BIG ISLAND MINING PTY LTD

ABN 12 112 787 470

Dargues Reef Gold Project

Preliminary Environmental Assessment

March 2010

Prepared by:

R.W. CORKERY & CO. PTY. LIMITED

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Preliminary Environmental Assessment

Prepared for:

Big Island Mining Pty Ltd
ABN: 12 112 787 470
Ground Floor, 22 Oxford Close
WEST LEEDERVILLE WA 6007

Telephone: (08) 6380 1093
Facsimile: (08) 6380 1387
Email: aj@cortonaresources.com.au

Prepared by:

R.W. Corkery & Co. Pty. Limited
Geological & Environmental Consultants
ABN: 31 002 033 712

Brooklyn Office:
1st Floor, 12 Dangar Road
PO Box 239
BROOKLYN NSW 2083

Telephone: (02) 9985 8511
Facsimile: (02) 9985 8208
Email: brooklyn@rwcorkery.com

Orange Office:
Suite 15, 256 Anson Street
ORANGE NSW 2800

Telephone: (02) 6362 5411
Facsimile: (02) 6361 3622
Email: orange@rwcorkery.com

Brisbane Office:
Level 3, 1 Eagle Street
BRISBANE QLD 4000

Telephone: (07) 3360 0217
Facsimile: (07) 3360 0222
Email: brisbane@rwcorkery.com

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1. INTRODUCTION

1.1 SCOPE

Big Island Mining Limited ("the Proponent") proposes to construct and operate the Dargues Reef Gold Project ("the Project") located approximately 13km to the south of Braidwood (**Figure 1**). The Project would comprise an underground gold mine, a processing plant, a temporary waste rock emplacement and a tailings storage facility, as well as ancillary activities and associated infrastructure.

The Project is classified as a "Major Project" in accordance with Paragraph 5 of Schedule 1 of *State Environmental Planning Policy (Major Projects) 2005* ("Major Projects SEPP") because the capital expenditure would be more than $30 million. This *Preliminary Environmental Assessment* has been prepared by R.W. Corkery & Co. Pty. Limited in support of the Proponent's application for project approval for the Project.

This document introduces the Project and provides information on the key environmental issues to be addressed in the design and assessment of the Project. The information provided will ultimately be incorporated into a comprehensive *Environmental Assessment*, to be prepared in accordance with the requirements of Section 75H of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This document has been prepared for circulation to the Department of Planning, other relevant State government agencies, Palerang Council and the local community.

1.2 THE PROPONENT

The proponent, Big Island Mining Limited, is a wholly owned subsidiary of Cortona Resources Limited (Cortona). Cortona is an Australian listed public gold mining and exploration company which has been in existence since 2006. Cortona has a portfolio of gold projects in NSW and Western Australia and its principal focus is on continued expansion of its gold resource inventory with the primary objective of becoming a successful and profitable gold producer.

Cortona has approximately 1 200 shareholders. Baker Steel Gold Fund is the largest shareholder with a 13% stake in the Company. Cortona is controlled by a board of four individuals with a combined experience in mining-related industries of more than 90 years. Cortona recently raised $10 million, providing sufficient funding to complete a project feasibility study and environmental assessment, as well as ongoing exploration.

1.3 PROJECT SITE

The Project Site comprises an area of approximately 396ha and incorporates all areas of Project-related activities (**Figure 2**). **Table 1** presents land titles within the Project Site.

Table 1
Project Site Land Titles

Lot	DP	Lot	DP
101	755934	2	986483
102	755934	3	986483
104	755934	4	986483
1	986483	5	986483

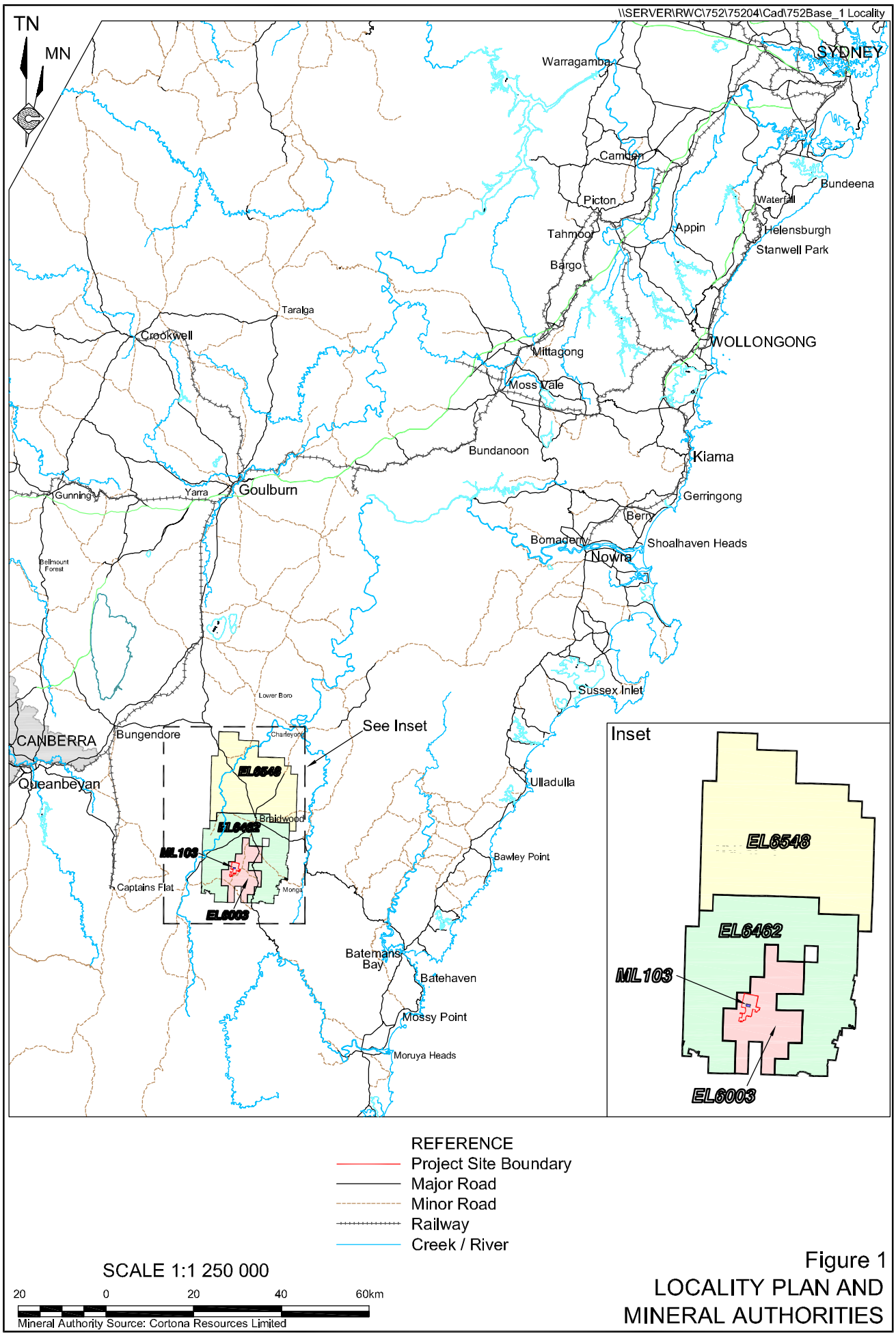


Figure 1
LOCALITY PLAN AND
MINERAL AUTHORITIES

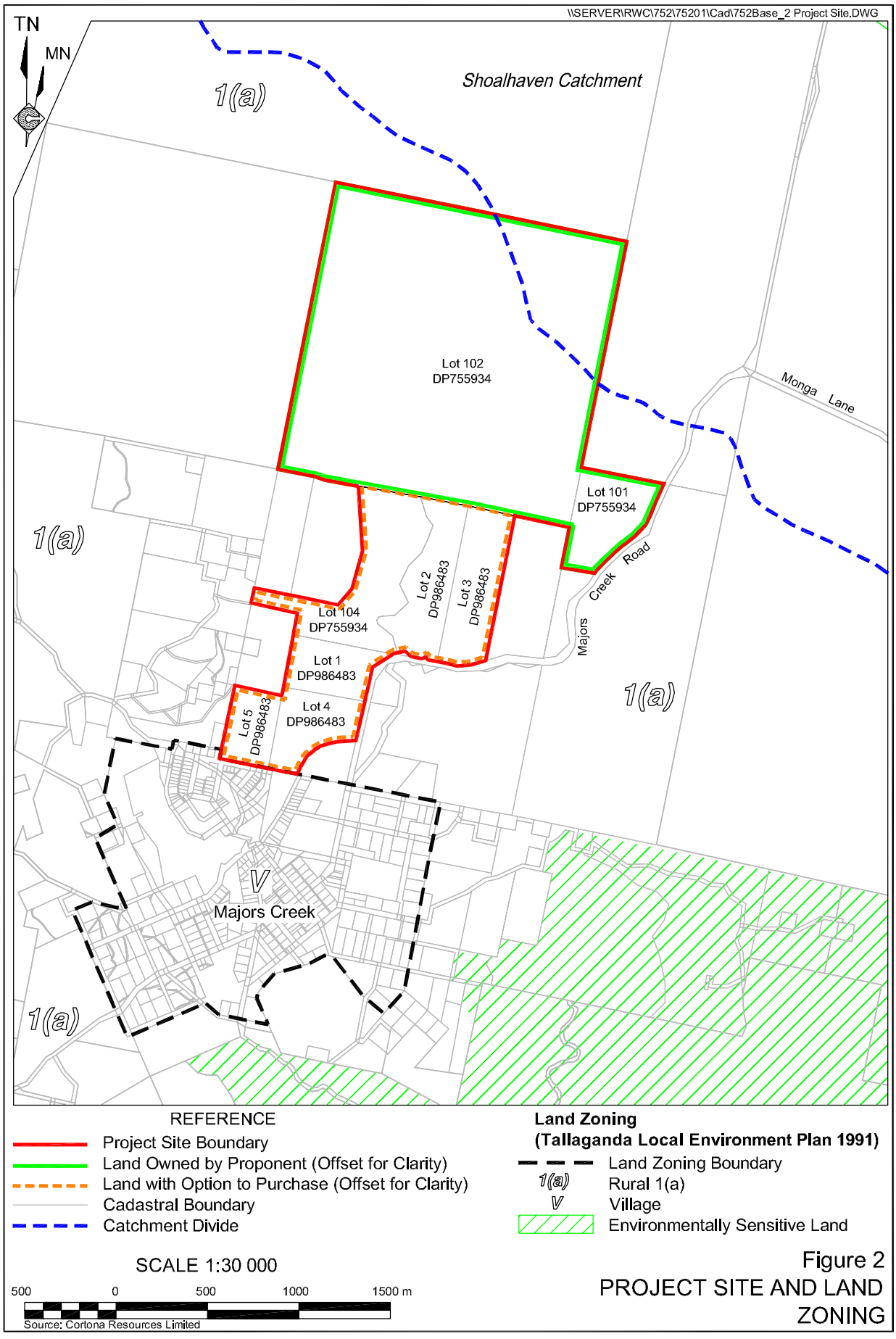


Figure 2
PROJECT SITE AND LAND ZONING

1.4 MANAGEMENT OF INVESTIGATIONS

The preparation of this document has involved a study team managed by Mr Mitchell Bland (B.Sc (Hons), MEcon Geol, LLB (Hons)), Principal Environmental Consultant with R.W. Corkery & Co Pty. Limited. Mr Bland will also manage the preparation of the *Environmental Assessment* for the Project. Peer review of the *Environmental Assessment* will be undertaken by Mr Rob Corkery (B.Sc. (Hons), M.Appl. (Sc)), Principal with the same Company.

Several professional staff within Cortona Resources Limited assisted with the preparation of this document including, but not limited to:

- Mr Ajanth (AJ) Saverimutto, Operations Manager;
- Mr Greg Cozens, NSW Exploration Manager; and

Strong emphasis has been, and would continue to be, placed upon a multi-disciplinary team approach to the design of the Project, the description of the existing environment, identification of key issues, development of appropriate safeguards and assessment of impacts. The following specialist consultancies have been commissioned to undertake an initial assessment of the existing environment and identify potential constraints posed by the Project. A summary of the results of those initial assessments are presented in Section 6 of this document.

- Ecology– Gaia Research Pty Ltd.

  –Mr Garry Daly (B.Sc (Zoology), Dip Ed).
- Heritage – Archaeological Surveys & Reports Pty Ltd

  –Mr John Appleton (BA (Hons).
- Noise and blasting – Spectrum Acoustics.

  –Mr Neil Pennington (PhD, B.Sc (Physics), B.Math (Hons)).
- Air quality and greenhouse gasses – PAE Holmes.

  –Judith Cox (B.Eng (Hons)).
- Surface water, soils and land capability – SEEC Morse McVey.

  –Mr Andrew Macleod (B.Sc (Hons), CPSS, CPESC).
- Groundwater – Australasian Groundwater & Environmental Consultants Pty Ltd

  –Mr Errol Briese (B.Sc (Hons), Grad Dip (Management), MIAH, MIAG, RP Geo.).
- Traffic and transportation – Transport & Urban Planning.

  –Mr Terry Lawrence (M. Urb. Plan).

Once confirmation of the key issues to be assessed is established through receipt of Director-General's requirements (DGRs) for the *Environmental Assessment*, these consultancies will complete their respective assessments of impacts and provide recommendations for necessary design and operational safeguards.

2. BACKGROUND TO THE PROJECT

2.1 INTRODUCTION

The Proponent and its predecessors have controlled exploration licences over the Project Site since 2002. At that time, an exploration program was commenced to identify additional hard rock gold resources associated with the historic Jembaicumbene, Majors Creek (also known as Elrington) and Araluen alluvial goldfields.

This sub-section provides an overview of the mineral authorities held by the Proponent, a description of the geology and mineralisation within and surrounding the Project Site and an overview of the resources and reserves that underpin the Project.

