson's curse, Vipers bugloss, Italian bugloss [<i>Echium plantagineum</i> , <i>E. vulgare</i> and <i>E. italicum</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread.
Perennial thistle / Canada thistle [<i>Cirsium arvense</i>]	3	The plant must be fully and continuously suppressed and destroyed.
* Pond apple [<i>Annona glabra</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
* Prickly acacia [<i>Vachellia nilotica</i> (syn. <i>Acacia nilotica</i>)]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
* Prickly pear [<i>Opuntia species</i> except <i>O. ficus-indica</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
* Prickly pear [<i>Cylindropuntia species</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed. This is an All of NSW declaration.
Red rice [<i>Oryza rufipogon</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Rhus tree [<i>Toxicodendron succedaneum</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed. This is an All of NSW declaration.
* Rubber vine [<i>Cryptostegia grandiflora</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
* Sagittaria [<i>Sagittaria platyphylla</i> (syn. <i>Sagittaria graminea</i> variety <i>platyphylla</i>)]	4	The plant must not be sold, propagated or knowingly distributed

Weed	Class	Legal requirements
* Salvinia [<i>Salvinia molesta</i>]	2	The plant must be eradicated from the land and that land must be kept free of the plant
* Scotch broom / English broom [<i>Cytisus scoparius</i> subspecies <i>scoparius</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Scotch, Stemless, Illyrian and Taurian thistles [<i>Onopordum species</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread.
Senegal tea plant [<i>Gymnocoronis spilanthoides</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
* Serrated tussock [<i>Nassella trichotoma</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed.
Siam weed [<i>Chromolaena odorata</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
* Silver-leaf nightshade [<i>Solanum elaeagnifolium</i>]	4	The plant must not be sold, propagated or knowingly distributed
Smooth-stemmed turnip [<i>Brassica barrelieri</i> subspecies <i>oxyrrhina</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Soldier thistle [<i>Picnomon acarna</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Spiny burrgrass [<i>Cenchrus longispinus</i> ; <i>C. spinifex</i> (syn. <i>Cenchrus incertus</i>)]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Spotted knapweed [<i>Centaurea stoebe</i> subspecies <i>micranthos</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
St. John's wort [<i>Hypericum perforatum</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Sweet briar [<i>Rosa rubiginosa</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread

Weed	Class	Legal requirements
Texas blueweed [<i>Helianthus ciliaris</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.
Tropical soda apple [<i>Solanum viarum</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Water caltrop [<i>Trapa</i> species]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
* Water hyacinth [<i>Eichhornia crassipes</i>]	2	The plant must be eradicated from the land and that land must be kept free of the plant
Water lettuce [<i>Pistia stratiotes</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Water soldier [<i>Stratiotes aloides</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Willows [<i>Salix</i> species]; Includes all <i>Salix</i> species except <i>S. babylonica</i> , <i>S. x reichardtii</i> , <i>S. x calodendron</i> , <i>S. cinerea</i> and <i>S. nigra</i>	4	The plant must not be sold, propagated or knowingly distributed. This is an All of NSW declaration.
Witchweed [<i>Striga</i> species except the native <i>Striga parviflora</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Yellow burrhead [<i>Limnocharis flava</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant. This is an All of NSW declaration.
Yellow nutgrass [<i>Cyperus esculentus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with. This is an All of NSW declaration.

APPENDIX C FLORA SPECIES RECORDED

All native and introduced vascular plant species encountered within the study area, and their relative abundances, were recorded (where identifiable). Cover/abundance assessments are based on visual estimates of foliage cover (after Carnahan 1997), scored using a modified Braun-Blanquet 6-point scale:

- | | |
|---|--|
| 1 | 1 to a few individuals present, less than 5% cover |
| 2 | many individuals present, but still less than 5% cover |
| 3 | 5 - <20% cover |
| 4 | 20 - <50% cover |
| 5 | 50 - <75% cover |
| 6 | 75 - 100% cover |

Cover/abundance scores relate to representative quadrats conducted as a component of the BioBanking plots. Additional species encountered during the random meander are identified in the column 'RM'. A cover abundance score is not provided in this instance as the abundance of these species varies markedly across the study area

Where uncertainty exists due to the unavailability of reproductive material, the taxon is preceded by a question mark, or plants are identified to genus level only. Scientific nomenclature follows Harden (1990-2002), with recent name changes as per the Australian Plant Name Index of the Australian National Herbarium.

Species not indigenous to the area are preceded by an asterisk (*), and weeds declared as noxious within the Cooma – Monaro local government area are denoted by a triangle (△).

Scientific name	Common name	Family	Abundance									
			B1	B2	B3	B4	B5	B6	B7	B8	RM	
Trees												
<i>Eucalyptus pauciflora</i>	Snow Gum	Myrtaceae									✓	
<i>Eucalyptus viminalis</i>	Ribbon Gum	Myrtaceae	2	2	3		2	2	2	1		
Shrubs												
<i>Acacia dealbata</i>	Silver Wattle	Fabaceae (Mimosoideae)									✓	
<i>Amyema pendula</i>		Loranthaceae									✓	
<i>Bursaria spinosa subsp. lasiophylla</i>	Blackthorn	Pittosporaceae	1		2							
<i>Cassinia longifolia</i>		Asteraceae									✓	
<i>Melicytus dentatus</i>	Gruggly Bush	Violaceae									✓	
△ * <i>Rosa rubiginosa</i>	Sweet Briar	Rosaceae	1	1	2		2					
Climbers												
<i>Glycine clandestina</i>	Twining glycine	Fabaceae (Faboideae)									✓	
Forbs												
<i>Acaena ovina</i>	Sheep's Burr	Rosaceae									✓	
* <i>Acetosella vulgaris</i>	Sheep Sorrel	Polygonaceae			2		2	2		2		
<i>Ajuga australis</i>	Austral Bugle	Lamiaceae	1									
* <i>Arenaria</i> sp.	Sandwort	Caryophyllaceae	2	2			1			1		
<i>Asperula conferta</i>	Common Woodruff	Rubiaceae							2			
* <i>Capsella bursa-pastoris</i>	Shepherds Purse	Brassicaceae					1	1		2		
<i>Brachyscome ciliaris</i>		Asteraceae									✓	
* <i>Carthamus lanatus</i>	Saffron Thistle	Asteraceae					1	2				
* <i>Centaurium erythraea</i>	Common Centaury	Gentianaceae									✓	
* <i>Cerastium glomeratum</i>	Mouse-ear Chickweed	Caryophyllaceae		2	2				2			
<i>Chrysocephalum apiculatum</i>	Common Everlasting	Asteraceae	2	1	2				2			
<i>Chrysocephalum semipapposum</i>	Clustered Everlasting	Asteraceae									✓	
* <i>Cicendia quadridentatus</i>		Gentiaceae									✓	

Scientific name	Common name	Family	Abundance									
			B1	B2	B3	B4	B5	B6	B7	B8	RM	
*Cirsium vulgare	Spear Thistle	Asteraceae			1	2	2	2			2	
Convolvulus erubescens	Pink Bindweed	Convolvulaceae										✓
*Conyza sp.	Fleabane	Asteraceae				2		1				
Cymbonotus preissianus	Austral Bear's Ear	Asteraceae	2									
Cymbonotus lawsonianus	Bear's Ear	Asteraceae		2	1				1			
Dichondra repens	Kidney Weed	Convolvulaceae										✓
*Erodium cicutarium	Storksbill	Geraniaceae		1	1	1	2	2	2	2		
Euchiton sphaericus	Star Cudweed	Asteraceae										✓
*Gamochaeta calviceps	Cudweed	Asteraceae									1	
Glycine tabacina	Variable Glycine	Fabaceae (Faboideae)										✓
Haloragis heterophylla	Variable Raspwort	Haloragaceae		1								
Hydrocotyle laxiflora	Stinking Pennywort	Apiaceae			2				2			
Hypericum gramineum	Small St John's Wort	Clusiaceae		1								
△ *Hypericum perforatum	St John's Wort	Clusiaceae				2						
*Hypochoaeris glabra	Smooth Catsear	Asteraceae										
*Hypochoaeris radicata	Catsear	Asteraceae	2	2	2	2	2	2	2	2	2	
Hypoxis hygrometrica	Golden Weather-grass	Hypoxidaceae										
*Lactuca sativa	Prickly Lettuce	Asteraceae				1	1	1	1	1	1	
*Marrubium vulgare	White Horehound	Lamiaceae						1	2			
*Myosotis discolor	Forget-me-not	Boraginaceae	1			2	2	2	2	2	2	
△ *Onopodum acanthium	Scotch Thistle	Asteraceae				2	2	2			2	
Oreomyrrhis eriopoda	Australian Carraway	Apiaceae		1								
Oxalis perennans		Oxalidaceae	2	2	1			1				
*Paronychia brasiliiana	Chilean Whitlow	Caryophyllaceae									2	
*Petrohragia nanteuillii	Proliferous Pink	Caryophyllaceae	2	2	2				2			
*Plantago lanceolata	Lamb's Tongues	Plantaginaceae									1	
Poranthera microphylla	Small Poranthera	Phyllanthaceae						1				
Rumex brownii	Swamp Dock	Polygonaceae						1				

Scientific name	Common name	Family	Abundance									
			B1	B2	B3	B4	B5	B6	B7	B8	RM	
*Salvia verbenaca	Vervain	Lamiaceae			1	1	1	1	1	1		
*Sanguisorba minor	Sheeps Burnett	Rosaceae	1		1							
*Silene sp.	A Catchfly	Caryophyllaceae									1	
?Solenogyne sp.		Asteraceae		1								
*Sonchus asper subsp. asper	Prickly Sowthistle	Asteraceae				1	1	1				
Stackhousia monogyna	Creamy Candle	Stackhousiaceae										
Swainsona behriana	Behr's Swainson-pea	Fabaceae (Faboideae)		2	2				2			
*taraxicum officinale	Dandelion	Asteraceae							1			
*Trifolium arvense	Haresfoot Clover	Fabaceae (Faboideae)	3	3	3	2	3	3	2	2		
*Trifolium dubium	Yellow Suckling Clover	Fabaceae (Faboideae)		2	1	2	2	2	2	2		
*Trifolium repens	White Clover	Fabaceae (Faboideae)										
*Trifolium subterraneum	Subterranean Clover	Fabaceae (Faboideae)										
Triptlodiscus pygmaeus	Common Sunray	Asteraceae	2	2	2							
*Verbascum thapsus	Great Mullein	Scrophulariaceae	1		1	1	2					
Vittadinia gracilis	A Fuzzweed	Asteraceae										
Wahlenbergia communis	Tufted Bluebell	Campanulaceae	1	1	1				1			
Wahlenbergia multicaulis	Tadgell's Bluebell	Campanulaceae										
Ferns												
Cheilanthes sieberi	Rock Fern	Pteridaceae										
Grasses												
*Aira spp.	A Hairgrass	Poaceae					2					
*Anthoxanthum odoratum	Sweet Vernal Grass	Poaceae										
Aristida sp		Poaceae	2							1		
Austrostipa scabra subsp. falcata	Corkscrew Grass	Poaceae	2							1		
*Avena sp.	Wild Oats	Poaceae										
*Briza minor	Shivery Grass	Poaceae						2				
*Bromus hordeaceus	Soft Brome	Poaceae	2	2	2	2	1	2	2			

Scientific name	Common name	Family	Abundance								RM
			B1	B2	B3	B4	B5	B6	B7	B8	
<i>*Dactylis glomerata</i>	Cocksfoot	Poaceae							1		
<i>Elymus scaber</i>	Common Wheatgrass	Poaceae									✓
△ <i>*Eragrostis curvula</i>	African Lovegrass	Poaceae	5	5	5	5	5	5	5	5	5
<i>*Hordeum leporinum</i>	Barley Grass	Poaceae				2	2	2	3		2
<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass	Poaceae									2
△ <i>*Nassella trichotoma</i>	Serrated Tussock	Poaceae				1	1	1			
<i>Poa sieberiana</i> var. <i>sieberiana</i>	Snowgrass	Poaceae									✓
<i>Rytidosperma carphoides</i>	Short Wallaby Grass	Poaceae									✓
<i>Rytidosperma</i> spp.		Poaceae									✓
<i>*Vulpia</i> spp.	Rat's-tail Fescue	Poaceae	2								
Graminoids											
<i>Juncus</i> spp.	A Rush	Juncaceae									✓
<i>Lomandra filiformis</i> subsp. <i>coriacea</i>	Wattle Matt-rush	Lomandraceae									✓

APPENDIX D BIOBANKING PLOT RESULTS

Benchmark variables:

Native Spp. #: number of native species (species richness)

HTB: number of hollow bearing trees

Logs: linear length of fallen logs.

MR602: Ribbon Gum - Snow Gum grassy open forest on flats and undulating hills of the eastern tableland, South Eastern Highlands (Grassy)

Moderate to good condition

	Native Spp. #	Native cover				Native ground cover						Exotic plant cover	HBTs	Logs (m)
		Overstorey		Midstorey		Grasses		Shrubs		Other				
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max			
Benchmark	10	15%	40%	5%	30%	5%	60%	5%	50%	5%	20%	0%	2	70
B6	3	16%		0%		0%		0%		0%		76%	2	34

Regeneration within the entire zone included one out of two species which gives a regeneration score = 0.5.

MR602: Ribbon Gum - Snow Gum grassy open forest on flats and undulating hills of the eastern tableland, South Eastern Highlands (Shrubby)

Moderate to good condition

	Native Spp. #	Native cover				Native ground cover						Exotic plant cover	HBTs	Logs (m)
		Overstorey		Midstorey		Grasses		Shrubs		Other				
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max			
Benchmark	10	15%	40%	5%	30%	5%	60%	5%	50%	5%	20%	0%	2	70
B1	15	9%		0%		2%		0%		2%		72%	1	29
B2	11	2.5%		0%		0%		0%		10%		76%	0	7
B3	9	4.5%		6.5%		0%		0%		4%		80%	1	28
B7	9	5.5%		0%		0%		0%		4%		88%	0	6

Regeneration within the entire zone included one out of one species which gives a regeneration score = 1

MR602: Ribbon Gum - Snow Gum grassy open forest on flats and undulating hills of the eastern tableland, South Eastern Highlands (Grassy)

Low condition

	Native Spp. #	Native cover				Native ground cover						Exotic plant cover	HBTs	Logs (m)
		Overstorey		Midstorey		Grasses		Shrubs		Other				
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max			
Benchmark	10	15%	40%	5%	30%	5%	60%	5%	50%	5%	20%	0%	2	70
B4	0	0%		0%		0%		0%		0%		70%	0	0

	Native	Native cover		Native ground cover			Exotic	HBTs	Logs
B5	2	0%	0%	0%	0%	0%	80%	0	0
B8	3	0%	0%	0%	0%	94%	0%	1	15

No regeneration was observed in this zone which gives a regeneration score = 0.

APPENDIX E FAUNA SPECIES RECORDED

Species listed as vulnerable on Schedule 2 of the TSC Act are noted in **bold**. Species preceded by an * are introduced species. Where a species was identified in either a tile array or a formal survey, additional opportunistic observations were not recorded.

Common Name	Scientific Name	Record method	capture	Observation Type
Amphibians				
Spotted Grass Frog	<i>Limnodynastes tasmaniensi</i>	Tile array		Observed
Southern Brown Tree Frog	<i>Litoria ewingii</i>	Tile array		Observed
Verreaux's Frog	<i>Litoria verreauxii</i>	Tile array		Observed
Smooth Toadlet	<i>Uperoleia laevis</i>	Tile array		Observed
Wrinkled Toadlet	<i>Uperoleia rugosa</i>	Tile array		Observed
Birds				
*Eurasian Skylark	<i>Alauda arvensis</i>	Survey		Observed
Red Wattlebird	<i>Anthochaera carunculata</i>	Survey		Observed
Little Corella	<i>Cacatua sanguinea</i>	Opportunistic		Observed
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	Survey		Observed
Australian Raven	<i>Corvus coronoides</i>	Survey		Observed
Little Raven	<i>Corvus mellori</i>	Survey		Observed
Stubble Quail	<i>Coturnix pectoralis</i>	Survey		Observed
Magpie	<i>Cracticus tibicen</i>	Survey		Observed
Laughing Kookaburra	<i>Dacelo novaeguineae</i>	Survey		Observed
Galah	<i>Eolophus roseicapilla</i>	Survey		Observed
Nankeen Kestrel	<i>Falco cenchroides</i>	Survey		Observed
Magpie Lark	<i>Granllina cyanoleuca</i>	Survey		Observed
Noisy Miner	<i>Manorina melancephala</i>	Survey		Observed
Crested Pigeon	<i>Ocyphaps lophotes</i>	Survey		Observed
Striated Pardalote	<i>Pardalotus striatus</i>	Survey		Observed
Crimson Rosella	<i>Platycercus elegans</i>	Opportunistic		Observed
Eastern Rosella	<i>Platycercus eximius</i>	Survey		Observed
Red-rumped Parrot	<i>Psephotus haematonotus</i>	Survey		Observed
Pied Currawong	<i>Strepera graculina</i>	Survey		Observed
*Common Starling	<i>Sturnus vulgaris</i>	Survey		Observed
Mammals				

Common Name	Scientific Name	Record method capture	Observation Type
*Hare	<i>Lepus</i> sp.	Opportunistic	Observed
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	Opportunistic	Observed
Brushtail Possum	<i>Trichosurus vulpecula</i>	Survey	Observed
*European Fox	<i>Vulpes vulpes</i>	Opportunistic	Observed
Microbats			
White-striped Mastiff Bat	<i>Austronomus australis</i>	Survey	ANABAT
Southeastern Freetail Bat	<i>Mormopterus planiceps</i>	Survey	ANABAT
Gould's Wattled Bat	<i>Chalinolobus gouldii</i>	Survey	ANABAT
Chocolcate Wattled Bat	<i>Chalinolobus morio</i>	Survey	ANABAT
Eastern Bent-wing Bat	<i>Miniopterus schreibersii oceanensis</i>	Survey	ANABAT
Long-eared Bat (species unidentified)	<i>Nyctophilus</i> sp.	Survey	ANABAT
Large Forest Bat	<i>Vespadelus darlingtoni</i>	Survey	ANABAT
Southern Forest Bat	<i>Vespadelus regulus</i>	Survey	ANABAT
Little Forest Bat	<i>Vespadelus vulturnus</i>	Survey	ANABAT
Monotremes			
Short-beaked Echidna	<i>Tachyglossus aculeatus</i>	Opportunistic	Observed
Reptiles			
Red-throated Skink	<i>Acritoscincus platynotum</i>	Tile array	Observed
Jacky Dragon	<i>Amphibolurus muricatus</i>	Tile array	Observed
Eastern Ctenotus	<i>Ctenotus orientalis</i>	Tile array	Observed
Garden Skink	<i>Lampropholis delicata</i>	Tile array	Observed
Common Dwarf Skink	<i>Menetia greyii</i>	Tile array	Observed
Eastern Bearded Dragon	<i>Pogona barbata</i>	Opportunistic	Observed
Tussock Skink	<i>Pseudemoia pagenstecheir</i>	Tile array	Observed
Eastern Brown Snake	<i>Pseudonaja textilis</i>	Opportunistic	Observed

APPENDIX F GRASSLAND FAUNA HABITAT ASSESSMENT RESULTS

		Transect							
		RT1		RT2		RT3		RT4	
		Total	%	Total	%	Total	%	Total	%
Strata	Bare ground	1	2	1	2	0	0	0	0
	Cryptogam	0	0	0	0	0	0	0	0
	Embedded rock	0	0	0	0	0	0	0	0
	Loose surface rock	0	0	0	0	0	0	0	0
	Detached leaf litter	5	10	17	34	29	58	17	34
	Large tussock base (.10cm diameter)	4	8	0	0	0	0	3	6
	Small tussock base (<10cm diameter)	1	2	0	0	0	0	3	6
exotic plant cover	Exotic perennial grass	32	64	23	46	27	54	25	50
	Exotic annual grass	0	0	0	0	0	0	0	0
	Clover (trifolium spp.)	10	20	2	4	0	0	0	0
	Exotic forb	1	2	14	28	10	20	18	36
	Noxious weed	1	2	0	0	1	2	0	0
perennial native grasses	Native forb	3	6	0	0	0	0	0	0
	Native shrub	0	0	0	0	0	0	0	0
	Sedge/rush	0	0	0	0	0	0	0	0
	Austrofanthonia spp. (wallaby grass)	0	0	0	0	0	0	0	0
	Austrostipa spp. (spear grass)	0	0	0	0	0	0	0	0
	Elymus scaber (native wheat grass)	0	0	0	0	0	0	0	0
	Panicum spp. (blown grass)	0	0	0	0	0	0	0	0
	Dichlachne spp. (plume grass)	0	0	0	0	0	0	0	0
	Bothriochloa macra (red grass)	0	0	0	0	0	0	0	0
	Themeda australis (kangaroo grass)	0	0	0	0	0	0	0	0
	Microtena spp. (weeping grass)	0	0	0	0	0	0	0	0
	Aristida ramosa (purple wire grass)	0	0	0	0	0	0	0	0
	Joycea spp. (red anther wallaby grass)	0	0	0	0	0	0	0	0
	Poa spp.	0	0	0	0	0	0	0	0

APPENDIX G THREATENED SPECIES EVALUATIONS

An evaluation of presence of habitat and likelihood of occurrence of threatened flora and fauna recorded within a 10 km radius of the subject site is presented overleaf. Records are from a search of the OEH Wildlife Atlas and the EPBC Protected Matters search tool from the Department of the Environment. Ecology information has been obtained from the Threatened Species Profiles on the NSW OEH website (www.threatenedspecies.environment.nsw.gov.au) and the Department of the Environment's Species Profile and Threats Database (SPRAT; <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>) unless otherwise referenced.

Codes:

Presence of habitat

- Present:** Potential or known suitable abiotic factors such as soil type, geology, moisture content, topography, aspect and/or altitude are present within the Proposal Site. Associated species/vegetation type is present within the proposal site.
- Marginal:** Some suitable habitat is present within the proposal site.
- Absent:** No suitable resources/landscape/vegetation type is present within the proposal site

Likelihood of occurrence

- None:** Species / EEC does not occur at the site.
- Unlikely:** Species is not likely to occur.
- Possible:** Species could occur and proposal site may provide suitable conditions.
- Present:** Species was recorded during the field investigations.

Possible to be impacted

- No:** The proposal would not impact this species or its habitats. The proposal would not result in an impact to this species. No Assessment of Significance (AoS) is necessary for this species.
- Yes:** The proposal could impact this species or its habitats. An AoS has been prepared for this species

- TSC-V** Listed as Vulnerable under the Threatened Species Conservation Act
- TSC-E** Listed as Endangered under the Threatened Species Conservation Act
- TSC-EEC** Listed as an Endangered Ecological Community under the Threatened Species Conservation Act
- TSC-EP** Listed as an Endangered Population under the Threatened Species Conservation Act
- EPBC-V** Listed as Vulnerable under the Environment Protection and Biodiversity Conservation Act
- EPBC-E** Listed as Endangered under the Environment Protection and Biodiversity Conservation Act
- EPBC-EEC** Listed as an Endangered Ecological Community under the Environment Protection and Biodiversity Conservation Act
- EPBC-CEEC** Listed as a Critically Endangered Ecological Community under the Environment Protection and Biodiversity Conservation Act

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Amphibians</i>						
<i>Litoria castanea</i> Yellow-spotted Tree Frog	E	E	The bell frogs are large mostly aquatic tree frogs, with only small finger and toe pads. The Yellow-spotted Bell Frog is distinguished from other members of the group by its fully webbed toes and yellow spots on the groin and the back of the thighs. Elsewhere it is marbled green and gold, with black spots. This patterning varies greatly, but the pale green mid-back stripe is unvarying. The larger females may be up 9 cm long. The call is a series of loud, droning grunts, like a distant motorbike. The tadpoles are large, growing to about 8 cm long with a pinkish-grey body and yellowish fins. This species requires large, permanent ponds or slow flowing streams with plenty of emergent vegetation as breeding habitat.	Absent	Unlikely	No
<i>Litoria raniformis</i> Growling Grass Frog	E	V	One of the largest frog species in Australia, these animals may reach up to 104 mm in length, with females usually larger than males. Animals vary greatly in colour and pattern but are typically olive to bright emerald green, with irregular gold, brown, black or bronze spotting with a pale green stripe down the centre of the back. Undersides are white and coarsely granular, although during the breeding season males may become yellow or dark grey/black under the throat. The groin and posterior of the thighs are turquoise blue. They lack webbing on their fingers but the toes are almost fully webbed and toe discs are small and approximately equal in width to the digits. The male's call is a growling, engine-like "waaa waaa waaa", heard during the breeding season. This species is usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. Breeding occurs during the warmer months and is triggered by flooding or a significant rise in water levels. The species has been known to breed anytime from early spring through to late summer/early autumn.	Absent	Unlikely	No
<i>Birds</i>						

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Anthochaera phrygia</i> Regent Honeyeater	CE	E, M	The Regent Honeyeater mainly inhabits temperate woodlands and open forests of the inland slopes of south-east Australia. Birds are also found in drier coastal woodlands and forests in some years. There are only three known key breeding regions remaining: north-east Victoria (Chiltern-Albury), and in NSW at Capertee Valley and the Bundarra-Barraba region. In NSW the distribution is very patchy and mainly confined to the two main breeding areas and surrounding fragmented woodlands. In some years non-breeding flocks converge on flowering coastal woodlands and forests. 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 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. 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 <i>E. microcarpa</i>, <i>E. punctata</i>, <i>E. polyanthemus</i>, <i>E. mollucana</i>, <i>Corymbia robusta</i>, <i>E. crebra</i>, <i>E. caleyi</i>, <i>Corymbia maculata</i>, <i>E. mckieana</i>, <i>E. macrorhyncha</i>, <i>E. laevopinea</i>, and <i>Angophora floribunda</i>. Nectar and fruit from the mistletoes <i>A. miquelii</i>, <i>A. pendula</i> and <i>A. cambagei</i> are also eaten during the breeding season. When nectar is scarce lerp and honeydew comprise a large proportion of the diet. A shrubby understory is an important source of insects and nesting material. The species breeds between July and January in Box-Ironbark and other temperate woodlands and riparian gallery forest dominated by River Sheoak. Regent Honeyeaters usually nest in horizontal branches or forks in tall mature eucalypts and Sheoaks. Also nest in mistletoe haustoria.	Absent	Unlikely	No

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Botaurus poiciloptilus</i> Australasian Bittern	E	E	In NSW, this species occurs along the coast and is frequently recorded in the Murray-Darling Basin, notably in floodplain wetlands of the Murrumbidgee, Lachlan, Macquarie and Gwydir Rivers. Occurs in permanent freshwater wetlands with tall, dense vegetation. Favours permanent and seasonal freshwater habitats, particularly those dominated by sedges, rushes and/or reeds (e.g. <i>Phragmites</i> , <i>Cyperus</i> , <i>Eleocharis</i> , <i>Juncus</i> , <i>Typha</i> , <i>Baumea</i> , <i>Bolboschoenus</i>) or cutting grass (<i>Gahnia</i>) growing over muddy or peaty substrate. Hides during the day amongst dense reeds or rushes and feed mainly at night on frogs, fish, yabbies, spiders, insects and snails. Feeding platforms may be constructed over deeper water from reeds trampled by the bird; platforms are often littered with prey remains. Breeding occurs in summer from October to January; nests are built in secluded places in densely-vegetated wetlands on a platform of reeds. In Australia, the Bittern occurs with the Australian Painted Snipe <i>Rostratula benghalensis australis</i> .	Absent	Unlikely	No
<i>Circus assimilis</i> Spotted Harrier	V		The Spotted Harrier occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania. Individuals disperse widely in NSW and comprise a single population. Occurs in grassy open woodland including acacia and mallee remnants, inland riparian woodland, and grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn), with young remaining in the nest for several months. Preys on terrestrial mammals (eg bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion.	Marginal	Possible – likely to forage in agricultural lands adjacent to road	No. Abundance of habitat adjacent to site

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Chthonicola sagittata</i> Speckled Warbler	V		Has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. There has been a decline in population density throughout its range, with the decline exceeding 40% where no vegetation remnants larger than 100 ha survive. 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. 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.	Marginal	Possible	No. Abundance of habitat adjacent to site
<i>Epthianura albifrons</i> White-fronted Chat	V		The White-fronted Chat is found in damp open habitats, particularly wetlands containing saltmarsh areas that are bordered by open grasslands or lightly timbered lands. Along the coastline, White-fronted Chats are found in estuarine and marshy grounds with vegetation less than 1 m tall. The species is also observed in open grasslands and sometimes in low shrubs bordering wetland areas. Inland, the White-fronted Chat is often observed in open grassy plains, saltlakes and salt pans that are along the margins of rivers and waterways. The species is sensitive to human disturbance and is not found in built areas.	Marginal	Possible	No. Abundance of habitat adjacent to site

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Hieraaetus morphnoides</i> Little Eagle	V		The Little Eagle is a medium-sized bird of prey that 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. Occupies open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used. 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.	Assumed present. Foraging and breeding habitat. Two nest sites observed.	Assumed present	Yes, if nest is in use when stage 3 extraction commences. An AoS has been prepared.
<i>Lathamus discolor</i> Swift Parrot	E	E	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. 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 <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> . Commonly used lerp infested trees include Grey Box <i>E. microcarpa</i> , Grey Box <i>E. moluccana</i> and Blackbutt <i>E. pilularis</i> . Return to home foraging sites on a cyclic basis depending on food availability.	Marginal. Foraging habitat only.	Possible. Although does contain favoured feed trees.	No. Species unlikely to rely on the site.

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Petroica boodang</i> Scarlet Robin	V		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. 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. 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. 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.	Marginal. Some areas across site contain logs and fallen timber.	Possible. May occur on occasion, particularly in autumn and winter.	No. Important habitat components are not present in vegetation to be removed.
<i>Petroica phoenicea</i> Flame Robin	V		Endemic to SE Australia, and ranges from near the Queensland border to SE South Australia and also in Tasmania. In NSW, it breeds in upland areas and in winter, many birds move to the inland slopes and plains. It is likely that there are two separate populations in NSW, one in the Northern Tablelands, and another ranging from the Central to Southern Tablelands. Breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes. Prefers clearings or areas with open understoreys. The groundlayer of the breeding habitat is dominated by native grasses and the shrub layer may be either sparse or dense. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgeland at high altitudes. In winter, birds migrate to drier more open habitats in the lowlands (i.e. valleys below the ranges, and to the western slopes and plains). Often occurs in recently burnt areas; however, habitat becomes unsuitable as vegetation closes up following regeneration. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees. In winter, occasionally seen in heathland or other shrublands in coastal areas. Birds forage from low perches, from which they sally or pounce onto small invertebrates which they take from the ground or off tree trunks, logs and other coarse woody debris. Flying insects are often taken in the air and sometimes glean for invertebrates from foliage and bark. In their autumn and winter habitats, birds often sally from fence-posts or thistles and other prominent perches in open habitats.	Present – broad habitat preferences	Possible. May occur on occasion, particularly in winter	No. The removal of potential habitat is unlikely to impact this species considering abundance of suitable habitat in adjacent NPs.

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Fish</i>						
<i>Bidyanus bidyanus</i> Silver Perch		CE	A medium to large fish recorded throughout the Murray-Darling Basin, with most records along the Murray River and Victorian tributaries. The preferred habitat for this species is lowland, turbid and slow-flowing rivers (Lintermans, 2007).	Absent	None	No
<i>Maccullochella peelii</i> Murray Cod		V	Australia's largest freshwater fish, the Murray Cod is easily identified by its large mouth, creamy coloured belly and green mottled head and body. The species is generally associated with deep holes in rivers, and habitats with instream rocks, stumps, fallen trees or undercut banks (Lintermans, 2007).	Absent	None	No
<i>Macquaria australasica</i> Macquarie Perch	E	E	The Macquarie Perch is a riverine, schooling species. It prefers deep, rocky holes with considerable cover and a substrate of small boulders, pebbles and gravel. Occurs within rivers, dams and tributaries in Southern NSW (Ecology Lab, 2003), but mainly in the upper reaches of rivers and streams where siltation levels are low. The species appears to prefer pools with cover.	Absent	None	No
<i>Mammals</i>						
<i>Dasyurus maculatus</i> Spotted-tailed Quoll	V	E	Found on the east coast of NSW, Tasmania, eastern Victoria and north-eastern Queensland. 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. The home-range of this species is unknown, but estimates are between 800ha and 20km ² . Usually traverse their ranges along densely vegetated creeklines. They need suitable den sites and abundant food, requiring large areas of intact vegetation for foraging. Use 'latrine sites', often on flat rocks among boulder fields and rocky cliff-faces; 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.	Marginal. Site does not provide suitable den sites.	Possible. May traverse site on occasion to forage.	No. Species is unlikely to rely on the habitat within the site. The works are unlikely to substantially affect movement of this wide ranging species.

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Petaurus norfolcensis</i> Squirrel Glider	V		The Squirrel Glider is sparsely distributed along the east coast and immediate inland districts from western Victoria to north Queensland. The species is found inland as far as the Grampians in Victoria and the Pilliga and the Coonabarabran areas of NSW. Inhabits dry sclerophyll forest and woodland and is generally absent from rainforest and closed forest. In NSW, potential habitat includes Box-Ironbark forests and woodlands in the west, the River Red Gum forests of the Murray Valley and the eucalypt forests of the northeast. Requires abundant hollow-bearing trees and a mix of eucalypts, acacias and banksias. Nightly movements are estimated at between 300 and 500 m. Home-ranges have been estimated at between 0.65 and 8.55ha. Smooth-barked eucalypts are preferred as these eucalypts form hollows more readily than rough-barked and support a greater diversity of invertebrates. Squirrel Glider's forage in the upper and lower forest canopies and in the shrub understorey.	Absent	Unlikely	No
<i>Phascolarctos cinereus</i> Koala	V	V	Occurs in eastern Australia, from north-eastern Queensland to south-eastern South Australia and to the west of the Great Dividing Range. 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. The koala inhabits a range of eucalypt forest and woodland communities, including coastal forests, the woodlands of the tablelands and western slopes, and the riparian communities of the western plains. Examples of important shelter trees are cypress pine and brush box. The quality of forest and woodland communities as habitat for koalas is influenced by a range of factors, such as; species and size of trees present; structural diversity of the vegetation; soil nutrients; climate and rainfall; size and disturbance history of the habitat patch. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Home range size varies with quality of habitat, ranging from less than two ha to several hundred hectares in size. Breeding season for the koala peaks between September and February.	Present. Two species of Koala feed tree present, but no individuals or signs observed.	Possible. May occur on occasion.	No. Feed trees make up less than 15% of total trees. Site is fragmented and abundance of better quality habitat in adjacent NPs.

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Potorous tridactylus</i> Long-nosed Potoroo	V	V	In NSW it is generally restricted to the east of the Great Dividing Range, with an annual rainfall exceeding 760 mm. Inhabits coastal heaths and dry and wet sclerophyll forests. Dense understorey with occasional open areas is an essential part of habitat, and may consist of grass-trees, sedges, ferns or heath, or of low shrubs of tea-trees or melaleucas. A sandy loam soil is also a common feature. The main habitat requirements would appear to be access to some form of dense vegetation for shelter and the presence of an abundant supply of fungi for food. The fruit-bodies of hypogaeous (underground-fruited) fungi are a large component of the diet of the Long-nosed Potoroo. They also eat roots, tubers, insects and their larvae and other soft-bodied animals in the soil. Individuals are mainly solitary, non-territorial and have home range sizes ranging between 2-5 ha. Breeding peaks typically occur in late winter to early summer.	Absent	Unlikely	No
<i>Pteropus poliocephalus</i> Grey-headed Flying-fox	V	V	Grey-headed Flying-foxes are found within 200 km of the eastern coast of Australia, from Bundaberg in Queensland to Melbourne in Victoria. Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source, often in stands of riparian rainforest, Paperbark or Casuarina forest, and are commonly found in gullies, close to water, or in vegetation with a dense canopy. Forage on the nectar and pollen of native trees, in particular <i>Eucalyptus</i> , <i>Melaleuca</i> and <i>Banksia</i> , and fruits of rainforest trees and vines. Travel up to 50 km to forage. Annual mating commences in January and a single young is born each October or November. Site fidelity to camps is high with some camps being used for over a century.	Present	Possible. May occur on site occasionally, but more likely to utilise riparian corridors adjacent to site.	No. The site is unlikely to provide important roosting or foraging habitat.
<i>Reptiles</i>						

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Aprasia parapulchella</i> Pink-tailed Worm Lizard	V	V	The Pink-tailed Worm Lizard is worm-like, with a dark-brown head and nape, gradually merging with the pale grey or grey-brown body. The tail, nearly as long as its body, is pink or reddish-brown towards the tip. Its snout and tail are both rounded. There are no external ear openings. The broad, non-forked tongue, frequently used to wipe the eyes, and the presence of small hind-limb flaps, distinguishes it from a juvenile snake. Specimens grow to about 25 cm in length. The species inhabits sloping, open woodland areas with a predominately native grass cover that are well drained with a cover of partially embedded surface rocks.	Marginal	Possible	No. Habitat is marginal within the development area with few available surface rocks. Searches for this species did not record an individuals.
<i>Delma impar</i> Striped Legless Lizard	V	V	The Striped Legless Lizard differs most obviously from a snake in having external ear openings, small scaly flaps for hind limbs, a long tail and a broad, undivided tongue. It is pale grey-brown above, with a darker head, and almost white below. The most distinguishing characteristic is a pattern of light and dark parallel lines running along the length of the body, although these may be very pale or even absent in some individuals. This parallel stripe pattern breaks up into a diagonal pattern on the tail. They grow to about 30 cm in length, with up to three-quarters of this being the tail. This species is found mainly in the EEC Natural Temperate Grassland or open Box-gum Woodlands, though are found in grasslands with a high exotic component.	Marginal	Possible	No. Habitat is marginal within the development area with few available surface rocks. Searches for this species did not record an individuals.

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Tympanocryptis pinguicollis</i> Grassland Earless Dragon	E	E	The Grassland Earless Dragon is a small dragon, with a maximum adult head and body length of around 7 cm, and a maximum overall length of 16 cm. It has three thin white lines running from the neck, along the body and down the tail. These lines divide an irregular pattern of light and dark brown or reddish cross-bands on the back. This patchy pattern gives it very good camouflage in its grassland habitat. This species has no external ear openings. Dragon lizards are characterised by rough spiny body scales and an erect stance, clear of the ground. This species is restricted to a small number of Natural Temperate Grassland sites dominated by wallaby grasses (<i>Nothodanthonia</i> spp.), spear grasses (<i>Austrostipa</i> spp.), Poa Tussock (<i>Poa sieberiana</i>), Red Grass (<i>Bothriochloa macra</i>), and occasionally Kangaroo Grass (<i>Themeda australis</i>). Introduced pasture grasses occur at many of the sites supporting this species, which has also been captured in secondary grassland.	Marginal	Unlikely	No. Habitat is considered extremely marginal. Searches did not record this species.
<i>Varanus rosenbergi</i> Rosenberg's Goanna	V		Rosenberg's Goanna occurs on the Sydney Sandstone in Wollemi National Park to the north-west of Sydney, in the Goulburn and ACT regions and near Cooma in the south. There are records from the South West Slopes near Khancoban and Tooma River. Also occurs in South Australia and Western Australia. Found in heath, open forest and woodland. Associated with termites, the mounds of which this species nests in; termite mounds are a critical habitat component. Individuals require large areas of habitat. Feeds on carrion, birds, eggs, reptiles and small mammals. Shelters in hollow logs, rock crevices and in burrows, which they may dig for themselves, or they may use other species' burrows, such as rabbit warrens. Runs along the ground when pursued (as opposed to the Lace Monitor, which climbs trees). Lays up to 14 eggs in a termite mound; the hatchlings dig themselves out of the mounds. Generally slow moving; on the tablelands likely only to be seen on the hottest days.	Absent	Unlikely	No
Plants						

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Calotis glandulosa</i> Mauve Burr-daisy	V	V	An erect or ascending, branching herb growing to 35 cm high. Mauve Burr-daisy's main distribution is in the Monaro and Kosciuszko regions. There are three known sites in the upper Shoalhaven catchment. There are old and possibly dubious records from near Oberon, the Dubbo area and Mt Imlay. In Kosciuszko NP this species is locally abundant near Tantangara Dam, Nungar Plain, and surrounding areas in grassland and along roadsides. Found in montane and sub-alpine grasslands in the Australian Alps. Found in subalpine grassland (dominated by <i>Poa</i> spp.), and montane or natural temperate grassland (dominated by <i>Themeda australis</i>) and Snow Gum (<i>Eucalyptus pauciflora</i>) Woodlands on the Monaro and Shoalhaven area. This species prefers grazing-restricted sites, such as Beloka Cemetery <i>Themeda triandra</i> dominated grassland. Appears to be a coloniser of bare patches, which explains why it often occurs on roadsides. Apparently common on roadsides in parts of the Monaro, though it does not persist for long in such sites. Does not persist in heavily-grazed pastures of the Monaro or the Shoalhaven area.	Present	Unlikely A targeted flora survey did not identify this species.	No.
<i>Dodonaea procumbens</i> Creeping Hop-bush	V	V	A low spreading shrub that forms a ground-hugging mat up to 1 m across and 10 cm tall. Found in the dry areas of the Monaro, between Michelago and Dalgety. Here it occurs mostly in Natural Temperate Grassland or Snow Gum <i>Eucalyptus pauciflora</i> Woodland. There is one population at Lake Bathurst (the northern-most occurrence of the species). Here it occurs in adjacent to the lake bed in grassland dominated by Corkscrew Grass <i>Austrostipa scabra</i> and Curly Sedge <i>Carex bichenoviana</i> . Creeping Hop-bush also occurs in South Australia and Victoria. Grows in Natural Temperate Grassland or fringing eucalypt woodland of Snow Gum (<i>Eucalyptus pauciflora</i>). Grows in open bare patches where there is little competition from other species. Found on sandy-clay soils, usually on or near vertically-tilted shale outcrops. Produces roots along the stems that enable the plants to recover from minor disturbances. Often occurs on roadside batters. Does not persist in heavily grazed pastures of the Monaro.	Marginal	Unlikely Sub-optimal habitat and targeted flora survey did not identify this species.	No.

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Pelargonium striatellum</i> sp. (G.W.Carr 10345) Omeo Stork's-bill	E	E	A tufted perennial herb with a basal vegetative rosette and flowering stems to 15 cm tall. Currently known to occur at four localities in the Southern Tablelands, at altitudes ranging from 680-1030m ASL.: Lake Bathurst near Goulburn, on grazing leasehold; two sites (one probably extinct) on private grazing properties south-west of Cooma; and at Maffra Lake near Dalgety in a fenced Travelling Stock Reserve assessed as having high conservation values. A terrestrial plant with a narrow habitat just above the high-water level of irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture and the paludal and aquatic communities. It colonises exposed lake beds during dry periods. The extent of habitat at any one site, and the persistence of the species, is likely be closely related to the combined effects of inundation frequency and the topography of lake bed and shoreline, in maintaining a more or less extensive disturbed interzone between grass-dominated communities and sedge-dominated aquatic vegetation, as well as to past and current grazing regimes and other forms of disturbance. Species directly associated with <i>Pelargonium</i> sp. (G. W. Carr 10345) vary considerably between sites, but are typically a disturbed (often intermittently grazed) grass/sedge/herb assemblage.	Absent	None	No
<i>Rutidosia leirolepis</i> Monaro Golden Daisy		V	A low, tufted perennial with a woody root-stock with flowers that occur on erect woolly stems to about 25 cm tall. Known from 21 locations in Kosciuszko National Park (NP) on high treeless plains, mainly above an altitude of 1200 m and over an area totalling about 17 hectares. These populations occur mainly in the Klandra, Long Plain and Happy Jacks Plain areas. A few other populations occur outside the park, further east on the Monaro Tableland, near Cooma, at Adaminaby and at Dry Plain. Within Kosciuszko NP, Monaro Golden Daisy is usually found above 1200 m in or on the margins of subalpine treeless plains supporting alpine heath and grassland communities of the Alpine Complex. These communities are dominated by snow grasses (<i>Poa</i> spp.) and various shrub species, such as <i>Leucopogon hookeri</i> , <i>Pimelea biflora</i> , <i>Oxylobium ellipticum</i> , <i>Pultenaea fasciculata</i> , and occur on usually shallow soils derived from basalt, granite and sedimentary substrates. Populations outside the park are found at lower altitudes of 860–1010 m, on the temperate montane grasslands of the Monaro Tablelands, typically dominated by grasses of the genera <i>Austrodanthonia</i> , <i>Austrostipa</i> , <i>Poa</i> and/or <i>Themeda triandra</i> . Apparently highly susceptible to grazing, being retained in only a small number of populations on roadsides, un-grazed reserves and very lightly grazed pastures on private lands. Flowers in summer.	Marginal	Unlikely Sub-optimal habitat and targeted flora survey did not identify this species.	No.

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Rutidosia leptorrhynchoidea</i> Button Wrinklewort	E		A slender perennial wildflower that grows to about 30 cm in height. Flowers from December to April. Known from 17 populations in the ACT region (ten within the ACT, six near Queanbeyan and one near Goulburn (NSW)) and nine in Victoria. In NSW, large known populations include The Poplars and Gundaring Travelling Stock Reserve. Occurs in box-gum woodland, secondary grassland derived from box-gum woodland or in natural temperate grassland; and often in the ecotone between the two communities. In the ACT and NSW, topography is undulating, 570–780 m above sea level and soils are red-brown clays to clay loams, shallow and stony. Tends to occupy areas where there is less competition from other plants and less shading from woodland trees. Exhibits an ability to colonise disturbed areas (eg. vehicle tracks, bulldozer scrapings and areas of soil erosion). It grows best where the grass and herb cover is relatively low, these sites usually occur on low rises with shallow soil and low moisture status. Associated eucalypts at NSW and ACT sites include Blakely's Red Gum (<i>Eucalyptus blakelyi</i>), Long-leaved Box (<i>E. goniacalyx</i>), Yellow Box (<i>E. melliodora</i>), Red Box (<i>E. polyanthemos</i>) and Apple Box (<i>E. bridgesiana</i>). Many sites are associated with Kangaroo Grass (<i>Themeda triandra</i>). Normally flowers between December to March; plants do not usually flower until their second year.	Absent	None	No
<i>Swainsona sericea</i> Silky Swainson-pea	V		A prostrate or erect perennial, growing to 10 cm tall. Silky Swainson-pea has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland. Found in Natural Temperate Grassland and Snow Gum <i>Eucalyptus pauciflora</i> Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. Sometimes found in association with cypress-pines <i>Callitris</i> spp. Habitat on plains is unknown.	Marginal	Unlikely Sub-optimal habitat and targeted flora survey did not identify this species.	No
<i>Thesium australe</i> Austral Toadflax	E	V	An erect perennial herb to 40 cm high. Found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland or grassy woodland, often found in damp sites in association with Kangaroo Grass (<i>Themeda australis</i>). A root parasite that takes water and some nutrients from other plants, especially Kangaroo Grass. Flowering is predominantly in spring and summer.	Absent	None	No
<i>Ecological communities</i>						

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Alpine Sphagnum Bogs and Associated Fens</i>		EEC	This EEC is known as the habitat for a number of threatened amphibians including both the Northern and Southern Corroboree frogs, as well as other frogs, birds and plants. The EEC is dominated by bogs, fens, wet heathland and peatland.	Absent	None	No
<i>Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions</i>	EEC		Comprises a dense, open or sparse layer of shrubs (including species of <i>Baeckea</i> , <i>Callistemon</i> and <i>Leptospermum</i>) with soft-leaved sedges, grasses and forbs. It is the only type of wetland that may contain more than trace amounts of <i>Sphagnum</i> spp., the hummock peat-forming mosses. Small trees may be present as scattered emergents or absent. currently known from parts of the Local Government Areas of Armidale Dumaresq, Bega Valley, Bellingen, Blue Mountains, Bombala, Cooma-Monaro, Eurobodalla, Gloucester, Greater Argyle, Guyra, Hawkesbury, Lithgow, Oberon, Palerang, Severn, Shoalhaven, Snowy River, Tenterfield, Tumbarumba, Tumut, Upper Lachlan and Wingecarribee but may occur elsewhere in these bioregions. The community is currently known from conservation reserves including Werrikimbee, Barrington, Kanangra-Boyd, Monga, Wadbilliga, South East Forests and Kosciusko National Parks. The Montane Peatlands community is associated with accumulated peaty or organic-mineral sediments on poorly drained flats in the headwaters of streams. It occurs on undulating tablelands and plateaux, above 400-500 m elevation, generally in catchments with basic volcanic or fine-grained sedimentary substrates or, occasionally, granite.	Absent	None	No
<i>Natural Temperate Grassland of the Southern Tablelands and the Australian Capital Territory</i>		EEC	Natural temperate grassland is grassy vegetation dominated by moderately tall (25–50 cm) to tall (50–100 cm), dense to open tussock grasses in the genera <i>Austrodanthonia</i> , <i>Austrostipa</i> , <i>Bothriochloa</i> , <i>Poa</i> and <i>Themeda</i> . Up to 70% of all plant species may be forbs (i.e. herbaceous, non-grassy/non-grass-like plants). The community may be treeless or contain up to 10% cover of trees, shrubs or sedges.	Absent	None	No

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	EEC		Tableland Basalt Forest is dominated by an open eucalypt canopy of variable composition. <i>Eucalyptus viminalis</i> , <i>E. radiata</i> , <i>E. dalrympleana</i> subsp. <i>dalrympleana</i> and <i>E. pauciflora</i> may occur in the community in pure stands or in varying combinations. The community typically has an open canopy of eucalypts with sparse mid-story shrubs (e.g. <i>Acacia melanoxylon</i> and <i>A. dealbata</i>) and understory shrubs (e.g. <i>Rubus parvifolius</i>) and a dense groundcover of herbs and grasses, although disturbed stands may lack either or both of the woody strata. The structure of the community varies depending on past and current disturbances, particularly fire history, clearing and grazing. Contemporary tree-dominated stands of the community are largely relics or regrowth of originally taller forests and woodlands, which are likely to have had scattered shrubs and a largely continuous grassy groundcover. At some sites, mature trees may exceed 30 m tall, although regrowth stands may be shorter than 10 m tall.	Absent	None	No
Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions	EEC		This community, commonly referred to as Tablelands Snow Gum Grassy Woodland, occurs as an open-forest, woodland or open woodland. This community may also occur as a secondary grassland where the trees have been removed, but the groundlayer remains. The main tree species are <i>Eucalyptus pauciflora</i> (Snow Gum), <i>E. rubida</i> (Candlebark), <i>E. stellulata</i> (Back Sallee) and <i>E. viminalis</i> (Ribbon Gum), either alone or in various combinations. Other eucalypt species may occur. A shrub layer may be present and sub-shrubs are common. The most common shrubs include <i>Meliccytus</i> sp. 'Snowfields' (Gruggly-bush) and <i>Melichrus urceolatus</i> (Urn Heath). The ground layer is grassy, with the most common species including <i>Themeda australis</i> (Kangaroo Grass), <i>Poa</i> spp. (snow-grasses), <i>Austrostipa</i> spp. (spear-grasses) and <i>Rytidosperma</i> spp. (wallaby-grasses). Sites in high condition have a range of forb (wildflower) species, including <i>Leptorhynchus squamatus</i> (Scaly-buttons), <i>Chryscephalum apiculatum</i> (Common Everlastings) and <i>Asperula conferta</i> (Native Woodluff). Many threatened flora and fauna species have been recorded in this community. The community commonly occurs on valley floors, margins of frost hollows and on footslopes and undulating hills. It occurs between approximately 600 and 1400 m in altitude on a variety of substrates, including basalt, sediments, granite, colluvium and alluvium.	Present	Occurs	Yes. An AoS has been prepared for this EEC.

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Upland Wetlands of the New England Tablelands and the Monaro Plateau</i>	EEC	EEC	This community is composed of a series of high altitude wetlands in the New England Tablelands of Northern NSW. The wetlands have small local catchments, and range from shallow and temporary to near-permanent wetlands. Vegetation is usually a combination of sedges, rushes, spike-rushes, grasses and other aquatic plants, occurring either on the shores of open water or extending across shallow or dry wetland beds, and can die back during dry periods. These wetlands are important habitat for a range of native wildlife.	Absent	None	No
<i>White Box-Yellow Box-Blakely's Red Gum Woodland Derived Grassland</i>	EEC	CEEC	White Box Yellow Box Blakely's Red Gum Woodland (commonly referred to as Box-Gum Woodland) is an open woodland community (sometimes occurring as a forest formation), in which the most obvious species are one or more of the following: White Box <i>Eucalyptus albens</i> , Yellow Box <i>E. melliodora</i> and Blakely's Red Gum <i>E. blakelyi</i> . Intact sites contain a high diversity of plant species, including the main tree species, additional tree species, some shrub species, several climbing plant species, many grasses and a very high diversity of herbs. The community also includes a range of mammal, bird, reptile, frog and invertebrate fauna species. Intact stands that contain diverse upper and mid-storeys and groundlayers are rare.	Absent	None	No
<i>Migratory species (listed under the EPBC Act)</i>						
<i>Apus pacificus</i> Fork-tailed Swift		M	This species breeds in the north-east and mid-east Asia and winters in Australia and southern New Guinea. It is a visitor to most parts of Western Australia, beginning to arrive in the Kimberley in late September, in the Pilbara and Eucla in November and in the south-west land division in mid-December, and leaving by late April. It is common in the Kimberley, uncommon to moderately common near north-west, west and southeast coasts and rare to scarce elsewhere. They never settle voluntarily on the ground and spend most of their lives in the air, living on the insects they catch in their beaks.	Marginal – rarely come down to land and have no particular vegetation preferences	Unlikely – no records within the region and generally uncommon in the south-east.	No

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Hirundapus caudacutus</i> White-throated Needle-tail		M	White-throated Needle-tails often occur in large numbers over eastern and northern Australia. They arrive in Australia from their breeding grounds in the northern hemisphere in about October each year and leave somewhere between May and August. They are aerial birds and for a time it was commonly believed that they did not land while in Australia. It has now been observed that birds will roost in trees, and radio-tracking has since confirmed that this is a regular activity. The White-throated Needle-tail feeds on flying insects, such as termites, ants, beetles and flies. They catch the insects in flight in their wide gaping beaks. Birds usually feed in rising thermal currents associated with storm fronts and bushfires and they are commonly seen moving with wind fronts. White-throated Needle-tails are non-breeding migrants in Australia.	Marginal – may seasonally be present in the area, but will only potentially utilise the site for roosting.	Unlikely – no records within 10 km of site.	No
<i>Merops ornatus</i> Rainbow Bee-eater		M	The Rainbow Bee-eater is found throughout mainland Australia, as well as eastern Indonesia, New Guinea and, rarely, the Solomon Islands. In Australia it is widespread, except in desert areas, and breeds throughout most of its range, although southern birds move north to breed. The Rainbow Bee-eater is most often found in open forests, woodlands and shrublands, and cleared areas, usually near water. It will be found on farmland with remnant vegetation and in orchards and vineyards. It will use disturbed sites such as quarries, cuttings and mines to build its nesting tunnels. Southern populations move north, often in huge flocks, during winter; northern populations are present year round. Rainbow Bee-eaters eat insects, mainly catching bees and wasps, as well as dragonflies, beetles, butterflies and moths. They catch flying insects on the wing and carry them back to a perch to beat them against it before swallowing them. Bees and wasps are rubbed against the perch to remove the stings and venom glands.	Marginal – wide range of habitat preference.	Possible – no records in area but may occur seasonally.	No – species will not rely on vegetation at the site for any aspect of its lifecycle.
<i>Monarcha melanopsis</i> Black-faced Monarch		M	The Black-faced Monarch is found along the coast of eastern Australia, becoming less common further south. The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating. Resident in the north of its range, but is a summer breeding migrant to coastal south-eastern Australia, arriving in September and returning northwards in March. The Black-faced Monarch forages for insects among foliage, or catches flying insects on the wing. The Black-faced Monarch builds a deep cup nest of casuarina needles, bark, roots, moss and spider web in the fork of a tree, about 3 m to 6 m above the ground. Only the female builds the nest, but both sexes incubate the eggs and feed the young.	Marginal – has a wide range of habitat preference whilst migrating.	Possible – may occur seasonally on the site, but no records within 10 km.	No – species will not rely on vegetation at the site for any aspect of its lifecycle.

Species	TSC Act	EPBC Act	Habitat requirements	Presence of habitat	Likelihood of occurrence	Potential Impact
<i>Myiagra cyanoleuca</i> Satin Flycatcher		M	The Satin Flycatcher is found along the east coast of Australia from far northern Queensland to Tasmania, including south-eastern South Australia. It is also found in New Guinea. The Satin Flycatcher is not a commonly seen species, especially in the far south of its range, where it is a summer breeding migrant. The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests. The Satin Flycatcher is a migratory species, moving northwards in winter to northern Queensland and Papua New Guinea, returning south to breed in spring. The Satin Flycatcher takes insects on the wing, foraging actively from perches in the mid to upper canopy.	Marginal – tall forests found near study area, and site has some wetter influences.	Unlikely – site not heavily forested enough.	No
<i>Rhipidura rufifrons</i> Rufous Fantail		M	The Rufous Fantail is found in northern and eastern coastal Australia, being more common in the north. It is also found in New Guinea, the Solomon Islands, Sulawesi and Guam. The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas. Strongly migratory in the south of its range, it moves northwards in winter, and virtually disappears from Victoria and New South Wales at this time. The Rufous Fantail feeds on insects, which it gleans from the middle and lower levels of the canopy. It is a very active feeder and constantly fans tail and flicks wings and body while foraging. The Rufous Fantail builds a small compact cup nest, of fine grasses bound with spider webs, that is suspended from a tree fork about 5 m from the ground. The bottom of the nest is drawn out into a long stem.	Absent – site likely too different from preferred rainforest habitat.	None	No

APPENDIX H ASSESSMENT OF SIGNIFICANCE

The *Environmental Planning and Assessment Act 1979 (EP&A Act)* specifies a set of seven factors which must be considered by decision makers in assessing the effect of a proposed development or activity on threatened species, populations or ecological communities, or their habitats. These factors are collectively referred to as the 'seven part test'.

Assessments have been undertaken to characterise the significance of the potential impact on

- *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions*, as this EEC, listed under the TSC Act, is present throughout the study area and will be impacted by the proposal.
- *Little Eagle (Hieraetus morphnoides)*, listed under the TSC Act, is assumed to be present throughout the study area and will be impacted by the proposal if stage 3 extraction commences.

Tablelands snow gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions.

- (a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.**

N/A

- (b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.**

N/A

- (c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:**

- is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or**
 - is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction**
- i. The proposal would result in the removal of 11.88 hectares of the EEC, all of which is heavily infested with African Lovegrass and 5.15 hectares is in low condition. The remaining 6.73 hectares is in moderate to good condition on the basis of overstorey cover only. The habitat to be removed is not considered to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at the risk of extinction given the high levels of degradation of the vegetation proposed for removal and that approximately 96 hectares of the local occurrence will remain, 45 hectares of which exhibits a degree of native understorey diversity similar to the moderate to good condition vegetation within the proposal area. Furthermore, 65 hectares of this remaining area will be protected as an offset for the proposal.

- ii. The proposal would result in the direct loss of 11.88 hectares of the ecological community. Additional impacts, such as the introduction and spread of weeds throughout the EEC or erosion risks as a result of extraction activities, have the potential to occur throughout the site. Mitigation measures have been identified to reduce the risk of these impacts occurring and with the implementation of these controls, the proposal is unlikely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction. In addition, subject to appropriate management, the condition and ecological function of communities within the offset sites are expected to improve over time.

(d) in relation to the habitat of a threatened species, population or ecological community:

- i. **the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
 - ii. **whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
 - iii. **the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**
- i. The proposal would result in the removal of approximately 5.15 hectares of the community in low condition and approximately 6.73 hectares of the community in moderate to good condition.
 - ii. The community has been highly cleared and fragmented in the locality mostly for agricultural purposes. The proposal area is located within a patch of the community approximately 110 hectares in size which has no connectivity to the east, north or west and limited connectivity to the south through a narrow (approximately 200 metres wide) thinned woodland corridor which links to more extensive habitat to the west. The proposal would reduce the size of the patch but would not substantially impact on this corridor. Given the extensive clearing of surrounding areas, the proposal would not cause substantial additional fragmentation or isolate areas of habitat.
 - iii. The habitat to be removed by the proposal is highly degraded due to invasion of the understorey by noxious weeds. Areas of the community in low condition have virtually no native component to the understorey and the conservation value of these areas with regard to the EEC is considered to be very low. The habitat to be removed in moderate to good condition is also heavily infested with noxious grass species however, some native forb diversity remains. The understorey is still predominately African Lovegrass but forbs persist in the intertussock spaces in low abundance. This type of habitat extends beyond the proposal foot print to the west over an area of approximately 50 hectares. The removal of 6.73 hectares (less than 5% of the total patch size and approximately 10% of the known habitat with some native diversity) is unlikely to jeopardise the long-term survival of the community in the locality. Further the residual 65 hectares of the community within the land parcel to be purchased by CMSC will be protected as an offset ensuring the long-term survival of the local occurrence.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No areas of critical habitat have been declared for this species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

There is no recovery plan or threat abatement plan for the *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions* EEC.

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

Three key threatening processes are considered relevant to impacts on EECs:

Clearing of native vegetation.

The clearing of native vegetation is listed as a Key Threatening Process, as a major contributor to the loss of biodiversity. In the determination, the NSW Scientific Committee found that 'clearing of any area of native vegetation, including areas less than two hectares in extent, may have significant impacts on biological diversity'. Clearing can lead to direct habitat loss, habitat fragmentation and associated genetic impacts, habitat degradation and off-site impacts such as downstream sedimentation. The proposal will involve clearing of native vegetation, but this is not considered to contribute significantly to the operation of clearing as a threatening process at the local or regional level, relative to the extensive clearing that has already taken place in the locality. Aside from the direct habitat loss of approximately 11.88 hectares of degraded habitat that is considered unlikely to provide important habitat for threatened species, the proposal will not result in habitat fragmentation or isolation and is unlikely to disrupt gene flow or have offsite impacts.

Invasion of native plant communities by exotic perennial grasses.

A number of exotic perennial grasses were recorded across the site. African Love Grass and Serrated Tussock are dominant across the site. Other species such as Chilean Needle Grass, Parramatta Grass, Paspalum and Phalaris could be introduced on vehicles and machinery used on the site during construction and operation but given the current dominance of African Lovegrass, this is unlikely to exacerbate this process within the study area.

There is a high potential for exotic perennial grasses that occur within the study area to be spread off site to other areas containing native plant communities. Strict weed control measures have been recommended as part of this assessment and if followed this risk is considered to be manageable.

Infection of native plants by *Phytophthora cinnamomi*

No evidence of *Phytophthora cinnamomi* was observed during the field survey but the pathogen is well established in higher rainfall areas; therefore, there is the potential for its introduction. With adherence to the machinery hygiene protocols recommended in this assessment, it is considered unlikely that the proposal would contribute to this KTP.

Conclusion

The proposal will result in the clearing of up to 11.88 hectares of the *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions* EEC, all of which is heavily infested with African Lovegrass and 5.15 hectares is in low condition. The remaining 6.73 hectares is in moderate to good condition on the basis of overstorey cover only. The proposal would not result in any further fragmentation or isolation of habitat for the EEC. The habitat to be removed is not considered important to the long-term survival of the community in the locality given the high levels of degradation and that approximately 96 hectares of the local occurrence will remain, 45 hectares of which exhibits a degree of

native understorey diversity similar to the moderate to good condition vegetation within the proposal area. Further 65 hectares of this remaining area will be protected as an offset for the proposal.

With the implementation of the mitigations measures recommended in this assessment, the proposal is not expected to significantly contribute to any KTPs.

A significant impact to the *Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions* EEC is considered unlikely as a result of the proposal.

Little eagle

(a) in the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Little Eagle requires open eucalypt forest, woodland or open woodlands and two nests, assumed to belong to the species, were observed within the area proposed for stage 3 extraction. Stage 1 and 2 of the proposal is expected to occur over the next 10 years (minimum). There would be no direct impact to the species during this time period. Indirect impacts such as noise generated by the Stage 1 and Stage 2 extraction activities, would be less than what currently occurs as these areas are a greater distance from the existing gravel pit operations. Stage 1 and Stage 2 operations would not be likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

It is proposed to monitor the nest sites prior to extraction activities in Stage 3 to determine if they are still active. If there is evidence that the species is still utilising the site, the trees housing the nests would be protected from disturbance, where possible, by placing a 50m buffer around the tree and removing the area from the extraction site. If protection is not possible, the proposal would result in the direct loss of two nest sites that may be utilised by the species. Tree removal would occur outside of the breeding season. Breeding habitat suitable for the species would remain within the localised area through the management of the offset site. Given the extended time frame prior to any potential disturbance to the species nesting sites, and the availability of suitable habitat in immediate proximity to the site, Stage 3 operations is not expected to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

N/A

(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

- i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or
- ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction

N/A

(d) in relation to the habitat of a threatened species, population or ecological community:

- i. the extent to which habitat is likely to be removed or modified as a result of the action proposed, and**
 - ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and**
 - iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**
- i. The proposal would result in the removal of approximately 11.88 hectares of woodland vegetation that could be utilised by the species.
 - ii. Woodland vegetation has been highly cleared and fragmented in the locality mostly for agricultural purposes. The proposal area is located within a patch of the woodland approximately 110 hectares in size which has no connectivity to the east, north or west and limited connectivity to the south through a narrow (approximately 200 metres wide) thinned woodland corridor which links to more extensive woodland/forest habitat to the west. The proposal would remove 11.88 hectares within this patch but would not further fragment or isolate this patch of habitat.
 - iii. The proposal would remove 11.88 hectares of woodland vegetation including the possible removal (worst case) of two trees prior to Stage 3 extraction that are assumed to be providing breeding habitat to the species. The species is highly mobile and is known to use different nest sites over successive years. In addition, 65 hectares of suitable habitat for the species would remain within the localised area through the management of the offset site. The removal of habitat for this proposal would not adversely affect the long-term survival of the species in the locality. Measures are included to reduce the risks to resident individuals.

(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No areas of critical habitat have been declared for this species.

(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan

There is no recovery plan or threat abatement plan for the Little Eagle

(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process

Clearing of native vegetation.

The clearing of native vegetation is listed as a Key Threatening Process, as a major contributor to the loss of biodiversity. In the determination, the NSW Scientific Committee found that 'clearing of any area of native vegetation, including areas less than two hectares in extent, may have significant impacts on biological diversity'. Clearing can lead to direct habitat loss, habitat fragmentation and associated genetic impacts, habitat degradation and off-site impacts such as downstream sedimentation. The proposal will involve clearing of native vegetation, which has been assumed to provide breeding and foraging habitat for the Little eagle.

The clearing is not considered to contribute significantly to the operation of clearing as a threatening process at the local or regional level, relative to the extensive clearing that has already taken place in the locality. Whilst the proposal will result in the direct habitat loss of approximately 11.88 hectares of

native vegetation, the proposal will not result in substantial additional habitat fragmentation or isolation and is unlikely to disrupt gene flow or have offsite impacts.

Conclusion

The proposal will result in the clearing of up to 11.88 hectares of suitable breeding and foraging habitat for the Little Eagle. The proposal would not result in significant additional fragmentation or isolation of habitat for the species. The habitat to be removed is not considered important to the long-term survival of the community in the locality given the high mobility of the species and the ability of the species to use different nest sites over successive years. Approximately 96 hectares of the local occurrence of woodland vegetation will remain, with 65 hectares of this remaining area to be protected as an offset for the proposal.

With the implementation of the mitigations measures recommended in this assessment to reduce risks to resident individuals, the proposal is not expected to significantly contribute to any KTPs.

A significant impact to the Little Eagle is considered unlikely as a result of the proposal.

APPENDIX I VEGETATION CLEARING GUIDELINES

General clearing and trimming guidelines

- Tree and shrub removal should aim to minimise disturbance to soils, waterways and neighbouring vegetation. This may be achieved using a chainsaw for felling and a small excavator to remove the stump, working from disturbed ground where practicable.
- Check for animals in the zone of disturbance before clearing and scare or remove them before beginning operations where possible. Re-check after clearing to ensure no animals have become trapped or injured during clearing operations.
- Clearly mark the limits of the vegetation to be removed and retained by differentiating with coloured flagging tape.
- Fell trees into the zone of disturbance to avoid damaging adjacent vegetation and do not push felled vegetation into areas to be retained.
- Retain tree hollows where practical when pruning branches.
- Take care when moving equipment near native vegetation to be retained.
- Mulch rather than burn cleared native vegetation. Where possible, consider distributing some logs from the felled trees into areas of vegetation to be retained where it would not be considered a fire hazard. This would provide additional habitat for ground dwelling fauna such as reptiles and small mammals.

Clearing Hollow-bearing Trees

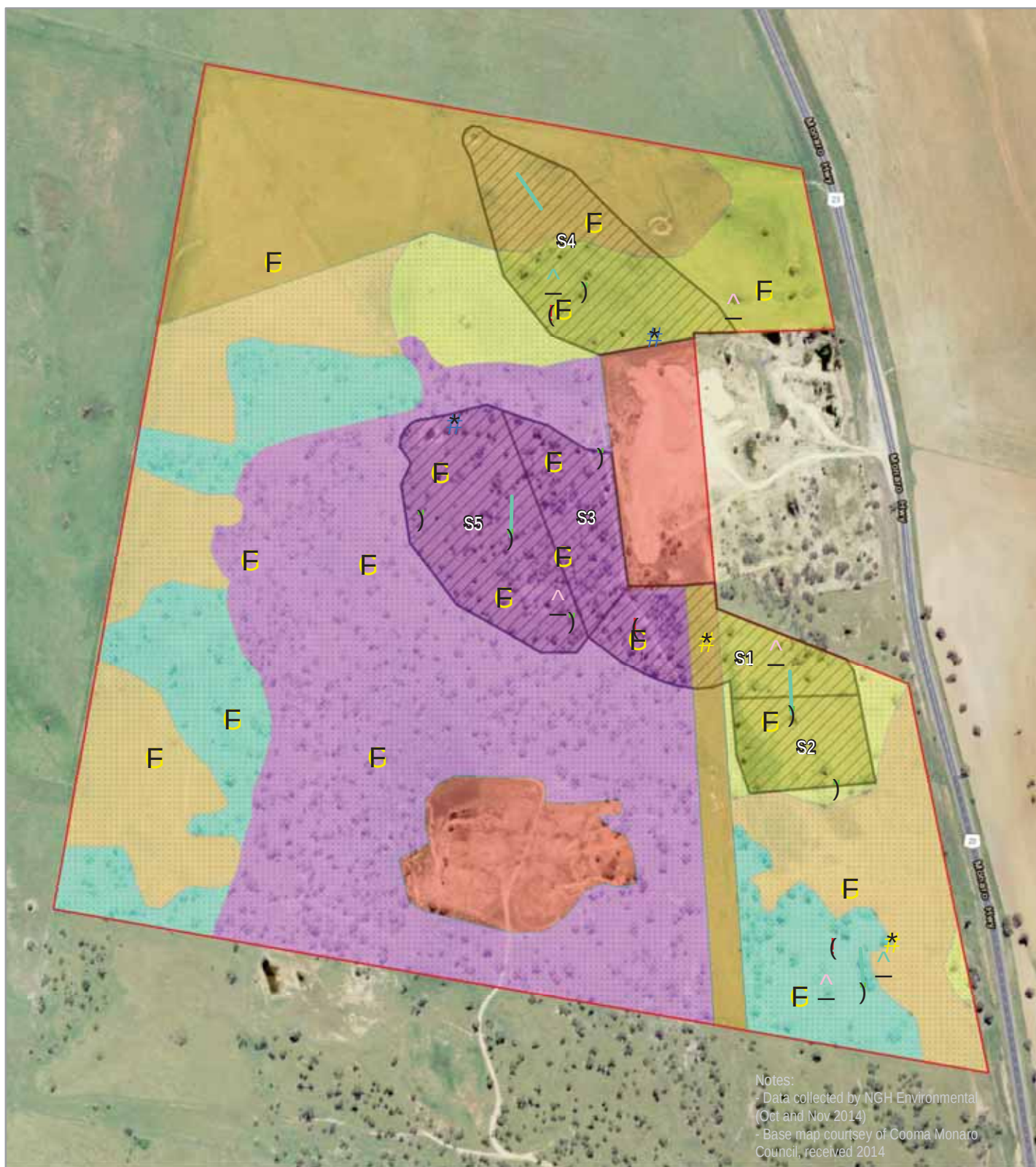
- Medium and large trees with hollows or cracks which may be used by fauna such as mammals, birds and bats which are required to be removed should be inspected prior to removal.
- Hollow-bearing tree (HBT) removal should be conducted between January to March to avoid the breeding seasons of bats, birds and hollow-bearing dependant fauna.
- Clearly mark the HBT to be removed and/or retained by differentiating with coloured flagging tape.
- Remove all non-hollow bearing vegetation prior to the removal of HBT.
- Where possible, leave HBT standing for at least one night after other clearing to allow any fauna the opportunity to remove themselves after site disturbance.
- Before felling HBT, tap along trunk using an excavator or loader to scare animals from the hollows. Repeat several times. The aim of this is to 'substantially' shake the tree. Most fauna would exit the tree during this process.
- For medium-large hollow-bearing trees which may contain arboreal mammals, sectional removal should be used with a suitably qualified and licensed zoologist or trained wildlife carer present. This person should ensure that any fauna found is safely located to nearby habitat.
- When using sectional removal, the non-hollow-bearing branches should be removed before the hollow-bearing branches.

Use and disposal of cleared vegetation

- Non-weedy vegetation can be mulched and re-used for site stabilisation and rehabilitation. Vegetation that contains weeds should not be re-used as mulch on any part of the site.
- Mulched plant material should be shredded when it is first cut, and allowed to decompose while the works are carried out. The decomposing pile should be stockpiled in a weed free area and turned weekly to prevent overheating and possible spontaneous combustion.
- Loose mulch should not be used in areas subject to significant surface water flows during rain.

- Large tree trunks and limbs, particularly hollows, fallen timber from the areas to be cleared, as well as felled timber should be redistributed in to areas with poor groundlayer complexity to supplement foraging habitat for Grey-crowned Babblers.
- Cleared vegetation that is not needed for mulch should be removed from the site or burnt in an open area, well away from retained trees, intact native vegetation and runoff flow paths.

APPENDIX J MAPS



SURVEY EFFORT

Upper Bunyan Gravel Pit

- Property boundary
- Offset area
- Proposed extraction areas
- E Reptile plot locations
- Grassland flora transect

October 2014

- # Anabat
- △ Stagwatch
-) BioBanking Plot

November 2014

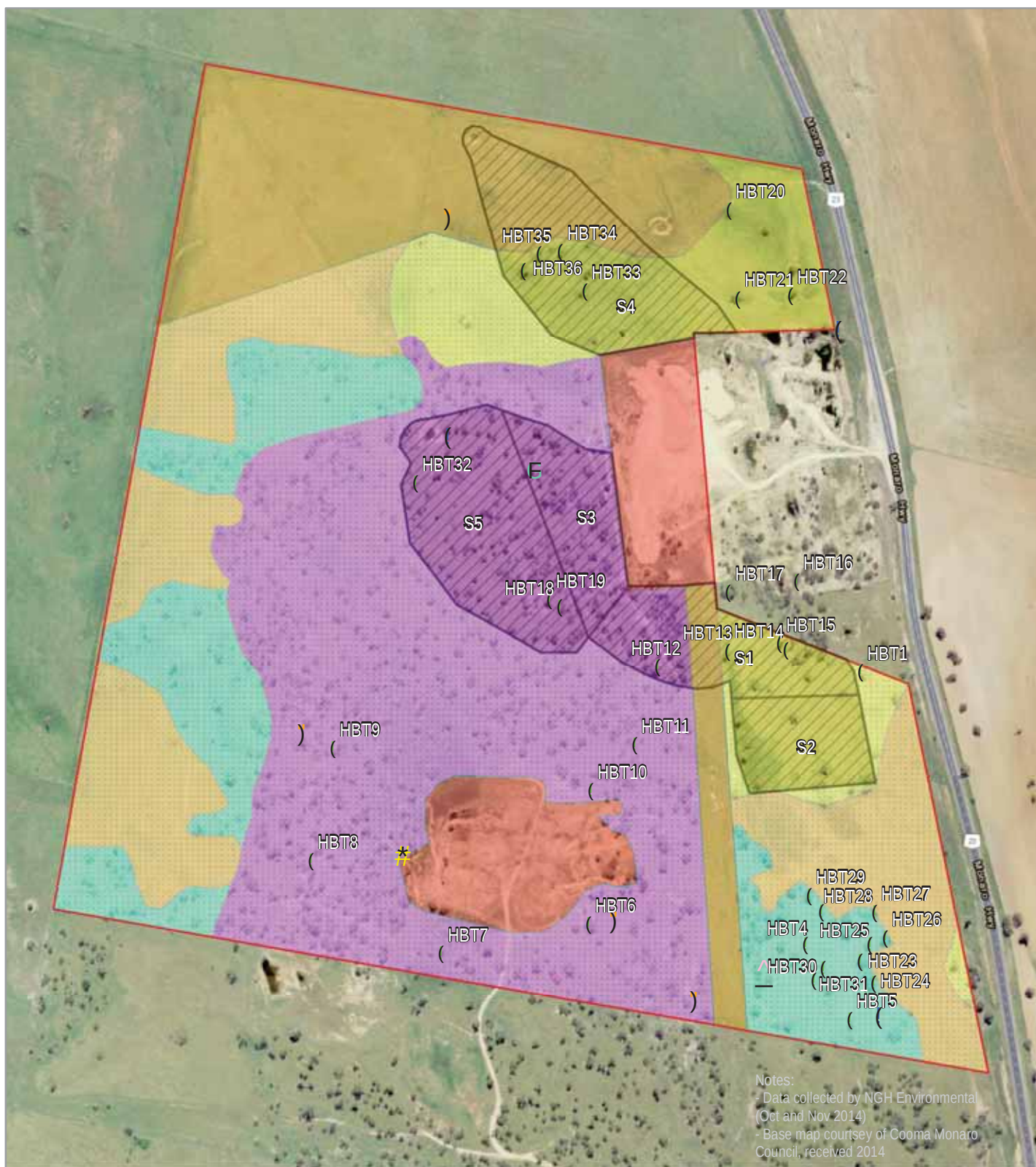
- # Anabat
- (Bird survey
- △ Stagwatch

Vegetation types

- Disturbed
- Exotic grassland (African Lovegrass)
- Ribbon Gum - Snow Gum grassy open forest - grassy - low
- Ribbon Gum - Snow Gum grassy open forest - grassy - moderate to good
- Ribbon Gum - Snow Gum grassy open forest - shrubby - moderate to good

0 50 100 200 Metres

A4 @ 1:6500
Ref: 5559 a
Author: JB



SURVEY RESULTS

Upper Bunyan Gravel Pit

Property boundary	Dam	Vegetation types
Offset area	Noisy Miner	Disturbed
Proposed extraction areas	Noxious weed	Exotic grassland (African Lovegrass)
	Rock outcrop	Ribbon Gum - Snow Gum grassy open forest - grassy - low
	Stick nest	Ribbon Gum - Snow Gum grassy open forest - grassy - moderate to good
	Hollow-bearing trees	Ribbon Gum - Snow Gum grassy open forest - shrubby - moderate to good

0 50 100 200 Metres

A4 @ 1:6500
Ref: 5559 b
Author: JB

APPENDIX K HOLLOW-BEARING TREE INVENTORY

Up to 11 trees would be removed by the development. Additionally, 2 trees occur in the existing quarry footprint and 18 in the surrounding area being considered as an offset site. Three hollow bearing trees are located north of the existing quarry and would not be affected by the proposal.