2.2 EXISTING MINERAL AUTHORITIES

Figure 1 and **Table 2** present the Mineral Authorities held by the Proponent.

Table 2
Mineral Authorities

Authority	Act year	Date Granted	Expiry Date	Mineral Groups[1]
ML103	1973	15 Dec 1975	14 Dec 2027	1
EL6548	1992	05 Apr 2006	04 Apr 2010	1
EL6003	1992	03 Oct 2002	02 Oct 2010	1
EL6462	1992	01 Sep 2005	31 Aug 2009[2]	1
Note 1: Mineral groups as defined under the *Mining Act 1992*. Note 2: Renewal pending				
Source: Cortona Resources Limited				

2.3 GEOLOGY, PREVIOUS EXPLORATION AND RESERVES

2.3.1 Regional and Local Geology

The Project Site is located within the eastern most section of the Lachlan Fold Belt and is associated with the Devonian-aged Braidwood Granodiorite (**Figure 3**). The Lachlan Fold Belt extends across eastern Australia from Queensland in the north through New South Wales, Victoria and Tasmania in the south. It's been described as a composite orogenic belt which has been subject to four episodes of folding, strong compression and uplift.

The Braidwood Granodiorite is a large elliptical pluton covering approximately 1 000km^2. The western contact of the granodiorite dips at a low angle towards the west while the eastern contact dips steeply to the east. This geometry is consistent with the intrusion having been tilted about 20° to the west following displacement during recent Tertiary-aged block faulting. Westward tilting followed by erosion has lead to the eastern portion of the intrusion being exposed at a deeper magmatic level than the western portion. The Braidwood Granodiorite has been geologically mapped as a hornblende- biotite granodiorite, with the eastern phase dominantly biotite granodiorite and the western phase- hornblende granodiorite. The unaltered hornblende granodiorite is a light coloured, equigranular granodiorite containing plagioclase, K feldspar, quartz, brown-green hornblende, minor chlorite altered biotite and accessory magnetite, apatite, sphene, zircon with trace pyrite.

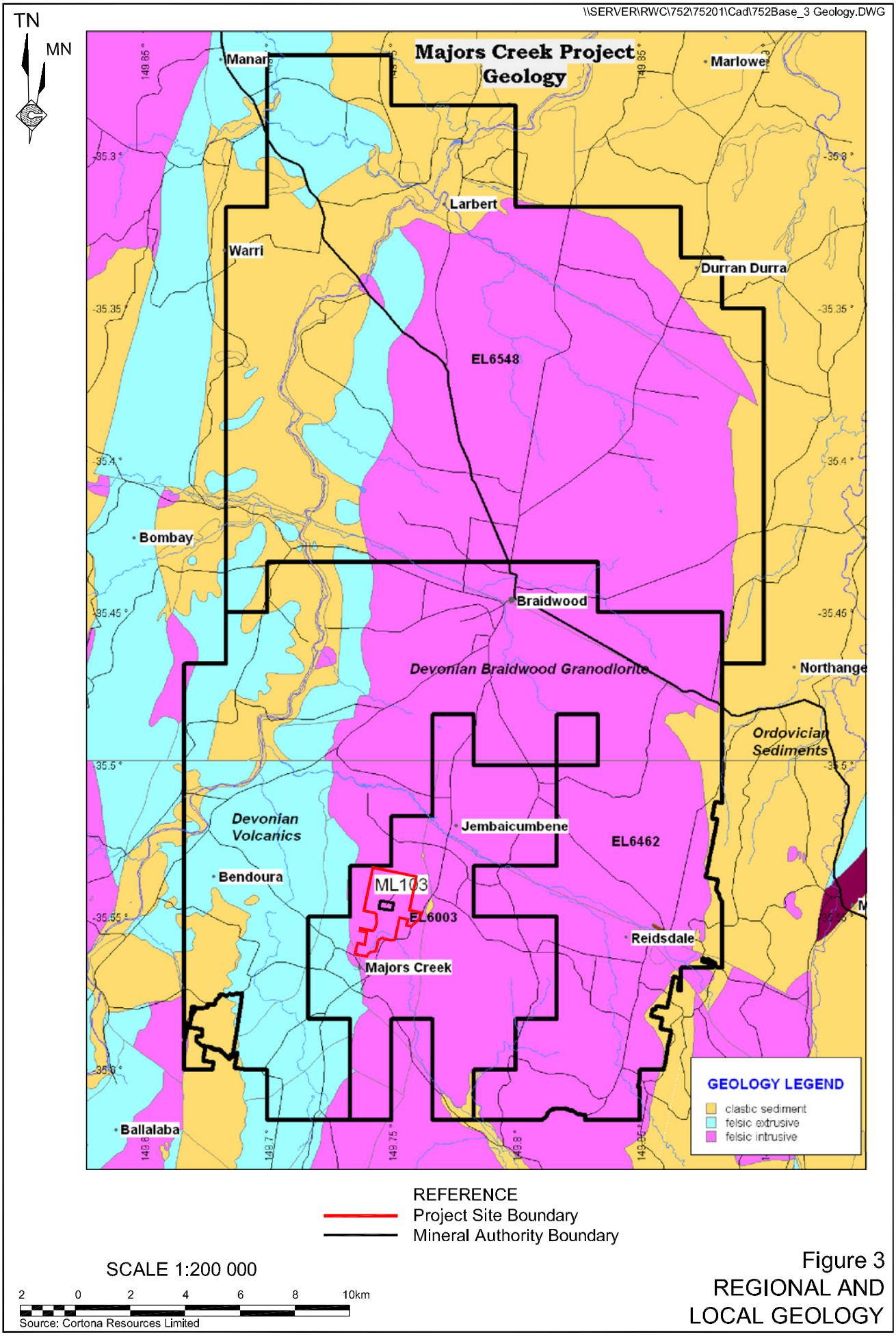


Figure 3
REGIONAL AND
LOCAL GEOLOGY

The Braidwood Granodiorite intrudes early Devonian-aged Long Flat Volcanics to the west and Ordovician-aged sediments to the east. Regional aeromagnetic data indicates that the Braidwood Granodiorite underlies the Long Flat Volcanics for approximately 10km to the west of the western contact exposed at the surface.

The Braidwood Granodiorite is cut by a number of east-southeast and southeast trending faults that are clearly visible on the aeromagnetic data. These faults appear to control drainage patterns within the area where the granodiorite is exposed at surface. The granodiorite is also cut by a second suite of structures striking to the north-northeast. Placer alluvial gold occurs in recent sediments deposited in the east-southeast and southeast drainage systems in the southwest portion of the pluton. The Jembaicumbene and Majors Creek-Araluen alluvial goldfields are prominent examples (**Figure 3**).

2.3.2 Historic Mining Operations

The Proponent's mineral authorities encompass the Majors Creek, Jembaicumbene Goldfield and a portion of the Araluen alluvial goldfields. Alluvial gold was first discovered at Majors Creek on 5 October 1851. Historical records indicate that more than 40 tons of gold has been produced from alluvial deposits in the Braidwood-Araluen area, the vast majority being won in the mid to late 1800's.

The Majors Creek and the Araluen Goldfields represent the largest alluvial goldfield in NSW. Past production records include a total of approximately 1.25 million ounces of gold has been produced, of which 98% was from alluvial workings, with the remainder from lode gold workings. .

The Dargues Reef ore body was discovered in the 1870's when James Dargues, who had been washing alluvium in Spring Creek came across an ant bed and washed it, he obtained £20 of gold from the process. He was convinced that a good reef lay underneath and eventually located the source. The reef cropped out on both sides of Spring Creek and the gold was scattered throughout the weathered granitic host material. . The claim was opened on both sides of Spring Creek as an open cut and a shaft was sunk on both sides of the reef to 10m. Twenty miners and about seven to nine horses and carts were employed, each of which carted ore to the crushing plant on the main creek. Water was obtained from a well with 180 tons of ore reportedly yielded, an average of 60oz of gold per week. After expenses were paid, the shareholders received between £10 and £15 a week. The crushing machinery paid for itself in a few weeks.

Following initial mining activities, further shafts were excavated between 1870 and 1891 and then again between 1914 and 1916. The Dargues Reef shaft was sunk to 67m with 3 levels, 2 on Big Blow Lode and one on Main Lode. Historic production from Dargues Reef was minimal, approximately 2 000t at a grade of approximately14g/t gold.

2.3.3 Previous Exploration Operations

Modern exploration commenced in the 1980's when Canyon Resources and Horizon Pacific explored the Dargues Reef area, drilling 8 surface and 12 underground drill holes. However, very few of these holes penetrated beneath the existing workings, and results were mixed.

In 2002, Moly Mines Ltd applied for and was granted EL6003 over the Dargues Reef deposit. Around the same time, the Company purchased ML103 from Mr A.F Jordan. In 2004, the Company commenced a drilling program consisting of a number of deeper drill holes to test for depth extensions of the known mineralisation at Dargues Reef and to explore for additional

lodes. That drilling program established that the loads could occur up to 60m north of the contact with the 'footwall' diorite dyke. Since 2004, approximately 220 holes have been drilled at Dargues Reef, firstly by Moly Mines Ltd, then by the Proponent.

In addition to exploration activities at Dargues Reef, the Proponent has identified a number of other areas of mineralisation which are progressively being tested and explored. Extraction of material within those areas does not form part of this application. However, subsequent applications may be made to include mineralisation that can be viably be extracted.

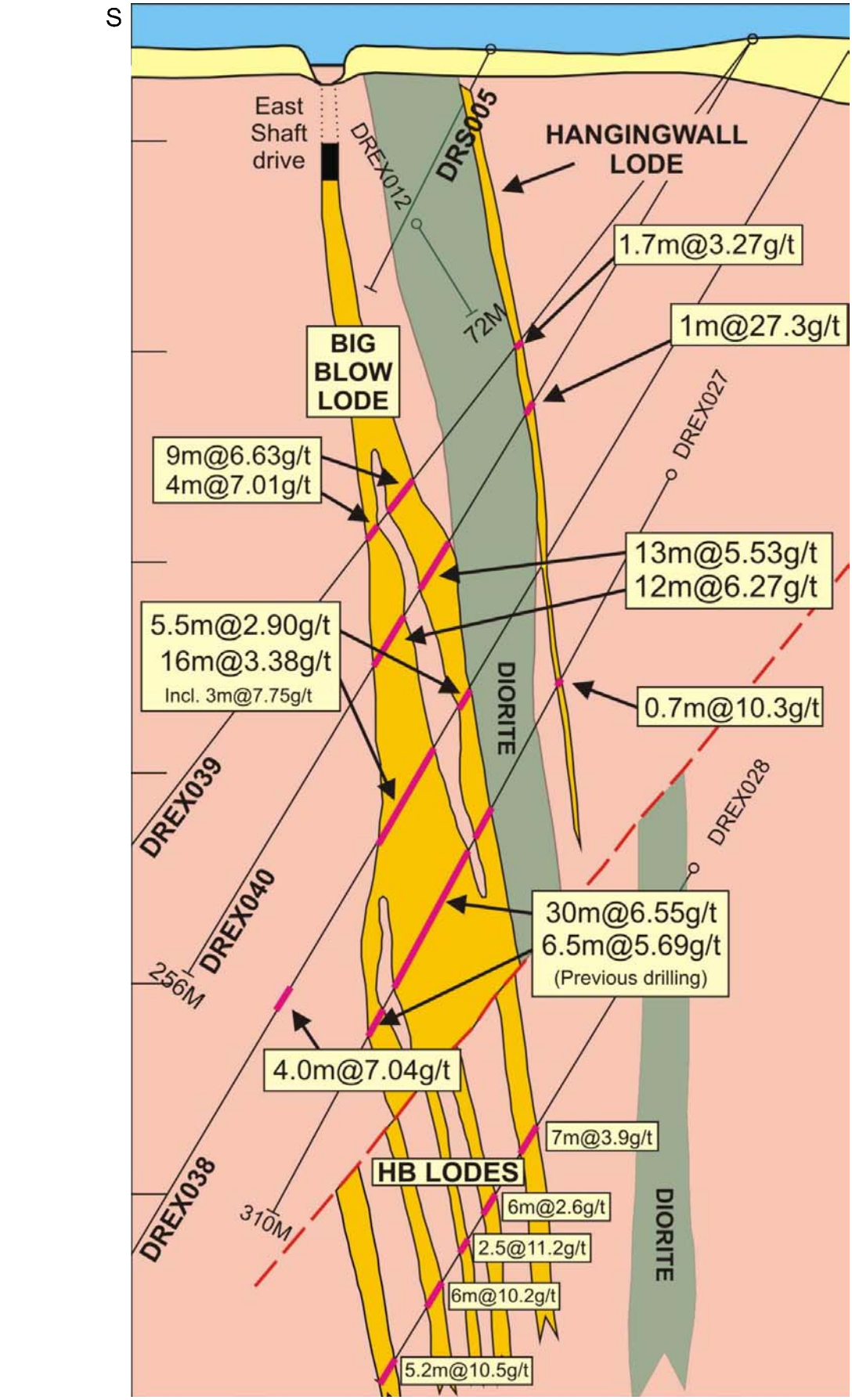
2.3.4 Dargues Reef Mineralisation

Gold mineralisation at Dargues Reef is structurally controlled and hosted within east-west trending lenses that maintain a steep southerly dip within strongly altered (sericite-silica-carbonate) granodiorite near the contacts of a sub vertical diorite to quartz diorite dyke (**Figure 4**). The lenses follow the east-west fracture system in the granodiorite, which is particularly well developed adjacent to the diorite dykes. Gold values are restricted to lenses and the alteration fronts are sharp and distinctive.

The gold mineralisation is hosted within both near vertical, east-striking lodes, and east northeast lodes that dip steeply to the south. The thickest and most consistently mineralized segment is the Main Lode, which has a strike length of at least 115m, remains open at depth and dips between 70^{o} and 85^{o} to the south. Its intersection with the Big Blow Lode plunges at about 70^{o} to the east. Interpretation suggests that richer and thicker shoots within the Big Blow Lode, and within other lodes, have a similar plunge. The current geological understanding of the lode configuration is they each have a width of between 5 and 20m, a strike length of up to 140m and they extend down dip for at least 450m. Several subsidiary high grade lodes occur along strike, at depth to the north and on the southern side of the dyke.. The ore zones are characterised by distinct mineralogical zoning. The gold is associated with pyrite and occurs along fractures and intergrown within pyrite grains. Minor free gold has been observed in the most strongly altered lodes.

Mineralisation formed during two events, initially with the deposition of euhedral and subhedral pyrite and associated early stage alteration. The second event is the deposition of irregular pyrite containing numerous inclusions of gold, chalcopyrite, bismuth, sulfosalts and galena (McQueen & Perkins, 1995). Alteration minerals include carbonate, white mica, chlorite, epidote, illite, montmorillonite and kaolinite. Broad areas of propylitic alteration are evident in the core up to 80m from the lenses and are moderately preserved in outcrop at Dargues Reef. The smaller localised zones of intense silica, sericite, pyrite/limonite (phyllic) alteration occur closer to the loads.

Dating of sericite (K-Ar method) from the intense alteration zones surrounding the lodes at Dargues Reef has provided ages of 411±5 million years (Ma) and 400±4Ma which is consistent with mineralisation occurring close to the time of crystallisation of the Braidwood Granodiorite. Stable and lead isotope data for Dargues Reef mineralisation indicates, or is consistent with, a granite related origin for mineralisation,. Indicating, the primary origin of gold mineralisation at Majors Creek is likely to be associated with late hydrothermal activity associated with the Braidwood Granodiorite (McQueen 2003).



Not to Scale

Source: Cortona Resources Limited

Figure 4
DARGUES REEF
MINERALISATION

2.3.5 Resources and Reserves

A Joint Ore Reserve Committee (JORC) Code-compliant resource estimate was prepared by Runge Limited in 2008. That estimate returned 1.44Mt at 6.2g/t gold for 286 000oz gold based on drilling to 450m depth. Following a mining assessment a mining resource was determined (**Table 3**). It is noted that mineralisation remains open in several directions including:

- down plunge and to the east within Plum's Lode;
- at depth within Main Lode; and
- along strike and down dip in some hanging wall lode positions.

Table 3
Mining Resource

	tonnes	grade	ounces	%
Indicated	398 240	6.0	77 334	41%
Inferred	774 000	4.5	111 000	59%
Total	**1 172 240**	**5.0**	**188 334**	**100%**
Note: Mining Resource based on minimum 2.5m mining with and exclusion of the Plums Lode.				
Source: Cortona Resources Limited				

3. APPROVALS REQUIRED

The Proponent anticipates that the following approvals will be required for the Dargues Reef Gold Project.

- Project Approval – Minister for Planning.

  Project approval will be required from the Minister for Planning for the Project under Part 3A of the *Environmental Planning and Assessment Act 1979*.

- Environment Protection Licence – Department of Environment, Climate Change and Water

  An Environment Protection Licence for underground mining operations, mineral processing operations and use of the tailings storage facility will be required. It is anticipated that the licence will also identify licensed discharge points and discharge limits and concentrations.

- Mining Lease – Industry and Investment NSW.

  The Proponent currently holds EL6003 and ML103 over the Project Site. A new mining lease may be required for sections of the Project Site not covered by ML103. In addition, any surface or depth restrictions on ML103 may be required to be amended.

- Water Access Licences - Department of Environment, Climate Change and Water – Office of Water.

A Water Access Licence will be required under either the *Water Act 1912* or the *Water Management Act 2000* to permit dewatering of the proposed underground mining operation. Additional Water Access Licence(s) will be required to permit extraction of water from one or more of the historic workings in the southern and eastern sections of the Project Site.

- A Section 138 Permit – Palerang Shire Council

  A permit under Section 138 of the *Roads Act 1993* would be required for the construction of the intersection of the site access road and Majors Creek Road.

- Dam safety Approval – Dam Safety Committee

  An approval from the NSW Dams Safety Committee would be required for the design and construction of the tailings storage facility.

- Explosives Storage and Use Licence – WorkCover Authority NSW

  A Licence issued by the WorkCover Authority NSW for the storage and use of explosives will be granted only when NSW Department of Primary Industries approves a Security Plan for the storage and handling of explosives (including explosive precursors).

- High Voltage Connection Agreement - County Energy.

  A high voltage connection agreement will be required to permit connection of the proposed electricity transmission line to the existing transmission grid from Country Energy which holds an electricity distributor's licence under the *Electricity Supply Act 1995*.

In addition, if project approval is granted, subsequent approvals would be required in accordance with the Mining Operations Plan requirements of the *Mining Act 1992* and mining lease conditions.

4. PLANNING ISSUES

4.1 PERMISSABILITY OF THE PROJECT

The Project Site occurs within the Palerang Local Government Area and permissibility of development is governed by the *Tallaganda Local Environment Plan 1991* ("Tallaganda LEP"). Under that Plan, the Project Site is zoned Zone 1(a). **Figure 2** presents the land zoning within and surrounding the Project Site.

Clause 9 of the Tallaganda LEP identifies that the objectives of Zone 1(a) (General Rural) are:

> *to promote the proper management and utilisation of resources by:*
> *(a) protecting, enhancing and conserving:*
>
> *(i) agricultural land, particularly prime crop and pasture land, in a manner which sustains its efficient and effective agricultural production potential,*
>
> *(ii) soil stability by controlling and locating development in accordance with soil capability, as identified by the Soil Conservation Service,*

(iii) forests of existing and potential commercial value for timber production,

(iv) valuable deposits of minerals, coal, petroleum and extractive materials by controlling the location of development for other purposes in order to ensure the efficient extraction of those deposits,

(v) trees and other vegetation on environmentally sensitive land and in any place where the conservation of the vegetation is significant to the protection of scenic amenity or natural wildlife habitat or is likely to control or contribute to the control of land degradation,

(vi) water resources and water catchment areas for use in the public interest,

(vii) localities of significance for nature conservation, including localities with rare plants, wetlands, permanent watercourses and significant wildlife habitat, and

(viii) places and buildings of archaeological or heritage significance, including aboriginal relics and places,

(b) facilitating farm adjustments,

(c) minimising the cost to the community of:

(i) fragmented and isolated development of rural land, and

(ii) providing, extending and maintaining public amenities and services, and

(d) providing land for future urban development, for rural residential development and for development for other non-agricultural purposes, in accordance with the need for that development, and subject to the capability of the land and its importance in terms of the other provisions of this clause.

Mining is permissible with consent within this zone.

4.2 CONSIDERATIONS OF STATE PLANNING INSTRUMENTS

4.2.1 State Environmental Planning Policy (Major Development) 2005

Clause 6 of the *State Environmental Planning Policy (Major Development) 2005* (Major Development SEPP) identifies that development of the kind specified in Schedule 1 of the Major Development SEPP is declared to be a Project. Paragraph 5(1)(b) of Schedule 1 identifies development for the purposes of mining-related works with a capital cost of more than $30 million as development to which the Major Development SEPP applies. The Proponent estimates that the capital cost for the Dargues Reef Gold Project would be approximately $42 million. As a result, the Minister declared the Project to be a Major Project for which project approval under Part 3A of the EP&A Act is required on 22 January 2010.

4.2.2 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

The *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) was gazetted on 17 February 2007 and specifies matters requiring consideration in the assessment of any mining-related development. These matters include the following.

- The compatibility of the proposed mine with surrounding land uses.
- The compatibility of the proposed development with other mining, petroleum production or extractive industry.
- Potential impacts on issues associated with natural resource management and environmental management.
- The efficiency of resource recovery and minimisation of the creation of waste.
- Consideration of alternative means of product transportation other than by road and that a code of conduct for the transport of materials on public roads is prepared.
- Consideration of rehabilitation of the land affected by the development.

An assessment of how each of these considerations is addressed will be provided within the *Environmental Assessment*.

4.2.3 State Environmental Planning Policy (Infrastructure) 2007

The *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) identifies, amongst other things, the matters to be considered in the assessment of development adjacent to particular types of infrastructure.

Clause 45 of the Infrastructure SEPP identifies that where development would be carried out within or immediately adjacent to an easement for electricity purposes, the determining authority must give written notice to the electricity supply, inviting comments about potential safety risks and take into consideration any response received. The Proponent notes that the Project would require the connection of an electricity transmission line. As a result, the determining authority would be required to consult with Country Energy in relation to the Project.

4.2.4 State Environmental Planning Policy No. 33 – Hazardous and Offensive Development

Hazardous and offensive industries, and potentially hazardous and offensive industries, relate to industries that, without the implementation of appropriate impact minimisation measures, would, or potentially would, pose a significant risk in relation to the locality, to human health, life or property, or to the biophysical environment. A risk screening of the Project will be presented in the *Environmental Assessment* in accordance with the document entitled *Applying SEPP 33 2nd edition,* (DUAP, 1997). The Proponent notes that the only hazardous goods that would be used within the Project Site would include the following.

- Diesel and other hydrocarbons that would be stored and used in accordance with a comprehensive *Hydrocarbon Management Plan*.
- Detonators, boosters and packaged explosives would be stored within approved magazines. Bulk explosives, if required, would be brought to the Project Site on a daily or as needs basis by an authorised contractor.

4.2.5 State Environmental Planning Policy No. 44 – Koala Habitat Protection

The former Tallaganda Local Government Area is identified in Schedule 1 of *State Environmental Planning Policy No. 44 – Koala Habitat Protection* as an area that could provide habitat for Koalas. As required by the SEPP, an investigation to determine if the Project Site represents core or potential Koala habitat will be presented in the *Environmental Assessment*.

4.2.6 Drinking Water Catchments Regional Environmental Plan No 1

Clause 6 of the *Drinking Water Catchments Regional Environmental Plan No 1* identifies the upper Shoalhaven River catchment as part of the land covered by this plan. The northeastern – most section of the Project Site extends into this catchment (**Figure 2**). The only ground disturbing activities that would be undertaken within the area covered by the plan would be construction and use of site access road.

Clause 25 of the Plan states that any activity proposed to be carried out on land to which the Plan applies should incorporate recommended practices and performance standards of the Sydney Catchment Authority. In addition, Clause 28 of the plan states that a person must not carry out development on land covered by the Plan except with the concurrence of the Chief Executive of the Sydney Catchment Authority, unless the development has no identifiable potential impact on water quality.

5. PROJECT DESCRIPTION

5.1 INTRODUCTION

This section provides an introduction to the Dargues Reef Gold Project. It is noted that the information provided in this section is, by necessity, preliminary and is provided to a level of detail that reflects the Proponent's current understanding of the Project. It is acknowledged that details in relation to aspects of the Project have yet to be determined and that as additional studies are completed, including the environmental studies already commenced, that aspects of the Project may be amended. As a result, the following information is provided for the information of the relevant government agencies and interested members of the community surrounding the Project Site. This information may, however, vary from the final Project description provided in the *Environmental Assessment*.

5.2 OBJECTIVES

The Proponent's objectives in constructing and operating the Dargues Reef Gold Project would be as follows.

- To safely mine the identified gold reserves.

- To operate the Project in a manner that would minimise surface disturbance and impacts on surrounding residents and the local environment.
- To implement a level of management control and mitigation measures that ensures compliance with appropriate environmental criteria and reasonable community expectations.
- To develop and operate the Project in compliance with all relevant statutory requirements.
- To create a final landform that is suitable for a post-mining land use that would be determined in consultation with the local community and could include a mixture of nature conservation, agriculture or light industry.
- To continue to maintain an open and honest relationship with the surrounding community.
- To establish a facility that can process additional mineral resources that may be identified within or in the vicinity of the Project Site.
- To achieve the above objectives in a cost-effective manner to ensure security of employment and the continued economic viability of the Proponent.

5.3 PROJECT OVERVIEW AND PROPOSED SITE LAYOUT

The Project would include the following components (**Figure 5**).

- Extraction of waste rock and ore material from the Dargues Reef Deposit using underground sublevel open stope mining methods with a suitable crown pillar to prevent surface subsidence.
- Construction and use of surface infrastructure required for the underground mine, including a box cut, portal and decline, magazines, communication tower, fuel store, ventilation rise, temporary waste rock emplacement and power and water supply.
- Construction and use of a processing plant and office area which would include a Run-of-Mine (ROM) pad, crushing and grinding, gravity separation and floatation circuits, site offices, workshops, laydown areas, ablutions facilities, stores, car parking, and associated infrastructure.
- Construction and use of a tailings storage facility.
- Construction and use of a water management system to enable the harvesting and supply of water for mining-related operations from eight dams that would be constructed under the Proponent's harvestable right. It is noted that approval for construction of these dams is not required, nor does it form part of this application
- Construction and use of a site access road and intersection to allow site access from Majors Creek Road.
- Transportation of sulphide concentrate from the Project Site to the Proponent's customers via public roads surrounding the Project Site using semi-trailers.

- Construction and use of ancillary infrastructure, including soil stockpiles, core yards, internal roads and tracks and surface water management structures.
- Construction and rehabilitation of a final landform that would be geotechnically stable and suitable for a final land use of nature conservation, agriculture or light industry.

5.4 INFRASTRUCTURE ESTABLISHMENT

5.4.1 Introduction

This section provides an overview of the infrastructure that would be required to be constructed during the life of the Project. Infrastructure to be constructed would include:

- a site access road and intersection (see Section 5.4.2);
- water distribution and management structures (see Section 5.4.3); and
- an electricity transmission line (see Section 5.4.4).

Construction of other infrastructure that would be required such as the underground mine, processing plant and tailings storage facility and associated services are described in subsequent sections of this document.

5.4.2 Site Access Road and Intersection

The Proponent would construct a site access road and intersection from Majors Creek Road to permit light and heavy vehicle access to the Project Site. The site access road intersection with Majors Creek Road would be located approximately 1.5km to the north of the point where the road crosses Majors Creek. The eastern section of the road would cross two ephemeral drainage lines immediately to the west of Majors Creek Road.