Easting	Northing	Label	Species	DBH (mm)	Hollow size			Location
					Small	Med	Large	
693203.8	5997966	HBT16	<i>E. viminalis</i>	900		1	P3	Existing quarry area
693123.3	5997953	HBT17	<i>E. viminalis</i>	800			1	Existing quarry area
693039.9	5997865	HBT12	<i>E. viminalis</i>	1000		2	2	Proposed expansion area
693122.3	5997883	HBT13	<i>E. viminalis</i>	900	1			Proposed expansion area
693191.4	5997885	HBT14	Stag	700		1	2	Proposed expansion area
693183.4	5997892	HBT15	<i>E. viminalis</i>	900			1	Proposed expansion area
692924.5	5997936	HBT18	<i>E. viminalis</i>	1000			1	Proposed expansion area
692912.3	5997944	HBT19	<i>E. viminalis</i>	1100		1		Proposed expansion area
692754.3	5998082	HBT32	<i>Eucalyptus viminalis</i>	600	3			Proposed expansion area
692954.3	5998308	HBT33	<i>Eucalyptus viminalis</i>	800	1	2		Proposed expansion area
692925.3	5998354	HBT34	<i>Eucalyptus viminalis</i>	400	1			Proposed expansion area
692900.3	5998352	HBT35	<i>Eucalyptus viminalis</i>	800	1			Proposed expansion area
692881.8	5998332	HBT36	<i>Eucalyptus viminalis</i>	700		1	1	Proposed expansion area
693279.5	5997859	HBT1	<i>E. viminalis</i>			1		Proposed offset area
693214.6	5997538	HBT4	Stags x 3		>3			Proposed offset area
693266.4	5997449	HBT5	<i>E. viminalis</i>				2	Proposed offset area
692958.4	5997562	HBT6	<i>E. viminalis</i>				>3	Proposed offset area

Easting	Northing	Label	Species	DBH		Hollow size	Location
692784.9	5997527	HBT7	<i>E. viminalis</i>		1		Proposed offset area
692631.4	5997636	HBT8	<i>E. viminalis</i>			>3	Proposed offset area
692657.3	5997769	HBT9	<i>E. viminalis</i>		1	3	Proposed offset area
692961.2	5997719	HBT10	Stag		1		Proposed offset area
693012.8	5997773	HBT11	Stag	850		>3	Proposed offset area
693278.7	5997518	HBT23	<i>Eucalyptus viminalis</i>	700	1		Proposed offset area
693294.5	5997492	HBT24	<i>Eucalyptus viminalis</i>	600		1	Proposed offset area
693290.3	5997537	HBT25	<i>Eucalyptus viminalis</i>	600		1	Proposed offset area
693308.3	5997545	HBT26	<i>Eucalyptus viminalis</i>	700	2		Proposed offset area
693295.9	5997575	HBT27	<i>Eucalyptus viminalis</i>	1000	1		Proposed offset area
693233.1	5997576	HBT28	<i>Eucalyptus viminalis</i>	900	Several	1	Proposed offset area
693218.5	5997595	HBT29	<i>Eucalyptus viminalis</i>	1100	Potentially several		Proposed offset area
693235.3	5997509	HBT30	Stag	900	Several	1	Proposed offset area
693224.1	5997496	HBT31	Stag	800	Several	1	Proposed offset area
693124	5998403	HBT20	<i>E. viminalis</i>	800		1	North of proposal area, not impacted
693134.6	5998299	HBT21	<i>E. viminalis</i>	1200		1	North of proposal area, not impacted
693196.8	5998303	HBT22	<i>E. viminalis</i>	1000	2		North of proposal area, not impacted

APPENDIX D OFFSET STRATEGY

D.1 REQUIREMENT TO OFFSET

Avoiding, minimising and mitigating impacts on biodiversity are the best ways to maintain biodiversity, and may be achieved through, planning, design, construction and maintenance processes. The mitigation measures identified within the biodiversity assessment have been developed to assist in minimising and mitigating impacts that cannot be avoided. Offsetting is a last resort that is implemented to compensate for residual impacts that cannot be avoided or completely mitigated.

The following strategy has been prepared for the proposed expansion of the Bunyan Gravel Pit. It includes:

- Calculation of the credit requirements created by clearing at the development site
- An evaluation of the ability of the offset site to meet the offset requirements of the proposed gravel pit expansion
- Recommendations for moving forward to meet the offset requirements of the proposal.

This advice has been prepared in consultation with OEH. Based on discussions with OEH², the strategy includes:

- A reduced impact on woodland vegetation, considered regionally significant
- Inclusion of areas of exotic dominated grassland in the offset site, that would be improved by the planting of appropriate overstorey vegetation.

This strategy is intended to inform a more detailed offset plan, which would include management actions required in the offset areas.

D.2 CREDIT REQUIREMENTS CREATED BY CLEARING AT THE DEVELOPMENT SITE

D.2.1 Methods

The Office of Environment and Heritage (OEH) BioBanking calculator was accessed on 30/07/2015 to determine the offset credit requirement for clearing associated with the proposed works. Vegetation plot data were collected in accordance with the BioBanking Assessment Methodology (BBAM) 2014 Appendix 2 by experienced project botanist Dave Maynard. This includes sampling nested 20m x 50m and 20 x 20m plots. Within these areas ten parameters are scored and entered against their respective vegetation zones. Calculations were undertaken by accredited assessor Brooke Marshall (035) to understand the credit requirement. This section details the key inputs used in the calculations.

Landscape value

One assessment circle set (1000 and 100ha) were constructed to cover the entire study area (Figure 1). Percent vegetation cover at the landscape scale for each circle was entered as follows:

² Teleconference 2 July 2015 with John Briggs and Susan Lamb, held after site inspection.

CMA – Murrumbidgee

Mitchell Landscape – Monaro Basalts and Sands

IBRA subregion – Monaro - Murrumbidgee

- 1000 ha before development = 16-20% of assessment circle
- 1000 ha after development = 16-20% of assessment circle
- 100 ha before development = 31-35% of assessment circle
- 100 ha after development = 26-30% of assessment circle
- Limiting link = 30-100m, not affected by the development
- Woody vegetation at benchmark, before and after development, no midstorey/groundcover

The Landscape score was calculated to be 12.6.



Figure 1. Landscape assessment circles.

Impact areas

Only one native vegetation community occurs on site. This corresponds the Biometric vegetation type MR602 Ribbon Gum - Snow Gum grassy open forest on flats and undulating hills of the eastern tableland, South Eastern Highlands.

The following impact areas would result from the clearing of all stages of the proposed quarry expansion. Staging for the development and offset site are mapped, Figure 2, in relation to the vegetation across the site.

Table 1 Clearing within each vegetation type.

Note: only native vegetation is included. Disturbed areas and areas of exotic dominated grassland has been excluded from the assessment.

Vegetation community	Threatened Ecological Community?	Condition	Area of vegetation estimated to be removed (ha)	Minimum plots required
Ribbon Gum - Snow Gum tall open woodland - grassy - low	Yes	Low	5.15	2
Ribbon Gum - Snow Gum tall open woodland - shrubby - moderate to good	Yes	Moderate to good	6.73	3
Total area (ha) of native vegetation to be removed in the development area			11.88	

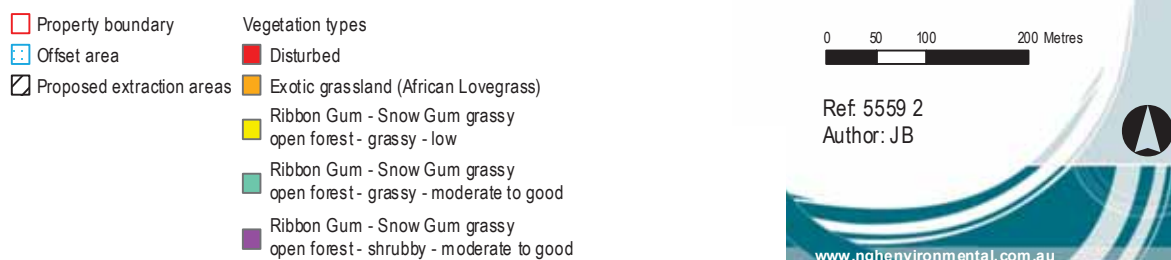


Figure 2. Development staging and proposed offset site

Assessment of geographic / habitat features

None of the following habitat features occur in the areas that would be impacted by the development – none are ticked as being impacted.

Impact?	Common name	Scientific name	Feature
☐	Austral Toadflax	<i>Thesium australe</i>	land within Kosciuszko National Park in Bondo (Part A) CMA subregion
☐	Rosenberg's Goanna	<i>Varanus rosenbergi</i>	land within eastern third of subregion, south-east of a line that runs through Tarcutta and Galong in Upper Slopes CMA subregion
☐	Mauve Burr-daisy	<i>Calotis glandulosa</i>	land south of Michelago in Monaro CMA subregion
☐	Tarengo Leek Orchid	<i>Prasophyllum petilum</i>	land east of Binalong in Upper Slopes CMA subregion
☐	Trailing Monotoca	<i>Monotoca rotundifolia</i>	land east of Monaro Highway in Monaro CMA subregion
☐	Pink Robin	<i>Petroica rodinogaster</i>	land within 40 m of gullies in eucalypt forests

Threatened species

The following species either require survey or should be assumed to occur:

Common name	Scientific name
Black Gum	<i>Eucalyptus aggregata</i>
Mauve Burr-daisy	<i>Calotis glandulosa</i>
Koala	<i>Phascolarctos cinereus</i>
Silky Swainson-pea	<i>Swainsona sericea</i>

Based on the field surveys conducted during appropriate survey windows, all four species are considered 'very unlikely' to be impacted. No impact was assigned to these species. No 'species' credits will be generated for these species.

Additional predicted threatened species returned included:

Common name	Scientific name
Barking Owl	<i>Ninox connivens</i>
Diamond Firetail	<i>Stagonopleura guttata</i>
Eastern False Pipistrelle	<i>Falsistrellus tasmaniensis</i>
Flame Robin	<i>Petroica phoenicea</i>
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata subsp. cucullata</i>

Common name	Scientific name
Little Eagle	<i>Hieraaetus morphnoides</i>
Little Whip Snake	<i>Suta flagellum</i>
Scarlet Robin	<i>Petroica boodang</i>
Speckled Warbler	<i>Chthonicola sagittata</i>
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>
Varied Sittella	<i>Daphoenositta chrysoptera</i>

These species are assumed to occur and may contribute to the credits generated in the assessment.

Site values

The following plot data were collected from the site in accordance with the BBAM 2014, Appendix 2. This includes sampling nested 20m x 50m and 20 x 20m plots. Within these areas ten parameters are scored and entered against their respective vegetation zones. In the development assessment, for each management zone all site scores were returned to zero, reflecting that all vegetation would be removed in each zone.

Table 2 Plot data

Vegetation code	PL OT ID	Native plant species richness	Native over- storey cover	Native mid- storey cover	Native ground cover (grasses)	Native ground cover (shrubs)	Native ground cover (other)	Exotic plant cover	Number of trees with hollows	Overst. regen	Total length of fallen logs	Easting	Northing	Zone
Ribbon Gum - Snow Gum tall open woodland - grassy - low	B4	0	0	0	0	0	0	70	0	0	0	693198	5997809	55
	B5	2	0	0	0	0	0	80	0	0	0	693252	5997722	55
Ribbon Gum - Snow Gum tall open woodland - shrubby – mod-good	B1	15	9	0	2	0	2	72	1	1	29	692973	5993112	55
	B2	11	2.5	0	0	0	10	76	0	1	7	692866	5998018	55
	B3	9	4.5	6.5	0	0	4	80	1	1	28	692939	5997919	55
	B7	9	5.5	0	0	0	4	88	0	1	6	692761	5998039	55

Offset site only:

Ribbon Gum - Snow Gum tall open woodland - shrubby – mod-good (grassy)	B6	3	16	0	0	0	0	0	76	2	0.5	34	693283	5997483	55
³ Ribbon Gum - Snow Gum tall open woodland - grassy - low	B5	1	0	0	0	0	0	100	0	0	0	0	693252	5997722	55

³ Plot B5 has been manipulated (BX; bold entries) to reflect an African Lovegrass paddock.
5559 Final v2.1

D.2.2 Results

Credit calculations

The following credit requirements have been generated by this assessment:

PC type code	Plant community type name	Red flag	Management zone area (ha)	Loss in LandScape Value	Loss in site value score	EEC Offset Multiplier	Credits req for TS	TS with highest credit req	TS offset multiplier	Ecosystem credits required
MR602	Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion	No	5.15	12.6	16.15	3.0	0		0.0	79
MR602	Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion	Yes	6.73	12.6	49.48	3.0	227	Barking Owl	3.0	271

One vegetation zone has generated a red flag. It is in moderate to good condition, > 70% cleared and an EEC.

No species credits are relevant to the proposal.

The credit statement generated from the assessment is provided in Attachment 1.

D.3 OFFSET SITE EVALUATION

D.3.1 Evaluation of the offset site

The residual area adjoining the development site is being considered as an offset site. It contains the same vegetation types as occur on the development site plus an additional shrubby formation of the Ribbon gum – Snow Gum woodland. It also contains large areas of grassland dominated by African Lovegrass. These areas, while not considered native vegetation, have potential to be improved by management actions that include the planting of appropriate overstorey species. In areas derived from woodland, there is an argument that, by restoring the appropriate overstorey species, that the woodland can be restored to some extent.

13.02 ha of African Lovegrass dominated grassland has been entered into the calculations. Based on landscape position and surrounding vegetation, there is a strong argument that these areas are woodland derived and not a natural grassland. The extent of this zone is mapped on Figure 1. This additional zone has been entered as 'Ribbon Gum - Snow Gum tall open woodland – grassy – low'. As only one low condition zone can be entered for each vegetation community, it is amalgamated with the 2.80 ha of native 'Ribbon Gum - Snow Gum tall open woodland - grassy – low' but is separated in the table below. In the calculations it has been entered as 'not an EEC' as the majority of the vegetation is now not EEC. One plot (BX) has been manipulated and used for this zone, showing African Lovegrass as the only species.

Table 3 Vegetation areas available at the offset site

Vegetation community	Threatened Ecological Community?	Condition	Area of vegetation available (ha)
Native vegetation			
Ribbon Gum - Snow Gum tall open woodland - grassy - low	Yes	Low	3.10
Ribbon Gum - Snow Gum tall open woodland - grassy - moderate to good	Yes	Moderate to good	10.24
Ribbon Gum - Snow Gum tall open woodland - shrubby - moderate to good	Yes	Moderate to good (other)	24.74
Non-native vegetation			
Ribbon Gum - Snow Gum tall open woodland - grassy – low ⁴	No	Low	13.02
Total area (ha)			51.10

Landscape values

The offset site forms part of a series of scattered remnants sparsely connecting to the forested foothills and ranges to the west. This connectivity (while tenuous) to large areas of connected habitat are considered appropriate for an offset site. The site could act as a 'stepping stone' for mobile fauna moving through an open landscape.

⁴ Exotic African Lovegrass grassland, once likely to be grassland derived from Ribbon Gum – Snow Gum tall open woodland.

Habitat values

The habitat values are equivalent at the offset site. Vegetation structure is very similar. Refer to photographs, Figure 3. The offset site contains 12 hollow bearing trees.

The site is also heavily infested with African Lovegrass, a highly invasive noxious weed. A management plan to control the spread of the weed would be required as part of an offset plan. The degree of infestation will make management very expensive and potentially impractical. The suitability of the site for an offset, given this degree of infestation, has been discussed with OEH. OEH (John Briggs, Susan Lamb, in a meeting 2 July 2015) noted:

- The canopy is in very good condition for the local area, which is suffering from die back
- The woodland is of a very high value, in a regional context
- With planting, the increase in overstorey cover in African Lovegrass dominated pasture would represent a substantive improvement





Figure 3: Potential offset site vegetation is very similar to the site to be developed.

D.3.2 Offset credit calculations

Creating a copy of the development site credit calculations file, offset calculations were undertaken using the plot data noted in Section 2.1 above. A copy was considered appropriate as the site is adjacent to the development site.

Alterations were made to the calculations as follows:

- The assessment type was listed as 'Biobank'
- Zone areas were altered as per the offset site areas above, Table 3.
- The shrubby variant of the Ribbon Gum vegetation type was listed as Moderate to Good (other) to differentiate it from the grassy variant. As only one plot was undertaken in the grassy variant, this plot was duplicated to achieve the 3 plots required for this zone.
- Tableland Basalt Forest was the only EEC that could be selected in the calculator. As all zones in moderate to good condition are considered EEC.
- 13.02 ha of African Lovegrass pasture is added to Ribbon Gum - Snow Gum tall open woodland - grassy – low. One plot with 100% exotic ground cover is entered for this zone (BX). It is not EEC.

Assessment of geographic / habitat features

As for the development site, none of the following habitat features occur in the areas that would be used as the offset.

Impact?	Common name	Scientific name	Feature
☐	Austral Toadflax	<i>Thesium australe</i>	land within Kosciuszko National Park in Bondo (Part A) CMA subregion
☐	Rosenberg's Goanna	<i>Varanus rosenbergi</i>	land within eastern third of subregion, south-east of a line

Impact?	Common name	Scientific name	Feature
			that runs through Tarcutta and Galong in Upper Slopes CMA subregion
☐	Mauve Burr-daisy	<i>Calotis glandulosa</i>	land south of Michelago in Monaro CMA subregion
☐	Tarengo Leek Orchid	<i>Prasophyllum petilum</i>	land east of Binalong in Upper Slopes CMA subregion
☐	Trailing Monotoca	<i>Monotoca rotundifolia</i>	land east of Monaro Highway in Monaro CMA subregion
☐	Pink Robin	<i>Petroica rodinogaster</i>	land within 40 m of gullies in eucalypt forests

Site values

Due to the African Lovegrass infestation 'Current scores' were retained manually (not allowed to improve by the default amount with management) for the following attributes, i.e. no improvement for these:

- Native plant species
- Native ground cover grasses
- Native ground cover shrubs
- Native ground cover other
- Exotic plant cover

Threatened species

The following species either require survey or should be assumed not to occur:

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Black Gum	<i>Eucalyptus aggregata</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hoary Sunray	<i>Leucochrysum albicans</i> subsp. <i>tricolor</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Koala	<i>Phascolarctos cinereus</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Silky Swainson-pea	<i>Swainsona sericea</i>									Yes	Yes	Yes	Yes

These species were not detected during field surveys and are therefore assumed not to occur.

Credit results

The following ecosystem credits are generated by the offset site, shown in comparison to the credit requirement from the development site. No threatened species credits are relevant to either site.

Table 4. Credit comparison

		Development site		Offset site		Net credits
Code	Vegetation name	Management zone area (ha)	Credit requirement from development site	Management zone area (ha)	Credits generated from offset site	
Low condition						
MR602	Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion	5.15	79	16.12	136	57 in surplus
Moderate to good condition						
MR602	Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion	6.73	271	10.24	75	43 in surplus
MR602	Ribbon Gum - Snow Gum grassy forest on damp flats, eastern South Eastern Highlands Bioregion (shrubby)			24.74	228	
Total			350		439	100 in surplus

D.4 SECURITY AND MANAGEMENT

D.4.1 Security

The biodiversity offset will need to be secured in perpetuity and managed for biodiversity improvement. A Conservation Property Vegetation Plan (CPVP) is proposed as the management vehicle. The CPVP would include the entire offset site as shown in Figure 2.

D.4.2 Staging

The extraction planned for Bunyan quarry would take place over an estimated 25 year period. While the entire offset site would be purchased upon approval of the quarry expansion, management of the offset site would be tied to extraction, such that the cost of management is not incurred too far in advance of the extraction program. This ensures that, should quarry operations be halted for any reason that the Council are not required to manage an offset site where the impact would no longer occur (or has been drastically reduced).

The following table estimates the areas of extraction and offset management over the life of the quarry in 5 year brackets. Extractions areas (S1 to S5) and corresponding offset management areas (O1 to O5) are also shown on Figure 4. This is subject to change and should be updated periodically to reflect existing site conditions. The important parameter is that the percentage of the total under management must be kept equivalent or higher than the percentage of extraction undertaken at any point. This issue would be best addressed as an annual audit item, in the management of the quarry.

Table 5. Extraction versus offset management

Years	Extraction areas			Offset management areas		
	ID	Area (ha)	% of total	ID	Area (ha)	% of total
0-5	S1	2.55	18%	O1a and b	9.44	18%
6-10	S2	1.44	10%	O2	5.33	10%
11-15	S3	1.88	14%	O3	6.96	14%
16-20	S4	4.06	29%	O4	15.03	29%
21-25	S5	3.87	28%	O5	14.33	28%
Totals		13.8	100%		51.10	100%



Figure 4 Planned stages of proposed gravel pit expansion and offset management zones for management

D.4.3 Management

A broad overview of key management actions for each offset management area is shown in Table 6. Detailed management actions would be outlined in the Biodiversity Offset Plan that would be prepared to guide the management of the offset site.

Table 6: Key management actions for offset management areas

Offset Management Area	Key Management Actions
O1a	Create a vegetation screen to the highway: • Prepare site and rip, boom spray and fencing to protect planting from stock • Planting to be done in stages, to ensure protection afforded to new plantings: ○ Fast growing species such as wattle. ○ Planting of overstorey species when protection established by wattles (areas with less than 5% canopy cover). Key eucalypt species would be trees appropriate to the Snow gum woodland vegetation type • Control of Serrated Tussock, St Johns Wort, Scotch Thistle, Briar Rose so plantings and native regeneration is not impeded. • African Lovegrass control would only be undertaken as spot spraying around new plantings with the objective of not impeding plantings
O1b	• Planting of native shrubs in the area of existing overstorey canopy in the south of the site. Species include Bursaria, Silver Wattle and Australian Blackwood. • Control of Serrated Tussock, St Johns Wort, Scotch Thistle, Briar Rose so plantings and natural regeneration is not impeded. • African Lovegrass control would only be undertaken in respect of not impeding plantings and native tree regeneration.
O2	• Protect natural regeneration of Bursaria and eucalypt seedlings • Control of Serrated Tussock, St Johns Wort, Scotch Thistle, Briar Rose so native regeneration is not impeded. • No control of African Lovegrass proposed. • Grazing to reduce biomass may be undertaken within clear limits with the objective of biodiversity management.
O3	• Protect natural regeneration of Bursaria and eucalypt seedlings • Control of Serrated Tussock, St Johns Wort, Scotch Thistle, Briar Rose so natural regeneration is not impeded. • No control of African Lovegrass proposed. • Grazing to reduce biomass may be undertaken within clear limits with the objective of biodiversity management.

Offset Management Area	Key Management Actions
O4	• Protect natural regeneration of Bursaria and eucalypt seedlings • Control of Serrated Tussock, St Johns Wort, Scotch Thistle, Briar Rose so natural regeneration is not impeded. • No control of African Lovegrass proposed. • Grazing to reduce biomass may be undertaken within clear limits with the objective of biodiversity management.
O5	• Protect natural regeneration of Bursaria and eucalypt seedlings • Control of Serrated Tussock, St Johns Wort, Scotch Thistle, Briar Rose so natural regeneration is not impeded. • No control of African Lovegrass proposed. • Grazing to reduce biomass may be undertaken within clear limits with the objective of biodiversity management.

Where over storey planting occurs, planting would occur at a density that would eventually achieve benchmark canopy values for the site.

Manual or chemical eradication of African Lovegrass is not considered to be a realistic objective for the offset management zones 2 to 5 at the offset site. With an increase in overstorey cover, some shading effect may assist to reduce abundance of this weed to a minor degree, allowing other species to grow. However, the key value of the site is its overstorey vegetation and even with an exotic groundcover, the increased landscape connectivity and nesting resources provided are considered justified.

Monitoring would occur at the site to determine rehabilitation success. Frequency of monitoring would be outlined in the detailed biodiversity offset plan and would be determined following consultation with OEH. The plan would provide clear success targets for plantings. Replanting would be undertaken if the criteria are not met. For example 80% success within 5 years of planting.

D.5 CONCLUSION AND RECOMMENDATIONS

The potential offset site credits are surplus to those required to offset the clearing proposed at the development site.

Consultation with OEH has been undertaken to reduce the extraction footprint and to allow some areas of African lovegrass to be managed for improvement.

While the offset site must be secured before extraction, management actions would be implemented in stages, tied to the areas of extraction. A CPVP is proposed as the management vehicle.

The surplus credit requirement could be used for other projects.

A detailed offset package, including a plan of management (and demonstration that funding for management will be available to manage the site in accordance with the plan of management) would be required, prior to impacts occurring.

APPENDIX E ABORIGINAL ARCHAEOLOGY ASSESSMENT

New South Wales Archaeology Pty Ltd ACN 106044366

Proposed Gravel Quarry, Bunyan, via Cooma NSW
Aboriginal Cultural Heritage Assessment Report

Date: 10 December 2014

Author: Dr Julie Dibden

Proponent: Cooma-Monaro Shire Council

Local Government Area: Cooma-Monaro Shire Council



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SUMMARY

This summary presents an overview of the legislative context, proposed development, subject area, and study aims, conclusions and recommendations.

The National Parks and Wildlife Act 1974 (NPW Act) is the primary legislation for the protection of some aspects of Aboriginal cultural heritage in NSW. One of the objectives of the NPW Act is:

... the conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including but not limited to: (i) places, objects and features of significance to Aboriginal people ... (s.2A(1)(b)).

Part 6 of the NPW Act is administered by the NSW Office of Environment and Heritage (NSW OEH) and provides specific protection for Aboriginal objects and declared Aboriginal places by establishing offences of harm. Harm is defined to mean destroying, defacing or damaging an Aboriginal object or declared Aboriginal place, or moving an object from the land. Anyone proposing to carry out an activity that may harm an Aboriginal object or declared Aboriginal place must investigate, assess and report on harm that may be caused by the activity they propose.

Cooma-Monaro Shire Council (the proponent) proposes to develop a gravel quarry on Lot 160 DP 724552, Bunyan, situated 12 kilometres north of Cooma. New South Wales Archaeology Pty Ltd has been commissioned to undertake an Aboriginal Cultural Heritage Assessment.

This assessment has been conducted in accordance with the NSW Office of Environment and Heritage's (NSW OEH 2011) *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* and *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (NSW DECCW 2010a).

A process of Aboriginal community consultation has been undertaken in accordance with the guidelines as set out in OEH's *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW DECCW 2010b).

The study has sought to identify and record Aboriginal cultural areas, objects or places, to assess the archaeological status of the proposal area, and to formulate management recommendations based on the results of community consultation, background research, field survey and impact assessment.

As a result of the assessment the following conclusions are made:

- o There are no identified heritage constraints in regard to the proposal. The subject area is assessed to be of very low cultural and archaeological heritage significance.
- o No further archaeological investigations are required.

- o No Aboriginal objects are known to be present in the activity area. An AHIP is not required.

Acknowledgments

Archaeological evidence confirms that Aboriginal people have had a long and continuous association with the region for thousands of years. We would in particular like to acknowledge and pay our respects to the traditional owners of the country which is encompassed by the proposal.

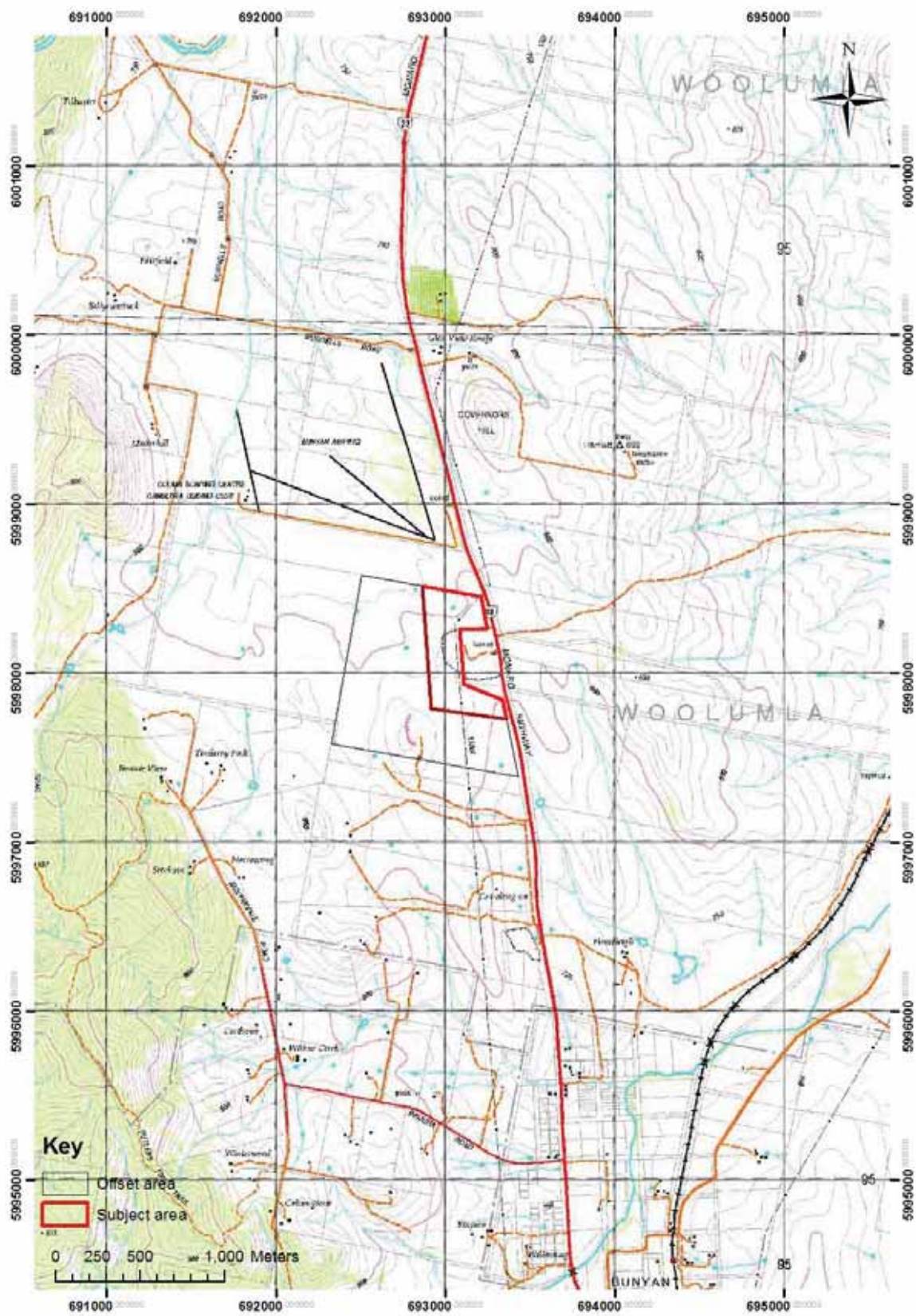


Figure 1 Location of the subject area (compiled using mapping from *Topoview Raster 2006* NSW Dept. of Lands).

1. INTRODUCTION

This document describes the Aboriginal cultural heritage assessment undertaken in respect of a proposed gravel quarry at Bunyan, via Cooma NSW (Figure 1). Cooma-Monaro Shire Council proposes to expand an existing gravel extraction pit adjacent to the Monaro Highway. The site is known as the Upper Bunyan Gravel Pit.

The subject area is located on the west side of the Monaro Highway, approximately 12 kilometres north of Cooma. There are no known Aboriginal objects on the subject land (AHIMS Site Search #142928).

The project is designated local development under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The objective of the cultural heritage assessment is to prepare an ACHAR which would form a component of an Environmental Impact Assessment (EIS).

The content and format of the report is set out in accordance with the NSW OEH (2011) *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* document. The report aims to document:

- o The Aboriginal objects and declared Aboriginal places (as relevant) located within the area of the proposed activity;
- o The cultural heritage values, including the significance of the Aboriginal objects and declared Aboriginal places that exist across the whole area that will be affected by the proposed activity, and the significance of these values for the Aboriginal people who have a cultural association with the land, as relevant;
- o How the requirements for consultation with Aboriginal people have been met (as specified in clause 80C of the NPW Regulation);
- o The views of those Aboriginal people regarding the likely impact of the proposed activity on their cultural heritage (if relevant);
- o The actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposed activity, with reference to the cultural heritage values identified;
- o Any practical measures that may be taken to protect and conserve those Aboriginal objects or declared Aboriginal places (if relevant); *and*
- o Any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm, or, if this is not possible, to manage (minimise) harm (if relevant).

This project has been undertaken by Julie Dibden (Australian National University: BA with Honours; PhD), NSW Archaeology Pty Ltd.

2. DESCRIPTION OF THE AREA

In this section, background and relevant contextual information is compiled, analysed and synthesized. The purpose of presenting this material is to gain an initial understanding of the cultural landscape; the following topics are addressed (*cf.* OEH 2011: 5):

- o The physical setting or landscape;
- o History of peoples living on that land; *and*
- o Material evidence of Aboriginal land use.

2.1 The Physical Setting or Landscape

Aboriginal people have occupied NSW for more than 42,000 years (Bowler *et al.* 2003). Evidence and cultural meanings relating to occupation are present throughout the landscape (NSW OEH 2011: iii).

A consideration of landscape is particularly valuable in archaeological modelling for the purposes of characterising and predicting the nature of Aboriginal occupation across the land. In Aboriginal society, landscape could be both the embodiment of Ancestral Beings and the basis of a social geography and economic and technological endeavour. The various features and elements of the landscape are/were physical places that are known and understood within the context of social and cultural practice.

Given that the natural resources that Aboriginal people harvested and utilised were not evenly distributed across landscapes, Aboriginal occupation and the archaeological manifestations of that occupation will not be uniform across space. Therefore, the examination of environmental context is valuable for predicting the type and nature of archaeological sites which might be expected to occur. Factors that typically inform the archaeological potential of landscape include the presence or absence of water, animal and plant foods, stone and other resources, the nature of the terrain and the cultural meanings associated with a place.

Additionally, geomorphological and humanly activated processes need to be defined as these will influence the degree to which material evidence may be visible and/or conserved. Land which is heavily grassed and geomorphologically stable will prevent the detection of archaeological material, while places which have suffered disturbance may no longer retain artefacts or stratified deposits. A consideration of such factors is necessary in assessing site significance and formulating mitigation and management recommendations. The following information describes the landscape context of the subject area.

The subject area is located in the Parish of Woolumla, County of Beresford, in the Cooma-Monaro Shire. It is located approximately 12 kilometres north of Cooma. The location is shown on Figure 1.

The property Lot 160 DP 724552 is 85 hectares, however, it is only the eastern section measuring a total area of 20 hectares where impacts would occur. The remainder of the property would be used as environmental off-set.

The area is situated on the Monaro and is part of the Eastern Uplands of southeastern Australia (Jennings and Mabbutt 1977). The Eastern Uplands consists of a wide plateau which extends from the coastal escarpment on the east, to the slopes of its western side. The landscape has low relative relief, lies generally below 600m altitude and slopes generally less than 5° with about 20% of the area containing steeper hills and ranges.

The Monaro is an area of high tablelands and mountains; it is bounded on the north by the Namadgi ranges, on the west by the alpine watershed, the east by the Kybayan and Gourrock escarpment and the south by the Victorian border (Flood 1980). Four distinct natural environments have been defined by Costin (1954); the alpine, sub-alpine, montane and tableland. The proposal area is situated within the latter. The tableland is generally located at elevations between 610 - 915m (Flood 1980).

The area has a strongly seasonal thermal climate (Jennings and Mabbutt 1977). In summer, hot days are followed by temperate nights, while in winter days are cool to cold and the nights cold and frosty with temperatures regularly falling below 0 degrees C. Each winter brings some light snow falls over most of the district which can be heavier on higher ground (Plowman 2007). Average rainfall annual is 688mm (Flood 1980). Flood (1980) draws attention to the phenomena of cold air drainage, frost and wind as affecting human occupation in the region. High winds and frost occur frequently; Flood (1980) argues that, in particular, the combination of cold temperature with wet winds was probably more significant in regard to human occupation than cold in itself.

In terms of the broader-scale landscape, the subject area comprises a broad, amorphous and undulating ridge crest. The ground surface over the site generally falls at a gentle slope to both the north and east. It is situated approximately midway between two water courses, Cooma Creek three kilometres to the east, and the Murrumbidgee River c. four kilometres to the west. There is no reliable water near the site although first order open depressions commence drainage at the site.

The site is underlain by weathered volcanic rock of the Murrumbidgee Batholith formation. Some small, low outcrops occur on the central ridge and, elsewhere, cobbles are scattered across paddocks. Some low quality quartz is present. A highly modified (50-100 year old regrowth) grassy woodland dominated by *Eucalyptus viminalis* occurs across the central area of the site. Elsewhere, the country is grassland (primarily weeds: Africa Lovegrass, St John's wort, serrated tussock and thistles) used for grazing (Plates 1 & 2). The great majority of the original vegetation structure has been altered through clearance and subsequent farming. Very few mature trees remain in the subject area which is dominated by secondary and tertiary regrowth. The local landscape has a history of European land use extending from the earlier-mid part of the 1800s and principally comprising the grazing of livestock, clearing and timber getting (Dearling 2004; Plowman 2007). The subject area itself has been subject to extensive clearance and grazing management over many years.



Plate 1 The subject area. Photo taken from northeast corner, looking 210°.



Plate 2 The western edge of the existing quarry; looking north. Note woodland in subject area.

2.2 History of Peoples Living on the Land

Aboriginal people have occupied Australia for at least 40,000 years and possibly as long as 60,000 (Mulvaney and Kamminga 1999: 2). By 35,000 years before present (BP), all major environmental zones in Australia, including periglacial environments of Tasmania, were occupied (Mulvaney and Kamminga 1999: 114).

At the time of early occupation, Australia experienced moderate temperatures. However, between 25,000 and 12,000 years BP (the Last Glacial Maximum), dry and either intensely hot or cold temperatures prevailed (Mulvaney and Kamminga 1999: 114). At this time the mean monthly temperatures on land were 6-10°C lower; in southern Australia coldness, drought and winds acted to change the vegetation structure from forests to grass and shrublands (Mulvaney and Kamminga 1999: 115-116).

During the Last Glacial Maximum at about 24-22,000 years ago, sea levels fell to about 130 metres below present and, accordingly, the continent was correspondingly larger. With the cessation of glacial conditions temperatures rose with a concomitant rise in sea levels. By c. 6,000 BP, sea levels had more or less stabilised to their current position. With the changes in climate during the Holocene, Aboriginal occupants had to deal not only with reduced landmass, but changing hydrological systems and vegetation; forests again inhabited the grass and shrublands of the Late Glacial Maximum. As Mulvaney and Kamminga (1999: 120) have remarked:

When humans arrived on Sahul's shores and dispersed across the continent, they faced a continual series of environmental challenges that persisted throughout the Pleistocene. The adaptability and endurance in colonising Sahul¹ is one of humankind's inspiring epics.

Aborigines have lived in the Cooma-Monaro district and its environs for at least 21,000 years (Flood *et. al* 1987). In the south-eastern highlands the Birrigai rock-shelter has provided dates of occupation from 21,000±200 years BP (Flood *et. al* 1987: 16). During the Pleistocene the environment of the region would have been cold steppe grassland with vegetated shrubs and scattered groups of Eucalypts located in protected positions (Mulvaney and Kamminga 1999). Between 23,000 and 15,000 years ago harsh conditions prevailed and the mountain peaks were glaciated above 1900 metres; periglacial conditions were present to at least 1000 metres above sea level. The alpine zone was a cold desert with scattered fields of perennial *Plantago* herb fields which may have provided some bulbs and tubers for human consumption (Mulvaney and Kamminga 1999). Over time, the Aboriginal people experienced and adapted to steady and considerable changes in conditions associated with gradual climatic warming, including the alteration of vegetation and variation in the distribution of wildlife (Young 2000).

¹ Sahul is the name given to the single Pleistocene era continent which combined Australia with New Guinea and Tasmania.

As far as possible, an ethnographic and historical review of Aboriginal life in the region will be outlined below. However, our understanding of Aboriginal people in this area, and the historical dimension of the colonial encounter has been reconstructed from scant records produced during a context of death and dispossession (Swain 1993: 115); it is sketchy and severely limited. Stanner (1977) has described the colonial and post-colonial past as a 'history of indifference', and this portrays both the substantive situation which prevailed and the general lack of regard for this history. For a considerable period of time after Europeans arrived in Australia, no concerted ethnographic investigations were undertaken to learn about the society and culture of Aboriginal people. As a result, in trying to reconstruct the complex traditional cultures of Aboriginal groups, investigators of today are necessarily required to piece together, as best as possible, fragmentary information derived from the incidental annotations of disparate early observers. As elsewhere, this applies also to the Aboriginal peoples who occupied the country that included the study area. Knowledge and understanding of Aboriginal social life and organisation in south-eastern New South Wales at the time of European occupation is minimal. Fundamental details relating to kinship, clan, territorial and religious organisation is, by and large, unknown.

At the time of European contact, the major part of what is now called the Monaro was inhabited by at least 500 Ngarigo speaking Aborigines (Helms 1895: 388). This group exploited the resources of the riverine, grassland and open forests of the region, including those located in the environs of the study area. Their choice of camp-site was influenced by several factors, and from archaeological evidence, Flood (1980: 158) indicates that in this region camp-sites will be typically found within one kilometre of reliable water sources, most usually within 100 metres from water, though never at the water's edge.

The Ngarigo people maintained social relationships with neighbouring groups including Ngunnawal, Djilamatang, Jamathang and coastal groups including the Yuin (Howitt 1904). Some information is recorded about the nature of Aboriginal occupation of the region during the early period of European occupation. The literature which does exist has presented a biased view of Aboriginal life within the mountains which is focused particularly on Bogong Moth exploitation. Indeed, the ethnohistoric literature has implied to some readers that seasonal exploitation of the moth was the major reason for Aboriginal usage of the Alpine region (Flood 1980).

Flood (1973, 1980) was heavily influenced by the extant ethnohistoric literature which focused on moth exploitation in her seminal study of the region. She constructed a hypothesis of seasonal usage of the highlands based on the exploitation of the moth. The moth, she argued, was important as an economic food source and its exploitation may have been causal as the impetus for the initial usage of the highlands. Flood (1980) suggested that the Ngarigo people occupied low altitude valleys (< than 600 m) in winter, moving into higher areas in summer primarily for the purpose of exploiting the Bogong Moth. She argued that the occupation pattern which resulted from the exploitation of moths is one in which a series of camps extended from the lowest valleys below 300 m up to the alpine treeline zone at 1830 m.

A contrary viewpoint to Flood's (1980) model has been provided by Chapman (1977) who argued that there was no evidence which pointed to the moth as being a staple food source; Chapman argued that the importance of the moth as a food resource has been over emphasized by early commentators. She argued that in addition to the lack of evidence that the moth was a reliable food source, moths lack the nutritional value to act as a staple and that the moth, in any case was primarily consumed by men. Chapman (1977) instead argued that the significance of moth exploitation was that it fostered social cohesion within the region. Likewise, Kamminga *et. al* (1989) have argued that the large inter tribal gatherings which were associated with moth exploitation acted to mediate and foster political and social linkages between the different language and tribal groups which came together during these occasions.