The access road would be an unsealed, two lane road suitable for use by light and heavy vehicles and sufficiently wide that two loaded semitrailer trucks can pass safely. Appropriate road-side drainage would be installed in accordance with the requirements of *Managing Urban Stormwater – Soils and Construction – Volume 2C Unsealed Roads* published by the Department of Environment and Climate Change in 2008.

The intersection with Majors Creek Road would be constructed to the standard identified in the *RTA Road Design Guide*. The intersection, including approximately 50m of the site access road, would be sealed and would be constructed in consultation with Palerang Shire Council

Where the site access road crosses drainage lines, the crossings would be designed in accordance with the guideline *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterways Crossings* published by the then Department of Primary Industries in 2003.

5.4.3 Water Management Structures

The Proponent proposes to construct eight dams in the locations indicated on **Figure 5** (the "harvestable rights dams"). Water captured within the harvestable rights dams would be used for mining related purposes. These dams would be constructed in a manner that is consistent with the Proponent's Harvestable Rights under Section 53 of the EP&A Act, namely the total volume of the dams would be less than 35.6ML and each dam would be constructed on a first

\\SERVER\RWC\752\75201\Cad\752Base_5 Layout.DWG

TN
MN

Proposed Magazines
Site Access Road
See Detail Right
Tailings Storage Facility
Tailings Storage Facility Access Road
Maiors Creek Road

Detail
Offices
Communications Tower
Concentrate Storage
Concentrator
Floatation
Raw Water
Reagents Storage
Crushing & Grinding
Processing Plant Office Area
Water Supply Tanks
ROM Pad
Power Facility
Settling Dam
Contractor Offices
Core Yard
Workshop
Fuel Bay
Lay Down Yard
Temporary Waste Rock Emplacement
Box Cut

REFERENCE

- Project Site Boundary
- Mineral Authority Boundary
- Contour (m AHD)(Interval = 5m (1m Inset))
- Contour (m AHD)(Interval = 2m) (derived from helimag survey)
- Creek / Drainage Line
- Unsealed Road
- Dam/Water Storage
- Harvestable Rights Dam (Indicative Location)
- Proposed Transmission Line and Easement
- Clean Water Diversion Structure
- Proposed Pipeline
- Proposed Road/Track
- Fence

SCALE 1:10 000

100 0 100 200 300 400 500 m

Base Map Source: Geo-spectrum (Australia) Pty Ltd

SCALE 1:5 000

50 0 50 100 150 200 250 m

Figure 5
PROJECT SITE LAYOUT

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or second order stream upstream of all springs or soaks. As a result, the Proponent contends that no further approval is required for the construction of the harvestable rights dams and, as a result, they do not form part of this application. However, notwithstanding the above, the Proponent would continue to consult the NSW Office of Water in relation to construction and use of these dams to ensure that all relevant requirements are met.

In addition, additional water for mining-related activities would be required. It is anticipated that this water would be sourced from one or more existing underground workings in the southern and eastern sections of the Project Site. Approval to extract this water is a component of this application

As a result, the Project would require construction of water reticulation structures, including pumps and piping, to deliver water from the harvestable rights dams and the underground workings to the processing plant.

Finally, a number of clean water diversion structures and dirty (potentially sediment-laden) containment structures, including containment banks and settling ponds, will also be required. Construction of these structures will require Project approval. Additional information in relation to the location, design, construction and operation of these structures, together with a detailed water balance, will be provided in the *Environmental Assessment*.

5.4.4 Transmission Line, Substation and Transformers

A transmission line would be constructed to provide power for the processing plant, underground mine, offices, workshop and other sections of the Project Site. At this stage, it is anticipated that a 22kV transmission line would be required and that the most likely location for the take off point from the existing transmission line grid network would be adjacent to the eastern boundary of the Project Site. The Proponent has commenced discussions with Country Energy in relation to the construction and operation of the proposed transmission line and additional information in relation to the proposed transmission line will be provided in the *Environmental Assessment*.

In addition, the Proponent would construct a substation, electricity distribution network and a range of transformers within the Project Site. The location of the substation is indicated on **Figure 5**. Within the substation the voltage would be reduced from 22kV to 11 000V for distribution within the Project Site. A range of transformers would be constructed to further reduce the voltage to 1 000V, 415V and 240V for use within various sections of the Project Site.

5.5 SITE PREPARATION

5.5.1 Introduction

This section describes the activities that would be undertaken in preparation for mining operations, namely, removal of vegetation and soil stripping and stockpiling operations.

5.5.2 Vegetation Clearing

Those sections of the Project Site that would be disturbed by the Project have largely been previously cleared and, as a result, vegetation that would be removed principally consists of grasses and scattered paddock trees. Limited areas of native vegetation would be disturbed. During vegetation clearing operations, larger vegetation would be removed using a bulldozer

with its blade positioned just above the surface. Ground cover vegetation would be removed with the topsoil to maximise the retention of the seed bank and nutrients within the soil, as well as to minimise opportunities for erosion and dust lift-off between removal of the larger vegetation and soil stripping.

Tree trunks would be stored for use during rehabilitation activities. Available seed would, wherever practicable, be harvested prior to clearing operations.

5.5.3 Soil Stripping

5.5.3.1 Introduction

Soil materials within those sections of the Project Site that would be disturbed by the Project have been assessed by Strategic Environmental and Engineering Consulting (SEEC). A full description of the soils assessment, including soil stripping depths and a soil inventory, will be provided in the *Environmental Assessment*. This sub-section provides an overview of the soil stripping procedures that would implemented during site preparation.

5.5.3.2 Soil Stripping Procedures

During soil stripping operations, the following procedures would be implemented.

- Strip soil material to the depths identified in the *Environmental Assessment*.
- Strip both topsoil and subsoil within the footprints of the proposed tailings storage facility, box cut and temporary waste rock emplacement.
- Strip topsoil only within the footprints of all other areas of disturbance.
- Ensure that soil materials are not stripped when in either an excessively dry or wet condition.
- Grade or push soil into windrows using graders or dozers for later collection by elevating scrapers or loading into trucks by front-end loaders to minimise compaction of soil materials.
- Use soil materials immediately in areas undergoing progressive rehabilitation, where practicable. Where this is not practicable, implement the following procedures.

  –Place soil transported by truck directly into storage.

  –Place soil transported by scrapers in thick “lifts” to minimise compaction.
- Minimise, as far as practicable, the operation of machinery on soil stockpiles to minimise compaction.
- Ensure that topsoil and subsoil stockpiles have a maximum height of 2m and 3m respectively.
- Leave the surface of the stockpile with an even but roughened surface to assist in erosion control and seed germination and emergence.

Establish an appropriate vegetative cover on all soil stockpiles to be retained for more than 3 months.

5.6 MINING OPERATIONS

5.6.1 Introduction

Project approval is sought for the extraction of ore and waste rock from within the proposed Dargues Reef Underground Gold Mine. This section provides an overview of the construction of the box cut and portal, underground development and stoping operations, stope backfilling, mining rate and sequence and mining equipment.

5.6.2 Construction of the Box Cut and Portal

5.6.2.1 Introduction

A box cut would be required to enable exposure of material with sufficient geotechnical competency to permit establishment of the portal. This section provides an overview of the construction of the box cut and portal establishment prior to commencement of underground development.

5.6.2.2 Layout of the Box Cut

Figure 5 presents an overview of the layout of the box cut. In summary, the box cut would be an elongate excavation that would permit access to the portal and decline via a haul road with an indicative gradient of approximately 1:7 (V:H). A detailed description of the design of the box cut once it has been finalised would be presented in the *Environmental Assessment*.

5.6.2.3 Construction of the Box Cut

The footprint of the box cut and any associated infrastructure would initially be marked on the ground to ensure that only the minimum area required is disturbed.

Once vegetation and soil material have been removed as described in Section 5.5 and surface water management structures have been constructed, the box cut would initially be excavated using conventional load and haul methods using an excavator or front-end-loader and haul trucks. Where required, a bulldozer may be used to rip material that cannot be extracted using an excavator or front-end loader.

Once extraction has progressed to a point where material cannot be extracted using an excavator, front-end loader or bulldozer, the material would be fragmented using drill and blast techniques. This would require drilling of holes using a hydraulic drill rig, loading of those holes with either pre-packaged or bulk explosives, boosters and detonators and fragmentation of the in situ material. Fragmented material would be removed using load and haul techniques described previously. All blasts would be designed and supervised by an appropriately qualified, licensed and experienced shot firer or blasting engineer. Additional details in relation to the blast parameters and the blast monitoring regime that would be implemented will be provided in the *Environmental Assessment*.

5.6.2.4 Formation of the Portal and Underground Infrastructure

Once the box cut has been excavated to the required dimensions and material of suitable competency has been exposed, the walls would be stabilised using a combination of rock bolts, cable bolts and shotcrete.

Once stabilised, the decline would be constructed using methods similar to those described in Section 5.6.3. Additional roof and wall support, however, may be required in the near surface sections of the decline. This may include rock bolts, cable bolts, shotcrete or steel arch structures.

Once the portal is established, infrastructure required for underground mining operations would be installed. This would indicatively include the following.

- Underground power, including a transformer to reduce the voltage of the distributed electricity to 1 000V, suitable for use underground.
- Ventilation, including one or more vent fans.
- Mine water supply to provide water for underground mining operations.
- A surface sump to allow water pumped from underground, as well as water collected within the box cut, to be removed.
- A tag board and associated surface safety equipment and infrastructure.

5.6.3 Underground Development

5.6.3.1 Introduction

Once the portal has been established and the required infrastructure installed, underground development may commence. Initially this would require development of the portal using a single heading. However, once portal development reaches the initial extraction level, development on multiple heading may be undertaken. This sub-section provides an overview of the proposed drill, blast, load and haul operations that would be undertaken, as well as the ventilation and emergency egress infrastructure that would be established.

5.6.3.2 Decline Design

The proposed decline and development would have the following indicative design parameters.

- Height and width – approximately 5.5m and 5.0m respectively.
- Gradient – approximately 1:7 (V:H).

5.6.3.3 Drill and Blast Operations

The decline and development headings would be developed using drilling and blast techniques. A jumbo, or underground drill rig, would drill a pattern of holes, the spacing and length of which would be determined by the blasting engineer or shot firer. Once drilling has been completed, these holes would be loaded with pre-packaged explosives, boosters and detonators and the in situ material fragmented.

Blasting would only be undertaken once the proposed mine has been evacuated, typically at meal breaks or shift change.

5.6.3.4 Load and Haul Operations

Fragmented material would be extracted using an underground loader. If required due to stability or safety issues, the loader may be remotely operated. The loader would be used to load underground haul trucks. Alternatively, the loader may be used to transport material to a loading bay for later reclamation.

Once loaded into haul trucks, fragmented material would be transported to the temporary waste rock emplacement on the surface (**Figure 5**) or used for stope for backfilling operations (see Section 5.9).

5.6.3.5 Ventilation and Emergency Egress

Once the portal is established, suitable ventilation would be required. Initially this would be provided using a ventilation fan located at the portal. Air would be pumped to the face of decline using air bags. Return air would flow back up the decline. As the decline progresses, the ventilation infrastructure would be advanced to ensure adequate ventilation in all sections of the advancing decline.

Once the decline has been advanced to the 650m AHD level, or approximately 35m below surface, a ventilation drive would be established. This would be an approximately 4.5m x 4.5m horizontal drive. Initially the ventilation drive would be driven into an existing shaft and the ventilation fan would be commissioned on top of the shaft. The ventilation fan would be used to extract exhaust air out of the mine. The main decline would be the principal are intake. The ventilation fan would have an indicative capacity of approximately 150m^3/second using a single intake and exhaust system.

Once the shaft has been commissioned for ventilation and the decline has progressed to approximately the 625m AHD level, additional 4.5m diameter, sub-vertical ventilation rises (vent rises) would constructed. These would be constructed using an up-hole-reaming construction method. This method would require a small pilot hole from the upper ventilation drive to the drive below. Progressively larger reaming heads would then be attached to drill string from below and the hole widened from the bottom up. Material removed during reaming operations would be permitted to fall to the base of the vent rise from where it would be removed using an underground loader. As development of the mine progresses, additional ventilation drives and rises would be constructed approximately every 25m vertically.

In addition, the vent rise and shaft would be fitted with appropriate emergency egress infrastructure, including ladder ways and platforms. Other mine services such as power and water may also be installed within the vent rise.

5.6.4 Underground Stoping Operations

5.6.4.1 Introduction

Underground mining of ore material would be undertaken using a sublevel open stoping mining method. **Figure 6** presents a schematic overview of this mining method and the following provides a brief description.

5.6.4.2 Stope Design

The Proponent proposes to extract ore material from a range of sub-vertical stopes or underground cavities. The detailed design of each stope would be determined following completion of additional drilling during development operations to better define the boundary between classes of material. However, each stope would be mined as a series of panels. A detailed description of the stope design will be provided in the *Environmental Assessment*.

It is noted that the stopes would be backfilled following completion of mining within each stope (see Section 5.6.5).

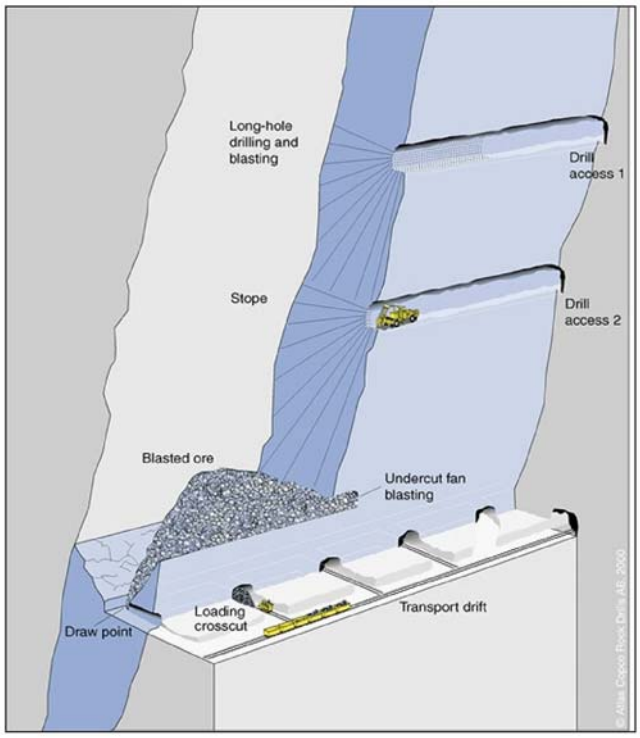


Figure 6
SCHEMATIC SUBLEVEL OPEN STOPING MINING METHOD

Source: Atlas Copco Rock Drills

5.6.4.3 Mining Operations

Sublevel open stoping recovers ore from elongate vertical stopes. Between stopes, pillars (vertical) and sills (horizontal) of unmined material are left to provide support and prevent ground collapse.

Figure 6 presents a schematic overview of the proposed mining method. In summary, a series of drill access levels are established. Drill holes are then drilled in a fan pattern from each drill access. The holes are loaded with explosives and the rock fragmented. The fragmented material is then extracted from a series of draw points at the base of each stope.

5.6.5 Stope Backfilling Operations

In order to ensure stability of sections of the proposed underground mine once mining operations have been completed in those sections, mined-out stopes would be backfilled using waste rock material sourced preferentially from concurrent underground development, with additional waste rock material transported from the temporary waste rock emplacement on the surface, if required.

This material would be transported to a drive in the vicinity of the top of the stope using an underground haul truck. The material would stockpiled in the drive and then pushed or tipped into the stope using an underground loader. During such operations, the loader may, where required, be operated remotely. Sections of some stopes would be cement stabilised.

5.6.6 Mining Rate

Table 4 presents the proposed mining rate for the life of the Project. In summary, the maximum mining rate would be approximately 500 000t per year, however, this production rate would vary depending on the number of stopes available at any one time. As a result, the mining rate would increase progressively as the mine is developed and would decrease towards the end of the life of the Project as stopes are completed.

Table 4
Indicative Mining Rate

Year	Ore (t)	Waste Rock (t)	Total (t)
1[1]	160 750	166 000	**326 750**
2	217 750	142 250	**360 000**
3	330 750	163 500	**494 250**
4	354 250	17 500	**371 750**
5	108 500	0	**108 500**
Total	**1 172 000**	**489 250**	**1 661 250**

Source: Cortona Resources Limited

5.6.7 Mining Equipment

Table 5 presents the indicative mobile mining equipment that would be required during the life of the Project. In addition, a number of light and heavy vehicles and ancillary equipment such as lighting plants will also be required

Table 5
Indicative Mining Equipment

Equipment Type	Indicative Maximum Number	Use	Proposed Hours of Operation
Underground Mining Equipment			
Long hole drill rig	2	Stope development	24 hours, 7 days
Jumbo	2	Drive and decline development	
Underground loader	2	Loading broken rock, backfilling stopes	
Underground Haul Truck[1]	2	Transporting fragmented rock	
Integrated tool carrier	1	Rock bolting, scaling, installing services	
Grader[1]	1	Maintaining drives and the decline	
Support and Surface Mining Equipment			
Bulldozer	1	Maintaining temporary waste rock emplacement, stockpile management	24 hours, 7 days
Front-end loader	1	ROM Pad management	

Note 1: This equipment would also operate on the surface
Source: Cortona Resources Limited

5.7 PROCESSING OPERATIONS

5.7.1 Introduction

Ore material would be processed within the processing plant. This sub-section provides a brief description of the layout of the processing plant, together with the ROM stockpiling, crushing and grinding, gravity and floatation operations.

5.7.2 Processing Plant Layout

Figure 5 presents the proposed layout of the processing plant area. In summary, the processing plant would comprise the following components.

- ROM pad.
- Crushing, screening and stockpile area.
- Processing plant area.
- Raw and process water dams and a settling dam.
- Workshops, hardstand areas, laboratory, ablutions and other ancillary infrastructure.

5.7.3 ROM Stockpiling, Crushing and Grinding Operations

Ore material would be transported to the ROM pad by haul trucks. This material would be stockpiled within the ROM pad according to the material's characteristics. A front-end loader would then be used to blend the material and deliver it to the ROM bin. Oversize material within the ROM pad would be broken on a campaign basis, as required, using a hydraulic rock breaker. Rock breaker campaigns are anticipated to be infrequent and limited in duration

Crushed material would be fed into one or more ball mills where the material would be reduced in size to a nominal 250µm.

5.7.4 Gravity and Floatation Circuit

Once ground, ore material would be mixed with water and passed through a gravity circuit which would be used to extract a portion of the gold from the ground ore material. This would be achieved through the use of a centrifugal gravity separation process.

Once passed through the gravity circuit, the less dense material would be passed through a series of floatation tanks where reagents would be mixed with the slurry and air forced through the mixture as fine bubbles. The grains of sulphide minerals, including the remaining gold, would preferentially adhere to the bubbles and would rise to the surface of the floatation tanks from where they would be removed and dried to form a sulphide concentrate. Tailings material would be managed as described in Section 5.8.

5.7.5 Reagent Management

All reagents used would be non-hazardous and would be stored in accordance with the manufacturer's instructions. Where required, this would include storage within a bunded storage area. Material Safety Data Sheets and appropriate spill management equipment would

be available in the vicinity of all reagent storage areas. A *Hydrocarbon, Chemical and Reagent Management Plan*, including emergency management procedures, would be developed and implemented throughout the life of the Project

5.8 TAILINGS MANAGEMENT

5.8.1 Introduction

Following completion of processing operations, ground ore material from which the gold and associated sulphides have been removed would be pumped to the tailings storage facility. This sub-section provides an overview of the proposed design of the tailings storage facility and the procedures that would be used during tailings placement to ensure appropriate densities and compaction are achieved within the facility.

5.8.2 Design and Construction of the Tailings Storage Facility

The proposed location and layout of the tailings storage facility is presented on **Figures 5** and **7**. The facility would be constructed in the upper section of an un-named valley to the east of the processing plant. The facility would comprise a single cell with a decant tower. In summary, the facility would be constructed in accordance with the requirements of the NSW Dams Safety Committee. The Proponent anticipates that the tailings storage facility would be a "prescribed" dam and would be listed in Schedule 1 of the *Dams Safety Act 1978*.

The following provides the indicative design criteria for the tailings storage facility.

- Maximum area of disturbance - approximately 9.3ha.
- Maximum embankment height – approximately 22m above the natural surface.
- Slope of outer face of the embankment – 1:3 (V:H).

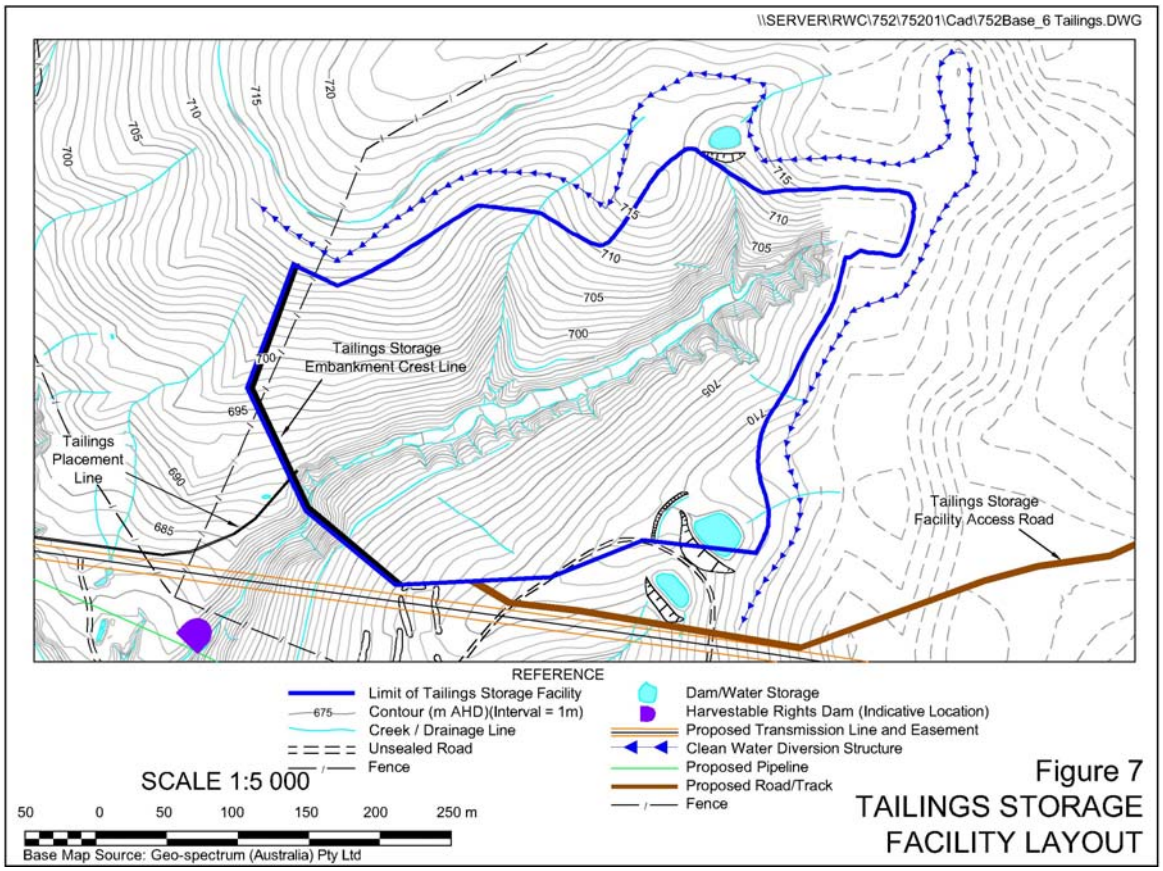
The floor and walls of the tailings storage facility, including the embankment, would be lined with either clay or an artificial liner to ensure a permeability of less than 1×10^{-9}m/s. In addition, a key trench and collection pond would be excavated to an appropriate depth down slope of the facility to ensure that any seepage from the facility is captured and pumped back to the facility. A series of monitoring piezometers would also be constructed to enable monitoring of shallow groundwater in the vicinity of the facility. Finally, clean water diversions would be constructed up slope of the facility to ensure that clean water did not flow onto the tailings storage area.

The tailings storage facility would be constructed in a series of lifts using waste rock from underground development, with the initial lift to be approximately 11m. Vegetation and soil resources would be removed from the area to be disturbed as described in Section 5.5 and used for rehabilitation of the facility or other sections of the Project Site.

5.8.3 Tailings Placement Procedures

Tailings material would be pumped from the processing plant and discharged to the tailings storage facility from a series of spigots or outlets around the circumference of the facility. The tailings material would settle out of the slurry and a proportion of the water would flow to the decant tower from where it would be pumped to the processing plant for reuse. This placement procedure would produce a tailings storage facility with an internally draining surface and allows the beach, or settled tailings material, to be kept moist by varying the tailings discharge

point, thereby minimising the potential for wind erosion of dust. This placement procedure also allows for an appropriate tailings density to be established, ensuring the ongoing stability of the tailings storage facility.



5.8.4 Tailings Volume

It is anticipated that during the life of the Project approximately 500 000m^3 of tailings material would be produced. The proposed tailings storage facility has a capacity to store approximately 600 000m^3 of material. As a result, the proposed facility would cater for all tailings material produced during the life of the Project.

5.9 WASTE ROCK MANAGEMENT

5.9.1 Introduction

During underground development operations, material that has insufficient gold to justify processing would be removed and placed either within the temporary waste rock emplacement (**Figure 5**) or used directly during stope backfilling operations or construction of site infrastructure. This sub-section provides an overview the design of the temporary waste rock emplacement and the procedures that would be implemented during placement operations. Details in relation to the characteristics of the waste rock material will be provided in the *Environmental Assessment*.

5.9.2 Temporary Waste Rock Emplacement Design

The temporary waste rock emplacement would have the following indicative design components.

- Area – approximately 1ha.
- Maximum elevation – approximately 25m higher than the existing surface.
- Batter slope – approximately 1:2 (V:H) or 30°.

5.9.3 Waste Rock Emplacement, Processing and Reclamation Procedures

Waste rock material placed within the temporary waste rock emplacement would initially be 'paddock dumped.' This material would then be levelled using a bulldozer to create a suitable level working area. Additional waste rock material would then be used to construct one or more ramps. Further waste rock material would then be 'face dumped' from the top of the ramp(s).

Where appropriate, waste rock material would be transported directly to other sections of the Project Site for use during infrastructure establishment, principally for construction of the tailings storage facility embankment. Placement procedures would be similar to those described previously.

In addition, waste rock material may be used during construction of other infrastructure during the life of the Project, including the site access road and other tracks and the proposed hardstand areas. In order to facilitate such uses, a mobile crushing plant, possibly including screening facilities, may be brought to site on a campaign basis to reduce the size of some of the waste rock material. The mobile crushing and screening plant would operate on a campaign basis and would be established within the footprint of the temporary waste rock emplacement. The plant would be located in a manner that would ensure the maximum possible screening of the plant from surrounding residences to ensure that impacts associated with the plant are minimised. Alternatively, waste rock material may be crushed using the proposed crushing circuit within the processing plant, once constructed.

Finally, waste rock material not use to establish surface infrastructure would be reclaimed and transported back underground using an excavator and / or front-end loader and underground haul trucks.

Once all waste rock has been removed, the footprint of the temporary waste rock emplacement would be rehabilitated as described in Section 5.16.

5.10 NON-PRODUCTION WASTE MANAGEMENT

Table 6 presents an estimate of the non-production wastes that would be generated during the life of the Project and briefly describes how they would be stored and subsequently removed from the Project Site.