Researchers such as Bowdler (1981), Cooke (1988), Gott (1982) and Kamminga *et. al* (1989) have drawn attention to a variety of vegetable products available locally which are likely to have been utilized as food resources. Bowdler (1981) has argued that the importance of the moth was more ideological than economic and that the yam daisy would have provided a more reliable food source.

A model of seasonal usage of the high country nevertheless continues to have currency within the literature. The seasonal migration to higher altitudes in summer months is accepted (*cf* Navin 1991). During winter small groups of Aboriginal people would have occupied the lower montane valleys and the adjacent tablelands (Mulvaney and Kamminga 1999: 298). The region would have opened up considerably however, in summer. It was during this time that people from other areas gathered to perform inter-tribal ceremonies (Mulvaney and Kamminga 1999: 299). Although ceremonial activities are not known to have taken place in the study area, nevertheless these affiliated groups moved through various corridors in order to congregate in the Alps, and while making their way through country they may have traversed the region where the survey area is situated (*cf* Howitt 1904; Payten 1949; Flood 1980).

White settlers began to move into the Monaro region during the early 1800s. European settlement ultimately resulted in the alienation of Aboriginal people from their traditional lands and changes in regard to cultural and economic relationships with country. In the local area Aboriginal people worked as shepherds and sheep washers on Bibbenluke Station in the mid 1800s (Dawson 1996).

Much of the impetus for early exploration in NSW was driven by the need for new land for grazing (*cf* Andrews 1998). In 1823, a group of experienced explorers gathered at the Throsby property at Bong Bong, Moss Vale to prepare for their next expedition. The men in question were Charles Throsby, Captain Mark Currie, Major John Ovens, Throsby's overseer Joseph Wild and an Aboriginal guide. Together they set out to explore the land south of Lake George, which had been partially explored in previous years by Throsby and Wild, who had discovered the Queanbeyan River and the Murrumbidgee. The party attempted to follow the Murrumbidgee south but upon encountering rugged terrain they elected to travel

a few kilometres to the east through a chain of clear downs that is thought to correspond to the Michelago, Colinton and Bredbo valleys. It was during this part of the journey that they came across an Aboriginal tribe near Billilingra. After overcoming some apparent initial fear of the newcomers the Aboriginal people engaged in conversation with the assistance of the guide accompanying Throsby's party, and amongst other things they informed the explorers that the area of the rolling downs was the 'Monaroo'. The group continued on and crossed a river they presumed to be the Murrumbidgee but that is thought to have more likely been the Numeralla and made it to an area in the vicinity of present day Bunyan before having to turn back on account of their limited supplies. They named the treeless rolling downs 'Brisbane Downs' after the governor of the time however the Aboriginal name proved the more popular name in time (Neal 1976: 5-6; Plowman 2007: 6, 8-9).

European settlement of the area began in the late 1820s as various farmers made the decision to take their chances with squatting. The Limits of Location at that time ended at Michelago, so all settlement to the south was technically illegal. Census records from 1828 indicate that there were already 20 new settlers on the Monaro, although there is some confusion regarding this number since the people listed were all servants living on the Limestone Plains. Nevertheless, Richard Brooks is known to have had stock and men at Gegedzerick near Berridale in 1827. In 1832 William Glanville came to the area to work for Joseph Ward at Wambook and he reported that at that time there was a hut at Cooma (Kuma) belonging to Cooper and Levy and that Coolringdon, Gegedzerick and Wambook were the only stations to the west of this. Two years later, John Lhotsky relayed information from Mr Bath, the manager of Kuma Station, that R. Campbell had been established at Waterholes, near Michelago for seven years, Richard Brooks had been at Jijedery (Gegedzerick) for six years, Cooper and Levy had been at Cooma for five years and Dr Reid had been at Bunyan for a similar period of time (Neal 1976; Plowman 2007: 10).

When John Lhotsky travelled through the region in 1834, he considered himself 'surrounded by absolute anarchy and lawlessness' (cited in Andrews 1998). At that time the majority of men living on the Monaro during the 1830s were assigned servants either serving their sentence, ticket of leave, or freed and in employment (Andrews 1998). The theft and resale of livestock was common practice.

2.3 Material Evidence

A search of the NSW OEH Aboriginal Heritage Information Management System (AHIMS) was conducted on 29th July 2014 (AHIMS client service ID: 142928). The search area measures 36 square kilometres, with a buffer of 50 meters, and is encompassed by the following co-ordinates at Datum GDA, Zone 55 - Eastings: 690000 - 696000, Northings: 5995000 - 6001000. Some 10 Aboriginal object sites are located in the AHIMS search area (Table 1; Figure 2). Searches have been conducted of the NSW State Heritage Inventory and the Australian Heritage database. No Aboriginal heritage sites are listed on these as being in the activity area.

Table 1 AHIMS Site search.

Site ID	Site name	Datum	Zone	Easting	Northing	Context	Site features	Site types	Recorders
62-2-0337	C 1	AGD	55	691600	5996500	Open site	Artefact : 1		
62-2-0242	EGP 2-32;	AGD	55	693250	6000600	Open site	Artefact : -	Open Camp Site	Kerry Navin
62-2-0382	Harnett 6	AGD	55	694922	6000144	Open site	Artefact : 19		Mr. Charles Dearing
62-2-0378	Harnett 9	AGD	55	695245	6000564	Open site	Artefact : 2		Mr. Charles Dearing
62-2-0032	Bunyan 10 Cowra Creek 1	AGD	55	695300	5995200	Open site	Artefact : -	Open Camp Site	Doctor. Tim Stone
62-2-0375	Harnett 3	AGD	55	695397	6000522	Open site	Artefact : 11		Mr. Charles Dearing
62-2-0372	Hartnett 1	AGD	55	695415	6000312	Open site	Artefact : 13		Mr. Charles Dearing
62-2-0373	Hartnett 2	AGD	55	695481	6000438	Open site	Artefact : 2		Mr. Charles Dearing
62-2-0379	Harnett 11	AGD	55	695509	6000731	Open site	Artefact : 2		Mr. Charles Dearing
62-2-0383	Harnett 10	AGD	55	695515	6000602	Open site	Artefact : 3		Mr. Charles Dearing

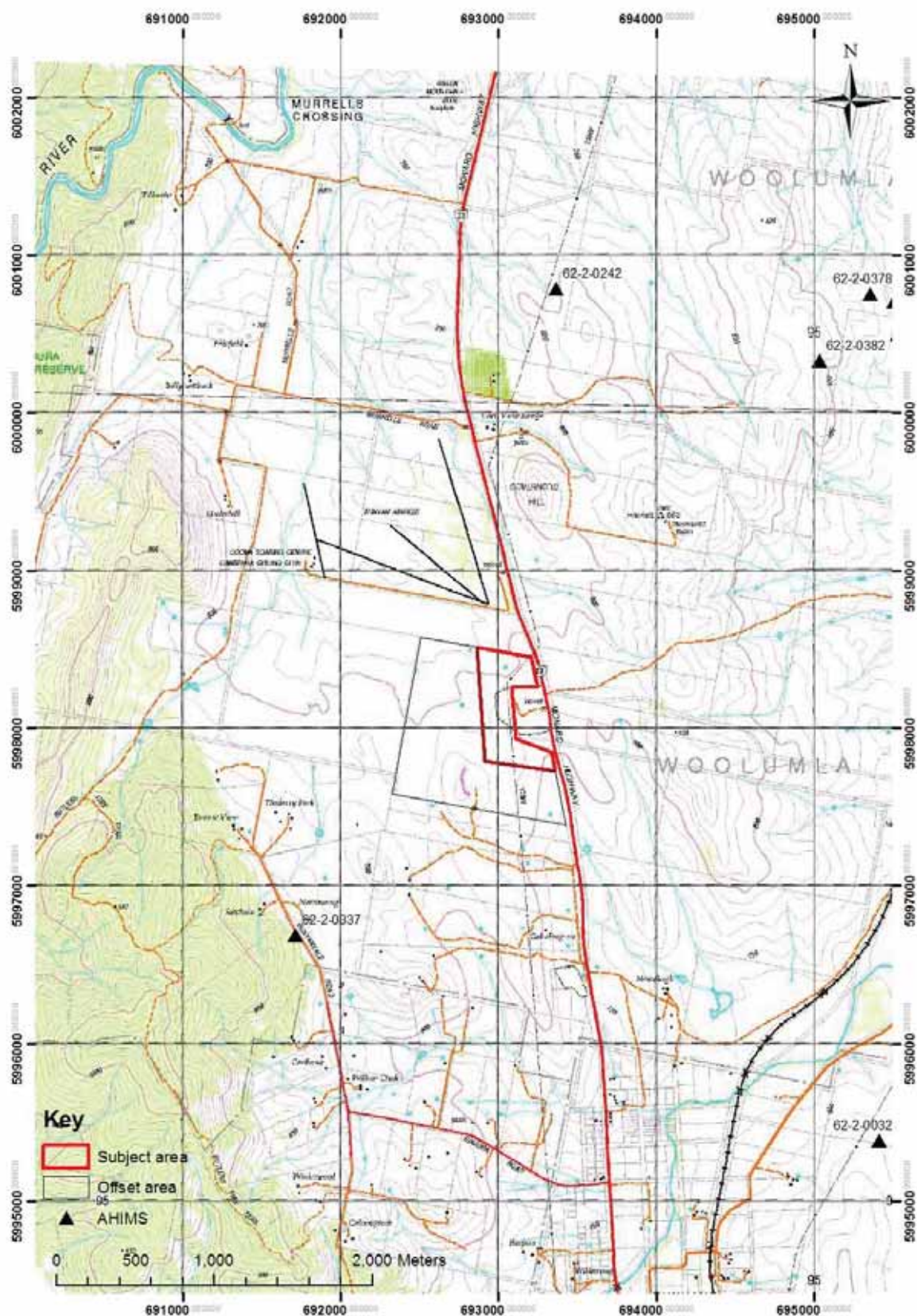


Figure 2 Location of the closest registered Aboriginal sites identified in the search of the NSW OEH AHIMS in respect of proposed activity area (compiled using mapping from Topoview Raster 2006 NSW Dept. of Lands).

2.3.1 Previous Archaeological Work

While archaeological studies conducted within the local area have been limited in number, a greater number of studies have been carried out within the broader region. The following discussion includes archaeological work and its results conducted within the wider Monaro area.

On the tablelands around Cooma, Flood (1980) recorded two artefact scatters which she described as being indications of transitory camp sites. One was positioned on a slope beside Cooma Creek, south of Cooma, while the other was recorded on a slope above Rock Flat in association with a quartzite deposit and mineral spring. Flood's (1980: 181) survey on the Monaro Tablelands was 'rather uneven', however, she argued that the site distribution patterns were significant. Flood (1980) found that few sites were recorded on the treeless parts of the tablelands and explained this as being due to the unfavourable nature of such an environment. Flood (1980) suggested that the location of sites in the area indicated an intention to exploit local raw material such as quartzite and basalt and could also be '...in the nature of transit camps'.

Djekic (1982) recorded twelve sites while surveying the route for a proposed transmission line between Cooma and Jindabyne. These sites were comprised of six scarred trees, four artefact scatters and two isolated artefact finds.

Lance and Hughes (1983) surveyed an area of c. six hectares in the northern area of the Cooma township for the proposed site of the Snowy Mountains Hydro-Electric Authority head office. Visibility was limited and no sites were found. However, Lance, formerly a Cooma resident, noted his previous observation of artefact scatters on slopes one kilometre from Cooma Creek near North Cooma, comprised of quartz and quartzite flakes and flaked pieces.

Paton (1985) recorded fourteen artefact scatters, six isolated finds and one stone quarry while surveying for the proposed Cooma-Royalla 132 kV transmission line north of Cooma. One extensive site recorded covered an area of 1,000 sq. metres; artefact density is calculated to have been in the order of one artefact per two square metres. Paton (1985) attributed the location and size of these sites to their aspect and proximity to the nearby Numeralla River.

In 1991 two burials were found in an alluvial terrace north-east of Bunyan. The skeletal remains were dated to about 6,000 years BP and were accompanied by grave goods, including 327 pierced macropod teeth from Eastern Grey, Red Neck and Swamp Wallabies, as well as 450 grams of red ochre (Feary and Pardoe 1992). Stone artefacts, including hammerstones, and bone implements were also found at the site.

Navin (1994) conducted a survey for a proposed Cooma sewerage augmentation program. This survey included planned pumping stations at Cooma North, Central Cooma, Cooma South and Polo Flats, as well as several kilometres of linking mains and a four hectare area beside Cooma Creek known as 'The Glen'. The survey located three Aboriginal sites adjacent

to Cooma Creek, two of which were small low density artefact scatters. The third site located on basal spur slopes on the western side of the ridgeline at 'The Glen', contained '...numerous concentrations of surface artefacts of varying density, surface area and artefact rock type' (Navin 1994:12). These included flakes, cores and flaked pieces of vein and crystal quartz, silcrete, volcanics and chert. Subsequent subsurface testing revealed a similar assemblage of raw materials present in the deposit (English and Gay 1994).

Kuskie, Navin and Officer (1996) surveyed the proposed route of the Eastern Gas Pipeline. On the Monaro section of their study area 101 sites were recorded; several artefact scatters were located in the local area. It was concluded that sites were situated on elevated, relatively level ground adjacent to a permanent water source, that larger sites occurred in proximity to major fluvial corridors or in areas where high quality quartz occurred and that sites tended to be situated in elevated contexts away from cold air drainage and tend to be found on north facing slopes.

An archaeological survey of a proposed pine plantation location in cleared, open farmland south-west of Countegany was undertaken by Stone (2000). This area is on the upper watersheds of Hindmarsh Creek and Dirty Waterhole Creek. Two small artefact scatters were recorded during the survey. Site 'Countegany 1' (62-2-0325) was located in association with a low sandy rise directly adjacent to Dirty Waterhole Creek. It contained seven stone artefacts, all flakes of quartz and silcrete. Site 'Countegany 2' (62-2-0324) was recorded on a low granite ridge fronting Hindmarsh Creek. It contained an unspecified number of flakes and a core of quartz, silcrete, chert and quartzite (Stone 2000). It was noted that the locations were most likely originally ribbon gum forest fronting the creek corridors (Stone 2000). From this information it may be deduced that these sites were associated with ecotonal positions in the landscape, in these cases between forest/woodland and second to third order riparian corridors.

Dibden and Mason (2003 pers observ.) recorded a sparse artefact scatter on the top of the cliff and extending southwards over a large area on the eastern side of Lambie Gorge.

Dibden (2003) conducted an assessment of a proposed subdivision site at West Cooma. The landforms comprised simple northward faces slopes at some distance from water. No Aboriginal artefacts were recorded. This result was argued to be in keeping with the relevant predictive model of site location.

Carter (2003) recorded an isolated find while surveying an area of ca. 2.5 hectares for a proposed subdivision of Lot 4 DP 845442, North Cooma. Carter (2003) assessed the study area to be of low potential generally.

A 2003 survey of Portion 319 of 31 ha in Yallakool Road did not locate any Aboriginal sites (Saunders 2003a). Areas of archaeological sensitivity associated with a creek and a drainage line were identified on the basis of topographic modelling, but were too disturbed to have retained any archaeological potential.

Saunders (2003b) surveyed an area of 4.047 hectares at North Cooma in response to a subdivision proposal, finding an extensive Aboriginal artefact scatter, comprised predominantly of chert and silcrete, in multiple exposures. The area surveyed was a low gradient footslope land element, and the Effective Survey Coverage was estimated to have been 2.8%.

Surface artefact salvage and subsurface testing subsequently recovered a total of 71 artefacts. Eighty two percent were recovered from the surface and 18% from the test pits (Saunders 2004a). The artefacts comprised flakes, flaked pieces, a blade and a chip. The raw material was mainly silcrete, with a small amount of chert and quartz.

Saunders (2004b) surveyed a proposed 27.8 ha subdivision in Yallakool Road, Cooma. The proposal area was situated mainly on the moderate to steep slopes of a major spur off the Tillabudgery ridgeline, but also included areas of low gradient basal slope near a minor tributary of Cooma Creek. No sites were found despite many areas of bare, partly eroded ground.

In 2004 Dearling carried out preliminary level archaeological assessments within eight northern Monaro nature reserves (Coornatha NR, Dangelong NR, Good Good NR, Kybeyan NR, Mt Clifforf NR, Numeralla NR, Undoo NR and Wadjan NR) and two state conservation areas (Kybeyan SCA and Macanally SCA). Based on environmental and topographic attributes, Dearling rated each study area's potential for prehistoric Aboriginal utilisation and subsequent archaeological signature; more rugged settings affording only periodic or sporadic water sources were generally seen as having low potential and most were most likely utilised during ephemeral, low intensity hunter-gatherer visitation, whereas zones with gentler terrain and more reliable water were attributed variable or higher potential (Dearling 2004). These assessments were based on a preliminary predictive model created on the basis of previous archaeological findings made in the broader region (Dearling 2004: 13-14), specifically:

- Sites will generally be found in association with low gradient or flat areas along major ridges, particularly at ridge junctions and connective points with subsidiary ridge features such as spurs, in saddles or on shoulders;
- Larger sites tend to occur on elevated terraces or basal slopes of spurs and knolls adjacent to permanent or ephemeral water sources, particularly above areas of cold air drainage;
- Near riverine corridors Aboriginal sites will be found on low gradient ground adjacent to but elevated above river channels (eg. low ridges, spurs, knolls and crests);
- Artefact scatters exhibiting higher artefact counts and greatest density will occur closer to permanent watercourses; and
- 'Major sites' will be found at or near spur termini above river valleys.

Subsequent survey of the nature reserves and state conservation areas resulted in the recording of 22 Aboriginal sites including 13 artefact scatters and nine isolated finds,

containing a total of 167 artefacts; one 'probable' Aboriginal scarred tree was also noted in Good Good NR (Dearling 2004: 122, 202). In general accordance with the predictive model, it was found that more rugged terrain with less reliable water sources (eg. Coornatha NR, Mt Clifford NR, Numeralla NR and elevated components of Dangelong NR) exhibited little archaeology aside from occasional small, low density artefact scatters (Dearling 2004: 19-20, 39). In these elevated areas, features such as major ridge lines were seen as examples of locations most likely to exhibit small sites with low artefact counts and densities (Dearling 2004: 122). Conversely, most finds were made near more substantial watercourses on locally elevated and well-drained features (eg. river and creek banks, basal slopes and slightly elevated crests in Kybayan SCA, Dangelong NR and Kybayan NR) with highest site/assemblage complexity being apparent within or close to ecological boundaries (Dearling 2004: 41, 57-58, 95 122). The highest artefact density was apparent in Good Good Nature Reserve where the low gradient spur and ridge system adjacent to Cowra Creek was seen to be a particularly attractive zone for Aboriginal occupation (Dearling 2004: 46, 122).

Saunders (2005a) located a small disturbed artefact scatter in a proposed 1.21 ha residential subdivision in Kiah Avenue, Cooma. Four stone artefacts were recorded on gently inclined lower slopes approximately 150m from Cooma Back Creek. The artefacts comprised three flakes and a core. Recorded stone types were chert, quartz and quartzite. Saunders concluded that the artefacts probably originated in Kiah Avenue and were outliers of a larger scatter situated on a less disturbed basal slope closer to the creek.

Saunders (2005b) also surveyed a proposed residential subdivision of 12.5 hectares in Kiah Avenue. The proposal area was situated on the eastern slopes of a spur emanating from Mt Gladstone and terminating at Cooma Back Creek. Slope gradient was variable, ranging from approximately 20%, mainly at upper elevations, to approximately 5%. Five small low density stone artefact scatters were recorded. The artefacts comprised flakes, flaked pieces and a core. Raw materials were quartz, volcanic, silcrete and quartzite. All the sites were all highly disturbed.

Dibden (2009a) conducted an assessment of the Boco Rock Wind Farm west of Nimmitabel. A total of 56 Aboriginal object locales were recorded. The majority of these are low or very low density stone artefact distributions located within Survey Units assessed to be of low archaeological potential and sensitivity. Stone artefacts were found in all environmental contexts surveyed except for flats beside the Maclaughlin River. Generally plateau and ridge crest landforms were found to contain sparse and isolated stone artefact distributions only, and in many Survey Units on such landforms, no artefacts were found at all. More consistent artefact distribution was found on lower elevation landforms including crests and slopes which fall away from the plateau, or otherwise, are situated above but in close proximity to the Maclaughlin River.

Dibden (2009) was commissioned by Lawrie Carlson, CSD Engineering, to undertake an Aboriginal archaeological assessment in relation to the proposed replacement of a water reservoir at Church Hill, located in North Cooma, NSW. The proposal area is situated on an elevated area about one kilometer to the east of Cooma Creek. The area is a gently sloping crest with a gradient ranging between 0 - 7°. Eleven stone artefacts were recorded in five

different exposures across the landform. Effective Survey Coverage encountered during the survey was low, however, numerous soil exposures were present. The area was assessed to be of low archaeological potential due to the high degree of prior impacts and the relatively low density of artefact distribution over that area. The Aboriginal objects recorded were assessed to be of low archaeological significance.

2.3.2 Predictive Model of Aboriginal Site Distribution

Based on the above review and a consideration of the elevation, geology, hydrology and topography of the study area, the type of Aboriginal objects known to occur in the region and the potential for their presence within the subject area are listed as follows.

Stone Artefacts

Stones artefacts are located either on the surface and/or in subsurface contexts. The detection of artefact scatters depends on ground surface factors and whether or not the potential archaeological bearing soil profile is visible. Prior ground disturbance, vegetation cover and sediment/gravel deposition can act to obscure artefact scatter presence. The raw materials used for artefact manufacture will commonly be silcrete, chert, quartzite, quartz and volcanics. Within the local area, stone artefacts will be widely distributed across the landscape in a virtual continuum, but with significant variations in density in relation to different environmental factors. Artefact density and site complexity will be greater near reliable water and the confluence of resource zones.

Given the environmental context on an amorphous ridge crest located at considerable distance from potable water, it is assessed that archaeological evidence in the form of stone artefacts would be present in very low density.

Grinding Grooves

Grinding grooves are found in rock surfaces and result from the manufacture and maintenance of ground edge tools. Given the absence of sandstone exposures, grinding groove sites are unlikely to be present.

Burial/interment sites

Burial/interment sites have been recorded within the wider region. On the Monaro they include human remains buried in excavated ground contexts (eg. Helms 1895: 404-406; Feary 1996), placed in limestone caves (eg. Spate 1997: 39) and deposited in standing hollow trees (eg. Helms 1895: 399; Flood 1980: 120). This site type is rarely located during field survey. There is, however, little potential for burials to be present in the study area given the underlying geology, paucity of very old hollow trees and lack of soil cover of any significant depth across the study area.

Rock Shelter Sites

Rock shelters sites are unlikely to be present in the study area given the absence of vertical stone outcrops.

Scarred and Carved Trees

Scarred and carved trees result from either domestic or ceremonial bark removal. Carved trees associated with burial grounds and other ceremonial places have been recorded in the wider region. In an Aboriginal land use context this site type would most likely have been situated on flat or low gradient landform units in areas suitable for either habitation and/or ceremonial purposes.

Bark removal by European people through the entire historic period and by natural processes such as fire blistering and branch fall make the identification of scarring from a causal point of view very difficult. Accordingly, given the propensity for trees to bear scarring from natural causes, their positive identification is impossible unless culturally specific variables such as stone hatchet cut marks or incised designs are evident and rigorous criteria with regard to tree species/age/size and specific characteristics with regard to regrowth is adopted.

Nevertheless, the likelihood of trees bearing cultural scarring remaining extant and in situ is low given events such as land clearance and bushfires. Generally scarred trees will only survive if they have been carefully protected (such as the trees associated with Yuranigh's grave at Molong where successive generations of European landholders have actively cared for them).

The subject area is has been cleared and this site type is unlikely to be present.

Stone Quarry and Procurement Sites

A lithic quarry is the location of an exploited stone source (Hiscock & Mitchell 1993:32). Sites will only be located where exposures of a stone type suitable for use in artefact manufacture occur. Given the general absence of stone outcrops in the proposal area this site type is unlikely to be recorded during the study. Comber (1988) recorded numerous quartz quarries on the Monaro.

Ceremonial Places and Sacred Geography

Burbung and ceremonial sites are places which were used for ritual and ceremonial purposes. Possibly the most significant ceremonial practices were those which were concerned with initiation and other rites of passage such as those associated with death. Sites associated with these ceremonies are burbung grounds and burial sites. Additionally, secret rituals were undertaken by individuals such as clever men. These rituals were commonly undertaken in 'natural' locations such as water holes.

In addition to site specific types and locales, Aboriginal people invested the landscape with meaning and significance; this is commonly referred to as a sacred geography. Natural features are those physical places which are intimately associated with spirits or the dwelling/activity places of certain mythical beings (*cf.* Knight 2001; Boot 2002). Boot (2002) refers to the sacred and secular meaning of landscape to Aboriginal people which has '...

legitimated their occupation as the guardians of the places created by their spiritual ancestors’.

Knight’s (2001) Masters research conducted in the area of the Weddin Mountains, examined the cultural construction and social practice of inhabiting a sacred landscape. This approach is a departure from a consideration of the land and its resources as being a determinant of behaviour, to one in which land is regarded as a *text*; – within this conception, land and its individual features, are redolent with meanings and significances which are religiously and ritually centred, rather than economically based.

Knight’s (*cf.* 2001:1) work was possible in great measure by the historical record which explicitly defines Weddin as a site of ritual significance. However, the research was additionally driven by a theoretical approach to ‘cultural landscapes’. Landscape is redefined away from considerations of its material features which provide a backdrop to human activity, towards a view that a landscape *is rather*, a conceptual entity. According to this view the natural world does not exist outside of its conceptual or cognitive apprehension. The landscape becomes known within a naming process or narrative; thus the landscape is brought into being and understanding – within this process: - ‘... explanatory parables...’ such as legends and mythology are the embodiment of the landscape narrative (Knight 2001: 6).

These narratives are relative to a particular culture, and it is this which makes an archaeological investigation of the cultural landscape such a thorny one. At distance in time and cultural geography, and especially in the absence of specific ethnographic information, how can the archaeologist attempt to investigate and know these narratives? Knight (2001: 11) employed the concept of the landscape as *mentifact*, whereby archaeological interpretation is concerned with the reconstruction of the landscape as a reflection of prehistoric cosmologies. He argued that this can be reconstructed by exploring the systematic relationships between sites and their topographic setting. This is defined as an *inherent* approach as it is concerned with the role of landscape in both everyday and sacred life. This view is concerned with an integration of the sacred and profane rather than their existence as separate categories of social life: - where “Cult activity may have existed as an inextricably ‘embedded’ component of daily life, where significant locations and ritual aspects of material culture were thoroughly incorporated into secular ranges and uses” (Knight 2001:13). In this regard, Knight (2001: 14) correctly points out that no dichotomy between the material and ideational world existed within Aboriginal life.

Knight (2001: 15) argued that the notion of sacred space is of central concern within an inherent perspective on interpreting cultural landscape. Within human cosmologies, locales within the landscape are constructed as being sacred space; this process of the construction of sacred space has been termed *hierophany* by Eliade (1961 in Knight 2001: 15). However, while Knight (2001: 15) suggests that physical entities such as stones, trees, or topographic features such as mountains, caves and rocky outcrops may be subject to such processes of transformation or construction, in reality, in Aboriginal society any natural feature of less obvious significance can and should be included within this listing. Aboriginal constructions of *hierophany* can include the most insignificant landscape features and objects of less fixed

temporal existence such as animals and plants. While the outside observer readily 'sees' and apprehends mountains and rocky features, more subtle elements of the natural world are easily passed 'unseen'. This point is one which suggests that the personal cultural geography of the archaeologist can severely impact upon the interpretation of the sacred landscape (*cf.* also, Boot 2002: 288). Knight (2001) does acknowledge this by illustrating the issue with reference to the example of "Jump Up Rock" situated north of Weddin. This place is only understood to have been an important landscape feature by recourse to prior knowledge regarding the meaning of the site name; the hill itself is insignificant and therefore not readily apprehended through an outsiders gaze as being of special significance.

Knight (2001: 16) refers to the issue of peculiarities of form (e.g. shape, colour, size or texture) and natural distinctiveness (e.g. isolated mountains or rocky features within a plains context) as being an important distinguishing feature of sacred locales. Knight (2001: 16) argues that the construction of sacred space in such a manner is particularly relevant to people for whom the natural domain is the dwelling place of/or the manifestation of their deities. Knight (2001: 16) again draws from Eliade (1964) to suggest that it is at the sacred place that the three fundamental cosmological worlds, the everyday, the upper and underworld may converge; typically the upper world will be associated as a point of 'access' with tall things such as trees while the underworld will be associated with pools and caves. Eliade contends that places where all three worlds can possibly connect, the *axis mundi*, are of a heightened order of sacredness. Hierophanies are therefore natural features which are ascribed sacredness. Additionally, Knight (2001: 17) refers to their ability to provide a landscape based opportunity for people to commune with other worldly deities and associated power because they may constitute spatial access between worlds via ritual.

Guided by these theoretical considerations, Knight (2001: 20) engaged with Bradley's (cited in Knight 2001) model of the 'archaeology of natural places' in order to provide guidance for investigating the cultural landscape. In this view, natural places can be explored archaeologically in order to determine the nature of their role in human cosmologies by attending to four archaeological categories: - Votive offerings, rock art, production sites and monuments. This model was developed within a European context, with its attendant biases of concepts and archaeological categories; clearly not all concepts, some of which are clearly Eurocentric, will be applicable in Australia. However, while not all of these data sets may be expected to be found within the Australian context, corresponding cultural landscape themes, human belief systems and site patterning are to a large degree readily discernible within ethnographies, historical documentation, extant Aboriginal societies and the archaeological record.

Knight (2001) gives consideration to the types of natural places which might be ascribed sacred significance. These include mountains, woodlands and groves, springs, pools and lagoons, rock outcrops and caves and sinkholes. He argues that Aboriginal cosmology is expressed via the natural landscape and sacred places were those which were directly related to the Dreaming. He says that these sacred sites typically are those which are remarkable or important physiographically such as caves, rocks and so on.

Given the potential for natural features to have been important places within an Aboriginal cosmological frame of reference, the survey has sought to identify outstanding natural features present in the study area. Some local places on the Monaro are known in respect of their sacredness; these include the Green Hills stone arrangement (Flood 1980: 146-150), the initiation ridge line near Bunyan (Knight and Boot 2010) and the 'teaching place' landscape in the Badja forest (Grinbergs and Knight 1995: 34, 53). However, none of these places occurs in direct or close proximity to the proposal area.

Contact Sites

These sites are those which contain evidence of Aboriginal occupation during the period of early European occupation. Evidence of this period of 'contact' could potentially be Aboriginal flaked glass, burials with historic grave goods or markers, and debris from 'fringe camps' where Aborigines who were employed by, or traded with the white community, may have lived or camped. The most likely location for contact period occupation sites would be places adjacent to permanent water and located in relative proximity to centres of European occupation such as towns and homesteads. The potential for such sites to be in the subject area is unlikely.

2.3.2 Field Survey – Methodology

The methodological approach adopted in this assessment attends particularly to location and relationality as a means of contextualising the material evidence of cultural practice across space. Given the nature of the physiography, different places within the region are likely to have been utilised for different purposes, and also by different categories of people. Landscape is more than a set of 'objective' topographic features. Landscapes are constructed out of cultural and social engagement; they are '... topographies of the social and cultural as much as they are physical contours' (David & Thomas 2008: 35). The conceptual approach to understanding landscape in this assessment is based on a concern with experience, occupation and bodily practice (cf. Thomas 2008: 305). The location of material evidence in different environmental and topographic contexts across the study area has the potential to be informative of different activities and social contexts. Landform and environmental elements, as measurable empirical space, will be employed methodologically to explore landuse, occupation and the nature of both recorded and unseen (ie subsurface) material evidence. Given the vast space encompassed by the study area, this methodology allows for the identification, at a fine level of spatial resolution, of elements representative of the patterns of social life and how these may vary over space.

The archaeological survey entailed a comprehensive pedestrian survey undertaken by three people. Mr Eric Naylor, Sites Officer, Merrimans LALC assisted with the field survey. The survey was aimed at locating Aboriginal objects, areas and places. An assessment was also made of prior land disturbance, survey coverage variables (ground exposure and archaeological visibility) and the potential archaeological sensitivity of the land.

Field survey was designed to assess the archaeological sensitivity of the entire subject area. Survey Units are broad polygon areas defined according to landform element. The survey

methodology entailed walking across individual Survey Units. The field survey was particularly focused on any areas of ground surface exposure that may have been present within each Survey Unit. Each Survey Unit was surveyed until the entire area had been systematically inspected. This methodology enabled direct visual inspection of as much of the ground surface of the area as practicable.

The approach to recording in the current study has been a 'nonsite' methodology: the elementary unit recorded is an artefact rather than a site (*cf* Dunnell 1993; Shott 1995). The rationale behind this approach is that artefacts may be directly observed however 'sites' are a construction within an interpretative process. Given that it can be expected that full archaeological visibility will not be encountered during the survey the process of identifying site boundaries (if they exist at all) will not be possible.

The density and nature of the artefact distribution will vary across the landscape in accordance with a number of behavioural factors which resulted in artefact discard. While cultural factors will have informed the nature of land use, and the resultant artefact discard, environmental variables are those which can be utilised archaeologically in order to analyse the variability in artefact density and nature across the landscape. Accordingly in this study while the artefact is the elementary unit recorded it is the Survey Unit which is utilised as a framework of recording, analysis, and management (*cf* Wandsnider and Camilli 1992). The study area has been divided into four six Survey Units each of which have been defined according to landform elements.

The data collected during this field assessment forms the basis for the documentation of survey results outlined in the section below.

Survey Unit Variables

Landscape variables utilised are conventional categories taken from the *Australian Soil and Land Survey Field Handbook* (McDonald *et al.* 1998).

Survey Coverage Variables

Survey Coverage Variables are a measure of ground surveyed during the study and the type of archaeological visibility present within that surveyed area. Survey coverage variables provide a measure with which to assess the effectiveness of the survey so as to provide an informed basis for the formulation of management strategies.

Specifically, an analysis of survey coverage is necessary in order to determine whether or not the opportunity to observe stone artefacts in or on the ground was achieved during the survey. In the event that it is determined that ground exposures provided a minimal opportunity to record stone artefacts, it may be necessary to undertake archaeological test excavation for determining whether or not stone artefacts are present. Conversely, if ground exposures encountered provided an ideal opportunity to record the presence of stone artefacts, the survey results may be considered to be adequate and, accordingly, no further archaeological work may be required.

Two variables were used to measure ground surface visibility during the study; the area of ground exposure encountered, and the quality and type of ground visibility (archaeological visibility) within those exposures. The survey coverage variables estimated during the survey are defined as follows:

Ground Exposure (GE) – an estimate of the area of exposures of bare ground; and

Archaeology Visibility (AV) – an estimate of the average levels of potential archaeological surface visibility within those exposures of bare ground. Archaeological visibility is generally less than ground exposure as it is dependent on adequate breaching of the bare ground surface which provides a view of the subsurface soil context. Based on subsurface test excavation results conducted in a range of different soil types across New South Wales it is understood that artefacts are primarily situated 10 - 30 cm below the ground surface; reasonable archaeological visibility therefore requires breaching of the ground surface to at least a depth of 10 cm.

Based on the two visibility variables as defined above, an estimate (Net Effective Exposure – NEE) of the archaeological potential of exposure area within a survey unit has been calculated. The Effective Survey Coverage (ESC) calculation is a percentage estimate of the proportion of the Survey Unit which provided the potential to view archaeological material.

2.3.3 Field Survey – Results

In accordance with the OEH *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*, the purpose of a field survey is to record the material traces and evidence of Aboriginal land use that are:

- o Visible at or on the ground surface, or
- o Exposed in section or visible as features (e.g. rock shelters with rock-art),

and to identify those areas where it can be inferred that, although not visible, material traces have a high likelihood of being present under the ground surface (DECCW 2010a: 12).

Survey Coverage and Observations

During the field survey effective survey coverage (ESC) was variable, but generally low. Survey coverage is described and summarised in Table 2 below. The subject area consists of one morphological landform, an undulating, gentle gradient crest, however, six Survey Units have been delineated based on changes to aspect and gradient.

The entire area of proposed impacts has undergone relatively high levels of prior disturbance associated with land clearance and in some areas landscape modification (water diversion works), track use, dam construction and other mechanical disturbance. This previous landuse is assessed to have caused moderate levels of impact to almost all ground surfaces where impacts are proposed, and to any Aboriginal objects which may once have been present in those areas.

Cobbles occur across the site, including quartz. On Survey Unit 4, the crest proper, a small, low outcrop of quartz is present. The quartz is poor quality and the outcrop, while accompanied by abundant shatter, possesses no features reflecting extraction. All trees located within areas of direct impact were inspected during the survey and no evidence of Aboriginal scarring is evident. However, as discussed above, all trees and regrowth.

Ground exposures inspected included areas of animal marks, dam walls, tracks and burrows, and bare earth. Ground exposures were fairly infrequent and measured approximately a total of 820 square metres in area. Of that ground exposure area, archaeological visibility inspected (the potential artefact bearing soil profile) was also very low, as exposures frequently were not sufficiently deep as to reveal the potential artefact bearing soils. Archaeological visibility is estimated to have been c. 682 square metres (NEE). Effective Survey Coverage is calculated to have been 0.3% of the proposal area.

No stone artefacts were found in the subject area. The ESC encountered during the field survey is considered to be low and less than adequate for the purposes of determining the archaeological status and potential of the subject area. Accordingly, recourse to the predictive model is necessary in order to consider the nature of the archaeological sensitivity of the subject site. In this regard, all Survey Units are predicted to contain very low to negligible artefact density.

Table 2 Survey Coverage

SU	Landform	Area	GE	AV	NEE	ESC	Predicted artefact density
SU1 (Plate 3)	Undulating crest; very gentle gradient and aspect 210°. General disturbance + water diversion channels associated with dam.	3.8 ha	c. 150 sq m	60%	90 sq m	0.2%	Very low/negligible
SU2 (Plate 4)	Undulating crest; very gentle gradient and aspect 0°. General disturbance + water diversion channels associated with dam.	3.6 ha	c. 100 sq m	60%	90 sq m	0.2%	Very low/negligible
SU3 (Plate 5)	Undulating crest; gentle gradient and aspect 270°. Regrowth woodland.	5.6 ha	c. 50 sq m	60%	90 sq m	0.05%	Very low/negligible
SU4 (Plate 6)	Undulating crest; very gentle gradient and open aspect. Low bedrock outcrops near north end. Regrowth woodland. General disturbance + some quarrying.	5.4 ha	c. 500 sq m	80%	400 sq m	0.7%	Very low/negligible
SU5 (Plate 7)	Undulating crest – slight drainage depression; very gentle gradient and aspect 120°. Regrowth woodland.	1.5 ha	c. 20 sq m	60%	12 sq m	0.08%	Very low/negligible
SU6	Undulating crest; gentle gradient and aspect 90°.	0.9 ha	0	-	-	-	Very low/negligible
Total		20.8	820 sq m		682 sq m	0.3%	

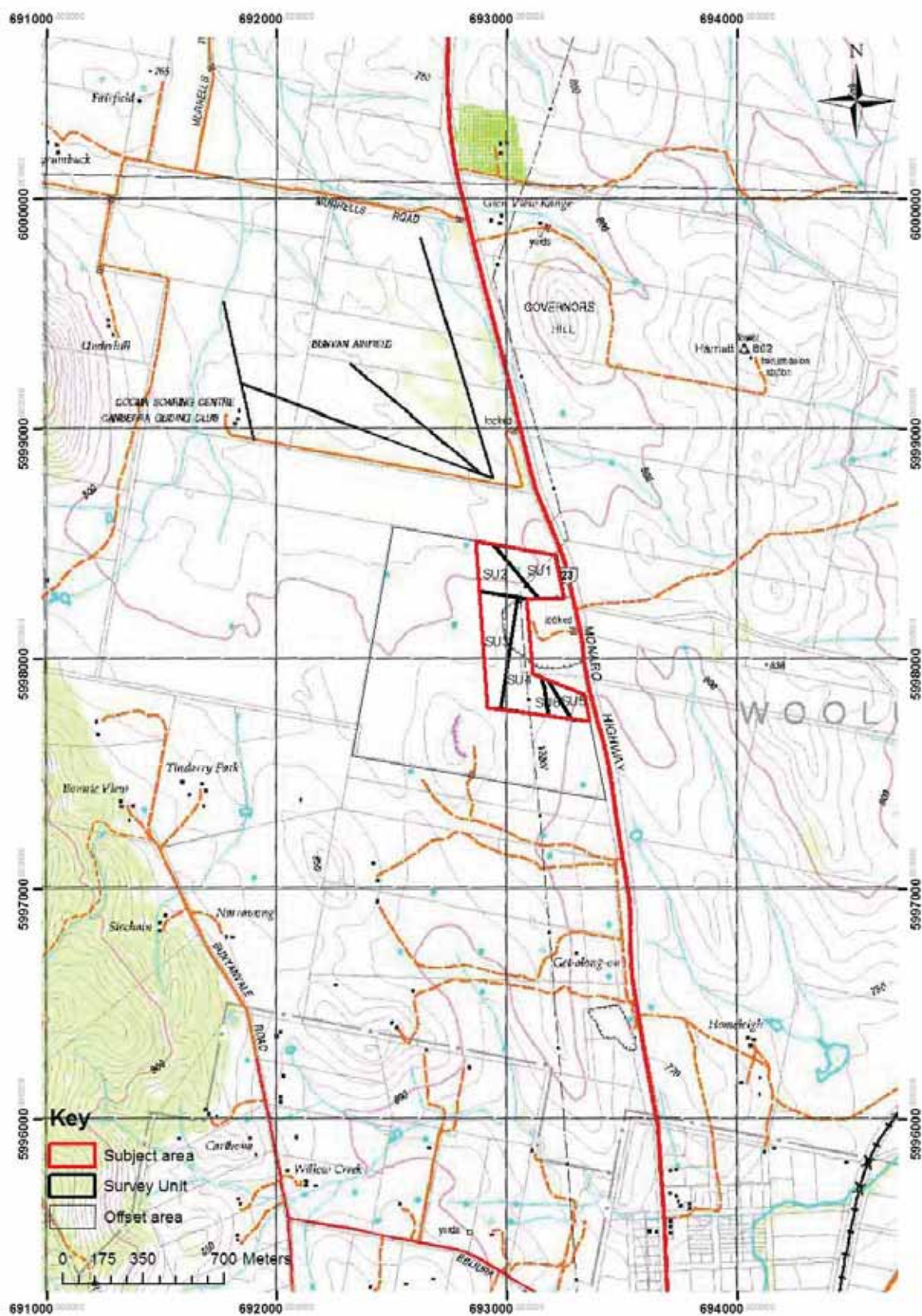


Figure 3 Location of Survey Units in the subject area.