Table 6
Non-Production Waste Management

Waste Type	Storage	Removal
General waste (including food scraps)	Covered bins located within lunch rooms, offices and elsewhere as required. Where these bins would be located in open areas, they would be fitted with animal-proof lids.	Collected on a regular basis by licensed waste contractor and transported to a licensed waste disposal facility.
Waste oils and greases	Placed within bunded tank(s) within the workshop area.	Collected on a regular basis by a licensed waste contractor and transported to an appropriately licensed facility.
Batteries and tyres	Batteries would be placed within a covered and marked used battery storage area until removed from site. Tyres would be placed within a marked used tyre storage area until removed from site or used for another purpose.	Batteries would be collected on a regular basis by a licensed disposal contractor and recycled. Tyres would be reused on site for construction of retaining walls, erosion protection, traffic control or would be removed from site for reuse elsewhere or recycling.
Scrap Steel/Metal	Stored in a specified areas within the workshop area or elsewhere as required.	Collected on a regular basis by a scrap metal recycler.
General Recyclables	Covered bins located within lunch rooms, offices and elsewhere as required. Where these bins are located outside a closed building they would be fitted with animal-proof lids.	Collected on a regular basis by a licensed recycling contractor and transported to an appropriate recycling facility.
Waste water	Waste water from ablutions facilities would be treated within one or more 'biocycle' treatment facility and the treated water used for irrigation of garden areas or areas undergoing rehabilitation within the Project Site.	

5.11 TRANSPORTATION

5.11.1 Introduction

This sub-section describes the Project-related transportation activities within and surrounding the Project Site.

5.11.2 Project Site Transportation

5.11.2.1 Internal Road Network

A range of internal haul roads and other roads would be constructed during and following site establishment. These would include the following (**Figure 5**).

- A site access road (see Section 5.4.2).
- A haul road from the box cut to the ROM Pad.
- Various unsealed access tracks.

The haul road from the box cut to the ROM Pad would be an unsealed road and would cater for both light and heavy vehicles. Other roads and tracks within the Project Site would be constructed to a standard suitable for their intended use and would be unsealed.

The internal haul roads would be designed, constructed and/or maintained in accordance with the following parameters.

- The width would be a minimum of three times the width of the largest vehicle likely to travel the road, where appropriate.
- A safety bund, a minimum of half the wheel height of the largest vehicle likely to travel the road, if required, would be positioned on the downslope side of the haul roads where the haul road is located adjacent to, or traverse, steep slopes.
- In order to maintain all weather access, the surfaces would be sheeted with suitable materials.
- The roads would be routinely maintained and watered to suppress the generation of dust.
- All haul roads would be constructed to avoid excessive erosion during rain events. Surface runoff from these haul roads would be contained as part of the overall dirty water management system.
- Appropriate roadside drainage would be installed adjacent to all roads in accordance with the requirements of *Managing Urban Stormwater – Volume 2C Unsealed Roads* published by the then Department of Environment and Climate Change in January 2008.

5.11.3 External Transportation

5.11.3.1 External Road Network

The Proponent anticipates that there would be two principal transportation routes to access the Project Site as follows (**Figure 2**).

- From the north or east via Araluen Road and Majors Creek Road.
- From the south via Majors Creek Road.

It is noted that limited numbers of vehicles may approach the site from the east via Araluen Road, Monga Lane and Majors Creek Road. However, the Proponent anticipates that the number of vehicles that would use this route would be very limited. No Project-related heavy vehicles would use this route.

5.11.3.2 Traffic Types

Traffic types associated with the Project would include the following.

- Light vehicles – including passenger vehicles and light trucks and buses.
- Heavy vehicles – including rigid trucks, and semi-trailers delivering consumables and supplies.

- Oversize and overweight vehicles – delivering components of the processing plant and mobile fleet. The Proponent would ensure that all oversize and overweight vehicles would have the appropriate permits and approvals and would be appropriately escorted, when required.

5.12 FACILITIES AND SERVICES

5.12.1 Facilities

5.12.1.1 Introduction

The Proponent would establish the following facilities within the Project Site to support the proposed mining and processing operations. This sub-section describes each of these components.

- An office area and car park.
- Mining contractor's offices.
- A workshop area.
- A drill core storage and processing facility.
- A concentrate storage area.
- An explosives storage area.

5.12.1.2 Office Area and Car Park

An office area and carpark would be constructed during the construction phase of the Project and would comprise the following components (**Figure 5)**.

- A series of demountable buildings that would comprise the Proponent's site office, ablution facilities, first aid room, security and meeting rooms.
- An unsealed car park.

5.12.1.3 Mining Contractor's Offices

A contractor's office area would be constructed for the mining contractor to the south of the proposed ROM Pad and would comprise the following components (**Figure 5)**.

- A series of demountable buildings that would comprise the mining contractor's site office, ablution facilities, first aid room, security and meeting rooms.
- An unsealed car park.

5.12.1.4 Workshop Area

The Proponent would establish a workshop area to the south of the ROM Pad comprising the following components.

- One or more workshop buildings, including a concrete sealed floor and vehicle inspection bays. A small bund or containment structure around the perimeter of the building would contain potentially contaminated runoff and an oil/water separator would be incorporated in the drainage plan.

- A stores facility.
- A vehicle wash down bay,
- A hardstand area comprising an unsealed area for storage of excess equipment awaiting use or removal from site, or parking of mobile equipment.
- A fuel bay and refuelling area incorporating a covered concrete bunded storage area containing fuel tanks, unused oil and grease, waste oil tank and a concrete sealed refuelling area. All potentially contaminated surface water runoff would be directed to an oil/water separator.

5.12.1.5 Drill Core Storage and Processing Facility

The Proponent would construct a drill core storage and processing facility to the south of the proposed mining contractor's offices (**Figure 5**) comprising the following components.

- A hardstand core storage area, possibly with core storage racks.
- An unsealed hardstand layout area to allow logging of drill core.
- A core processing facility comprising a small enclosed area with one or more core saws.

5.12.1.6 Concentrate Storage Area

The Proponent would construct a concentrate storage area adjacent to the processing plant (**Figure 5**) comprising the following components.

- A concrete sealed storage area.
- Surface water controls to ensure no concentrate loss during rainfall events.

5.12.1.7 Explosives Storage Area

The Proponent would construct an explosives storage area adjacent to site access road (**Figure 5**). The explosives magazines would be transportable structures and would comply with all required standards and guidelines.

It is noted that safety and security issues associated with the proposed explosives storage area are discussed in Section 5.15.2.

5.12.2 Services

5.12.2.1 Electricity Supply

Construction of the proposed electricity transmission line, substations and transformers is described in Section 5.4.4. This sub-section describes the services that would be required to distribute power within the Project Site.

Power for the processing plant and the various buildings within the Project Site would be provided by a distribution system from the proposed substation described in Section 5.4.4. The distribution network would be partially above ground and partially buried. Additional details in relation to the distribution network will be provided in the *Environmental Assessment*.

Power for underground dewatering pumps, ventilation fans and communication would be provided by an underground distribution system that would be managed by an appropriately qualified, licensed and experienced electrical engineer.

Power for pumps and other infrastructure not located within the main processing plant / office area may be provided by either overhead powerlines or by diesel generators.

If haul trucks are required to pass beneath any overhead powerlines, the powerlines would be elevated to a height where the haul trucks may pass safely beneath them.

5.12.2.2 Communications

The Proponent's office, processing plant, underground mine and mining contractor's office would be serviced by telephone and data lines. In addition, communications within the remainder of the Project Site would be via two-way radio and/or mobile phone.

5.12.2.3 Hydrocarbons

All diesel fuel for the mobile equipment would be stored in tanks with a total indicative capacity of 50 000L in the vicinity of the workshop area (**Figure 5**). These tanks would be either self bunded or located within a bunded fuel bay. Bunding, if required, would be sized to meet the relevant containment requirements and Australian Standard AS 1940:2004.

A sealed refuelling area would be located adjacent to the fuel bay with all drainage directed to an oil/water separator. All haul trucks and other mobile equipment that would regularly access the surface would utilise the refuelling area while the jumbos, underground loaders, pumps and other less mobile equipment would be refuelled at their work site using a mobile fuel tanker or tray-mounted fuel tanks.

Any bulk oils, greases and waste oils would be stored within a similarly bunded area.

5.12.2.4 Potable Water

Potable water would be transported to site as required. Water for ablutions purposes would be sourced from the harvestable rights dams.

5.12.2.5 Operational Water

Operational water requirements, namely water for processing, dust suppression and underground mining operations and workshop wash down purposes, are estimated to be up to approximately 280ML per year. It is anticipated that approximately 100ML of water would be able to be reclaimed from the proposed tailings storage facility. As a result, an estimated approximately 180ML of makeup water per year would be required. This water would be obtained from the following sources.

- The Proponent's harvestable right under Section 53 of the EP&A Act. The infrastructure required for harvesting this water is described briefly in Section 5.4.3 and additional details would be provided in the *Environmental Assessment*. Approval to construct the required dams and harvest water is not being sought. However, approval to construct the reticulation system to distribute water from the dams will be required
- Groundwater from existing workings in the southern and eastern sections of the Project Site. A licence would be required for extraction of this water and groundwater investigations are ongoing.

Additional information in relation to the provision of operational water, including a detailed description of the harvestable rights dams, water reticulation system, groundwater extraction and a detailed water balance and impact assessment will be provided in the *Environmental Assessment*.

5.13 PROJECT LIFE AND HOURS OF OPERATION

5.13.1 Project Life

The Proponent anticipates that mining operations would require approximately five years to complete. However, in the event that the proposed rate of mining is lower than anticipated or more ore material is identified, additional time may be required. In addition, following completion of mining operations, site decommissioning and rehabilitation operations may take up to two years. As a result, the proposed Project life would be nine years.

The Proponent, however, notes that throughout the life of the mine, the Company plans to explore for possible extensions to the known mineralisation and for new areas of mineralisation within its mining tenements. Further ore reserves indicated by this program may extend the Project life. Separate applications for approval to extract that material would be made at that time.

5.13.2 Hours of Operation

Table 7 presents the proposed hours of operation for each of the relevant components of the Project.

Table 7
Proposed Hours of Operation

Activity	Proposed Days of Operation	Proposed Hours of Operation[1]
Vegetation clearing and topsoil stripping	7 days a week, during each campaign	Daylight hours
Construction operations – Box cut	7 days a week	Daylight hours
Construction operations – Remainder	7 days a week	24 hours per day
Underground mining operations	7 days a week	24 hours per day
Maintenance operations	7 days a week	24 hours per day
Processing operations	7 days a week	24 hours per day
Rehabilitation operations	7 days a week	7:00am to 10.00pm

Source: Cortona Resources Limited

5.14 EMPLOYMENT, CAPITAL COST AND ECONOMIC CONTRIBUTIONS

Additional information in relation to the employment, capital cost and economic contributions of the Project would be provided in the *Environmental Assessment*. However, in summary the Project would contribute the following to the surrounding communities.

- Approximately 60 full-time equivalent positions during the operational phase of the Project.
- The capital cost of the Project is anticipated to be approximately $42 million.

- The Project would contribute between approximately $9 million to $30 million per year to the local, regional and national economies through wages, purchases of goods and services and taxes and royalties. Of this, up to approximately $9 million would be wages to employees and contractors.

5.15 SAFETY AND SECURITY

5.15.1 Public and Employee Safety

The Proponent recognises that the proximity of the Project Site to the village of Majors Creek and Majors Creek Road would necessitate the implementation of procedures and controls to protect the safety of the public. In addition, measures would be implemented to ensure the safety of visitors to the Project Site, contractors and employees as well as ensuring the security of facilities and equipment from unauthorised access.

It is the Proponent's policy that each person employed on, or visiting the Project Site would be provided with a safe and healthy working environment. In order to achieve this, the Proponent would implement a recruitment, induction and training program to achieve the following objectives.

- To ensure compliance with statutory regulations and maintain constant awareness of new and changing regulations.
- To eliminate or control safety and health hazards in the working environment in order to achieve the highest possible standards for occupational safety in the mining industry.
- To ensure the suitability of prospective employees through a structured recruitment procedure.
- To provide relevant occupational health and safety information and training to all personnel.
- To develop and constantly review safe working practices and job training.
- To conduct regular safety meetings and provide an open forum for input from all employees.
- To provide effective emergency arrangements for all employees, visitors and general public protection.
- To maintain good morale and safety awareness through regular employee assessment and counselling.
- To ensure all contractors adopt and maintain Proponent's policy objectives and safety standards at all times.

Central to all aspects of site public and employee safety would be the following.

- The adoption of a pro-active approach to employee and public safety.
- Strict compliance at all times with the requirements of the following.

  –*Mine Health and Safety Act 2004.*

– *Mine Health and Safety Regulation 2007.*

– *General Rule 2000.*

– *Occupational Health and Safety Act 2000.*

– *Occupational Health and Safety Regulation 2001*

– *Occupational Health and Safety (Dangerous Goods) Act 2003.*

– *Explosives Act 2003.*

– *Explosives Regulation 2005.*

– *Dams Safety Act 1978.*

– *All other relevant legislation and Australian Standards.*

- An *Occupational Health and Safety Policy* to cover all component activities at the mine.

Specifically, the following safety and security measures would be implemented.

- A Mine Safety Management Plan, including a Contractor Safety Management Plan, would be prepared in accordance with the requirements of the Mines Health and Safety Act 2004.
- The existing fence around the Project Site would be maintained and signage erected to prevent inadvertent assess to the Project Site. In addition, additional fences would be erected around the operational sections of the Project Site as required.
- A safety bund approximately 2m high would be constructed around the perimeter of the box cut. This bund would remain in place following completion of mining-related activities.
- An automated gate operated by swipe card would be installed in the vicinity of the office area. This would be the only vehicular access point to the operational sections of the Project Site. This system would record the individuals who enter and leave the operational section of the Project Site and would restrict access to those who do not have the appropriate approvals. All other non-Project related vehicles would be required to report to the site office before being permitted to enter the operational sections of the Project Site.
- Security/warning signs would be positioned at strategic locations around or within the Project Site indicating the presence of earthmoving and mining equipment, deep excavations and steep slopes. The positioning of signs would depend on the location of the mining activities at any one time.
- Signs identifying blasting procedures and times would also be installed adjacent to the approached to the Box Cut.
- Employee and contractor inductions would include safe working practices and regular follow-up safety meetings and reviews.