Plate 3 Survey Unit 1 taken from near highway at northeast corner of existing quarry.



Plate 4 Survey Unit 2 taken from near northwest corner of the subject area; looking 160°.



Plate 5 Survey Unit 3 taken from SU4 near southwest corner of existing quarry; looking west.



Plate 6 Survey Unit 4 taken from near south end; looking north.



Plate 7 Survey Unit 5; looking 150°.

3. CONSULTATION PROCESS

A formal process of Aboriginal community consultation has been undertaken as a component of this assessment in accordance with the guidelines as set out in the NSW OEH's *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW DECCW 2010b).

3.1 Consultation

In order to identify, notify and register Aboriginal people who may hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places in the subject area, the following procedure was implemented (Copies of all documentation relating to this process will be submitted to OEH [Queanbeyan] in separate correspondence).

Correspondence dated 5 August 2014 was sent to:

- o NSW OEH Queanbeyan office;
- o Merrimans Local Aboriginal Land Council;
- o the Office of the Registrar, Aboriginal Land Rights Act 1983;
- o the National Native Title Tribunal, requesting a list of registered native title claimants, native title holders and registered Indigenous Land Use Agreements;
- o Native Title Services Corporation Limited (NTSCORP Limited);
- o Cooma-Monaro Shire Council.

In addition an advertisement has been placed with the local paper (Cooma-Monaro Express) and appeared in the 7 August 2014 edition.

In accordance with NSW OEH list of relevant parties for the area, further correspondence dated 5 August 2014 was sent to:

- o Ngunnawal Elders Corp;
- o Ngunnawal Heritage Aboriginal Corporation;
- o Konanggo Aboriginal Cultural Heritage Services;
- o Carl and Tina Brown;
- o Yuwang Aboriginal Cultural Heritage Services;
- o Colleen Dixon;
- o Gunjeewong Cultural Heritage Aboriginal Corporation;
- o Buru Ngunnawal Aboriginal Corporation;
- o Alice Williams;
- o Koomurri Ngunnawal Aboriginal Corporation.

The Office of the Registrar Aboriginal Land Rights Act 1983 responded (12 August 2014) indicating that there does not appear to be registered Aboriginal owners for the project area. NTSCORP responded on 11 August 2014, indicating that they would provide our correspondence to any individuals, groups or organisations NTSCORP is aware assert traditional interest in the area. The National Native Title Tribunal responded via email dated 7 August 2014 indicating that Native Title had been extinguished over the area. Cooma Monaro Sire Council provided various lists of people, all of which contained old and out of date information. Further correspondence was written to the following Local Aboriginal Land Councils on the list (Bega, Wagonga, Bodalla, Mogo and Cobowra) to seek names of persons or groups who may wish to register and interest in the process (dated 12 August 2014).

The following group registered an interest in this project:

- o Buru Ngunawal Aboriginal Corporation;
- o Ngunawal Heritage Aboriginal Corporation;
- o Koomurri Ngunawal Aboriginal Corporation;
- o Merrimans Local Aboriginal Land Council.

In accordance with Section 4.2 and 4.3 of the *Aboriginal cultural heritage consultation requirements for proponents 2010* (NSW DECCW 2010b) guidelines, information with regard to the project, proposed consultation process and assessment methodology was furnished to the RAP's for comment on 27 August 2014.

The following response has been received:

Graeme Dobson, Ngunawal Heritage Aboriginal Corporation, indicated that it is important to be consistent with current protocols, guidelines and requirements and to actively involve Aboriginal Stakeholders when Aboriginal heritage may be impacted by any proposed works. This is to ensure duty of care to all Aboriginal heritage with best practice and provide a positive outcome for all parties.

No cultural information has been received in regard to the subject area.

Mr Eric Naylor, Merrimans Local Aboriginal Land Council, assisted with the field survey.

A draft copy of the report was provided to RAPS for review and comment. One response has been received. Mr Glen (Gilan) Freeman, Koomurri Ngunawal Aboriginal Corporation, emailed on 26 November 2014, indicating that his group had no issues with the report.

4. SUMMARY AND ANALYSIS OF BACKGROUND INFORMATION

In previous sections, the results of the background research, survey and consultation has been outlined. The purpose of this section of the ACHAR is to explain the results.

It is noted that no information about Aboriginal places, areas or objects has been identified as a result of the formal process of Aboriginal consultation which has been undertaken (as specified in clause 80C of the NPW Regulation).

No previously recorded sites are listed on AHIMS as being present in the study area and none were encountered during the field survey.

In an Aboriginal land use context, the subject area would have been a forest resource environment. The area contains low biodiversity values and a source of potable water is absent. The site is located well away reliable creeks and rivers. For this reason, the area is predicted to have been utilised for sporadic Aboriginal occupation associated with hunting and gathering forays conducted away from base camp locations. It is predicted that the material evidence of such occupation would be a very low density to negligible distribution of artefacts.

The ESC encountered during the field survey is low and considered to be less than adequate for the purposes of determining the archaeological status and potential of the subject area. However, as noted above it is predicted that artefact distribution would be very low to negligible.

Subsurface test excavation is not warranted and there are no information gaps which are of a significant magnitude to warrant any further consideration.

5. CULTURAL HERITAGE VALUES AND STATEMENT OF SIGNIFICANCE

The information provided in this report and the assessment of significance of Aboriginal objects provides the basis for the proponent to make informed decisions regarding management and mitigation which should be undertaken in respect of proposed impacts.

5.1 Significance Assessment Criteria

The NPWS (1997) defines significance as relating to the meaning of sites: “meaning is to do with the values people put on things, places, sites, land”. The following significance assessment criteria is derived from the relevant aspects of ICOMOS Burra Charter and NSW Department of Urban Affairs and Planning’s ‘State Heritage Inventory Evaluation Criteria and Management Guidelines’.

Aboriginal sites are assessed under the following categories of significance:

- cultural value to contemporary Aboriginal people,
- archaeological value,
- aesthetic value,
- representativeness, and
- educational value.

Aboriginal cultural significance

The Aboriginal community will value a place in accordance with a variety of factors including contemporary associations and beliefs and historical relationships. Most heritage evidence is valued by Aboriginal people given its symbolic embodiment and physical relationship with their ancestral past.

Archaeological value

The assessment of archaeological value involves determining the potential of a place to provide information which is of value in scientific analysis and the resolution of potential archaeological research questions. Relevant research topics may be defined and addressed within the academy, the context of cultural heritage management or Aboriginal communities. Increasingly, research issues are being constructed with reference to the broader landscape rather than focusing specifically on individual site locales. In order to assess scientific value, sites are evaluated in terms of nature of the evidence, whether or not they contain undisturbed artefactual material, occur within a context which enables the testing of certain propositions, are very old or contain significant time depth, contain large artefactual assemblages or material diversity, have unusual characteristics, are of good preservation, or are a part of a larger site complex. Increasingly, a range of site types, including low density artefact distributions, are regarded to be just as important as high density sites for providing research opportunities.

In order to assess the criteria of archaeological significance further, and also to consider the criteria of rarity, consideration can be given to the distribution of stone artefacts across the continent. There are two estimates of the quantity of accumulated stone artefacts in Australia (Wright 1983:118; Kamminga 1991:14; 2002). Wright estimated an average of 500,000 débitage items and 24,000 finished tools per square kilometre, which equates to a total of about 180 billion finished stone tools and four trillion stone débitage items in Australia. Kamminga's estimates, which were determined from a different set of variables, provide a conservative estimate of 200 billion stone tools and 40 million tonnes of flaking débitage (see Kamminga 1991:14; 2002). These two estimates are similar, and suggest that the actual number of stone tools and items of flaking débitage in Australia is in the trillions. The stone artefacts distributed in the proposed activity area cannot, therefore, be considered to be rare.

The vast majority of stone artefacts found in Australia comprise flaking debris (termed débitage) from stone tool making. While it can be reasonably inferred from a range of ethnographic and archaeological evidence that discarded stone artefacts and flaking debris was not valued by the maker, in certain circumstances these objects may to varying degrees have archaeological research potential and/or Aboriginal social value. However, only in very exceptional circumstances is archaeological research potential high for particular open context sites such as those encountered in the subject area (Kamminga, J. pers. comm. June 2009).

Representativeness

Representative value is the degree to which a "class of sites are conserved and whether the particular site being assessed should be conserved in order to ensure that we retain a representative sample of the archaeological record as a whole" (NPWS 1997). Factors defined by NPWS (1997) for assessing sites in terms of representativeness include defining variability, knowing what is already conserved and considering the connectivity of sites.

Educational value

The educational value of cultural heritage is dependent on the potential for interpretation to a general visitor audience, compatible Aboriginal values, a resistant site fabric, and feasible site access and management resources.

Aesthetic value

Aesthetic value relates to aspects of sensory perception. This value is culturally contingent.

5.2 Significance Value of the Aboriginal Object Sites in the Study Area

No Aboriginal objects are known to be present in the subject area. The majority of the subject area is assessed to be of very low archaeological value primarily because of the predicted very low to negligible distribution of stone artefacts. As a result of the process of Aboriginal consultation, no cultural values have been identified.

6. THE PROPOSED ACTIVITY

In this section, the nature and extent of the proposed activity and any potential harm to Aboriginal areas, objects and/or places is identified.

6.1 Proposed Impacts

In accordance with essential road maintenance requirements, Cooma-Monaro Shire Council proposes to expand an existing gravel extraction pit adjacent to the Monaro Highway (Figure 4).

Cooma Monaro Shire Council currently operate a gravel pit 12 km north of Cooma, NSW. The gravel extracted from the site is used for road construction and maintenance within the LGA. This pit is one of seven similar sized pits operating in the shire. The extraction of gravel has now reached the western boundary of the site.

Cooma Monaro Shire Council proposes to purchase an 85 hectare adjoining Crown land parcel (Lot 160 DP 724552). Cooma Monaro Shire Council would use 20 hectares of this purchased land to expand an existing Cooma Monaro Shire Council gravel pit. The residual 65 hectare area would be available for use as offsets to the clearing required.

Lot 160 DP 724552 is currently subject to a grazing lease. Grazing (and the grazing lease) would be discontinued. A rifle club has been using the site. This would also be discontinued. An area previously used by the Roads and Maritime for extracting road material also occurs within the land parcel but has not been active for some time.

It is proposed that the existing gravel pit on council land would be expanded onto the new parcel in two stages. Stage One involves expansion 40 metres west, following the existing active area of the quarry which is now at this western boundary fence. Stage Two would commence once Stage One resources have been exhausted, expanding the operation to the south. No amenities or water supply are proposed. The proposal is simply to follow the resource into adjoining areas.

The proposed Bunyan gravel pit expansion would continue to extract 20,000 – 25,000 tonnes per year. Geotechnical investigations estimate that 630,000 cubic metres of material could be extracted from the site. The estimated life span of the gravel pit is 20 years, although this is subject to demand and the quality and distribution of the resource.

Access to and from the site would be from an existing unsealed entry on the Monaro Highway; no change to the access or haulage traffic is proposed.

The expansion and operation of the gravel pit would involve the following general activities:
Stage One

- o Removal of trees from the Stage One area;

- o Construction of soil and water management devices, including a sediment detention pond in the new northern area, to service to Stage One area;
- o Extraction of material in Stage One using a front end loader;
- o Screening and stockpiling of material onsite;
- o Loading into haul trucks, prior to use.

Stage Two

After the exhaustion of the Stage One area, activities would move to the southern expansion area. Stage Two and Stage Three (if required) activities would follow this same pattern.

Rehabilitation

Once activities are completed in an area, progressive stabilisation and rehabilitation would be carried out:

- o Reshape to achieve stable landforms
- o Rehabilitate landforms

6.2 Type of Harm

The proposed works entail ground disturbance and, accordingly, have the potential to cause impacts to any Aboriginal areas, places or objects which may be present within the zones of direct impact. The works would not cause harm to any known areas, places or objects.

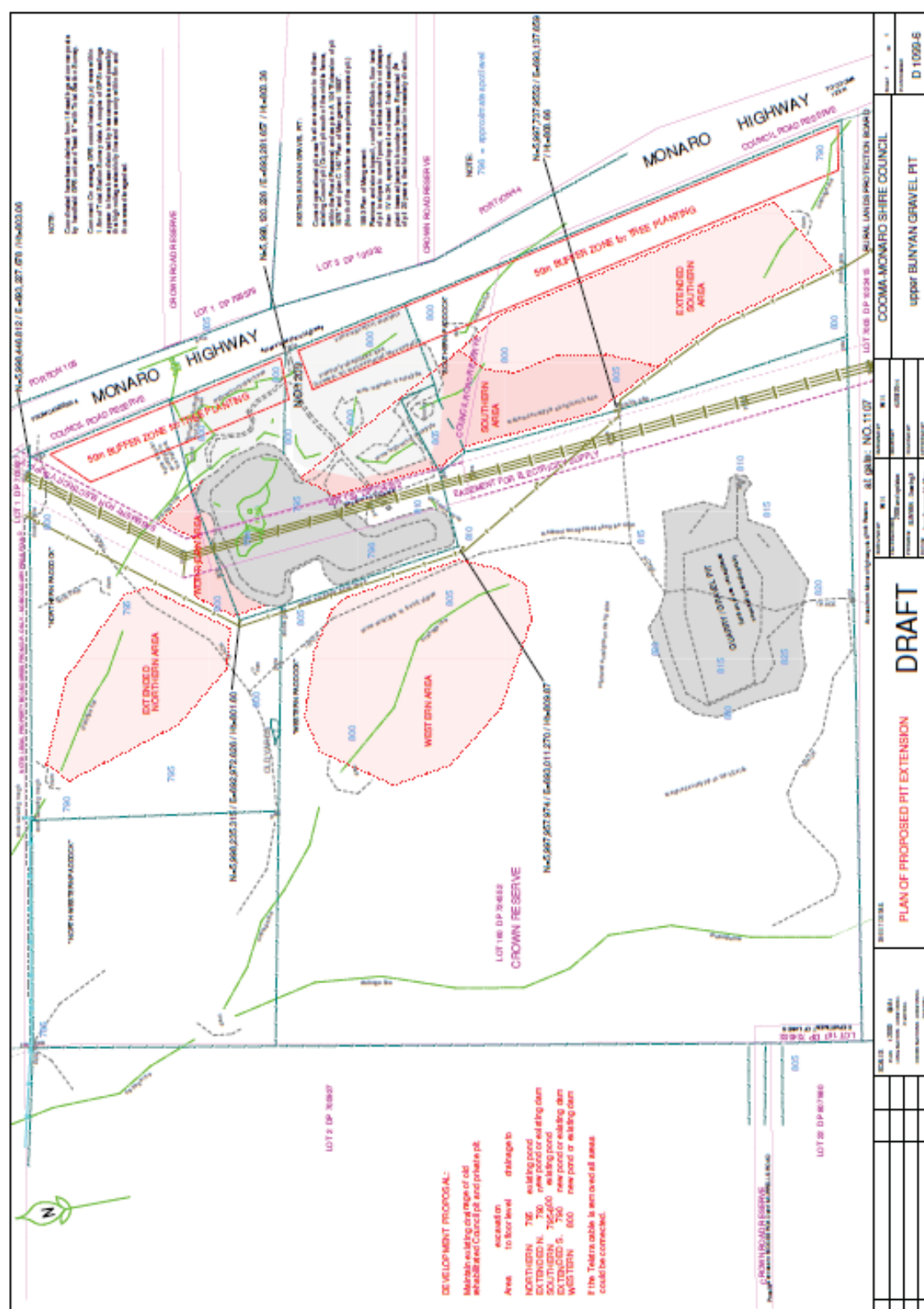


Figure 4 The proposed gravel quarry site.

7. AVOIDING AND/OR MINIMISING HARM

Ecologically Sustainable Development (ESD) is defined in the Protection of the Environment Administration Act 1991. Section 6(2) of that Act states that ESD requires the effective integration of economic and environmental considerations in decision-making processes and that ESD can be achieved through the implementation of:

- (a) the precautionary principle,
- (b) inter-generational equity,
- (c) conservation of biological diversity and ecological integrity,
- (d) improved valuation, pricing and incentive mechanisms.

The principles of ecologically sustainable development and the matter of cumulative harm have been considered for this project. The proposed impacts will occupy a comparatively small disturbance area. Given the low levels of prior, existing and potential future impacts in the local and regional context in which the proposed activity area is situated, the majority of cultural values, including archaeological, which attach to comparable landforms (elements and units) and the broader landscape remain intact across the region.

Avoidance or the mitigation of harm has not been considered as an option in relation to the proposed activities. It is considered that the significance of any undetected Aboriginal objects would not be sufficient to warrant the implementation of avoidance or impact mitigation strategies. However, a number of management strategies are possible and these are each given consideration below.

7.1 Management and Mitigation Strategies

Further Investigation

The field survey has been focused on recording artefactual material present on visible ground surfaces. Further archaeological investigation would entail subsurface excavation undertaken as test pits for the purposes of identifying the presence of artefact bearing soil deposits and their nature, extent, integrity and significance. Further archaeological investigation in the form of subsurface test excavation can be appropriate in certain situations. These generally arise when a proposed development is expected to involve ground disturbance in areas which are assessed to have potential to contain high density artefactual material and when the Effective Survey Coverage achieved during a survey of a project area is low due to ground cover, vegetation etc.

No areas of the proposal area have been identified which warrant further archaeological investigation in order to formulate appropriate management and mitigation strategies. It is our conclusion that artefact density in a subsurface context, where it may occur, would be very low and generally negligible.

Finally it is noted that no Aboriginal objects or survey units with potential conservation value have been identified to have a high probability of being present in the subject area. Accordingly, test excavation conducted under OEH's *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010: 24) is not necessary.

Conservation

Conservation is a suitable management option in any situation, however, it is not always feasible to achieve. Such a strategy is generally adopted in relation to sites which are assessed to be of high cultural and scientific significance, but can be adopted in relation to any site type. In the case at hand, the development of a conservation strategy is not relevant given the absence of known Aboriginal objects and the predicted low archaeological potential of the subject area.

Mitigated Impacts

Mitigated impact usually takes the form of partial impacts only (i.e. conservation of part of an Aboriginal site or Survey Unit) and/or salvage in the form of further research and archaeological analysis prior to impacts. Such a management strategy is generally appropriate when Aboriginal objects are assessed to be of moderate or high significance to the scientific and/or Aboriginal community and when avoidance of impacts and hence full conservation is not feasible. Salvage can include the surface collection or subsurface excavation of Aboriginal objects and subsequent research and analysis. In the case at hand, the development of a mitigated impact strategy is not required given the absence of known Aboriginal objects and the predicted low archaeological potential of the subject area.

Unmitigated Impacts

Unmitigated impact to Aboriginal objects can be given consideration when they are assessed to be of low archaeological and cultural significance and otherwise in situations where conservation is simply not feasible. Unmitigated impacts is appropriate in regard to the proposed activities.

Monitoring

Monitoring during construction for the purposes of identifying cultural material that may be uncovered during earth disturbance can be implemented as a management strategy. However, monitoring is a reactive rather than proactive strategy, and as such, is not an ideal management tool in cultural heritage management. Monitoring for artefacts is not a widely accepted method of management because sites of significance can be destroyed as monitoring is taking place and because it can result in lengthy and costly delays to development works if significant cultural material is uncovered. In the case at hand, the development of a monitoring strategy is not considered necessary or appropriate.

8. STATUTORY INFORMATION

The NPW Act provides statutory protection for all Aboriginal objects and Aboriginal Places.

An 'Aboriginal object' is defined as

'any deposit, object or material evidence (not being a handicraft for sale) relating to Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains'.

An Aboriginal place is an area declared by the Minister to be an Aboriginal place for the purposes of the Act (s84), being a place that in the opinion of the Minister *is or was of special significance with respect to Aboriginal culture*.

Part 6 of the National Parks and Wildlife Act 1974 (NPW Act) provides specific protection for Aboriginal objects and declared Aboriginal places by establishing offences of harm. Harm is defined to mean destroying, defacing, damaging or moving an object from the land. There are a number of defences and exemptions to the offence of harming an Aboriginal object or place. One of the defences is that the harm is carried out under an Aboriginal Heritage Impact Permit (AHIP).

A s90 AHIP is not required.

9. RECOMMENDATIONS

The following recommendations are made:

1. There are no identified cultural and/or archaeological heritage constraints in regard to the proposed works.
2. No further archaeological investigations are required in respect of the proposal.
3. No Aboriginal objects have been recorded in the subject area. Furthermore, the area is assessed to be of very low archaeological potential.
4. Section 7 of this report sets out possible management and mitigation strategies and the proponent and the Registered Aboriginal Parties should give consideration to these.

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GLOSSARY

Aboriginal object - A statutory term, meaning: ‘... any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains’ (s.5 NPW Act).

Declared Aboriginal place - A statutory term, meaning any place declared to be an Aboriginal place (under s.84 of the NPW Act) by the Minister administering the NPW Act, by order published in the NSW Government Gazette, because the Minister is of the opinion that the place is or was of special significance with respect to Aboriginal culture. It may or may not contain Aboriginal objects.

Development area - Area proposed to be impacted as part of a specified activity or development proposal.

Harm - A statutory term meaning ‘... any act or omission that destroys, defaces, damages an object or place or, in relation to an object – moves the object from the land on which it had been situated’ (s.5 NPW Act).

Place - An area of cultural value to Aboriginal people in the area (whether or not it is an Aboriginal place declared under s.84 of the Act).

Proponent - A person proposing an activity that may harm Aboriginal objects or declared Aboriginal places and who may apply for an AHIP under the NPW Act.

Proposed activity - The activity or works being proposed.

Subject area - The area that is the subject of archaeological investigation. Ordinarily this would include the area that is being considered for development approval, inclusive of the proposed development footprint and all associated land parcels. In this instance, the subject area is defined as the 20 hectare footprint in which proposed impacts would take place as documented in this report.

APPENDIX F NOISE ASSESSMENT

BUNYAN GRAVEL PIT

Environmental Noise Assessment of Proposed Expansion

18 November 2014

NGH Environmental

TG630-01F02 (rev 1) Report.docx

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Important Disclaimer:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

This document is issued subject to review and authorisation by the Team Leader noted by the initials printed in the last column above. If no initials appear, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

This document is prepared for the particular requirements of our Client referred to above in the 'Document details' which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Renzo Tonin & Associates. The information herein should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

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1 Introduction

Renzo Tonin & Associates was engaged to conduct an environmental noise assessment of the proposed expansion of the Bunyan Gravel Pit as part of the Environmental Impact Statement (EIS) for the project. Noise impact from the construction and operation phases of the project will be addressed in this report in accordance with relevant Council and EPA requirements and guidelines.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Project Description

2.1 Background Information

Cooma-Monaro Shire Council (CMSC) currently operates a gravel pit located approximately 12 km north of Cooma, NSW (Lot 160 DP 724552) and is one of seven similar sized pits operating in the shire. The gravel pit has potential to have an extraction rate of approximately 20,000 tonnes per year. The site is not required to operate under an Environmental Protection Licence, as the extraction rate is below 30,000 tonnes per year.

The gravel extracted from the site is used primarily for road construction and maintenance within the CMSC LGA. The extraction of gravel has now reached the western boundary of the site and as a result, CMSC proposes to purchase an 85 hectare Crown land parcel (Lot 160 DP 724552) adjoining the site. CMSC would use 20 hectares of this purchased land to expand the existing gravel pit and the residual 65 hectares would be available for use as offsets to the clearing required.

The adjoining lot is currently subject to a grazing lease; however, a rifle club has been using the site. The rifle club and grazing (and the grazing lease) would be discontinued following the purchase of the land. An area previously used by the Roads and Maritime Services for extracting road material also occurs within the land parcel but has not been active for some time.

It is proposed that the existing gravel pit on Council land would be expanded onto the new parcel in three stages:

- Stage One involves expanding the pit 40m to the west, following the existing active area of the quarry which is now at this western boundary fence.
- Stage Two would commence once Stage One resources have been exhausted, expanding the operation to the south.
- Stage Three expands the operation to the north and it would commence once Stage Two has been exhausted.

No amenities or water supply are proposed. Figure 1 shows the location of the staging of works.

2.2 Receiver locations

The nearest affected receivers were identified during a site visit as follows:

- **Receiver R1 – 1297 Monaro Highway**
Residential property potentially affected by Stage Three works and located approximately 1,100m directly northwest of the project development area.

- **Receiver R2 – 1271 Monaro Highway**
Residential property potentially affected by Stage One works and located approximately 940m directly west of the project development area.
- **Receiver R3 – 266 Bunyanvale Road**
Residential property potentially affected by Stage One works and located approximately 910m directly southwest of the project development area.
- **Receiver R4 – 1105 Monaro Highway**
Residential property potentially affected by Stage Two works and located approximately 885m directly southwest of the project development area.
- **Receiver R5 – 1039 Monaro Highway**
Residential property potentially affected by Stage Two works and located approximately 1,260m directly south of the project development area.
- **Receiver R6 – 116 Binjura Road**
Residential property potentially affected by Stage Two works and located approximately 1,250m directly south of the project development area.
- **Receiver R7 – 1038 Monaro Highway**
Residential property potentially affected by Stage Two works and located approximately 1,290m directly southeast of the project development area.

Figure 2 provides details of the site, surrounds and receiver locations.

2.3 Hours of Operation

Hours of operation are proposed to be 7:00am to 6:00pm Monday to Friday, with occasional operations on Saturdays. Road haulage will occur during the proposed hours of operation.

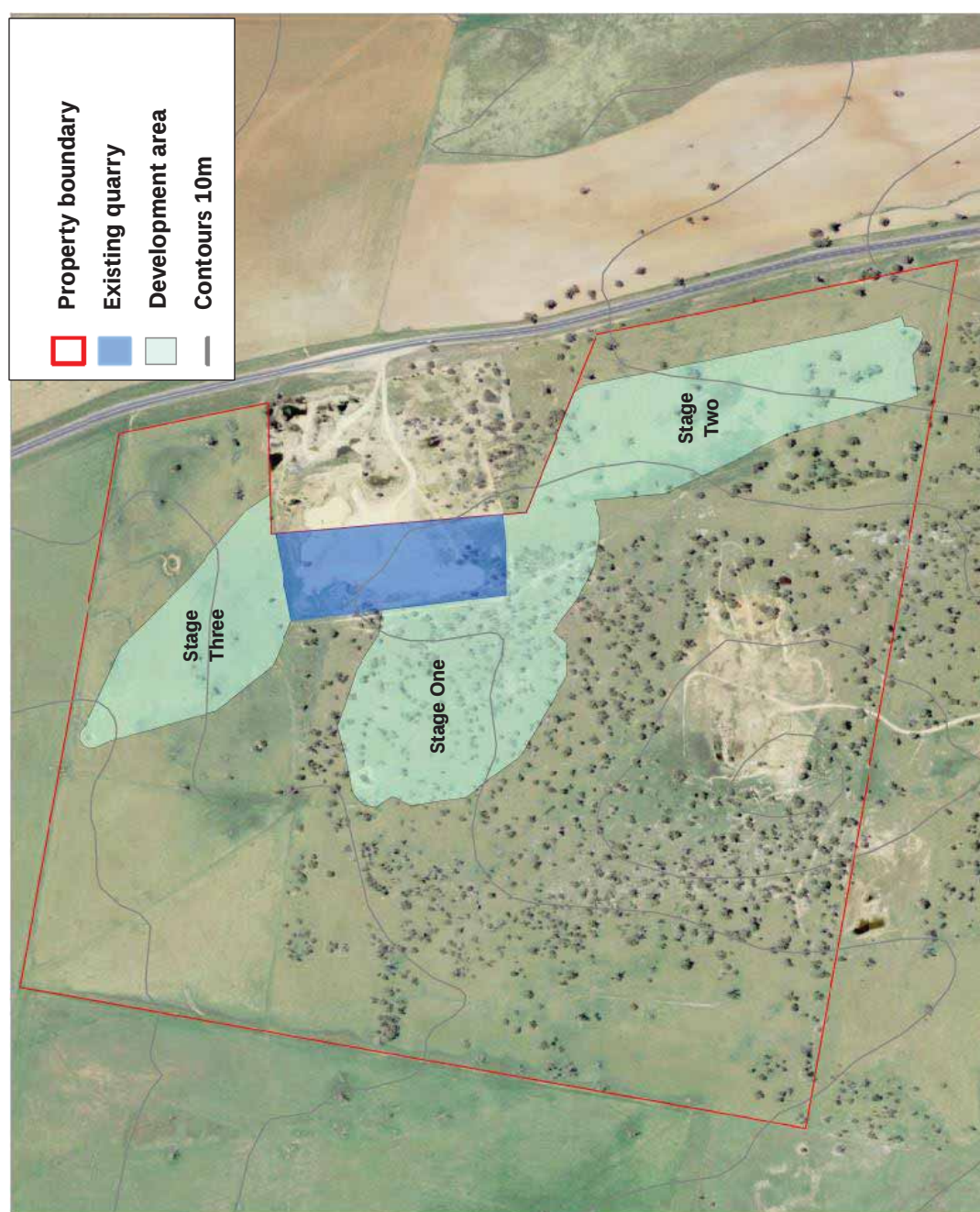
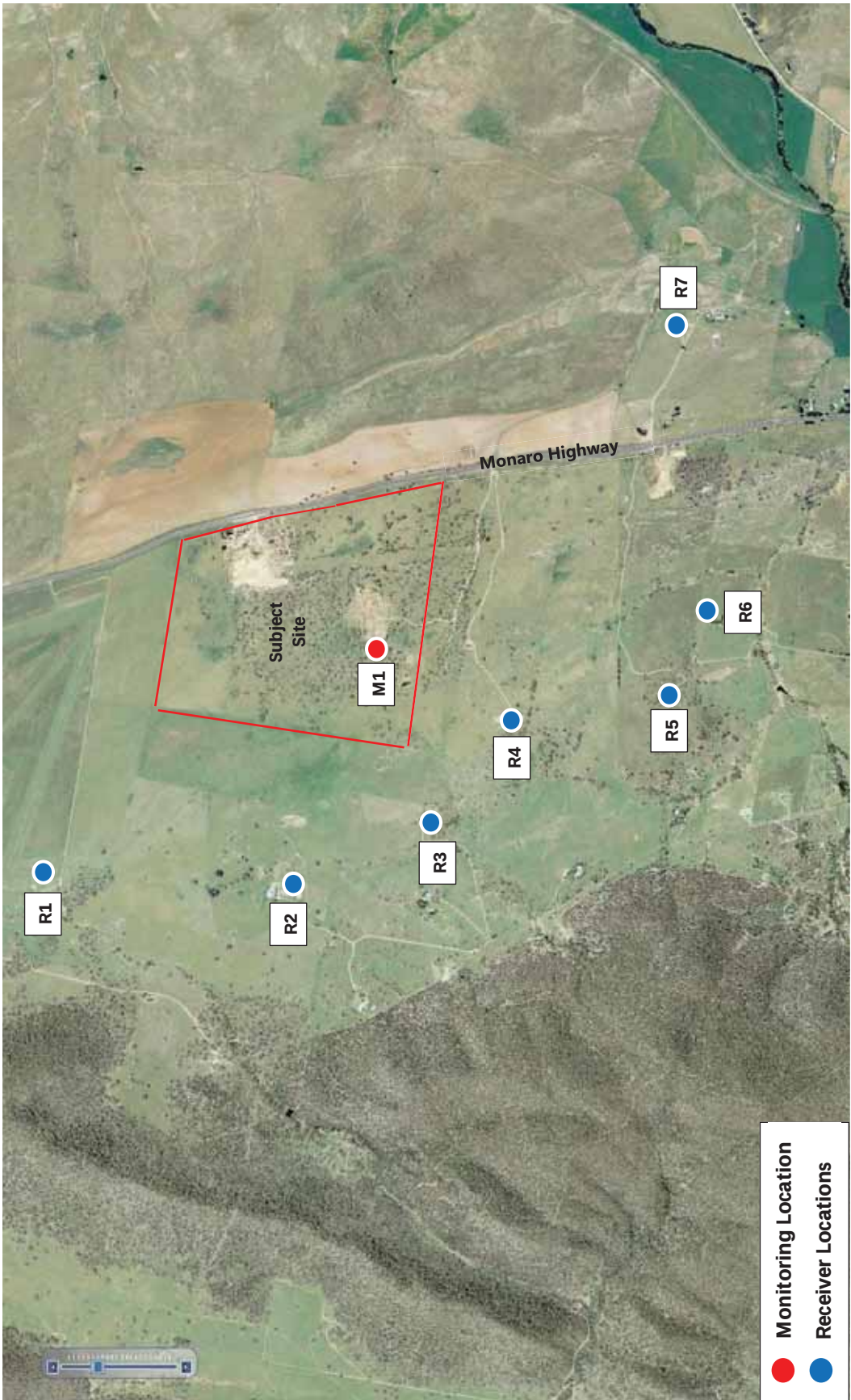


Figure 1 – Subject site plan and staging locations

Figure 2 – Site, surrounds and receiver and noise monitoring locations



3 Existing Noise Environment

Background noise varies over the course of any 24 hour period, typically from a minimum at 3am in the morning to a maximum during morning and afternoon traffic peak hours. Therefore, the NSW 'Industrial Noise Policy' (INP – Environment Protection Authority NSW 2000) requires that the level of background and ambient noise be assessed separately for the daytime, evening and night-time periods. The NSW INP defines these periods as follows:

- **Day** is defined as 7:00am to 6:00pm, Monday to Saturday and 8:00am to 6:00pm Sundays & Public Holidays.
- **Evening** is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays.
- **Night** is defined as 10:00pm to 7:00am, Monday to Saturday and 10:00pm to 8:00am Sundays & Public Holidays.

3.1 Noise Monitoring Locations

Noise monitoring is to be undertaken at a location considered to represent the nearest or potentially most affected residential locations. In this case noise monitoring was undertaken at the following location, considered to be representative of the nearest affected residential locations.

- **Location M1 – South western end of project area**
Noise monitor located at the south western end of the project area and in the 'free field'. The noise monitor was placed in excess of 600m from the Monaro Highway with no line of sight to the road. Noise data represents the ambient and background noise environment for residences surrounding the project area.

To quantify the existing ambient noise environment, long-term (unattended) noise monitoring was conducted at Location M1 between Thursday 23rd October and Monday 3rd November 2014.

Appendix A of this report presents a description of noise terms. Appendix B details the noise monitoring methodology and the graphical recorded outputs from long term noise monitoring are included in Appendix C. The graphs in Appendix C were analysed to determine an assessment background level (ABL) for each day, evening and night period in each 24 hour period of noise monitoring, and based on the median of individual ABLs an overall single Rating Background Level (RBL) for the day, evening and night period is determined over the entire monitoring period in accordance with the NSW INP.

3.2 Existing Background & Ambient Noise Levels

Due to the locality of the project area, the presence of high winds was a common occurrence and it was noticed during the analysis of the noise monitoring data that the monitored background and ambient noise levels were generally affected by adverse wind conditions predominantly during the day time. As

per INP guidelines, periods of wind affected data were excluded from the monitoring results, which resulted in 7 days out of the 12 days of monitoring being excluded. Nevertheless, the noise monitoring results for the five acceptable day periods were considered to be representative of the noise environment of the areas surrounding the subject site.

Existing background and ambient noise levels are presented in Table 3.1 below. The noise monitor was positioned outdoors in the 'free-field' (ie away from building facades). Construction and operation noise from the site should be assessed away from the facade at the potentially most affected residential boundaries and therefore the representative noise levels listed in Table 3.1 are directly applicable.

Table 3.1 – Measured Existing Background (L_{90}) & Ambient (L_{eq}) Noise Levels, dB(A)

Location	L_{90} Background Noise Levels			L_{eq} Ambient Noise Levels		
	Day	Evening	Night	Day	Evening	Night
Location M1	30	29	29	44	40	41

The identified receivers surrounding the subject site are all classified as rural under INP guidelines. It was found that the background noise levels are representative of residences in a rural environment with day time, evening and night time background noise levels at 30dB(A) and under. It is noted that the proposed operations will occur within day time hours; therefore, only the day time L_{90} background noise level will be considered for assessment purposes from herein.

4 Operational Noise Assessment

4.1 Operational Noise Criteria

Noise impact from the general operation of the proposed Bunyan gravel pit expansion is assessed against the NSW Industrial Noise Policy (INP). The assessment procedure in terms of the INP has two components:

- Controlling intrusive noise impacts in the short term for residences
- Maintaining noise level amenity for particular land uses for residences and other land uses.

In accordance with the INP, noise impact should be assessed in terms of both intrusiveness and amenity.

4.1.1 Intrusiveness Criteria

According to the NSW INP, the intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level measured in the absence of the source by more than 5dB(A). It is noted that this is applicable to residential properties only.

Therefore, the intrusiveness criterion for residential noise receivers as summarised in the INP is as follows:

$$L_{Aeq, 15 \text{ minute}} \leq \text{Rating Background Level } (L_{A90}) + 5 \text{ dB(A)}$$

Based on the monitored background noise levels presented in Section 3.2 and the proposed operating hours of the project, the intrusiveness criteria for the potentially most affected residential receiver locations are presented below.

Table 4.1 – Intrusiveness Noise Criteria, dB(A)

Receiver	Intrusiveness Criteria – $L_{Aeq,15min}$
	Day
All residential receivers	30 + 5 = 35

Notes: 1. Intrusiveness criteria only applicable for residential receivers

4.1.2 Amenity Criteria

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.1 of the NSW INP, the applicable parts of which are reproduced below.

Nearby critical receivers consists of residential properties situated in a rural area. Based on the nature of these receivers, the amenity criteria (L_{Aeq}) for rural residential properties will be applied. The applicable amenity noise criteria are presented in the table below.

Table 4.2 – Applicable Amenity Noise Criteria, dB(A)

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Amenity Noise Level	
			Acceptable	Maximum
Residence	Rural	Day	50	55

Notes: 1. Day is defined as 7:00am to 6:00pm, Monday to Saturday; 8:00am to 6:00pm Sundays & Public Holidays.

Comparing the amenity and the intrusiveness criteria shows that the intrusiveness criterion is more stringent for the day period. Compliance with the intrusiveness criteria will deem compliance with the amenity criteria. Therefore, the amenity criteria are not considered further in this report from herein.

4.2 Staging

The expansion and operation of the gravel pit would involve the following general activities:

Stage One

- Removal of trees from the Stage One area
- Construction of soil and water management devices, including a sediment detention pond in the new northern area, to service to Stage One area
- Extraction of material in Stage One using a front end loader
- Screening and stockpiling of material onsite
- Loading into haul trucks, prior to use

Stage Two

After the exhaustion of the Stage One area, activities would move to the southern expansion area. Stage Two activities would follow the same pattern as for Stage One activities.

Stage Three

After the exhaustion of the Stage Two area, activities would move to the northern expansion area. Stage Three activities would follow the same pattern as for Stage One activities.

Rehabilitate

Once activities are completed in an area, progressive stabilisation and rehabilitation would be carried out as follows:

- Reshape to achieve stable landforms
- Rehabilitate landforms

Currently no blasting and crushing are expected for the operation of the proposed expanded gravel pits. However they may occur in the future, therefore they have been covered in this EIS.