- Toolbox meetings would be held regularly and would include a review of safety-related matters.
- Regular drug and alcohol testing would be undertaken in accordance with the Proponent's Drug and Alcohol Policy.
- Where internal roads are adjacent to steep slopes, windrows along the down slope margins of those haul roads would be constructed to a minimum of half the wheel height of the largest item of mobile equipment onsite.
- Appropriate controls with respect to the use of explosives such as an *Explosives Safety and Security Plan* for storage and handling of explosives would be implemented to ensure compliance with statutory requirements at all times.
- The blasting engineer or shotfirer would use appropriate blasting procedures to contain all fly rock within the design blast envelope and minimise the generation of excessive ground and air vibrations.
- All earthmoving equipment would fitted with appropriate safety equipment in accordance with the *Guideline for Mobile and Transportable Equipment for Use in Mines* (MDG 15) published by the Department of Primary Industries – Mineral Resources.

5.15.2 Explosive Storage

Detonators, boosters and packaged explosives would be stored within magazines within the explosives storage area (**Figure 5**). This area would be secured by a 1.8m high security fence topped with barbed wire and a lockable gate. In addition, the explosives storage area would be the subject of regular inspection by security personnel working for or contracted to the Proponent. The magazines would be likely to be transportable structures, which would be constructed, secured, maintained and permitted in accordance with the relevant guidelines. Bulk explosives, if required would be transported to the Project Site on the day of the blast.

5.16 SITE REHABILITATION AND DECOMMISSIONING

5.16.1 Introduction

The Proponent would adopt a progressive approach to the rehabilitation of disturbed areas within the Project Site to ensure that, where practicable, areas where mining or waste rock removal are completed are quickly shaped and vegetated to provide a stable landform. The progressive formation of the post-mining landform and the establishment of a vegetative cover would also minimise the potential Project-related visual amenity and air quality impacts.

The following sub-sections describe the Proponent's rehabilitation objectives and the proposed final landform on completion of all proposed mining and associated disturbance. The procedures to be applied to each component of the mine, the water management structures and other areas of disturbance associated with the mining activities are also outlined. Refinements to these procedures, if required, would be undertaken on the basis of operational experience gained by the Proponent, or by others at similar operations. These refinements would be reported in the relevant Annual Environmental Management Report (AEMR) and/or any

amended Mining Operations Plans (MOPs) produced by the Proponent throughout the life of the Project.

5.16.2 Rehabilitation Objectives

The Proponent's rehabilitation objectives for all areas of mine-related disturbance within the Project Site can be defined in the short term and long term as follows.

Short Term Objectives

- Stabilise all disturbed areas no longer required for Project-related activities. This would help minimise erosion and dust generation, as well as reducing the visual impact of the proposed operation upon surrounding residents. This would be achieved through progressive reshaping, spreading of topsoil and seeding of the amenity bunds and waste rock emplacements and other areas of disturbance.
- Reduce the visual impact upon surrounding residents by early establishment of vegetation in areas where mining-related operations have been completed or in other areas of the Project Site.

Long Term Objectives

- Provide a low maintenance, geotechnically stable and safe landform which blends with surrounding landforms and provides land suitable for the final land use of nature conservation, agriculture or light industry.

5.16.3 Final Landform and Land Use

The final landform and land use has yet to be determined and additional information will be provided in the *Environmental Assessment*. In summary, however, the final landform would include the following components.

- A bunded and fenced box cut with the portal permanently sealed in a manner that it may be reopened in the event that mining operations re-commence in the future.
- An appropriately sealed ventilation rise.
- An appropriately shaped and covered, free draining tailings storage facility with appropriate surface water management structures and side slopes of approximately 1:3 (V:H).
- A shaped, covered and vegetated processing plant and office area with all infrastructure removed. Alternatively, sections of this area may remain unrehabilitated for use for light industry, subject to granting of further development/project approval.

The harvestable right dams, electricity transmission line and site access road would remain following completion of the Project.

Final land uses would be determined in consultation with surrounding residents and the relevant government agencies. It is likely, however, that sections of the Project Site would be revegetated and used for nature conservation or agriculture or remain unrehabilitated for use for light industry. In particular, it is noted that the processing plant and office areas may be suitable for a number of industrial uses, particularly taking into account the fact that power,

water and site access will be in place. However, it is further noted that no development approval exists for such uses and amendments may be required to the Tallaganda LEP or subsequent documents to permit such uses.

5.16.4 Decommissioning of Infrastructure and Services

Following completion of mining-related operations, and assuming that no further mining operations are proposed, the Proponent would remove infrastructure and services specifically established to service the mining operation that would no longer be required. This would include the processing plant and associated infrastructure. Other items of infrastructure would remain provided that a subsequent use can be identified. Indicatively, this would include the following.

- Water reticulation system.
- Electricity transmission line, substation and transformer.
- Site buildings, including the office and workshops.
- Site access road.

All concrete footings and foundations of buildings or structures to be dismantled or demolished, if any, would be broken up and removed and all areas to be rehabilitated would be re-profiled to near pre-mining levels. Previously stockpiled soil material would be re-spread over all areas to be rehabilitated and the areas would be revegetated.

5.16.5 Box Cut, Portal and Ventilation Rise

The box cut, portal and ventilation rise would remain following completion of the Project. A bund and security fence would be constructed around the box cut during the life of the Project and these would be extended to prevent inadvertent access once mining operations have been completed. In addition, the portal would be sealed in accordance with the relevant guidelines applicable at the time. The method of sealing would permit re-opening of the portal if required.

The ventilation rise would similarly be fenced during the life of the Project. Once decommissioned, the rise would be sealed accordance with the relevant guidelines applicable at the time.

5.16.6 Tailings Storage Facility

The tailings storage facility would, following completion of mining-related operations, be allowed to dry out and settle. Once complete, the facility would be shaped to form a free draining landform, capped with suitable material, revegetated and appropriate surface water control structures installed. Additional details in relation to the design of the final landform for the rehabilitated tailings storage facility would be included in the *Environmental Assessment*.

5.16.7 Other Areas of Disturbance

On completion of all mining-related and associated activities, the Proponent would:

- remove and rip all remaining internal roads tracks, with the exception of the site access road, spread subsoil and revegetate;

- remove buildings and rip or scrape the compacted floor of hardstand areas not required for subsequent land uses, spread subsoil and topsoil and revegetate; and
- install appropriate drainage controls.

5.16.8 Rehabilitation Management and Monitoring

The Proponent's commitment to effective rehabilitation would involve an ongoing monitoring and maintenance program following completion of mining-related operations. Areas being rehabilitated would be regularly inspected and the following would be noted.

- Evidence of any erosion or sedimentation from areas with establishing vegetation cover.
- Success of initial cover crop or grass cover establishment.
- Success of tree and shrub plantings.
- Natural regeneration of native species.
- Adequacy of drainage controls.
- General stability of the rehabilitated areas.

Post-mining rehabilitation remediation and enhancement activities would include but not be limited to the following.

- Where rehabilitation success appears limited, maintenance activities would be initiated. These may include re-seeding and where necessary, re-topsoiling and/or the application of specialised treatments.
- If drainage controls are found to be inadequate for their intended purpose, or compromised by wildlife or native vegetation, these would be replaced.
- Temporary fences would be installed to exclude native fauna, if grazing appears to be excessive.
- In the event areas of excessive erosion and sedimentation are identified, remedial works such as importation of additional fill, subsoil or topsoil material, or redesigning of water management structures would be undertaken.
- Appropriate noxious weed control or eradication methods and programs would be undertaken in consultation with DPI-Agriculture and / or the local Noxious Weeds Inspector.

No time limit has been placed on post-mining rehabilitation monitoring and maintenance. Rather, maintenance would continue until such time as the objectives outlined in Section 5.16.2 are achieved to the satisfaction of the relevant government agencies.

6. ENVIRONMENTAL SETTING AND CONSTRAINTS

6.1 BACKGROUND

6.1.1 Introduction

The descriptions of various environmental aspects of the Project throughout this section are reliant upon a range of background information common to many of the key environmental issues. In this sub-section, background information is provided on the topography, climate, land uses surrounding the Project Site. Additional information in relation to landownership, residences and the community will be provided in the *Environmental Assessment*.

6.1.2 Topography and Drainage

The Project is located in an area of undulating hills between two arms of the Great Dividing Range (**Figure 8**). Approximately 10km to the west of the Project Site are areas of elevated hills and steeply incised valleys and gullies. The highest point in this area is an unnamed hill located approximately 17km to the west of the Project Site with a maximum elevation of 1 346m AHD.

Approximately 11km to the east of the Project Site is an area of elevated hills and incised valleys. The highest point in this area, with an elevation of approximately 965m AHD, is Monga Mountain, located approximately 20km to the northeast of the Project Site. To the east of this line of hills is a steep escarpment with average slopes of approximately 1:1 (V:H) which links the coastal areas in the east with the more elevated areas to the east of the Project Site.

Approximately 2km to the south of the Project Site is an area of steeply incised valleys. The principal valley to the south of the Project Site is the Araluen Valley, the head of which occurs in the southern section of the Exploration Licence 6003. Average slopes in this area are approximately 1:3 (V:H) to 1:5 (V:H).

To the north of the Project Site the topography is dominated by undulating hills with elevations between approximately 600m AHD and 750m AHD, with occasional steep sided hills (**Figure 8**). The highest point in this area is Mount Gillamatong, located approximately 9km to the north of the Project Site, with a maximum elevation of 907m AHD. Slopes are typically less than 1:10 (V:H), with some more steeply sloped areas having slopes of up to approximately 1:5 (V:H).

Drainage to the north, east and west of the Project Site is dominated by the Shoalhaven River and its tributaries (**Figure 8**). The Shoalhaven River generally flows to the north-northeast and is part of the area administered by the Sydney Catchment Management Authority.

With the exception of the northeastern section of the Project Site, the entire Project Site is within the Araluen Catchment. Majors Creek, a tributary of the Araluen River, flows from the gently undulating areas around the village of Majors Creek to the head of the steeply incised Araluen Valley.

Within the northern section of the Project Site, drainage is dominated by Spring Creek and its tributaries (**Figure 8**). The upper section of the Spring Creek is fed by a small spring. The tributaries of Spring Creek do not appear to be spring fed.

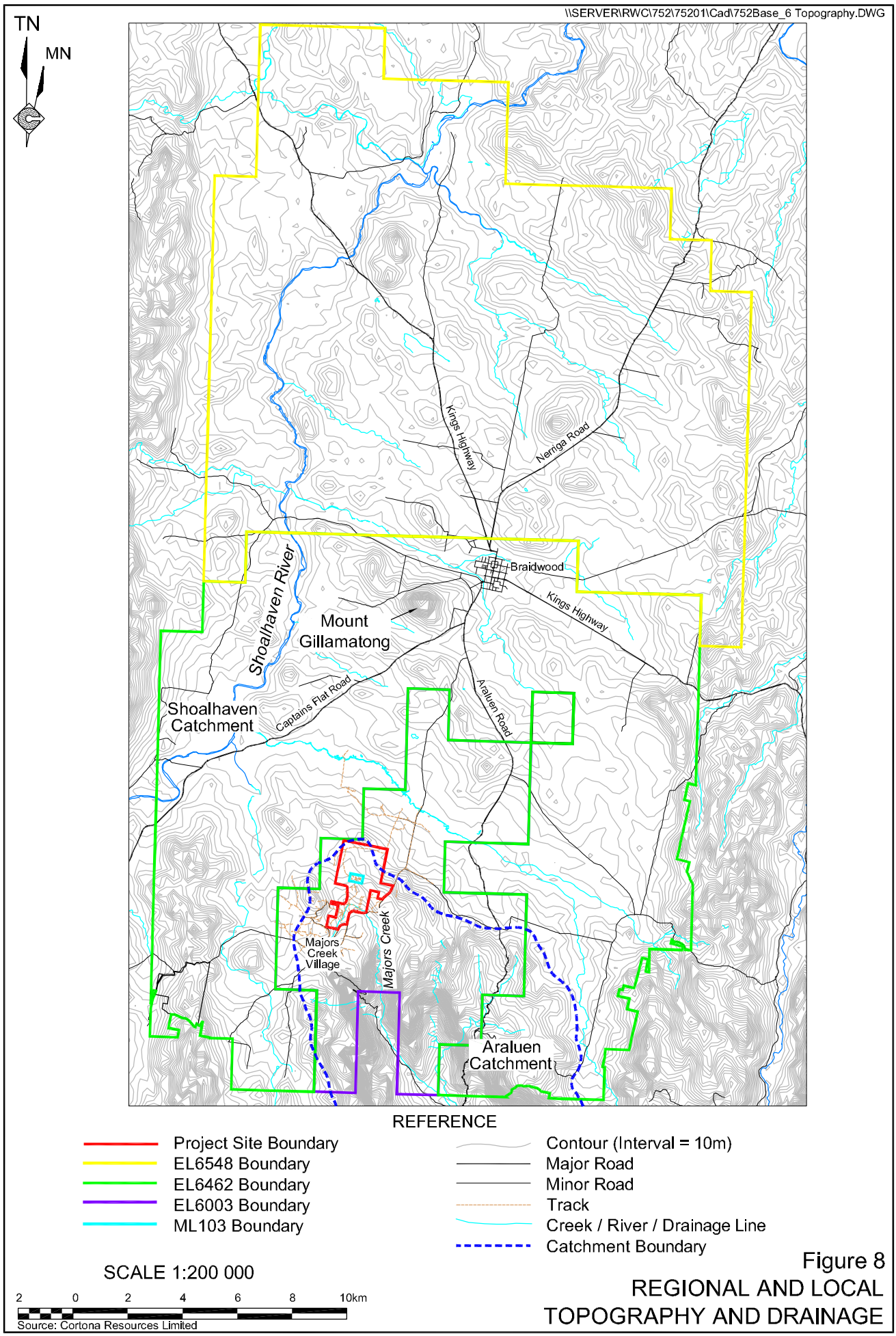


Figure 8
REGIONAL AND LOCAL TOPOGRAPHY AND DRAINAGE

6.1.3 Climate

6.1.3.1 Introduction

Meteorological data from the following Bureau of Meteorology-operated stations is presented in **Table 8.** These stations are located approximately 12km to the north-northeast of the Project Site.