4.3 Operational Noise Sources

The following table lists associated plant and equipment likely to be used for the operation of the proposed Bunyan gravel pit expansion.

Table 4.3 – Typical Operational Plant and Equipment & Sound Power Levels, dB(A)

Plant Item	Plant Description	No. of Items	L_{Aeq} Sound Power Levels per Item, dB(A) re 1pW
1	Screener	1	114
2	Front End Loader	2	110
3	Bulldozer	1	109
4	Tipper Truck	2	105
5	Truck & Dog	1	105
6	4WD	2	88

The sound power levels for the majority of activities presented in the above table are provided by the client, based on maximum levels given in Table A1 of Australian Standard 2436 - 2010 'Guide to Noise Control on Construction, Demolition and Maintenance Sites', the ICNG, information from past projects and/or information held in our library files.

4.4 Operational Noise Assessment

Noise emissions were predicted by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments using CadnaA (version 4.4) noise modelling computer program. The program calculates the contribution of each noise source at each specified receptor point and allows for the prediction of the total noise from a site.

The noise prediction models takes into account:

- Location of noise sources and receiver locations;
- Height of sources and receivers;
- Separation distances between sources and receivers;
- Ground type between sources and receivers (soft); and
- Attenuation from barriers (natural and purpose built).

Noise predictions were prepared for each of the following meteorological conditions:

1. Calm & isothermal conditions (acoustically neutral) – no wind and no temperature inversion

2. Slight to gentle breeze – 3m/s wind velocity at 10m from ground level between each noise source and each noise receiver (as per INP default wind conditions). Wind direction was based on wind travelling from the source to the receiver.

It is noted that as the subject site only operates during the day period, temperature inversion effects are not assessed as these effects are only considered during night time periods.

Table 4.4 below presents the predicted noise levels for the worst case scenario based on concurrent operation of all the plant and equipment presented in Table 4.3.

Table 4.4 – Predicted $L_{Aeq,15min}$ Operational Noise Levels at Receiver Locations, dB(A)

Receiver Location	Intrusiveness Criteria	Predicted Operational Noise Levels, $L_{Aeq, 15min}$		Comply? (Yes/No)
		Calm & isothermal conditions ¹	Slight to gentle breeze ¹	
R1 - 1297 Monaro Hwy	35	30	34	Yes
R2 - 1271 Monaro Hwy		31	35	Yes
R3 - 266 Bunyanvale Rd		30	35	Yes
R4 - 1105 Monaro Hwy		26	30	Yes
R5 - 1039 Monaro Hwy		30	35	Yes
R6 - 116 Binjura Rd		20	25	Yes
R7 - 1038 Monaro Hwy		24	29	Yes

Results presented in Table 4.4 above indicate that the noise emissions from the operational phase of the proposed Bunyan gravel pit expansion will comply with the nominated noise criteria at all receiver locations.

5 Road Traffic Noise Assessment

Noise impact from the potential increase in traffic on the surrounding road network due to operational activities is assessed against the NSW 'Road Noise Policy' (RNP). The RNP sets out criteria to be applied to particular types of road and land uses. These noise criteria are to be applied when assessing noise impact and determining mitigation measures for sensitive receivers that are potentially affected by road traffic noise associated with the construction and operation of the subject site, with the aim of preserving the amenity appropriate to the land use.

A traffic and transport study was prepared for the proposed Bunyan gravel pit expansion by Bega Duo Designs, dated October 2014. The study identifies the type of trucks to be utilised in product haulage to be truck and dog trailers with a maximum of up to four (4) trips per day (i.e. 8 movements, 4 in and 4 out) or up to four (4) movements in the worst one hour period. The quarry is to be operated by two Council employee and assuming they will arriving and leaving work by car, car traffic will comprise of up to (2) trips per day (i.e. 4 movements, 2 in and 2 out) or up to two (2) movements in the worst one hour period.

5.1 Road Traffic Noise Criteria

Based on functionality, Monaro Highway is categorised as a freeway. As the proposed Bunyan gravel pit expansion transports gravel to potential road works sites within the Council area, there is potential for the project generated traffic to travel along local roads. For existing residences affected by additional traffic on existing freeways, arterial and local roads generated by land use development, the following road traffic noise criteria apply.

Table 5.1 – RNP Road Traffic Noise Criteria, dB(A)

Road Category	Type of project/land use	Assessment Criteria, dB(A)	
		Day 7am – 10pm	Night 10pm – 7am
Freeway/arterial/sub-arterial roads	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	L _{Aeq} (15 hour) 60 (external)	L _{Aeq} (9 hour) 55 (external)
Local Roads	6. Existing residences affected by additional traffic on existing local roads generated by land use developments	L _{Aeq} (1 hour) 55 (external)	L _{Aeq} (1 hour) 50 (external)

5.2 Predicted Road Traffic Noise

As discussed previously, a maximum of eight truck movements per day will be used for product haulage with four truck movements in the worst one hour period. Haulage of materials will only occur during the day time period. Results of the road traffic noise predictions are presented in the table below. It is noted that the predicted noise levels represent the traffic noise contribution from the eight truck movements and four car movements, and does not take into account existing traffic noise levels due to existing general traffic flows.

Table 5.2 – Predicted Road Traffic Noise Contribution Levels Along Public Roads, dB(A)

Receiver	Criteria	Truck Traffic Movements	Car Traffic Movements	Speed (km/h)	Distance to Road	Predicted Noise Level	Exceed?
Residences on Monaro Highway	L _{Aeq, (15 hour)} 60	8 per day	4 per day	100	90m ¹	34	No
Residences on local roads in Cooma	L _{Aeq, (1 hour)} 55	4 per hour	2 per hour	50	10m ¹	53	No

Notes: 1. Based on closest distance from façade of dwelling to road

From the above table it can be seen that road traffic noise level contributions from the six truck movements associated with the site are at least 2dB(A) below the applicable noise criteria. Therefore, traffic noise levels as a result of the operation of the proposed Bunyan gravel pit expansion would not adversely contribute to the existing traffic noise levels at the most affected residences along the surrounding roads.

6 Conclusion

Renzo Tonin and Associates have completed an environmental noise assessment of the proposed expansion of the Bunyan Gravel Pit. Noise emissions from the operations of the project were predicted to comply with the nominated INP criteria at the nearest affected receivers. Road traffic noise impacts on residential properties potentially affected by the project generated traffic were found to comply with the relevant RNP criteria.

APPENDIX A Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibels. The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.
L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.

L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The “equivalent noise level” is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B Long-term noise monitoring methodology

B.1 Noise monitoring equipment

A long-term unattended noise monitor consists of a sound level meter housed inside a weather resistant enclosure. Noise levels are monitored continuously with statistical data stored in memory for every 15-minute period.

Long term noise monitoring was conducted using the following instrumentation:

Description	Type	Octave band data	Logger location(s)
RTA02 (NTi Audio XL2, with low noise microphone)	Type 2	Broadband only	M1
Notes: All meters comply with AS IEC 61672.1 2004 "Electroacoustics - Sound Level Meters" and designated either Type 1 or Type 2 as per table, and are suitable for field use.			

The equipment was calibrated prior and subsequent to the measurement period using a Bruel & Kjaer Type 4231 calibrator. No significant drift in calibration was observed.

B.2 Meteorology during monitoring

Measurements affected by extraneous noise, wind (greater than 5m/s) or rain were excluded from the recorded data in accordance with the NSW INP. Determination of extraneous meteorological conditions was based on data provided by the Bureau of Meteorology (BOM), for a location considered representative of the noise monitoring location(s). However, the data was adjusted to account for the height difference between the BOM weather station, where wind speed and direction is recorded at a height of 10m above ground level, and the microphone location, which is typically 1.5m above ground level (and less than 3m). The correction factor applied to the data is based on Table C.1 of ISO 4354:2009 '*Wind actions on structures*'.

B.3 Noise vs time graphs

Noise almost always varies with time. Noise environments can be described using various descriptors to show how a noise ranges about a level. In this report, noise values measured or referred to include the L_{10} , L_{90} , and L_{eq} levels. The statistical descriptors L_{10} and L_{90} measure the noise level exceeded for 10% and 90% of the sample measurement time. The L_{eq} level is the equivalent continuous noise level or the level averaged on an equal energy basis. Measurement sample periods are usually ten to fifteen minutes. The Noise -vs- Time graphs representing measured noise levels, as presented in this report, illustrate these concepts for the broadband dB(A) results.

APPENDIX C Long term noise monitoring results

Bunyan Gravel Pit - South Western End

Background & Ambient Noise Monitoring Results - NSW 'Industrial Noise Policy', 2000						
	L _{A90} Background Noise Levels ⁵			L _{Aeq} Ambient Noise Levels		
Date	Day	Evening	Night	Day	Evening	Night
Thursday-23-October-2014	-	-	38.6	-	-	43.4
Friday-24-October-2014	-	33.4	29.7	-	41.8	40.8
Saturday-25-October-2014	29.9	28.9	36.8	42.1	40.2	40.0
Sunday-26-October-2014	30.2	29.1	28.0	48.9	38.2	40.8
Monday-27-October-2014	-	30.9	27.8	-	43.3	40.8
Tuesday-28-October-2014	-	28.7	28.7	-	39.8	41.6
Wednesday-29-October-2014	29.5	28.8	33.7	39.7	39.1	39.9
Thursday-30-October-2014	30.6	27.4	27.4	39.6	38.8	42.7
Friday-31-October-2014	-	28.0	-	-	39.1	-
Saturday-01-November-2014	-	-	27.0	-	-	39.3
Sunday-02-November-2014	-	27.6	30.0	-	37.0	42.3
Monday-03-November-2014	29.3	-	-	40.7	-	-
Representative Weekday	29.5	28.8	29.2	40.0	40.7	41.7
Representative Weekend	30.0	28.9	29.0	46.7	38.7	40.8
Representative Week	29.9	28.8	29.2	43.9	40.1	41.3

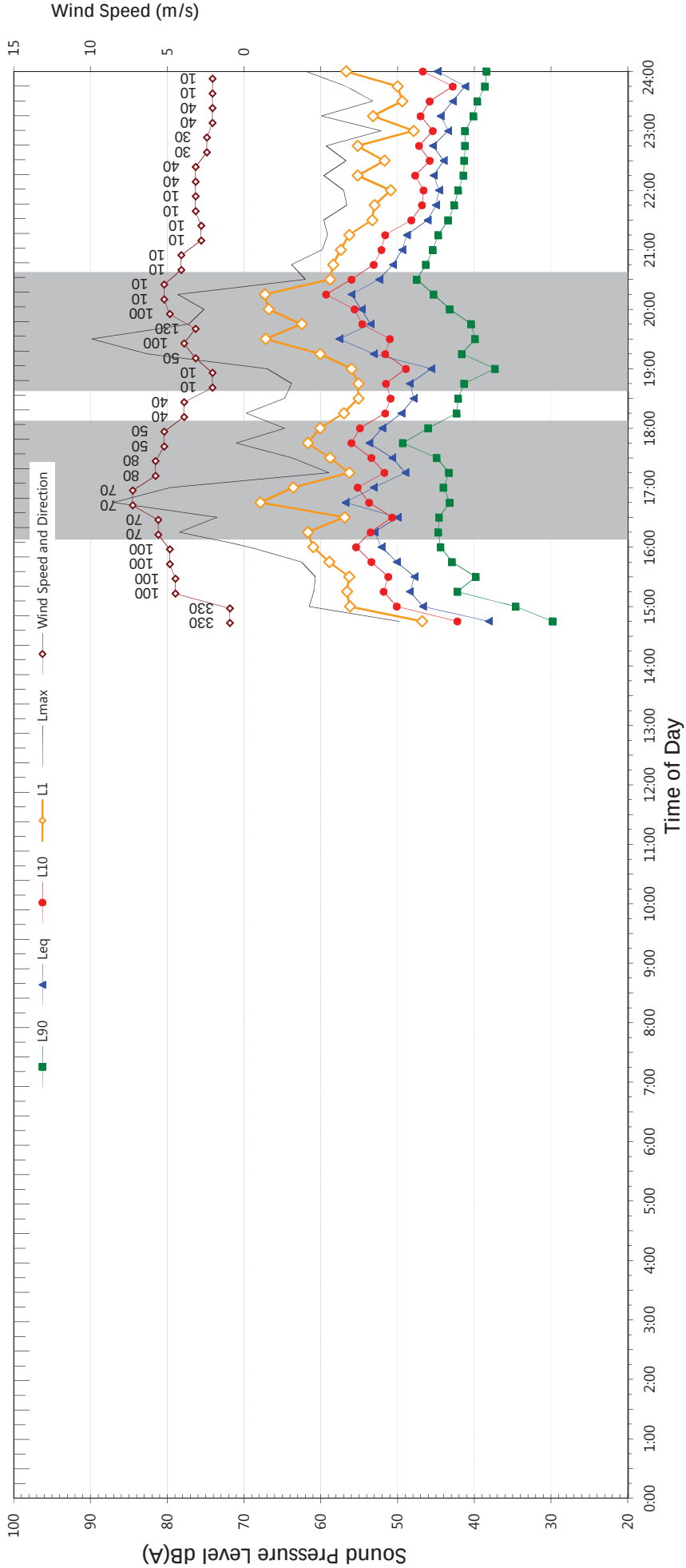
Notes:

1. Day is taken to be 7:00am to 6:00pm
2. Evening is taken to be 6:00pm to 10:00pm.
3. Night is taken to be the remaining periods.
4. Rating Background Level (RBL) for L90 and logarithmic average for Leq
5. Assessment Background Level (ABL)
6. Rating Background Level (RBL) for L90 and logarithmic average for Leq

Unattended Noise Monitoring Results

Bunyan Gravel Pit - South Western End

Thursday, 23 October 2014



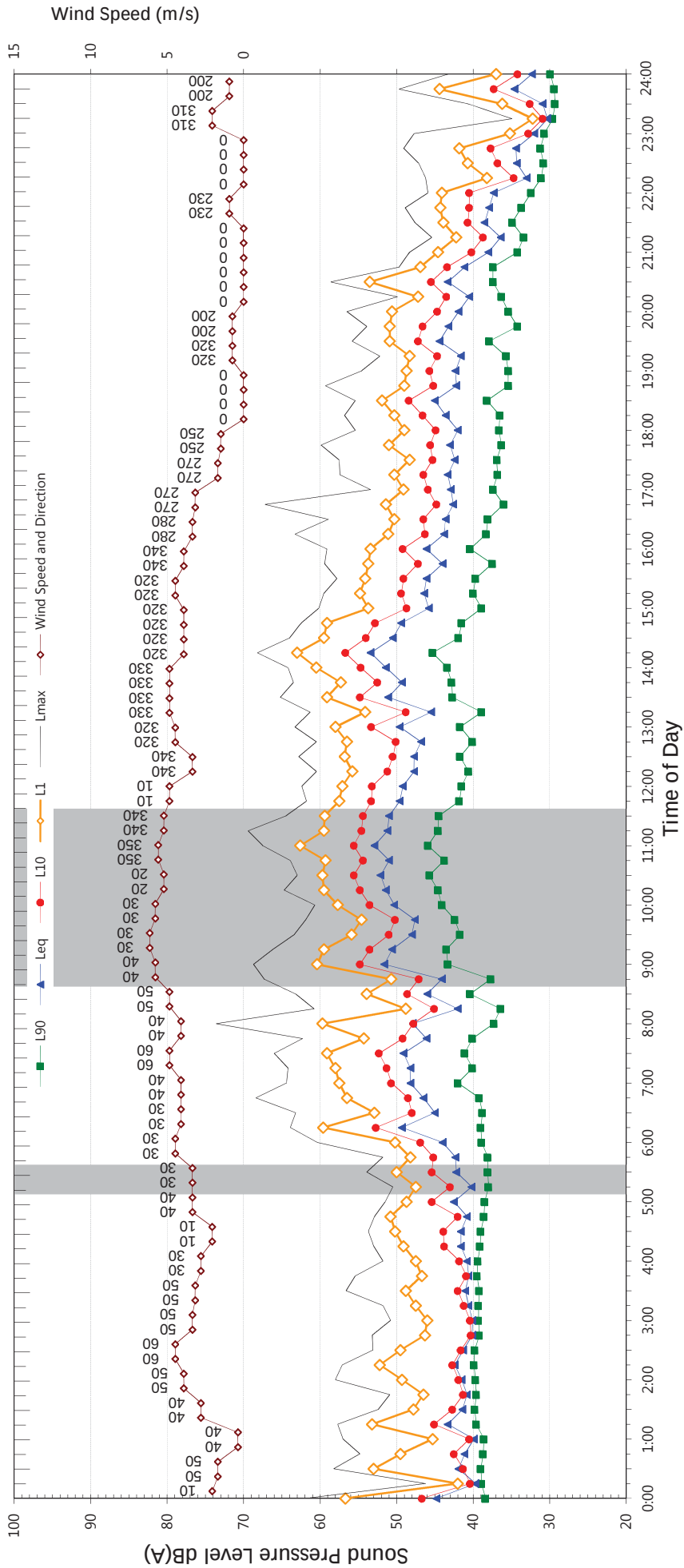
NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night ²
	7am-6pm	6pm-10pm	10pm-7am
L ₉₀	-	-	38.6
Leq	-	-	43.4

- NOTES:
1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
 2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
 3. Graphed data measured in free-field; tabulated results facade corrected
 4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Bunyan Gravel Pit - South Western End

Friday, 24 October 2014



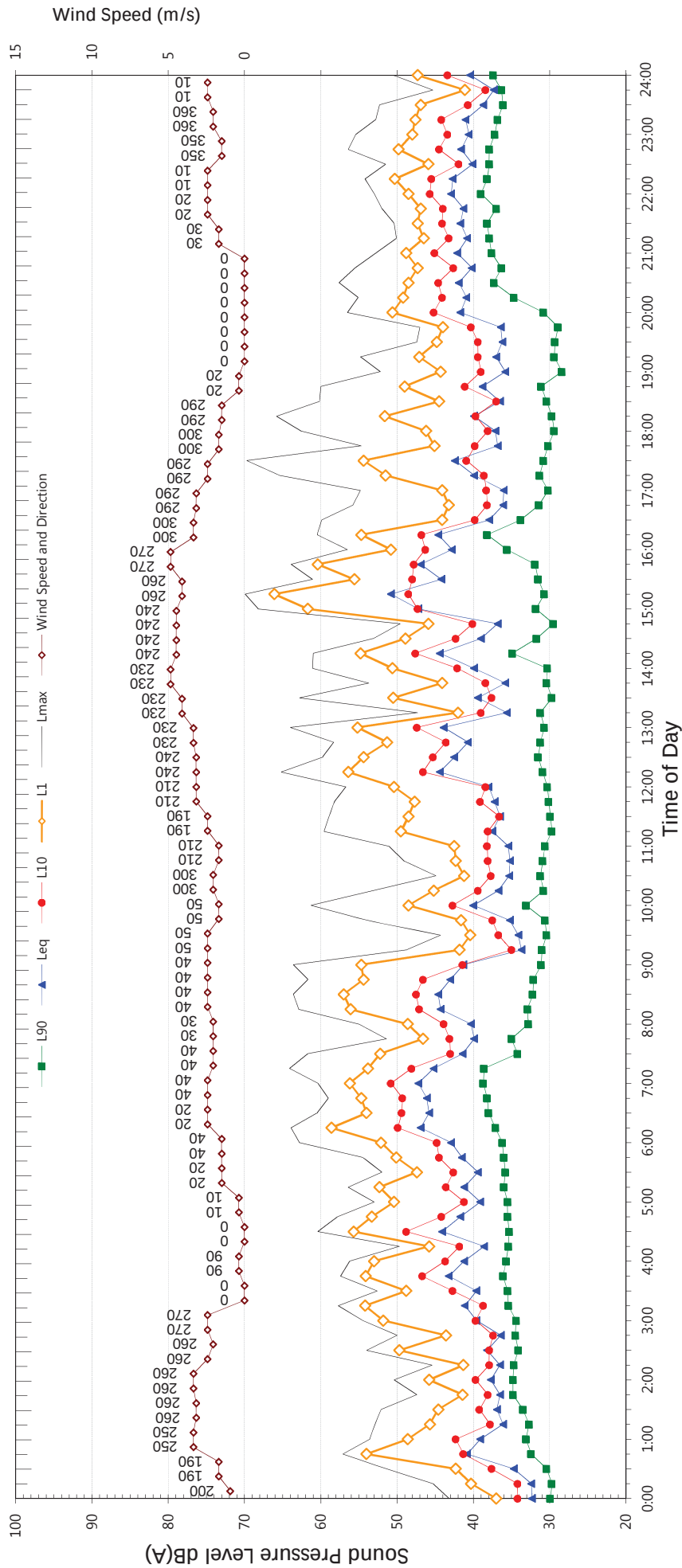
NSW Industrial Noise Policy (Free Field)			
Descriptor	Day		Night ²
	7am-6pm	6pm-10pm	10pm-7am
L ₉₀	-	33.4	29.7
Leq	-	41.8	40.8

- NOTES:
1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
 2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
 3. Graphed data measured in free-field; tabulated results facade corrected
 4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Bunyan Gravel Pit - South Western End

Saturday, 25 October 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Night ²	
	7am-6pm	6pm-10pm	10pm-7am
L ₉₀	29.9	28.9	36.8
Leq	42.1	40.2	40.0

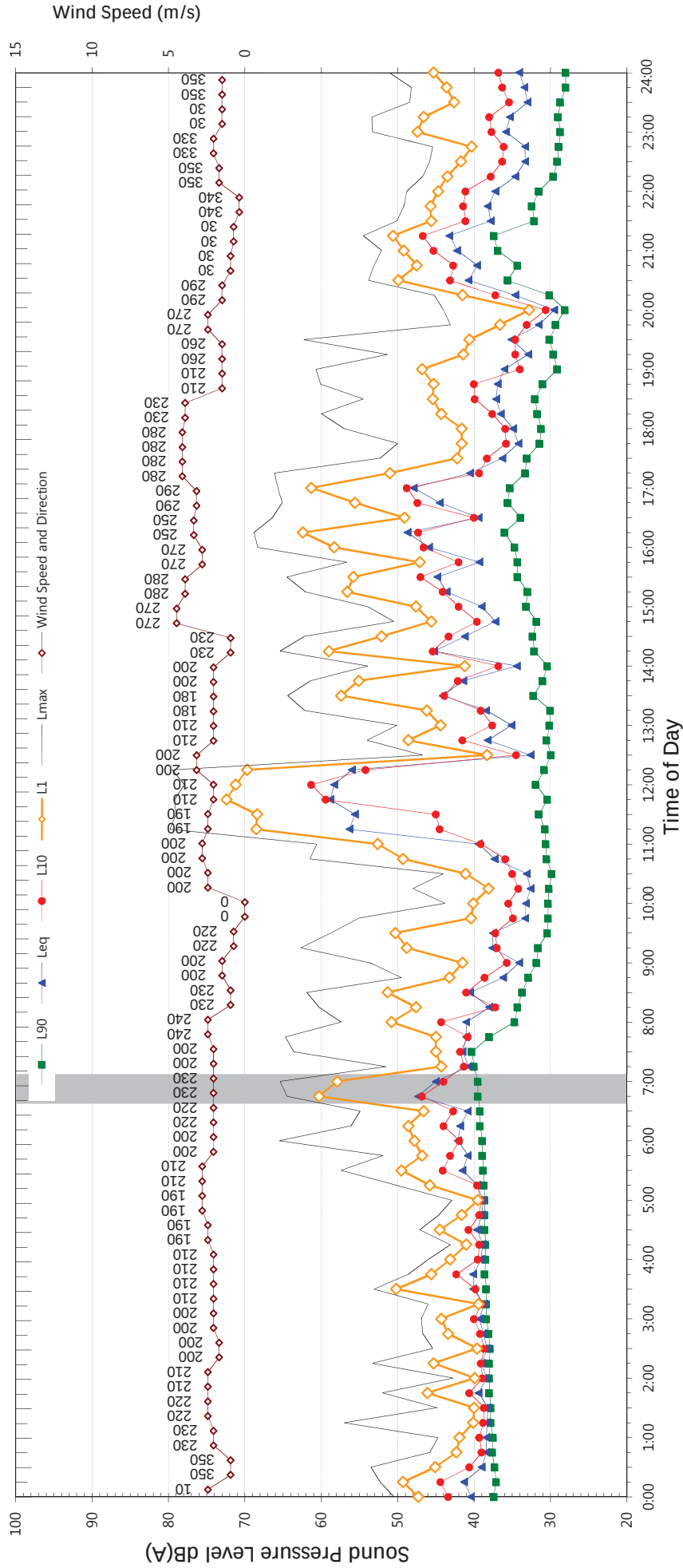
NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Bunyan Gravel Pit - South Western End

Sunday, 26 October 2014



NSW Industrial Noise Policy (Free Field)			
Descriptor	Day		Night ²
	7am-6pm	6pm-10pm	10pm-7am
L ₉₀	30.2	29.1	28.0
Leq	48.9	38.2	40.8

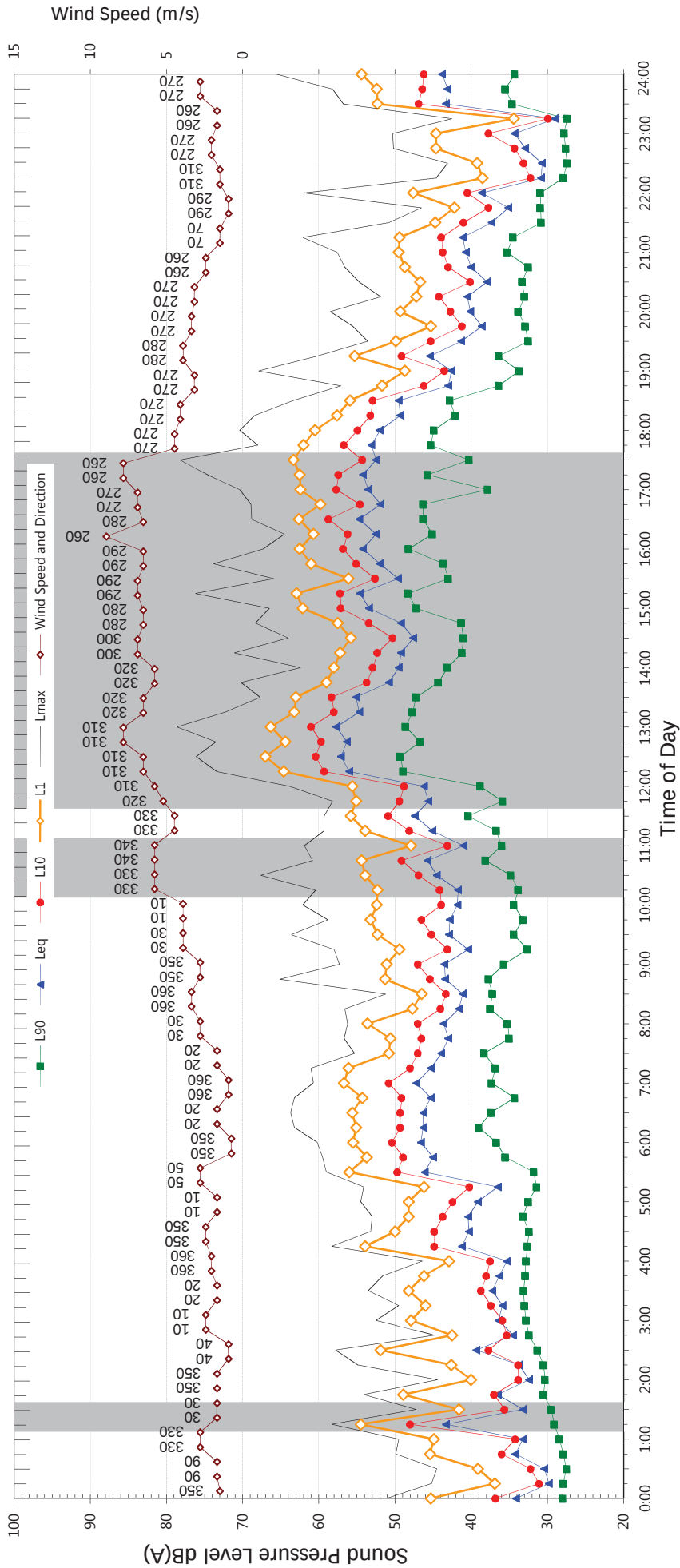
NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Bunyan Gravel Pit - South Western End

Monday, 27 October 2014



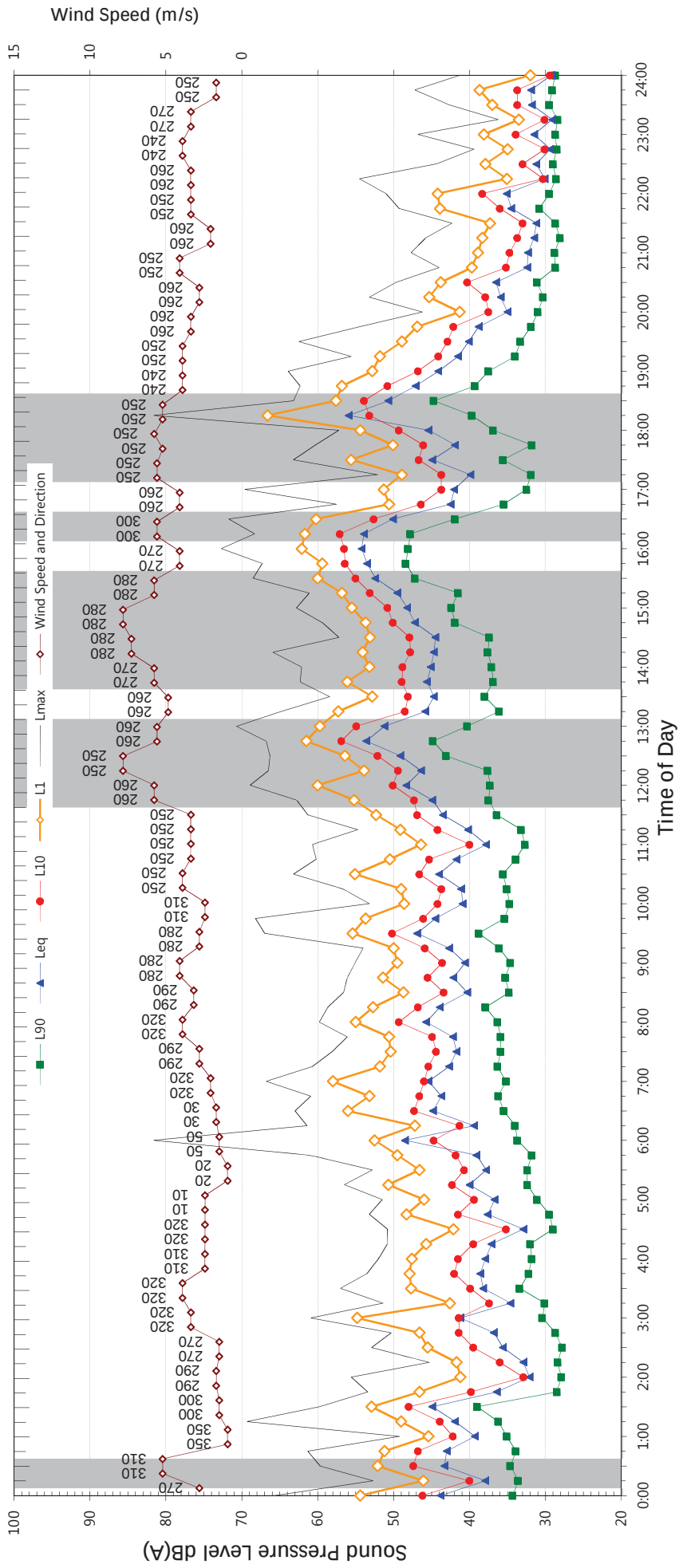
NSW Industrial Noise Policy (Free Field)			
Descriptor	Day		Night ²
	7am-6pm	6pm-10pm	10pm-7am
L ₉₀	-	30.9	27.8
Leq	-	43.3	40.8

- NOTES:
1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
 2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
 3. Graphed data measured in free-field; tabulated results facade corrected
 4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Bunyan Gravel Pit - South Western End

Tuesday, 28 October 2014



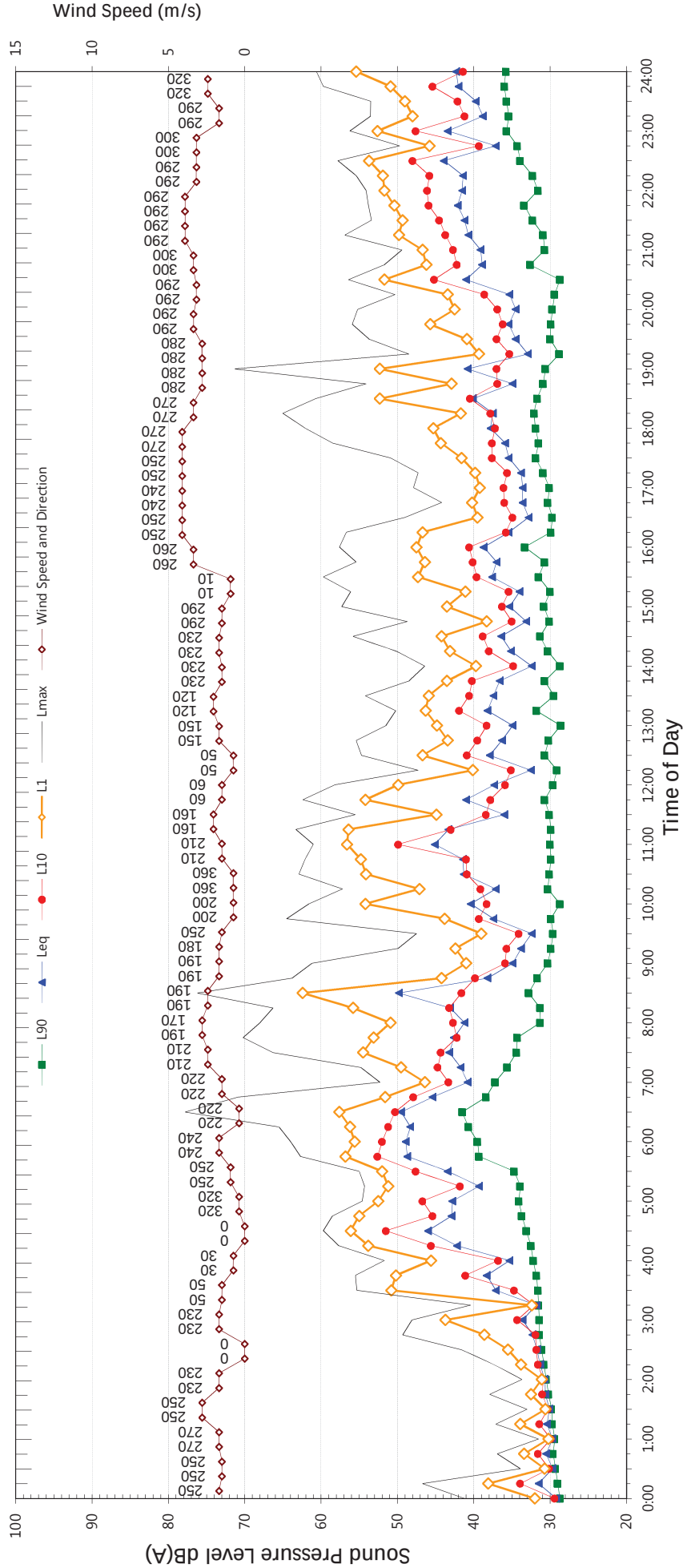
NSW Industrial Noise Policy (Free Field)			
Descriptor	Day		Night ²
	7am-6pm	6pm-10pm	10pm-7am
L ₉₀	-	28.7	28.7
Leq	-	39.8	41.6

- NOTES:
1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
 2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
 3. Graphed data measured in free-field; tabulated results facade corrected
 4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Bunyan Gravel Pit - South Western End

Wednesday, 29 October 2014



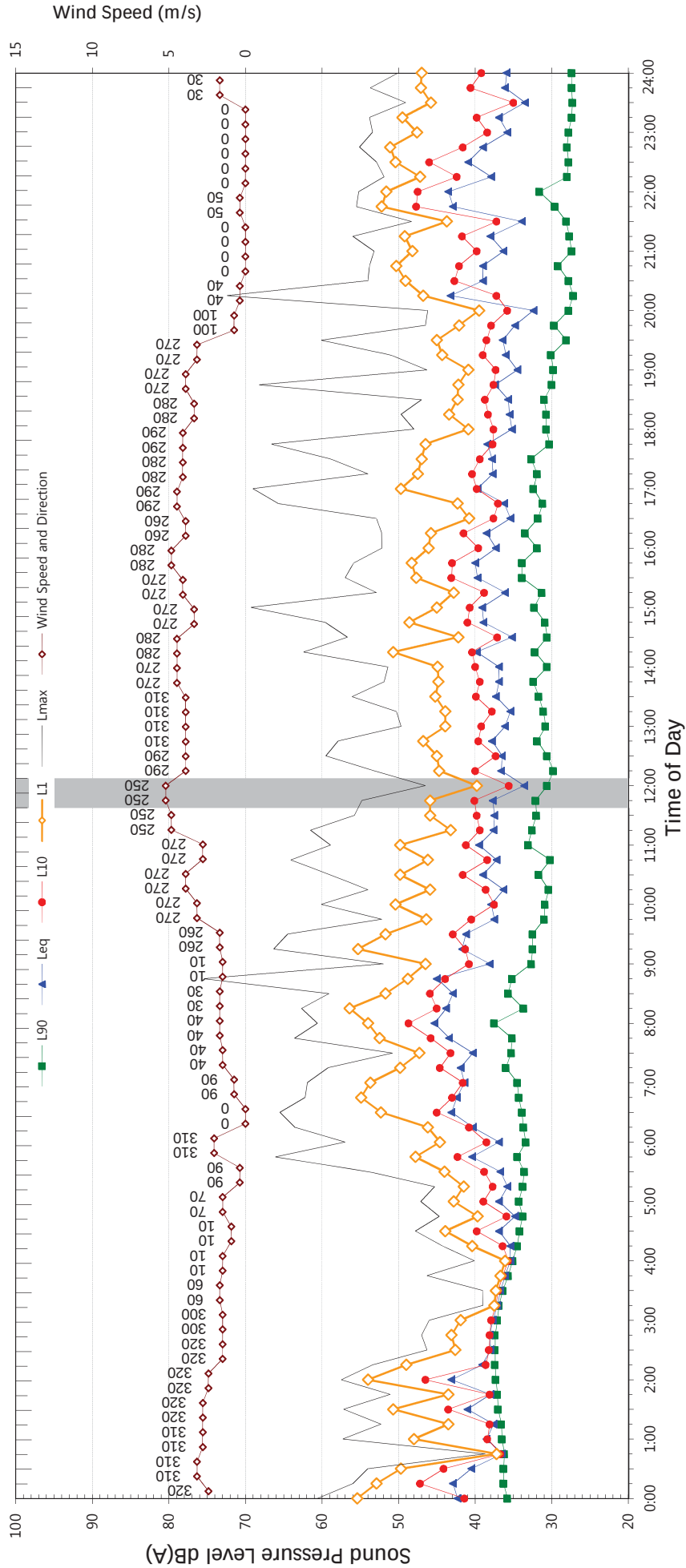
NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night ²
	7am-6pm	6pm-10pm	10pm-7am
L ₉₀	29.5	28.8	33.7
Leq	39.7	39.1	39.9

- NOTES:
1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
 2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
 3. Graphed data measured in free-field; tabulated results facade corrected
 4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Bunyan Gravel Pit - South Western End

Thursday, 30 October 2014



NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq $\geq$ 15dB(A)

NSW Industrial Noise Policy (Free Field)			
Descriptor	Day	Evening	Night ²
	7am-6pm	6pm-10pm	10pm-7am
L ₉₀	30.6	27.4	27.4
Leq	39.6	38.8	42.7

Data File:

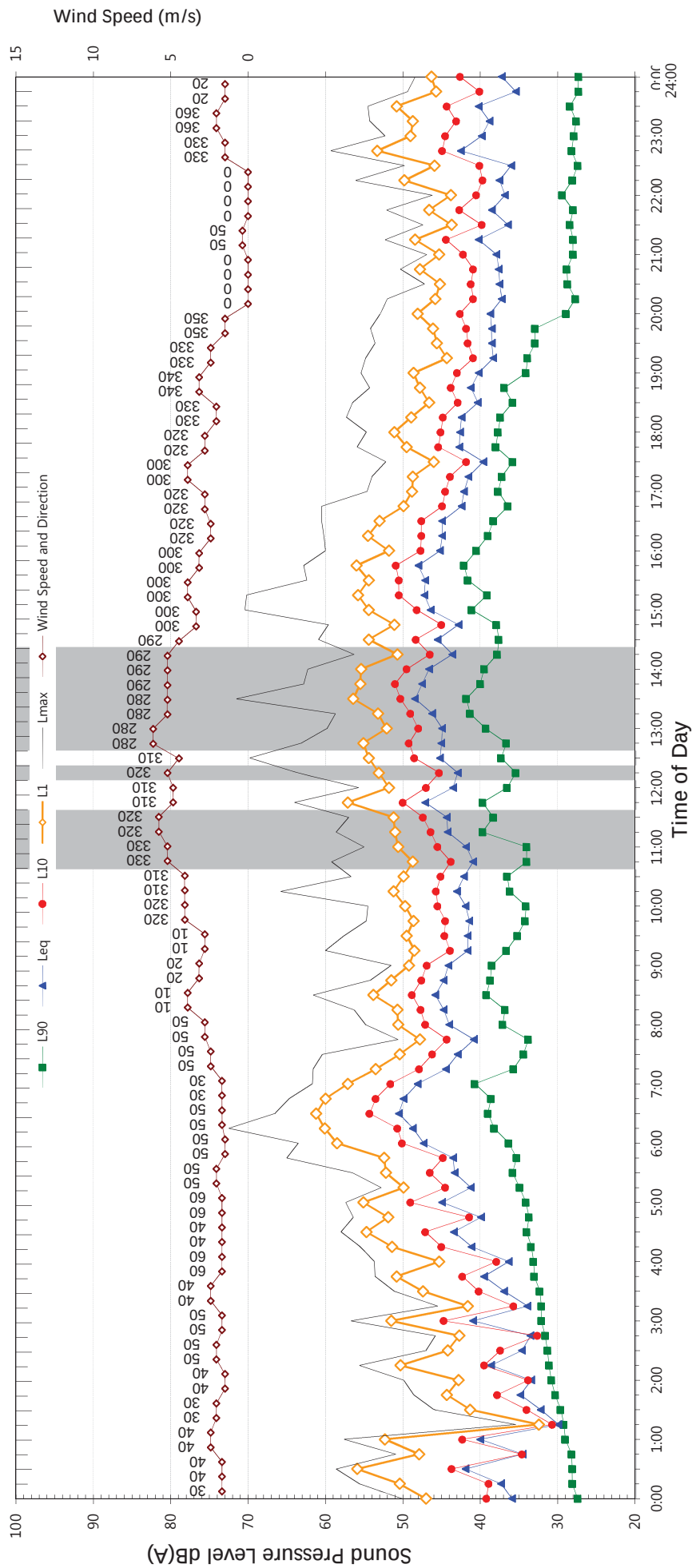
TG630-01L01 (rev 0) Bunyan Gravel Pit

Template QTE-05B (rev 109) Sydney Logger Graphs

Unattended Noise Monitoring Results

Bunyan Gravel Pit - South Western End

Friday, 31 October 2014



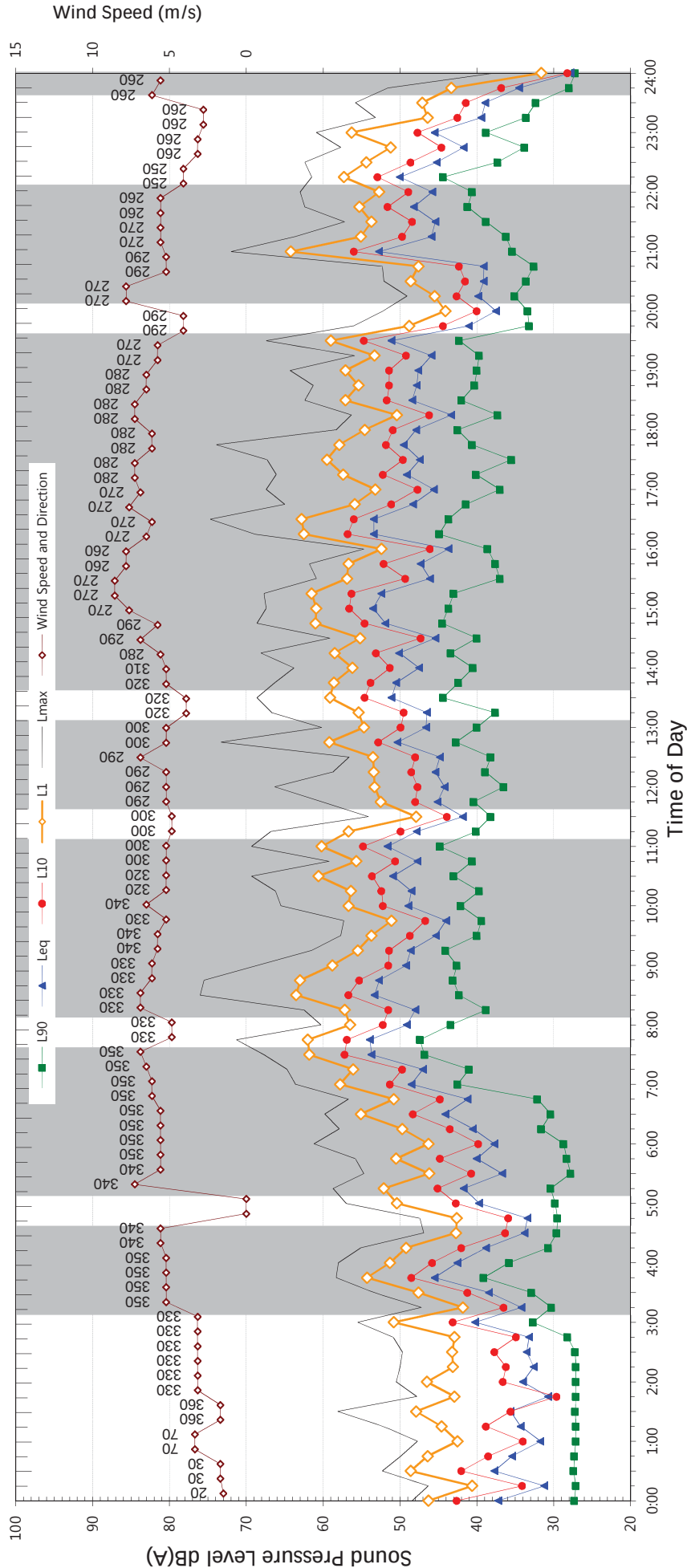
NSW Industrial Noise Policy (Free Field)				
Descriptor	Day		Night ²	
	7am-6pm	6pm-10pm	10pm-7am	
L ₉₀	-	28.0	-	
Leq	-	39.1	-	

- NOTES:
1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
 2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
 3. Graphed data measured in free-field; tabulated results facade corrected
 4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Bunyan Gravel Pit - South Western End

Saturday, 1 November 2014



NSW Industrial Noise Policy (Free Field)				
Descriptor	Day		Night ²	
	7am-6pm	6pm-10pm	10pm-7am	
L ₉₀	-	-	27.0	
Leq	-	-	39.3	

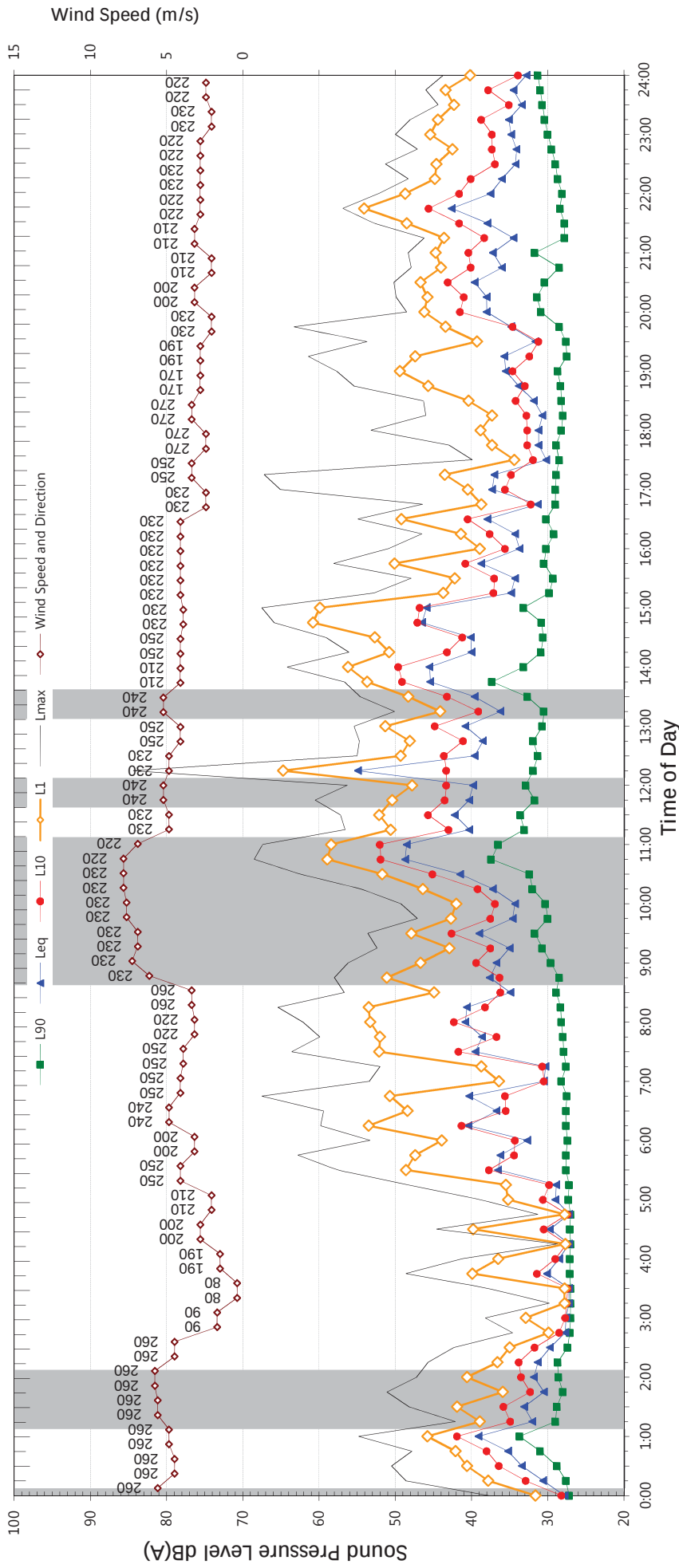
NOTES:

1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
3. Graphed data measured in free-field; tabulated results facade corrected
4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Bunyan Gravel Pit - South Western End

Sunday, 2 November 2014



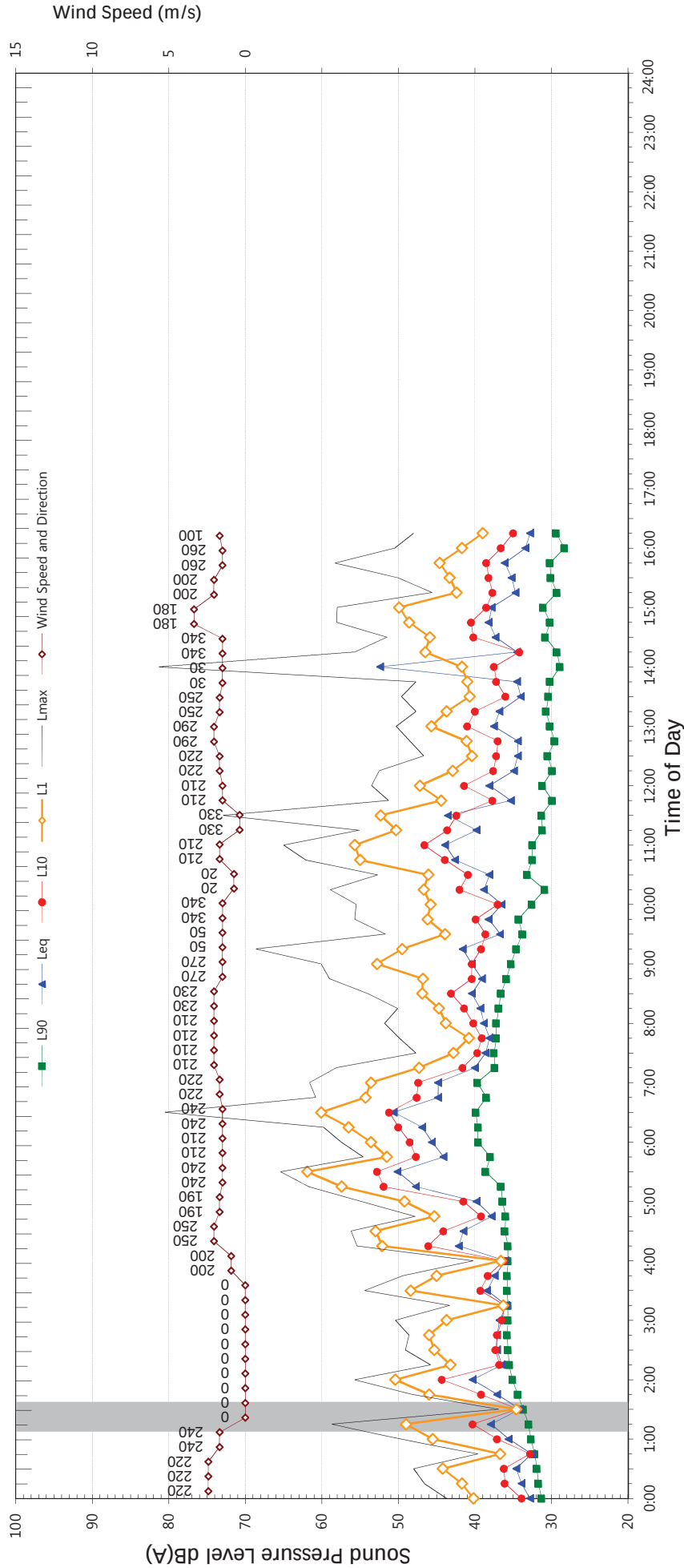
NSW Industrial Noise Policy (Free Field)				
Descriptor	Day		Night ²	
	7am-6pm	6pm-10pm	10pm-7am	
L ₉₀	-	27.6	30.0	
Leq	-	37.0	42.3	

- NOTES:
1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
 2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
 3. Graphed data measured in free-field; tabulated results facade corrected
 4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

Unattended Noise Monitoring Results

Bunyan Gravel Pit - South Western End

Monday, 3 November 2014



NSW Industrial Noise Policy (Free Field)				
Descriptor	Day		Night ²	
	7am-6pm	6pm-10pm	10pm-7am	
L ₉₀	29.3	-	-	
Leq	40.7	-	-	

- NOTES:
1. Shaded periods denote measurements adversely affected by rain, wind or extraneous noise - data in these periods are excluded from calculations.
 2. "Night" relates to period from 10pm on this graph to 7am on the following graph.
 3. Graphed data measured in free-field; tabulated results facade corrected
 4. Night time Lmax values are shown only where Lmax >65dB(A) and where Lmax- Leq ≥15dB(A)

APPENDIX G TRAFFIC REPORT

TRAFFIC & TRANSPORT STUDY



PROPOSED UPGRADING OF EXISTING GRAVEL QUARRY MONARO HIGHWAY BUNYAN

Cooma Monaro Shire Council

Prepared for ngh environmental

October 2014

By Rodger Ubrihien

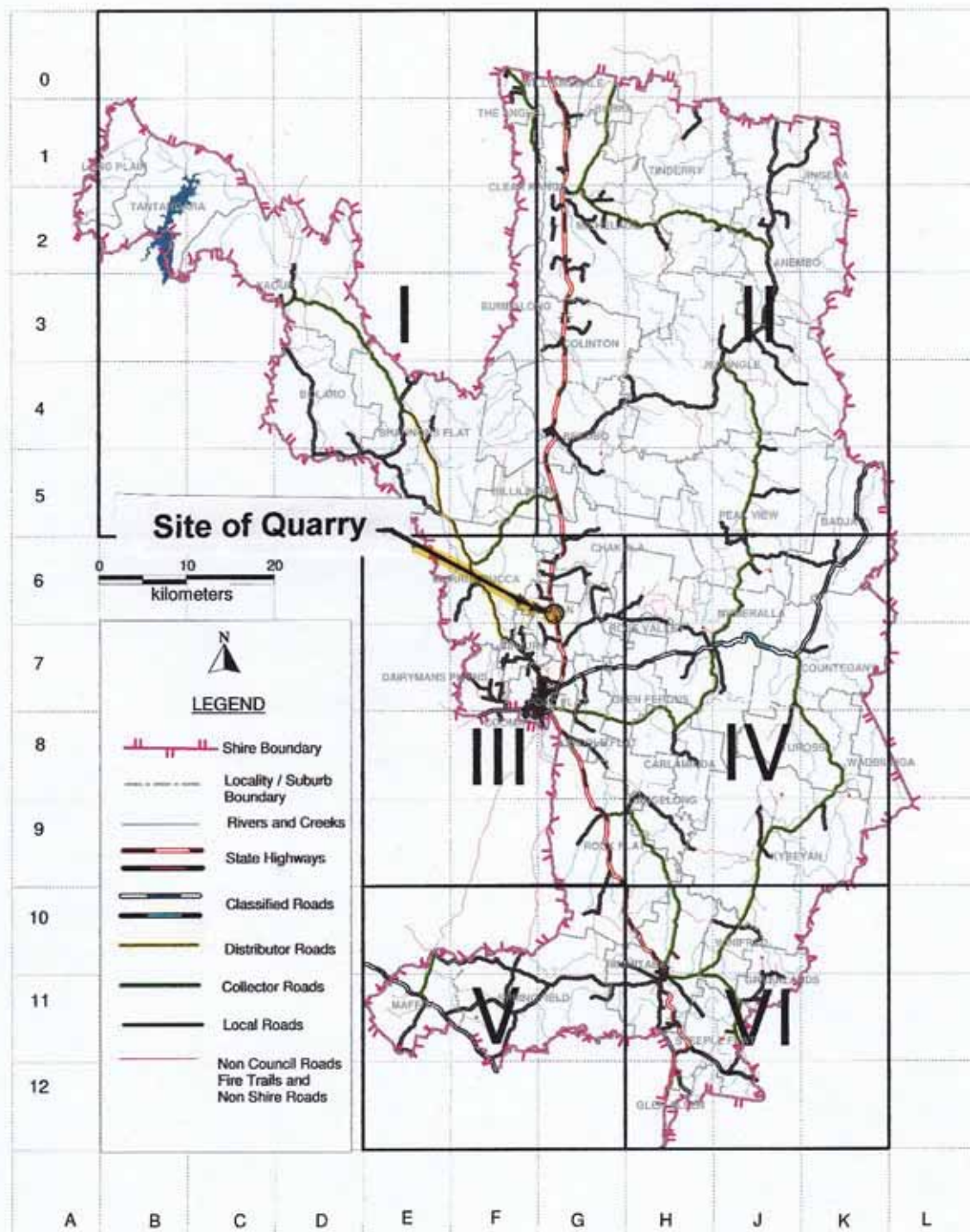
Bega Duo Designs

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Fig 1

COOMA-MONARO SHIRE COUNCIL RURAL ROADS LOCATION MAP



DISCLAIMER

The information contained in this map has been provided in good faith. Whilst all effort has been made to ensure accuracy and completeness of the information, the data providers take no responsibility for errors or omissions nor any loss or damage that may result from the use of this information.

Edition 1
February 2005

1 INTRODUCTION

The subject quarry site is on the western side of the Monaro Highway, approximately 12kms north of Cooma near Bunyan NSW. There are several quarries in the vicinity which have been operated in the past by Cooma Monaro Shire Council. The quarries provide natural gravel road base, primarily for the continuing maintenance of the Councils road network. The subject quarry is known within council as the Bunyan “Top Quarry”. The location map included as Fig. 1 shows the location of the quarry in relation to the road network.

Previous extraction rates from 2006 to 2013 are shown in Table 1 (Appendix 1). The available road base in the present quarry area is almost exhausted and the EIS currently being prepared is part of the planning process to extend the quarry into adjacent areas of crown land.



Plate 1 Looking towards the quarry entrance from the south



Plate 2 Looking towards the quarry entrance from the north

2 EXISTING TRAFFIC CONDITIONS

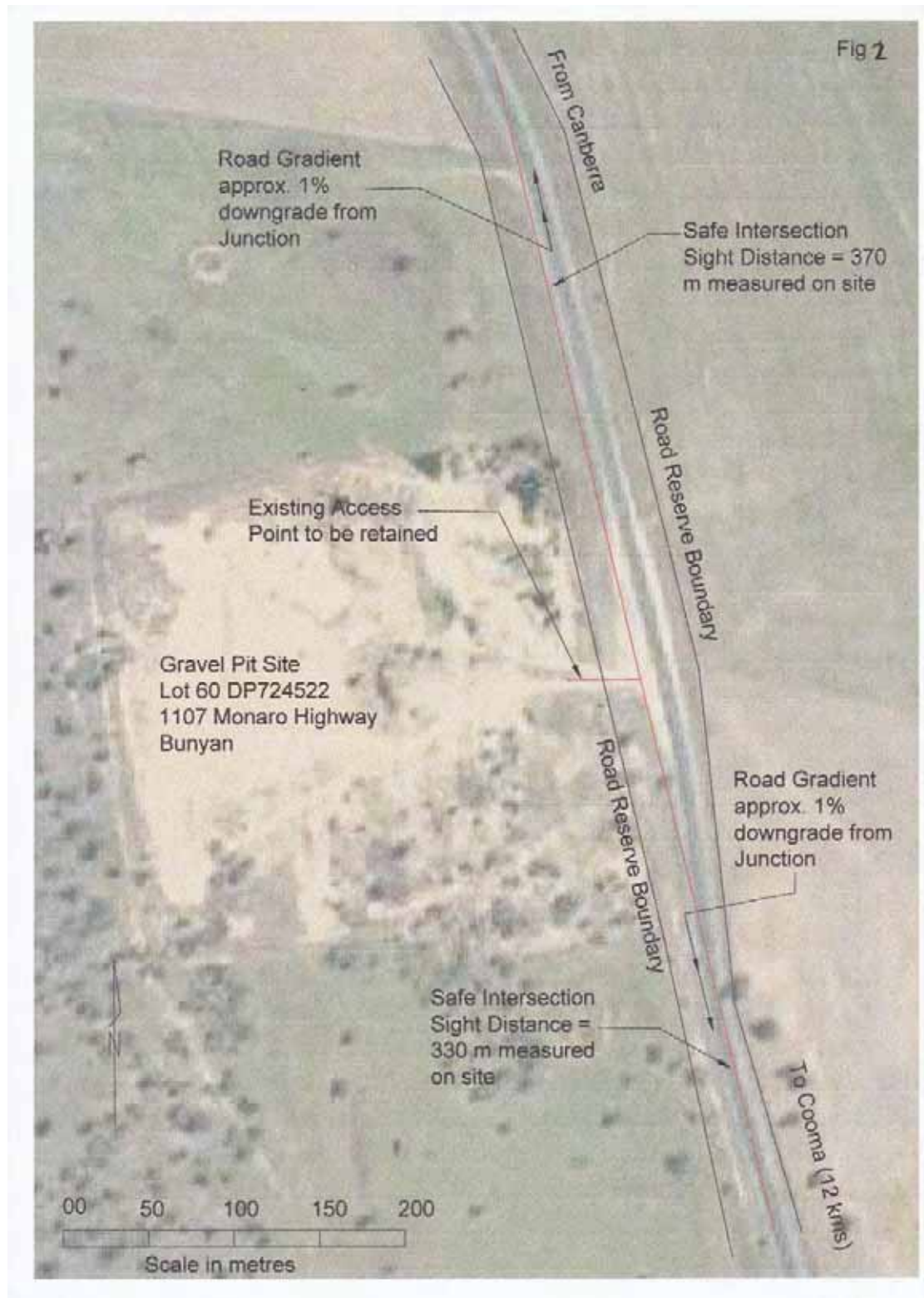
The entry to the quarry is near a crest on the Monaro Highway and is currently unsealed. It is proposed to retain the existing access location as it provides “safe intersection sight distance” in excess of “Austroads” design guidelines in both directions. The minimum requirement from the Austroads Guide to Road Design Part 4A Table 3.2 is 248 metres for travel speeds of 100 kilometres per hour. Sight distances measured on the site were 330m to the south and 370m to the north (see the diagram of the site Fig 2).

The Monaro Highway is a relatively high standard route linking the Southern Monaro Area and the snowfields to Canberra. In this location, it has 3.5m wide lanes, 1.0m wide sealed shoulders and edge lines. The route has a reputation for high speed accidents involving vehicles travelling to and from the snowfields. The section of highway adjacent to the quarry site has no overtaking opportunities because of the crest however the low gradients (approximately 1% in both directions) provide stopping sight distance well in excess of that required for 100km/h travel.

Traffic counts from Roads & Maritime Services (RMS) records indicate that the average annual daily traffic volume for Monaro Highway in 2013 was 4601 vehicles per day. The most recent hourly traffic counts made available by RMS indicate Monday to Friday peak hourly averages of

231 vehicles per hour southbound and 290 vehicles per hour northbound. These counts were recorded on the RMS permanent traffic counter at Bunyan for the working week commencing 8th September 2014.

Fig 2



The peak hourly week day traffic has been considered for design purposes as the quarry would not operate on weekends or on public holidays. (The hourly volumes on Friday and Sunday evenings can increase to over 1000 vehicles per hour). A diagram demonstrating the hourly peak volumes for northbound vehicles is included as Appendix 2.

The existing quarry traffic volumes are less than 5 vehicles per day averaged over a year (see the traffic movements provided by Cooma Monaro Shire Council in Appendix 1). The peak hourly volumes for the quarry are dependent on the number of haulage trucks engaged in the particular road projects and the length of the haul. The number of haul trucks is usually three and they would not normally return within the hour. The peak hourly flow would therefore be no more than six vehicles per hour. The existing wide gravel shoulders appear to be used by decelerating vehicles entering the quarry from the south (see Plate 2).



Plate 2 Gravel shoulder looking south from the quarry entrance

The accident records for the years from 2008 to 2013 made available by RMS indicate that there were two injury and two non injury accidents in the vicinity. All accidents were single vehicle “run off road” type accidents (two were during wet conditions). Excessive speed and fatigue were considered to be factors in these accidents.

3 TRAFFIC GENERATION AND IMPACTS

A detailed breakdown of the existing and proposed quarry operation is included as Appendix 1. The maximum annual extraction volume will be 13,000 cubic metres which is similar to previous years. Haulage will be by 18 cubic metre truck and dog trailers resulting in approximately 720 trips per annum or 4 trips per day maximum. Hours of operation are proposed to be 7am to 5pm Monday to Friday with no haulage on weekends or public holidays with the exception of natural disasters causing severe damage to roads. The quarry is to be operated by two council employees. Total traffic generation is estimated to be less than 6 vehicles per hour in the peak hour. This quarry traffic could be split between turns to the north or south. The location map (fig1) shows the distribution of Council roads in relation to the quarry.

The most significant traffic impacts will result from the conflict between the slow speed, heavy vehicles to and from the quarry and the high speed vehicles on Monaro Highway.

4 MINIMISING IMPACTS AT THE JUNCTION

Various measures are available to minimize the impacts by reconstruction of the junction and details are included in Austroads "Guide to Road Design Part 4A Unsignalised and Signalised Intersections.

There are several types of treatments which could be applicable to the proposed site. These treatments are normally referred to as BAL (Left turn treatments), BAR (shoulder widening for right turn), AUR (pavement widening with an unprotected right turn), CHR (pavement widening with a protected turn), AUL (auxiliary left turn). The AUL treatment has a short length alternate treatment (AUL(S)) which allows for some deceleration for the turning vehicles to occur in the through lane.

Selection of treatment using the "Austroads" guide is based mostly on the volume of right turning traffic compared to the volume of through traffic opposing the turn. The guide considers factors such as gap acceptance time and accident rates. The warrants included in the guide are demonstrated in graphical form (see Appendix 3).

Based on the projected design peak hourly traffic volumes of approximately 3 vehicles per hour for the right turn with 300 vehicles per hour in the opposing direction, the minimum junction treatment ("BAR/BAL") would be warranted (see Appendix 4).

Considering the potential for higher hourly volumes as discussed in section.2 of this report and the presence of wide gravel shoulder areas at the site, a higher standard of junction treatment could be considered. The provision of an "AUL(S)" turn lane for slow vehicles travelling from the south would

utilise the wide shoulder area and reduce the potential impacts related to the speed differential between through and turning vehicles. An extract from the Austroads “Guide to Road Design Part 4A showing the AUL(S) treatment is included as Appendix 5.

Considering that the junction is at a relatively isolated rural location on a high speed road, the provision of “truck turning” warning signs in advance of the quarry on Monaro Highway is desirable.

5 RECOMMENDED MITIGATION MEASURES

The following measures are recommended to address traffic impacts of the proposed quarry expansion:

- Widen and seal the eastern road shoulder at the junction in accordance with “BAR” (Basic right turn) treatment
- Provide a sealed auxiliary left turn treatment on the south western approach to the quarry in accordance with “AUL(S)” treatment.
- The entry to the quarry be sealed to the road reserve boundary
- Provide “Truck Turning” warning signs in accordance with Australian Standard AS1742.3.

Note:

Although Austroads guidelines are available, the choice of intersection treatment depends on accident potential, economy and current road administration policy. RMS has policies which may differ from the guidelines and their approval is required before any work within the road reserve on the Monaro Highway can commence. Discussions should be held with the RMS Network Safety Manager (based in the Southern Regional Office at Wollongong) prior to any works.

6 REFERENCES

Austroads 2010 ‘Guide to Road Design Part 4A Intersections at Grade’.

Roads and Traffic Authority 1999, *Road Design Guide*, Issue 1 May 1999.

Roads and Traffic Authority 2002, *Guide to Traffic Generating Developments*, October 2002.

Roads and Maritime Services, www.rta.nsw.gov.au

7 AUTHOR

Rodger John Ubrihien

Road Design Consultant,

Cert. Engineering Surveyor

Rodger has been involved in the survey, planning and design of road projects since commencing work with the Department of Main Roads NSW in 1966. Rodger gained knowledge in Traffic Engineering with the Roads and Traffic Authority Traffic Section in Sydney and Bega. Since opening his own business 'Bega Duo Designs' in 1993, Rodger has completed the planning of a wide variety of civil engineering and traffic engineering projects throughout NSW and ACT including Traffic Impact Studies for wind farms at Goulburn, Crookwell, Yass, Silverton, Nimmitabel & Glen Innes.

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Mobile 0417292170

8 APPENDICES

Appendix 1: Breakdown of quarry operation

TRAFFIC IMPACTS – BUNYAN GRAVEL PIT (TOP)

Likely impact movements and hours of operation

Operating hours 0700hr – 1700hr (odd Saturday)

- May need to work outside of standard hours in the event of an emergency such as significant rain event (natural disaster) causing severe damage to roads.

Number of staff on typical day

Maximum of up to 5 staff per day

- One loader operator
- One supervisor
- 3 Truck and Dog operators
- During winning of material would be supervisor and Dozer Operator (2 staff only)

Traffic movements

WINNING OF MATERIAL

Float to transport low loader/dozer on site x 3 visits/year x 3 days winning of material per visit (meaning x 2 movements per visit)

= 6 movements/year

Small vehicle (4WD) for operator to drive home each night and leave machine on site (x 2 movements/day x 3 days x 3 visits/year)

= 18 movements/year

Small vehicle (4WD) for supervisor to site visit (x 2 movements/day x 3 visits/year x 3 days/visit)

= 18 movements/year

Total 42 movements

HAULAGE

Total of x 722 Truck and Dog movements/year (3 Truck and Dog operators x 5 trips/day)

Total 1 000 movements

Estimated total movements per year for winning of material and haulage

= 1 444

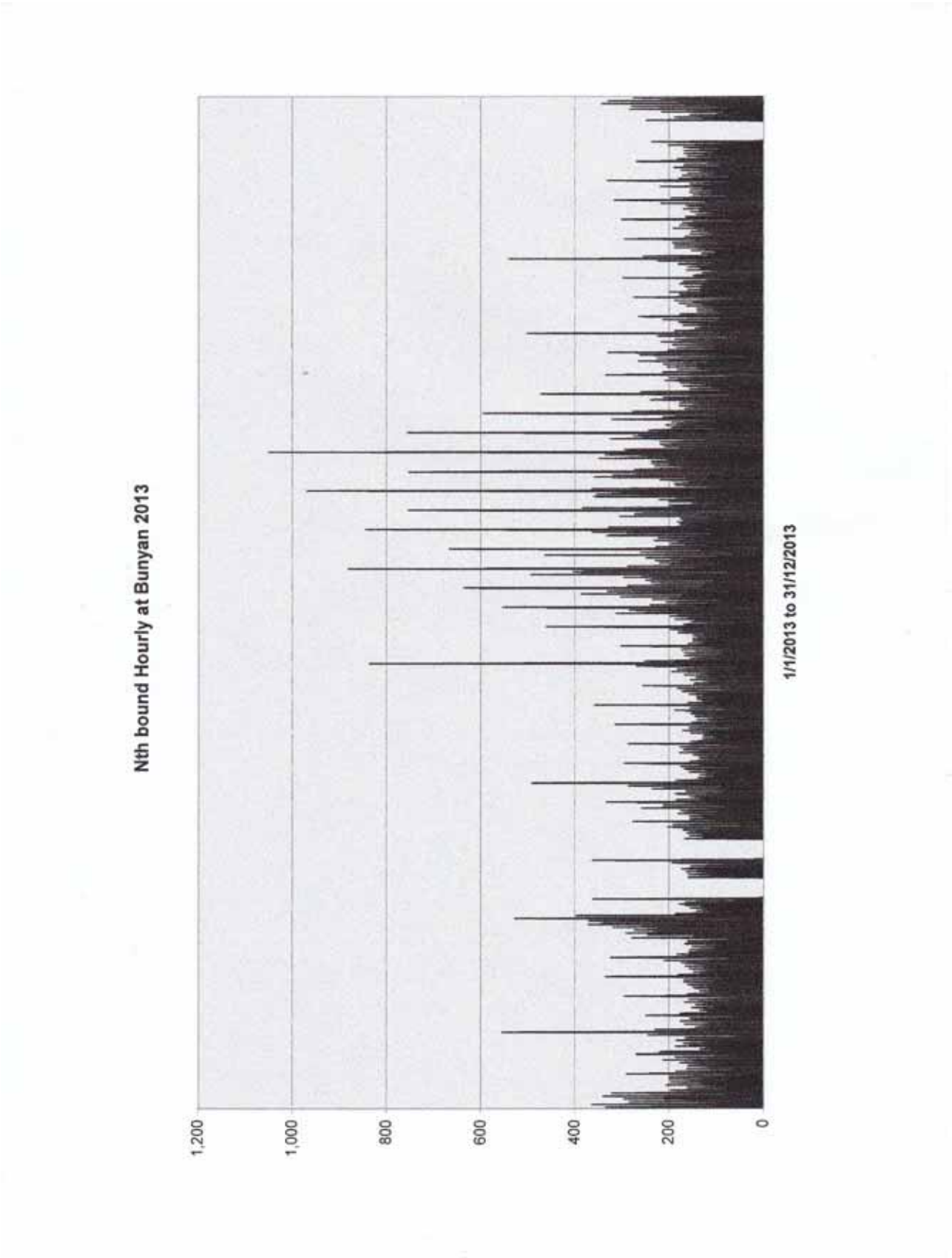
- Calculations have been done on a conversion of 1 tonne = 1.6cbm

- Note these calculations are based on Truck and Dog carrying 18cbm/haul and extraction of 13 000cbm/year (refer table below)

Table 1. Annual extraction of material by CMSC from Bunyan Gravel Pit from 2006 – 2013

Year	Annual extraction (cbm)
2006	2 372
2008	4 213
2009	320
2010	6 906
2011	8 323
2012	8 002
2013	12 858

Appendix 2: Northbound hourly traffic counts



Appendix 3: Austroads Fig 4.9 Warrants for turn treatments

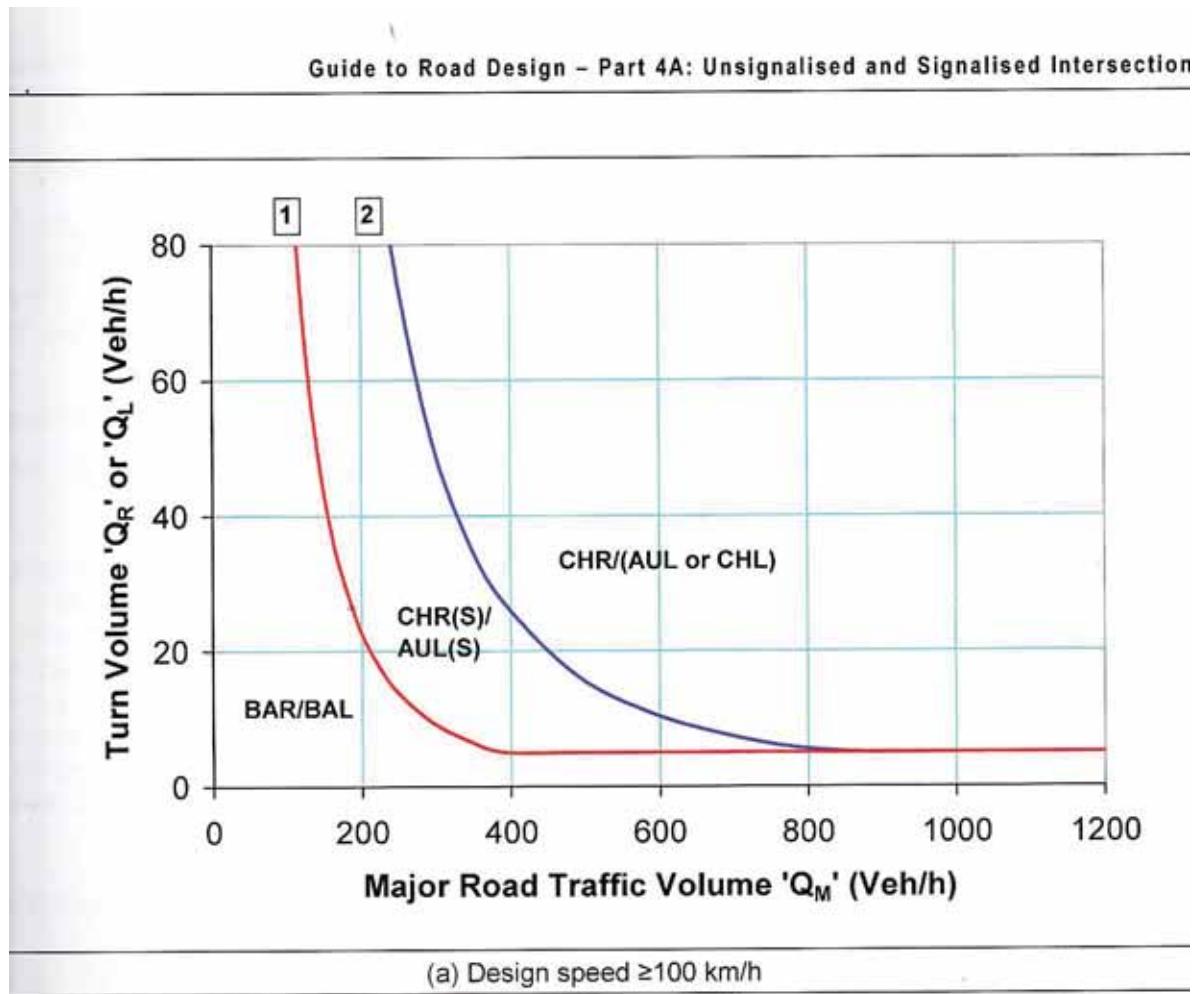
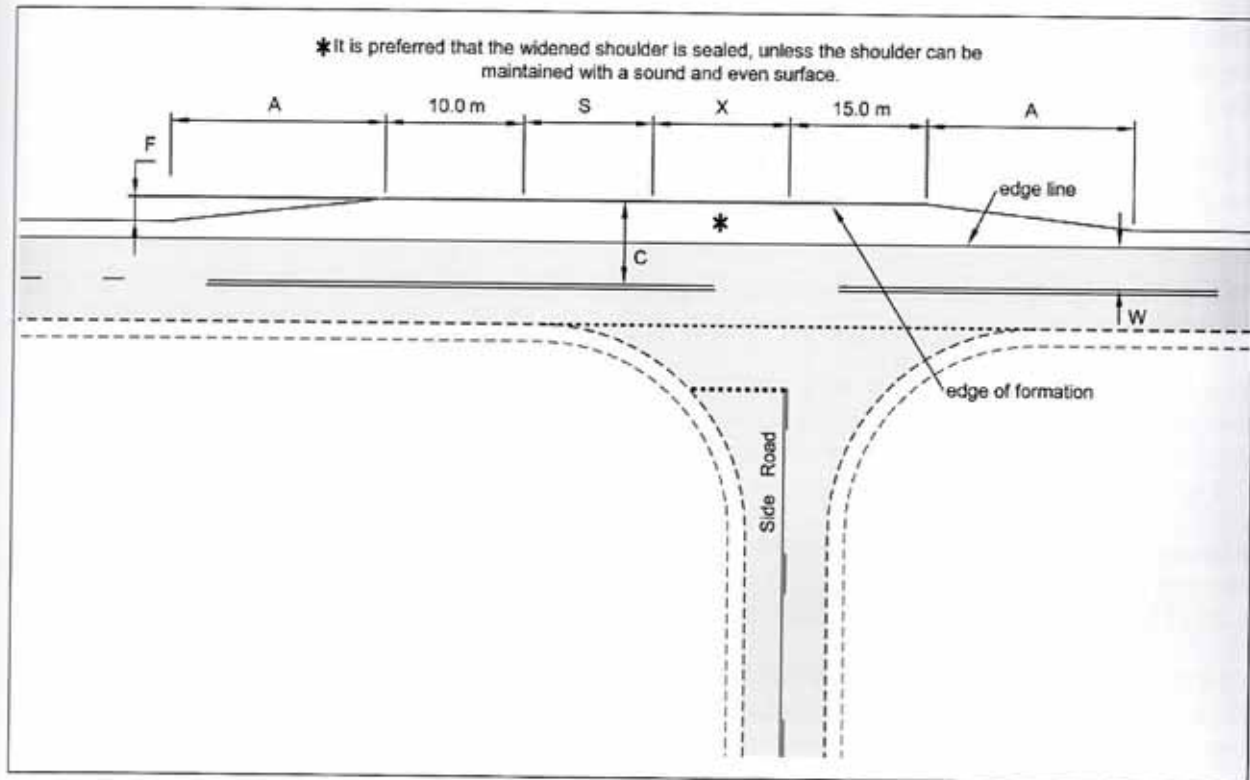


Figure 4.9: Warrants for turn treatments on the major road at unsignalised intersections

Appendix 4: Austroads Fig 7.5 Basic right turn treatment

Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections



Notes:

1. This treatment applies to the right turn from a major road to a minor road.

2. The dimensions of the treatment are defined thus:

W = Nominal through lane width (m) (including widening for curves). Width to be continuous through the intersection.