- Braidwood – Wallace Street Station - 1907 to 1975.
- Braidwood Racecourse Station - 1985 to 2007.

Data from these stations has been combined for the period 1907 to 2007.

Table 8
Climate Data

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Temperature (C°)													
Mean maximum temperature	26.0	25.4	23.0	19.1	15.2	12.0	11.4	13.2	16.4	19.4	22.0	25.0	
Mean minimum temperature	10.9	11.1	9.3	5.9	2.6	0.7	-0.2	0.8	2.7	5.4	7.6	9.6	
Rainfall (mm)													
Mean rainfall	70.3	65.6	69	56.4	58	66.5	47.2	47.4	48.8	62.7	62.9	64	718.8
Highest rainfall	261.9	323.6	339.6	249.4	663.9	517.1	344.6	250.8	145.6	357.2	216.4	277.7	1341.7
Lowest rainfall	0.8	0.0	0.3	0.0	1.2	0.5	0.0	0.6	4.1	2.0	1.3	0.0	340.0
Highest daily rainfall	104.6	175.0	160.4	118.0	199.9	113.3	101.9	89.6	154.9	106.7	86.9	106.7	
Note Temperature data from 1907 to 1975 sourced at Braidwood – Wallace Street. Temperature data from 1985 to 2007 has been sourced from the Braidwood Racecourse Station. Combined data has been used to calculate mean, maximum and minimum temperatures for the period 1907 to 2007.													
Source: Bureau of Meteorology – Braidwood – Wallace Street (Station number: 069010).													

6.1.3.2 Temperature and Humidity

January is the hottest month, with a maximum average temperature of 26.0°C. July is the coldest month with an average maximum temperature of 11.4°C and an average minimum temperature of -0.2°C.

6.1.3.3 Rainfall and Evaporation

Annual average rainfall is 718.8mm, with rainfall distributed reasonably evenly through the year, with between 47mm and 70mm falling on average each month. The driest year on record is 1982 when 340mm of rain was recorded. By contrast, the wettest year on record is 1974 when 1 341mm of rain was recorded. The maximum daily rainfall recorded is 200mm which was recorded on 27 April 1925.

6.1.3.4 Wind and Atmospheric Stability

Additional information in relation to the wind environment and atmospheric stability will be provided in the *Environmental Assessment*

6.1.4 Surrounding Land Use

Land uses surrounding the Project include the following (**Figure 9**).

- Agriculture – principally grazing of sheep and cattle, with some areas of cropping. Agricultural activities are principally undertaken in cleared areas on undulating hills.
- Nature conservation and forestry – these land uses are principally restricted to areas of steep slopes and areas unsuitable for other land uses.
- Residential and rural residential – Majors Creek and surrounding areas include areas of rural residential and residential land use.

6.2 SURFACE WATER

Catchments within and surrounding the Project Site are described in Section 6.1.2. In summary, the majority of the Project Site occurs within the Araluen Catchment, with a small section of the Project Site within the Shoalhaven Catchment. It is noted that the only activities proposed for the section of the Project Site within the Shoalhaven Catchment is construction and use of the site access road.

The surface water assessment for the Project has commenced and is being undertaken by SEEC. The *Environmental Assessment* will include a full description of the surface water environment, including a description of the harvestable right dams, a detailed water balance and an assessment of the surface-water related impacts of the Project.

6.3 GROUNDWATER

Limited groundwater has been encountered during drilling operations in the vicinity of Dargues Reef. As a result, the principal aquifer within the Braidwood Granodiorite is interpreted to be a fracture controlled aquifer with limited permeability and porosity. In addition, groundwater is likely to be associated with alluvial deposits adjacent to Majors Creek and other creeks in the vicinity of the Project Site, as well as at the interface between weathered and unweathered granodiorite. It is this later aquifer system that is interpreted to be the source of water in the spring in Spring Creek.

The groundwater assessment for the Project has commenced and is being undertaken by Australasian Groundwater & Environmental Consultants Pty Ltd, with a drilling program proposed to be completed in March 2010. The *Environmental Assessment* will include a full description of the groundwater environment surrounding the Project Site, including a description of each of the aquifers identified, as well as an assessment of the impacts of the proposed dewatering operations for the underground mine and groundwater extraction operation within historic workings within the Project Site. It is anticipated that spreadsheet modelling of the groundwater resource will be undertaken to identify potential groundwater impacts.

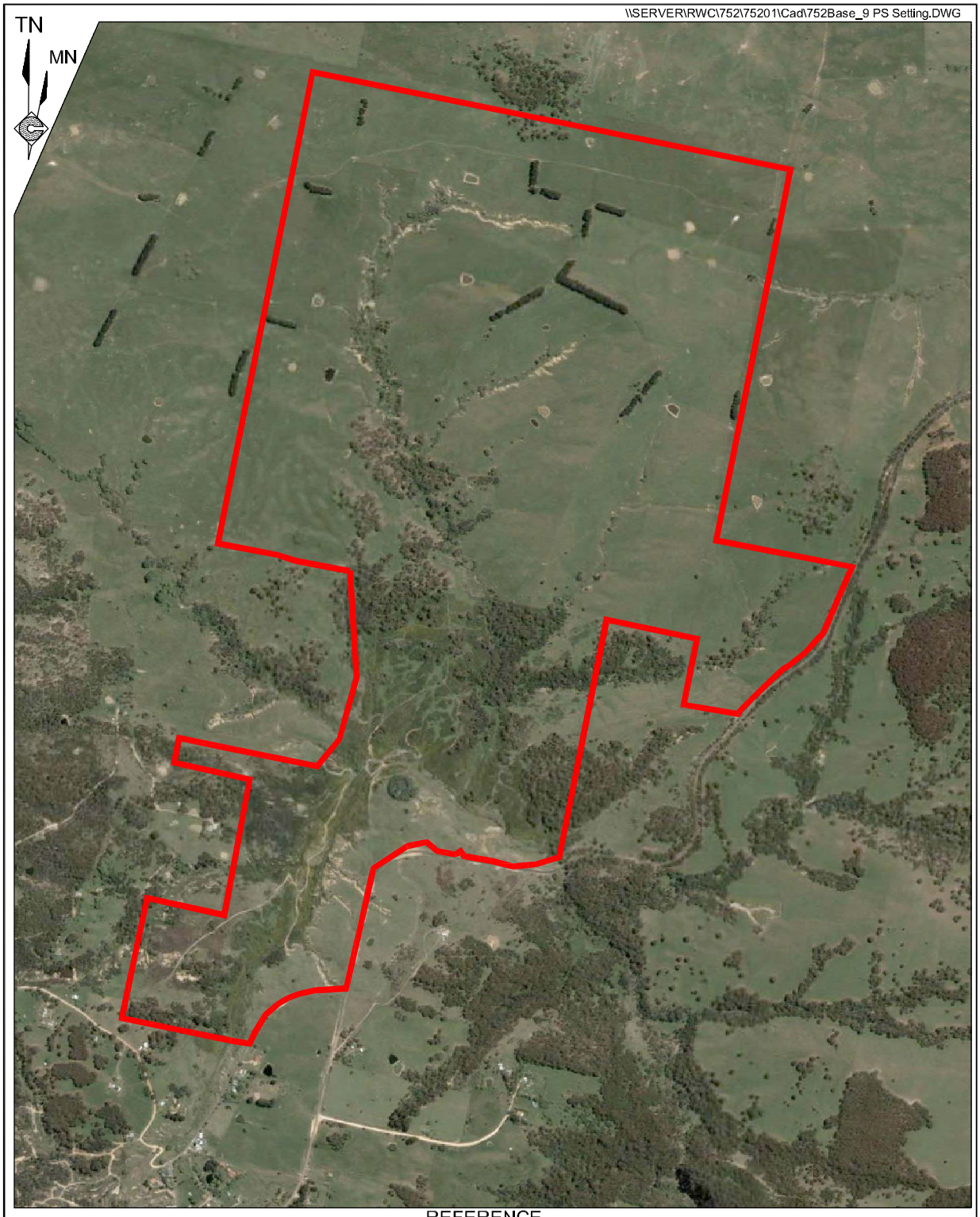


Figure 9
PROJECT SITE SETTING

6.4 ECOLOGY

6.4.1 Introduction

A preliminary ecology assessment has been prepared by Mr Garry Daly and Mr Greg Stone of Gaia Research Pty Ltd. This sub-section presents a description of the vegetation communities and threatened species observed or likely to occur within the Project Site. It is noted that additional ecology surveys have and will be undertaken and the results of those surveys will be included in the *Environmental Assessment*.

6.4.2 Vegetation Communities

The following vegetation communities have been identified within and surrounding the Project Site. No Endangered Ecological Communities have been identified to date within the Project Site.

Southern Tablelands Flats Forest

The remnants of the Southern Tablelands Flats Forest within and surrounding the Project Site comprise communities of open Eucalypt forest with a sparse shrub layer and continuous grassy groundcover. The overstory is dominated by Manna Gum and Narrow-leaved Peppermint with occasional Snow Gum. The Southern Tablelands Flats Forest has been extensively cleared and is listed as an over-cleared vegetation type.

Cool Montane Wet Forest

Small, disjunct remnants of Montane Wet Forest dominated by Brown Barrel, Manna Gum and Narrow-leaved Peppermint are present to the south of the Project Site. The Cool Montane Wet Forest is not classified as an over-cleared vegetation type within the Southern Rivers catchment.

Dry Sclerophyll Forest

Areas of Dry Sclerophyll Forest community are also present in the southern section of the Project Site. The community consists of an overstory dominated by various associations of Narrow-leaved Peppermint, River Peppermint, Candlebark, Manna Gum and Swamp Gum. Many previously cleared sites currently support stands of Late Black Wattle, indicating that native communities may be regenerating. The Dry Sclerophyll Forest does not have an affinity with any vegetation type listed as over-cleared within the Southern Rivers catchment.

Modified / Disturbed Land

Modified or disturbed land within and surrounding the Project Site includes grazing land, land this is highly degraded as a consequence of past mining activities, rural residential land, improved pasture and highly-cleared native vegetation communities.

6.4.3 Threatened Species

A search of the NSW National Parks and Wildlife Service flora database and the NSW Wildlife Atlas was undertaken on 18 November 2007. This search will be updated and the results presented in the *Environmental Assessment* in subsequent reports. The following were identified within 5km or the Survey Area.

- One threatened flora species, namely *Eucalyptus kartzoffiana* (Araluen Gum) listed under both the NSW *Threatened Species Conservation Act 1995* and the

Commonwealth *Environment Protection and Biodiversity Act 1999*. Araluen Gum grows near rivers, in grassy or shrubby woodland or in wet sclerophyll forest on moderately fertile sandy soil on granite (DECC, 2007). This species was not observed during previous site inspections; however, a more extensive survey would be required to determine the presence or absence of the species at the site.

- One threatened fauna species, namely *Phascolarctos cinereus* (Koala), was recorded within five kilometres of the Survey Area. This species was not recorded during previous site inspections.
- One threatened fauna species, namely, the Gang-gang Cockatoo, were observed with the Dargues Reef Survey Area. A pair of birds was observed in the vicinity of the core logging area. The birds were highly associated with a hollow in a Manna Gum and were observed to enter a hollow at the top of the tree. The behaviour of the birds indicated that they had selected the tree for nesting. The male and female made several inspections of the hollow and both birds remained within the tree for a period. This species was not identified in the database search as occurring within five kilometres of the Subject Site. Below the tree were a large shed and an area for sorting core samples. A drilling rig was located some 100 m from the nest tree and was operational at the time of the site inspection but this had no apparent impact on the birds
- One Endangered Ecological Community was recorded, namely the South Coast Grassy Woodland. This community was not located during the site inspection.
- One over-cleared vegetation type was identified, namely the Southern Tablelands Flats Forest. This community was located within the Project Site.

6.5 NOISE AND BLASTING

Spectrum Acoustics have commenced the noise and blasting assessment for the Project. In light of the rural nature of the Project Site, the default *Industrial Noise Policy* background noise level of 30dB(A) will be assumed for all residences surrounding the Project Site.

It is anticipated that two noise scenarios will be assessed, namely a construction scenario and an operational scenario.

6.6 HERITAGE

Archaeological Surveys & Reports Pty Ltd have commenced the heritage assessment for the Project, both Aboriginal and non-Aboriginal. Consultation with the local Aboriginal community is ongoing and a field survey will be undertaken when the consultation process is complete.

The field survey for the non-Aboriginal heritage survey will be undertaken concurrently with the Aboriginal heritage survey. It is anticipated that given the legacy of mining operations in the vicinity of the Project Site, that items of non-Aboriginal heritage significance may be identified during the survey.

6.7 AIR QUALITY

PAEHolmes have commenced the air quality and greenhouse gas assessment for the Project. It is anticipated that two air quality scenarios will be modelled as per the noise assessment.

6.8 TRAFFIC AND TRANSPORTATION

Transport & Urban Planning have commenced the traffic assessment for the Project. Automated traffic counters were placed on roads surrounding the Project Site in February 2010. It is anticipated that the Project will result in a significant increase in the number of heavy and light vehicles that use Majors Creek Road. However, it is noted that the overall numbers of vehicles on that road would remain low compared to the road's capacity.

7. REFERENCES

McQueen, K. G., 2003. *Evidence of a granite related source for the Braidwood Araluen Majors Creek Goldfields, NSW*, *Australia*. The Ishihara Symposium, July 2003, Geoscience Australia.

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