C = On straights – 6.5 m minimum

7.0 m minimum for Type 1 & Type 2 road trains

On curves – widths as above + curve widening (based on widening for the design turning vehicle plus widening for the design through vehicle).

$$A = \frac{0.5VF}{3.6}$$

Increase length A on tighter curves (e.g. those with a side friction demand greater than the maximum desirable). Where the design through vehicle is larger than or equal to a 19 m semi-trailer the minimum speed used to calculate A is 80 km/h.

V = Design speed of major road approach (km/h).

F = Formation/carrageway widening (m).

S = Storage length to cater for one design turning vehicle (m) (minimum length 12.5 m).

X = Distance based on design vehicle turning path, typically 10–15 m.

Source: QDMR (2006).

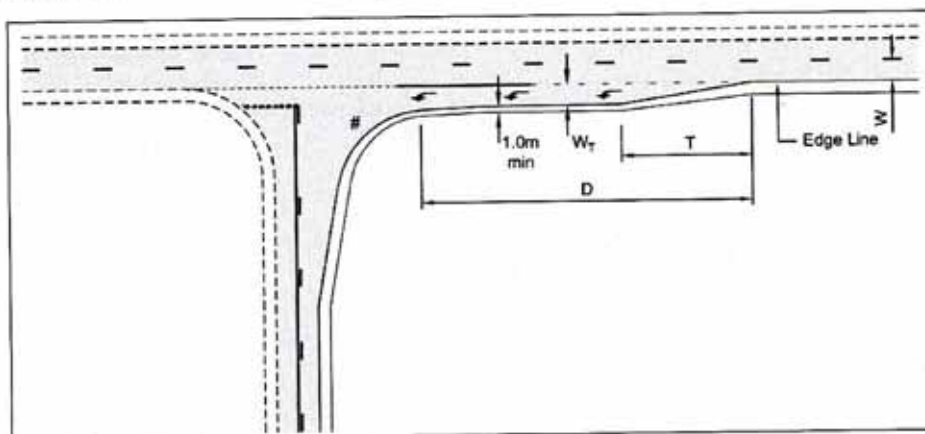
Figure 7.5: Basic right (BAR) turn treatment on a two-lane rural road

Appendix 5: Austroads Fig 8.3 Rural AUL(S) treatment

8.2.2 Rural Auxiliary Left-turn Treatment – Short Turn Lane [AUL(S)] on the Major Road

An AUL(S) turn treatment is shown in Figure 8.3. This treatment is suitable where there are low to moderate through and turning volumes (Section 4.8). For higher volume sites, a full-length AUL turn treatment is preferred. The required length of treatment is shown in Table 8.2.

The AUL(S) layout should not be used where there is reduced visibility to the turn treatment. Left-turning drivers on the major road need to perceive the location of the deceleration lane and the side road in time to make the necessary speed reduction in the through lane prior to diverging.



Notes:

1. # for setting out details of the left-turn geometry, use vehicle turning path templates and/or Table 8.2.
2. Approaches to left-turn slip lanes can create hazardous situations between cyclists and left-turning motor vehicles. Treatments to reduce the number of potential conflicts at left-turn slip lanes are given in this guide.
3. The dimensions of the treatment are defined as follows. Values of D and T are provided in Table 8.2.

- W = Nominal through lane width (m) (including widening for curves). For a new intersection on an existing road, the width is to be in accordance with the current link strategy.
- W_T = Nominal width of the turn lane (m), including widening for curves based on the design turning vehicle = 3.0 m minimum.
- T = Physical taper length (m) given by:

$$T = \frac{0.5VF}{3.6}$$

V = Design speed of major road approach (km/h).

Source: QDMR (2006).

Figure 8.3: Rural AUL(S) treatment with a short left-turn lane

APPENDIX H BACKGROUND SEARCHES

Search Results

1 result found.

Dromore Homestead Group Numarella Rd	Chakola, NSW, Australia	(Registered) Register of the National Estate (Non-statutory archive)
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0

Statutory listed items

Information and items listed in the State Heritage Inventory come from a number of sources. This means that there may be several entries for the same heritage item in the database. For clarity, the search results have been divided into two sections.

- **Section 1.** contains items listed by the **heritage council** under the NSW Heritage Act. This includes listing on the state heritage register, an interim heritage order or protected under section 136 of the NSW Heritage Act. This information is provided by the Heritage Branch.
- **Section 2.** contains items listed by **local councils & shires and state government agencies**. This section may also contain additional information on some of the items listed in the first section.

Section 1. Items listed under the NSW Heritage Act.

Your search returned 6 records.

Item name	Address	Suburb	LGA	SHR
Bredbo Rail Bridge Group	Goulburn-Bombala railway	Bredbo	Cooma-Monaro	01029
Cooma Railway Station and yard group	Bradley Street	Cooma	Cooma-Monaro	01116
Currango Homestead		Kosciuszko National Park	Cooma-Monaro	00983
Michelago rail bridge over Ingalara Creek	Goulburn-Bombala railway	Michelago	Cooma-Monaro	01048
Michelago Railway Station group	Goulburn-Bombala railway	Michelago	Cooma-Monaro	01192
Royal Hotel & Outbuildings	59 - 61 Lambie Street	Cooma	Cooma-Monaro	00616

ItemName

Section 2. Items listed by Local Government and State Agencies.

Your search returned 127 records.

Item name	Address	Suburb	LGA	Information source
Albertine Cottage		Numeralla	Cooma-Monaro	LGOV
All Saints Catholic Church		Numeralla	Cooma-Monaro	LGOV
All Saints Roman Catholic Church	Walker Street	Bredbo	Cooma-Monaro	LGOV
Antique Shop		Nimmitabel	Cooma-Monaro	LGOV
Avon Lake		Springfield	Cooma-Monaro	LGOV
Back Creek Battery		(not given)	Cooma-Monaro	LGOV

Complex				
Big Badja Alluvial Mining Area		(not given)	Cooma-Monaro	LGOV
Big Badja Gold Diggings		(not given)	Cooma-Monaro	LGOV
Billilingra		(not given)	Cooma-Monaro	LGOV
Blackridge		(not given)	Cooma-Monaro	LGOV
Bobundara Cemetery		Maffra	Cooma-Monaro	LGOV
Boland's Inn		Numeralla	Cooma-Monaro	LGOV
Bolero		Bolaro	Cooma-Monaro	LGOV
Bredbo Cemetery	Yaouk Street	Bredbo	Cooma-Monaro	LGOV
Bredbo Inn	Monaro Highway	Bredbo	Cooma-Monaro	LGOV
Bredbo River Rail Bridge		Bredbo	Cooma-Monaro	LGOV
Bredbo School	Cooma Street	Bredbo	Cooma-Monaro	LGOV
Bredbo Station		(not given)	Cooma-Monaro	LGOV
Bredbo, Bredbo River Underbridge	402.616km, Joppa Junction To Bombala Railway	Bredbo	Cooma-Monaro	SGOV
Buenawatha	Carlaminda Road	Numeralla	Cooma-Monaro	LGOV
Building Shell		(not given)	Cooma-Monaro	LGOV
Bulong	Mittagong Road	Cooma	Cooma-Monaro	LGOV
Bush Nursing Home		Nimmitabel	Cooma-Monaro	LGOV
Bushy Hill		(not given)	Cooma-Monaro	LGOV
Carlaminda	Carlaminda Road	Carlaminda	Cooma-Monaro	LGOV
Cemetery		Nimmitabel	Cooma-Monaro	LGOV
Chakola Post Office		Chakola	Cooma-Monaro	LGOV
Chakola Railway Precinct		Chakola	Cooma-Monaro	SGOV
Chakola, Umeralla Creek Underbridge	416.250km Goulburn To Bombala Railway	Chakola	Cooma-Monaro	SGOV
Cloyne		Bunyan	Cooma-Monaro	LGOV
Community Hall	Cosgrove Street		Cooma-Monaro	LGOV
Cooma Ambulance Station	72-74 Bombala Street	Cooma	Cooma-Monaro	SGOV

Cooma Courthouse	Vale Street	Cooma	Cooma-Monaro	SGOV
Cooma District Hospital	Bent,bombala,victoria Streets	Cooma	Cooma-Monaro	SGOV
Cooma Police Office	91 Massie Street	Cooma	Cooma-Monaro	SGOV
Cooma Police Official Residence 4	13 Vale Street	Cooma	Cooma-Monaro	SGOV
Cooma Police Residence 1	11 Vale Street	Cooma	Cooma-Monaro	SGOV
Cooma Police Station	91 Massie Street	Cooma	Cooma-Monaro	SGOV
Cooma Railway Precinct	Bradley Street	Cooma	Cooma-Monaro	SGOV
Cowra Creek Mine Sites: Town Area		Cowarra	Cooma-Monaro	LGOV
Curry Flat		Nimmitabel	Cooma-Monaro	LGOV
Dangelong		Dangelong	Cooma-Monaro	LGOV
Driscoll's Inn		(not given)	Cooma-Monaro	LGOV
Dromore Station		(not given)	Cooma-Monaro	LGOV
Fiery Creek		(not given)	Cooma-Monaro	LGOV
Geldmacher House		Nimmitabel	Cooma-Monaro	LGOV
Geldmacher Mill		Nimmitabel	Cooma-Monaro	LGOV
Glanroe		(not given)	Cooma-Monaro	LGOV
Glenfergus		(not given)	Cooma-Monaro	LGOV
Gold Dale		(not given)	Cooma-Monaro	LGOV
Hatsell	Mittagong Road	Binjura	Cooma-Monaro	LGOV
Hayfield		Nimmitabel	Cooma-Monaro	LGOV
Ingalara Railway Bridge		(not given)	Cooma-Monaro	LGOV
Jerangle Cemetery		Jerangle	Cooma-Monaro	LGOV
Kaludah		Rock Flat	Cooma-Monaro	LGOV
Kelly's Cottage		Ingelara	Cooma-Monaro	LGOV
L 12 - Powder Van	Cooma-monaro Railway	Cooma	Cooma-Monaro	SGOV
Little Plain Hotel (former)		Jerangle	Cooma-Monaro	LGOV
Maffra		Maffra	Cooma-Monaro	LGOV

Maggies Hut		(not given)	Cooma-Monaro	LGOV
Manaroo		Rock Flat	Cooma-Monaro	LGOV
Michelago Cemetery		Michelago	Cooma-Monaro	LGOV
Michelago Ingalara Creek Underbridge	383.349km Goulburn To Bombala Railway	Michelago	Cooma-Monaro	SGOV
Michelago Railway Precinct		Michelago	Cooma-Monaro	SGOV
Michelago Station		Michelago	Cooma-Monaro	LGOV
Milton Park		Rock Flat	Cooma-Monaro	LGOV
Nimmitabel General Store	Bombala Street	Nimmitabel	Cooma-Monaro	LGOV
Nimmitabel Police Station and Official Residence	Clark Street, Corner Bombala Street	Nimmitabel	Cooma-Monaro	SGOV
Nimmitabel Railway Precinct		Nimmitabel	Cooma-Monaro	SGOV
Nimmitabel Railway Stockyard		Nimmitabel	Cooma-Monaro	SGOV
Numeralla Cemetery		Numeralla	Cooma-Monaro	LGOV
Numeralla Digger's Hall		Numeralla	Cooma-Monaro	LGOV
Old Bredbo		(not given)	Cooma-Monaro	LGOV
Old Farm Complex		Bunyan	Cooma-Monaro	LGOV
Old Mill and ruin		Dairymans Plains	Cooma-Monaro	LGOV
Old Springfield		Springfield	Cooma-Monaro	LGOV
Pavina		Michelago	Cooma-Monaro	LGOV
Peakview Memorial Hall		Peak View	Cooma-Monaro	LGOV
Pine Cottage	Kirke Street	Nimmitabel	Cooma-Monaro	LGOV
Pioneer Cemetery		(not given)	Cooma-Monaro	LGOV
Pioneers Hall	Bombala Street	Nimmitabel	Cooma-Monaro	LGOV
Police Station and Lockup	Bombala Street	Nimmitabel	Cooma-Monaro	LGOV
Post Office	Bombala Street	Nimmitabel	Cooma-Monaro	LGOV
Powder Van - Pv 22318	Cooma-monaro Railway	Cooma	Cooma-Monaro	SGOV
Primary School	Commissioner Street	Cooma	Cooma-Monaro	GAZ

Public School		Numeralla	Cooma-Monaro	LGOV
Public School		Jerangle	Cooma-Monaro	LGOV
Public School	Wolfe Street	Nimmitabel	Cooma-Monaro	LGOV
Railway Tunnel - Scotsdale		(not given)	Cooma-Monaro	LGOV
Residence (former Antique Shop)	Bombala Street	Nimmitabel	Cooma-Monaro	LGOV
Riversdale		(not given)	Cooma-Monaro	LGOV
Rock Flat		Rock Flat	Cooma-Monaro	LGOV
Rock Flat Mineral Mines		(not given)	Cooma-Monaro	LGOV
Rose Brook		Rose Valley	Cooma-Monaro	LGOV
Rose Valley		Rose Valley	Cooma-Monaro	LGOV
Royal Arms Hotel	Bombala Street	Nimmitabel	Cooma-Monaro	LGOV
Scrub Dell		(not given)	Cooma-Monaro	LGOV
Sheep fold		Middle Flat	Cooma-Monaro	LGOV
Shellgrove		(not given)	Cooma-Monaro	LGOV
Showground - Grandstand		Cooma	Cooma-Monaro	GAZ
Spring Downs		Chakola	Cooma-Monaro	LGOV
Squatter's Arms		Bunyan	Cooma-Monaro	LGOV
St Andrew's Anglican Church		Jerangle	Cooma-Monaro	LGOV
St Andrew's Roman Catholic Church	Kirke Street	Nimmitabel	Cooma-Monaro	LGOV
St Bartholomew's Anglican Church	Dulcie Street	Bredbo	Cooma-Monaro	LGOV
St. John's Anglican Church	Maclean Street	Numeralla	Cooma-Monaro	LGOV
St. Joseph's School and Convent	Kirke Street	Nimmitabel	Cooma-Monaro	LGOV
St. Mark's Chapel		Glen Fergus	Cooma-Monaro	LGOV
St. Peter's Anglican Church	Kirke Street	Nimmitabel	Cooma-Monaro	LGOV
Stockyard Creek Cemetery		Numeralla	Cooma-Monaro	LGOV
The Mansion		Nimmitabel	Cooma-Monaro	LGOV

The Point		Numeralla	Cooma-Monaro	LGOV
The Willows	Carliminda Road	Cooma	Cooma-Monaro	LGOV
Town Well	Bombala Street	Nimmitabel	Cooma-Monaro	LGOV
Tudor Inn	Bombala Street	Nimmitabel	Cooma-Monaro	LGOV
Tumbledown		(not given)	Cooma-Monaro	LGOV
Tynedale		Rock Flat	Cooma-Monaro	LGOV
Wangrah		(not given)	Cooma-Monaro	LGOV
War Memorial	Monaro Highway	Nimmitabel	Cooma-Monaro	LGOV
Wildwood		Michelago	Cooma-Monaro	LGOV
Willow Farm		(not given)	Cooma-Monaro	LGOV
Wondallee		(not given)	Cooma-Monaro	LGOV
Woodbine		Nimmitabel	Cooma-Monaro	LGOV
Wrens Nest Cottage	Church Road	Cooma	Cooma-Monaro	GAZ
Yandra		Springfield	Cooma-Monaro	LGOV
Yaouk Bridle Trail		(not given)	Cooma-Monaro	LGOV
Yarrawa		(not given)	Cooma-Monaro	LGOV

There was a total of 133 records matching your search criteria.

Key:

LGA = Local Government Area

GAZ= NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study, LGOV = Local Government, SGOV = State Government Agency.

Note: The Heritage Branch seeks to keep the State Heritage Inventory (SHI) up to date, however the latest listings in Local and Regional Environmental Plans (LEPs and REPs) may not yet be included. Always check with the relevant local council or shire for the most recent listings.

Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to Copyright the State of NSW through the Office of Environment and Heritage.

Search criteria : Public Report of all Valid Records of Threatened (listed on TSC Act 1995) or Commonwealth listed Communities in selected area [North: -36.09 West: 149.07999999999998 East: Report generated on 13/06/2014 1:14 PM

Kingdom	Scientific Name	Common Name	NSW status	Comm. status	Records
Community	<i>Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions</i>	Montane Peatlands and Swamps of the New England Tableland, NSW North Coast, Sydney Basin, South East Corner, South Eastern Highlands and Australian Alps bioregions	E3	E	K
Community	<i>Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory</i>	Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory		E	K
Community	<i>Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions</i>	Tableland Basalt Forest in the Sydney Basin and South Eastern Highlands Bioregions	E3		K
Community	<i>Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions</i>	Tablelands Snow Gum, Black Sallee, Candlebark and Ribbon Gum Grassy Woodland in the South Eastern Highlands, Sydney Basin, South East Corner and NSW South Western Slopes Bioregions	E3		K
Community	<i>White Box Yellow Box Blakely's Red Gum Woodland</i>	White Box Yellow Box Blakely's Red Gum Woodland	E3	CE	K

Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions.

Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°; ^^ rounded to 0.01°).

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Search criteria : Public Report of all Valid Records of Threatened (listed on TSC Act 1995) or Commonwealth listed Entities in selected area [North: -36.09 West: 149.07999999999998 East: 149.17999999999998 South: -36.19] returned a total of 16 records of 11 species.

Report generated on 13/06/2014 1:13 PM

Kingdom	Class	Family	Species Code	Scientific Name	Common Name	NSW status	Comm. status	Records
Animalia	Amphibia	Hylidae	3172	<i>Litoria castanea</i>	Yellow-spotted Tree frog	E4A,P	E	1
Animalia	Reptilia	Varanidae	2287	<i>Varanus rosenbergi</i>	Rosenberg's Goanna	V,P		1
Animalia	Aves	Accipitridae	0218	<i>Circus assimilis</i>	Spotted Harrier	V,P		1
Animalia	Aves	Accipitridae	0225	<i>Hieraaetus morphnoides</i>	Little Eagle	V,P		2
Animalia	Aves	Acanthizidae	0504	<i>Chthonicola sagittata</i>	Speckled Warbler	V,P		1
Animalia	Aves	Meliphagidae	0448	<i>Epthianura albifrons</i>	White-fronted Chat	V,P		1
Animalia	Aves	Petroicidae	8367	<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V,P		2
Animalia	Aves	Petroicidae	0380	<i>Petroica boodang</i>	Scarlet Robin	V,P		3
Animalia	Aves	Petroicidae	0382	<i>Petroica phoenicea</i>	Flame Robin	V,P		1
Animalia	Mammalia	Petauridae	1137	<i>Petaurus norfolcensis</i>	Squirrel Glider	V,P		1
Plantae	Flora	Sapindaceae	5905	<i>Dodonaea procumbens</i>	Creeping Hop-bush	V,P	V	2

Noxious weed declarations

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Noxious weed declarations for Cooma-Monaro Shire Council

Note: this control area includes the local council areas of - **Cooma-Monaro**

Weed	Class	Legal requirements
African boxthorn [<i>Lycium ferocissimum</i>] A Weed of National Significance	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
African feathergrass [<i>Pennisetum macrourum</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
African lovegrass [<i>Eragrostis curvula</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
African turnip weed [<i>Sisymbrium runcinatum</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
African turnip weed [<i>Sisymbrium thellungii</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Alligator weed [<i>Alternanthera philoxeroides</i>] A Weed of National Significance	2	The plant must be eradicated from the land and that land must be kept free of the plant
Anchored water hyacinth [<i>Eichhornia azurea</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Annual ragweed [<i>Ambrosia artemisiifolia</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Arrowhead [<i>Sagittaria calycina</i> variety <i>calycina</i> (syn. <i>Sagittaria montevidensis</i> subspecies <i>calycina</i>)]	4	The plant must not be sold, propagated or knowingly distributed
Artichoke thistle [<i>Cynara cardunculus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Asparagus [<i>Asparagus species</i>] Ex <i>A.aethiopicus</i> <i>A.africanus</i> <i>A.asparagoides</i> <i>A.declinatus</i> <i>A.falcatus</i> <i>A.macowanii</i> var. <i>zuluensis</i> <i>A.officinalis</i> <i>A.plumosus</i> <i>A.racemosus</i> <i>A.virgatus</i>	4	The plant must not be sold, propagated or knowingly distributed
Athel tree / Athel pine [<i>Tamarix aphylla</i>] A Weed of National Significance	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Bathurst/Noogoora/Hunter/South American/Californian/cockle burrs [<i>Xanthium species</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Bear-skin fescue [<i>Festuca gautieri</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with

		This is an All of NSW declaration
Black knapweed [<i>Centaurea xmoncktonii</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Black willow [<i>Salix nigra</i>] A Weed of National Significance	2	The plant must be eradicated from the land and that land must be kept free of the plant
Blackberry [<i>Rubus fruticosus aggregate species</i>] except cultivars Black satin Chehalem Chester Thornless Dirksen Thornless Loch Ness Murrindindi Silvan Smooth stem Thornfree	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed This is an All of NSW declaration
Boneseed [<i>Chrysanthemoides monilifera subsp. monilifera</i>] A Weed of National Significance	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Bridal creeper [<i>Asparagus asparagoides</i> (syn. <i>Myrsiphyllum asparagoides</i> , <i>Asparagus medeoloides</i>)]	4	The plant must not be sold, propagated or knowingly distributed
Bridal veil creeper [<i>Asparagus declinatus</i> (syn. <i>Asparagus crispus</i> , <i>Myrsiphyllum declinatum</i>)] A Weed of National Significance	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Broomrapes [<i>Orobancha species except the native O. cernua variety australiana and O. minor</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Burr ragweed [<i>Ambrosia confertiflora</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Cabomba [<i>All Cabomba species except C. furcata</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Cayenne snakeweed [<i>Stachytarpheta cayennensis</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Chilean needle grass [<i>Nassella neesiana</i>] A Weed of National Significance	3	The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed
Chinese violet [<i>Asystasia gangetica subsp. micrantha</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Climbing asparagus fern [<i>Asparagus plumosus</i> (syn. <i>Protasparagus plumosus</i>)] A Weed of National Significance	4	The plant must not be sold, propagated or knowingly distributed
Clockweed [<i>Gaura parviflora</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Corn sowthistle [<i>Sonchus arvensis</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Dodder [<i>All Cuscuta species except the native species C. australis, C. tasmanica and C. victoriana</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration

Includes All *Cuscuta* species except the native species *C. australis*, *C. tasmanica* and *C. victoriana*

Espartillo [<i>Amelichloa brachychaeta</i> , <i>Amelichloa caudata</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Eurasian water milfoil [<i>Myriophyllum spicatum</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Fine-bristled burr grass [<i>Cenchrus brownii</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Fireweed [<i>Senecio madagascariensis</i>] A Weed of National Significance	3	The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed
Flax-leaf broom [<i>Genista linifolia</i>] A Weed of National Significance	4	The plant must not be sold, propagated or knowingly distributed
Fountain grass [<i>Pennisetum setaceum</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Frogbit / Spongeplant [<i>Limnobium laevigatum</i> and <i>L. spongia</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Gallon's curse [<i>Cenchrus biflorus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Gamba grass [<i>Andropogon gayanus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Giant reed / Elephant grass [<i>Arundo donax</i>]	4	The plant must not be sold, propagated or knowingly distributed
Glaucous star thistle [<i>Carthamus glaucus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Golden dodder [<i>Cuscuta campestris</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Golden thistle [<i>Scolymus hispanicus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Gorse [<i>Ulex europaeus</i>] A Weed of National Significance	3	The plant must be fully and continuously suppressed and destroyed
Green cestrum [<i>Cestrum parqui</i>]	3	The plant must be fully and continuously suppressed and destroyed
Grey sallow [<i>Salix cinerea</i>] A Weed of National Significance	2	The plant must be eradicated from the land and that land must be kept free of the plant
Ground asparagus [<i>Asparagus aethiopicus</i> (syn. <i>Protasparagus aethiopicus</i>)]	4	The plant must not be sold, propagated or knowingly distributed
Groundsel bush [<i>Baccharis halimifolia</i>]	2	The plant must be eradicated from the land and that land must be kept free of the plant

Harrisia cactus [<i>Harrisia species</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Hawkweed [<i>Hieracium species</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Heteranthera / Kidneyleaf mud plantain [<i>Heteranthera reniformis</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Horehound [<i>Marrubium vulgare</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Horsetail [<i>Equisetum species</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Hydrocotyl / Water pennywort [<i>Hydrocotyl ranunculoides</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Hymenachne [<i>Hymenachne amplexicaulis and hybrids</i>] A Weed of National Significance	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Karoo thorn [<i>Acacia karroo</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Kochia [<i>Bassia scoparia</i> (syn. <i>Kochia scoparia</i>) except <i>B. scoparia</i> subspecies <i>trichophylla</i>] except <i>Bassia scoparia</i> subspecies <i>trichophylla</i>	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Koster's curse / Clidemia [<i>Clidemia hirta</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Lagarosiphon [<i>Lagarosiphon major</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Leafy elodea / Dense waterweed / Egeria [<i>Egeria densa</i> (syn. <i>Elodea densa</i>)]	4	The plant must not be sold, propagated or knowingly distributed This is an All of NSW declaration
Lippia [<i>Phyla canescens</i>]	4	The plant must not be sold, propagated or knowingly distributed except incidentally in hay or lucerne This is an All of NSW declaration
Long-leaf willow primrose [<i>Ludwigia longifolia</i>]	3	The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed
Mexican feather grass [<i>Nassella tenuissima</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Mexican poppy [<i>Argemone mexicana</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Miconia [<i>Miconia species</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration

Mikania vine [<i>Mikania micrantha</i>] A Weed of National Significance	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Mimosa [<i>Mimosa pigra</i>] A Weed of National Significance	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Montpellier broom / Cape broom [<i>Genista monspessulana</i>] A Weed of National Significance	3	The plant must be fully and continuously suppressed and destroyed and the plant must not be sold, propagated or knowingly distributed
Mossman River grass [<i>Cenchrus echinatus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Nodding thistle [<i>Carduus nutans subpecies nutans</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Pampas grass [<i>Cortaderia species</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Parthenium weed [<i>Parthenium hysterophorus</i>] A Weed of National Significance	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Paterson's curse, Vipers bugloss, Italian bugloss [<i>Echium plantagineum</i> , <i>E. vulgare</i> and <i>E. italicum</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Perennial thistle / Canada thistle [<i>Cirsium arvense</i>]	3	The plant must be fully and continuously suppressed and destroyed
Pond apple [<i>Annona glabra</i>] A Weed of National Significance	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Prickly acacia [<i>Vachellia nilotica</i> (syn. <i>Acacia nilotica</i>)] A Weed of National Significance	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Prickly pear [<i>Opuntia species except O. ficus-indica</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Prickly pear [<i>Cylindropuntia species</i>] A Weed of National Significance	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed This is an All of NSW declaration
Red rice [<i>Oryza rufipogon</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Rhus tree [<i>Toxicodendron succedaneum</i> (syn. <i>Toxicodendron succedanea</i> , <i>Rhus succedanea</i>)]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed This is an All of NSW declaration
Rubber vine [<i>Cryptostegia grandiflora</i>] A Weed of National Significance	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Sagittaria [<i>Sagittaria platyphylla</i> (syn. <i>Sagittaria graminea</i> variety <i>platyphylla</i>)]	4	The plant must not be sold, propagated or knowingly distributed

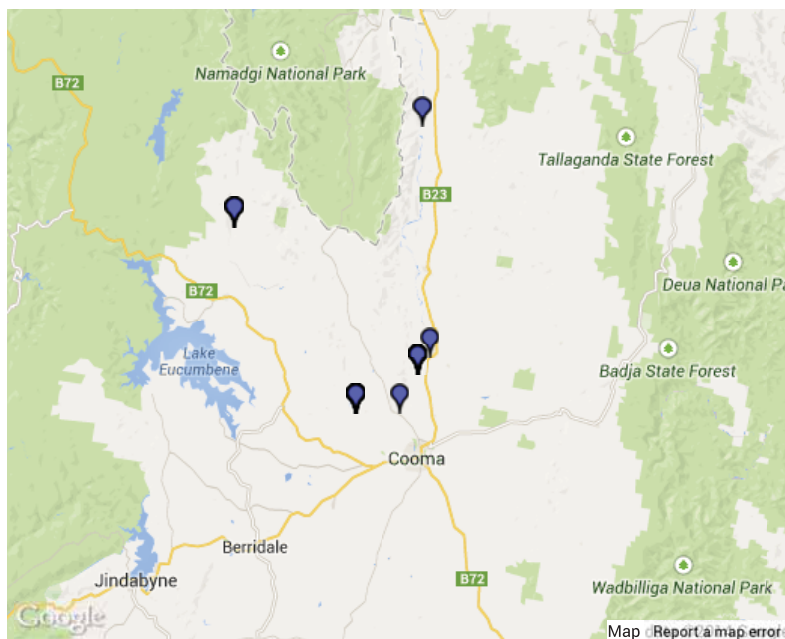
A Weed of National Significance		
Salvinia [<i>Salvinia molesta</i>] A Weed of National Significance	2	The plant must be eradicated from the land and that land must be kept free of the plant
Scotch broom / English broom [<i>Cytisus scoparius subspecies scoparius</i>] A Weed of National Significance	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Scotch, Stemless, Illyrian and Taurian thistles [<i>Onopordum species</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Senegal tea plant [<i>Gymnocoronis spilanthoides</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Serrated tussock [<i>Nassella trichotoma</i>] A Weed of National Significance	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Siam weed [<i>Chromolaena odorata</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Silver-leaf nightshade [<i>Solanum elaeagnifolium</i>] A Weed of National Significance	4	The plant must not be sold, propagated or knowingly distributed
Smooth-stemmed turnip [<i>Brassica barrelieri subspecies oxyrrhina</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Soldier thistle [<i>Picnomon acarna</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Spiny burrgrass [<i>Cenchrus longispinus</i> ; <i>C. spinifex</i> (syn. <i>Cenchrus incertus</i>)]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Spotted knapweed [<i>Centaurea stoebe subspecies micranthos</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
St. John's wort [<i>Hypericum perforatum</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread and the plant must not be sold, propagated or knowingly distributed
Sweet briar [<i>Rosa rubiginosa</i>]	4	The growth of the plant must be managed in a manner that continuously inhibits the ability of the plant to spread
Texas blueweed [<i>Helianthus ciliaris</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration
Tropical soda apple [<i>Solanum viarum</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Water caltrop [<i>Trapa species</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Water hyacinth [<i>Eichhornia crassipes</i>] A Weed of National Significance	2	The plant must be eradicated from the land and that land must be kept free of the plant

Water lettuce [<i>Pistia stratiotes</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Water soldier [<i>Stratiotes aloides</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Willows [<i>Salix species except S. babylonica, S. xreichardtii, S. xcalodendron, S. cinerea and S. nigra</i>] Includes all <i>Salix</i> species except <i>S. babylonica</i> , <i>S. x reichardtii</i> , <i>S. x calodendron</i>	4	The plant must not be sold, propagated or knowingly distributed
Witchweed [<i>Striga species except the native Striga parviflora</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Yellow burrhead [<i>Limnocharis flava</i>]	1	The plant must be eradicated from the land and that land must be kept free of the plant This is an All of NSW declaration
Yellow nutgrass [<i>Cyperus esculentus</i>]	5	The requirements in the Noxious Weeds Act 1993 for a notifiable weed must be complied with This is an All of NSW declaration

PRIMARY INDUSTRIES
Fishing and Aquaculture[Home](#) » [Fishing and aquaculture](#) » [Species protection](#) » [Records](#)

Threatened & protected species - records viewer

Records for this map are from the NSW Department of Primary Industries research surveys, they do not indicate the entire distribution of the species and there may be errors and omissions. To view the records using Google Earth you must download and install the Google Earth Plugin.



NOTE: The map depicts the expected distribution of this species in NSW. The records indicate locations where the species has been found.

Records

Macquarie perch

Waterbody: Murrumbidgee River Year: 1990 Datasource: Research

Macquarie perch

Waterbody: Murrumbidgee River Year: 1990 Datasource: Research

Macquarie perch

Waterbody: Murrumbidgee River Year: 1991 Datasource: Research

Macquarie perch

Waterbody: Murrumbidgee River Year: 1991 Datasource: Research

Macquarie perch

Waterbody: Murrumbidgee River Year: 1991 Datasource: Research

Macquarie perch

Records search

Step 1

Select an area type to search by:

[Statewide](#)[Catchment Management Authority](#)[Local Government Area](#)

LGA: COOMA-MONARO

Step 2

Select a species:

[Macquarie perch](#)
[Trout cod](#)

Step 3

Select a time period:

- ☐ pre 1980
☐ post 1980
☒ all records

[Search](#)



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 13/06/14 13:12:40

[Summary](#)

[Details](#)

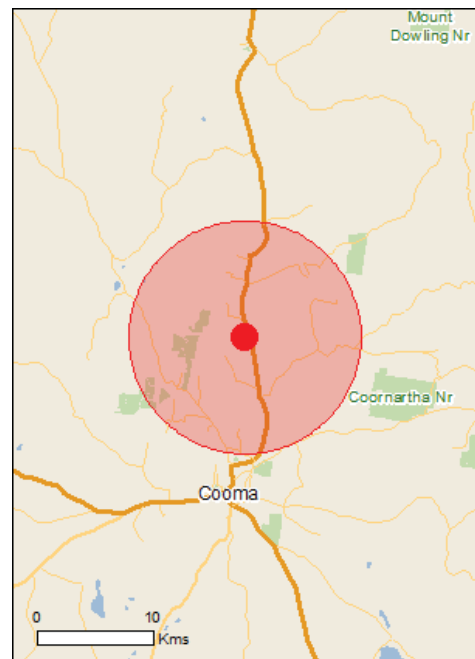
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

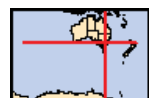
[Acknowledgements](#)



This map may contain data which are
©Commonwealth of Australia
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[Coordinates](#)

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	22
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As [heritage values](#) of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	12
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	5
State and Territory Reserves:	2
Regional Forest Agreements:	1
Invasive Species:	24
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (RAMSAR)	[Resource Information]
Name	Proximity
Banrock station wetland complex	Upstream from Ramsar
Coorong and lakes alexandrina and albert	Upstream from Ramsar
Riverland	Upstream from Ramsar

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Alpine Sphagnum Bogs and Associated Fens	Endangered	Community may occur within area
Natural Temperate Grassland of the Southern Tablelands of NSW and the Australian Capital Territory	Endangered	Community likely to occur within area
Upland Wetlands of the New England Tablelands and the Monaro Plateau	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia		
Regent Honeyeater [82338]	Endangered	Foraging, feeding or related behaviour may occur within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Lathamus discolor		
Swift Parrot [744]	Endangered	Species or species habitat may occur within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Fish		
Bidyanus bidyanus		
Silver Perch, Bidyan [76155]	Critically Endangered	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat may occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria castanea Yellow-spotted Tree Frog, Yellow-spotted Bell Frog [1848]	Endangered	Species or species habitat likely to occur within area
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog [1828]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Potorous tridactylus tridactylus Long-nosed Potoroo (SE mainland) [66645]	Vulnerable	Species or species habitat may occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Species or species habitat may occur within area
Plants		
Calotis glandulosa Mauve Burr-daisy [7842]	Vulnerable	Species or species habitat likely to occur within area
Dodonaea procumbens Trailing Hop-bush [12149]	Vulnerable	Species or species habitat likely to occur within area
Eucalyptus pulverulenta Silver-leaved Mountain Gum, Silver-leaved Gum [21537]	Vulnerable	Species or species habitat likely to occur within area
Pelargonium sp. Striatellum (G.W.Carr 10345) Omeo Stork's-bill [84065]	Endangered	Species or species habitat likely to occur within area
Rutidosia leiocarpis Monaro Golden Daisy [21490]	Vulnerable	Species or species habitat likely to occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat known to occur within area
Delma impar Striped Legless Lizard [1649]	Vulnerable	Species or species habitat known to occur within area
Tympanocryptis pinguicollis Grassland Earless Dragon [66727]	Endangered	Species or species habitat known to occur

Name	Status	Type of Presence within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat known to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat likely to occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Endangered	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Places on the RNE	[Resource Information]
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Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Haere Mai Grassland	NSW	Indicative Place
Upper Murrumbidgee River	NSW	Registered
Historic		
Cooma Cemetery	NSW	Indicative Place
Cooma Railway Station & Yard Group	NSW	Indicative Place
Dromore Homestead Group	NSW	Registered

State and Territory Reserves	[Resource Information]
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Name	State
Binjura	NSW
Mount Clifford	NSW

Regional Forest Agreements	[Resource Information]
----------------------------	--------------------------

Note that all areas with completed RFAs have been included.

Name	State
------	-------

Name	State
Southern RFA	New South Wales

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
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Birds

[Alauda arvensis](#)

Skylark [656]

Species or species habitat likely to occur within area

[Carduelis carduelis](#)

European Goldfinch [403]

Species or species habitat likely to occur within area

[Columba livia](#)

Rock Pigeon, Rock Dove, Domestic Pigeon [803]

Species or species habitat likely to occur within area

[Passer domesticus](#)

House Sparrow [405]

Species or species habitat likely to occur within area

[Streptopelia chinensis](#)

Spotted Turtle-Dove [780]

Species or species habitat likely to occur within area

[Sturnus vulgaris](#)

Common Starling [389]

Species or species habitat likely to occur within area

[Turdus merula](#)

Common Blackbird, Eurasian Blackbird [596]

Species or species habitat likely to occur within area

Mammals

[Bos taurus](#)

Domestic Cattle [16]

Species or species habitat likely to occur within area

[Canis lupus familiaris](#)

Domestic Dog [82654]

Species or species habitat likely to occur within area

[Capra hircus](#)

Goat [2]

Species or species habitat likely to occur within area

[Felis catus](#)

Cat, House Cat, Domestic Cat [19]

Species or species habitat likely to occur within area

[Feral deer](#)

Feral deer species in Australia [85733]

Species or species habitat likely to occur within area

[Lepus capensis](#)

Brown Hare [127]

Species or species habitat likely to occur within area

[Oryctolagus cuniculus](#)

Rabbit, European Rabbit [128]

Species or species habitat likely to occur within area

[Sus scrofa](#)

Pig [6]

Species or species habitat likely to occur within area

Name	Status	Type of Presence
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cytisus scoparius Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella trichotoma Serrated Tussock, Yass River Tussock, Yass Tussock, Nassella Tussock (NZ) [18884]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Ulex europaeus Gorse, Furze [7693]		Species or species habitat likely to occur within area

Coordinates

-36.13838 149.1427

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [Department of Environment, Climate Change and Water, New South Wales](#)
- [Department of Sustainability and Environment, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment and Natural Resources, South Australia](#)
- [Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts](#)
- [Environmental and Resource Management, Queensland](#)
- [Department of Environment and Conservation, Western Australia](#)
- [Department of the Environment, Climate Change, Energy and Water](#)
- [Birds Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [Museum Victoria](#)
- [Australian Museum](#)
- [SA Museum](#)
- [Queensland Museum](#)
- [Online Zoological Collections of Australian Museums](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Atherton and Canberra](#)
- [University of New England](#)
- [Ocean Biogeographic Information System](#)
- [Australian Government, Department of Defence](#)
- [State Forests of NSW](#)
- [Geoscience Australia](#)
- [CSIRO](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.