ALKANE RESOURCES LTD

ABN: 35 000 689 216

Tomingley Gold Mine

Environmental Assessment

Project Approval No. 09_0155

Modification 2

Prepared by:

R.W. CORKERY & CO. PTY. LIMITED

December 2014

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Environmental Assessment

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Ref No. 616/24

December 2014

Document Control

Document Title	Environmental Assessment – Modification 2			
Document Number	616/24			
Document Owner				
Revision	**Issue Date**	**Originator**	**Reviewed**	**Approved**
Version 1	2 December 2014	M Bland/A Irwin	M Williams	M Williams
Version 2				
Version 3				
Next Review Due				

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LIST OF ABBREVIATIONS

AHD	Australian Height Datum
ARI	Annual Recurrence Interval
CCC	Community Consultative Committee
DPE	Department of Planning & Environment
DRE	Division of Resources & Energy
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning & Assessment Act 1979*
EPL	Environment Protection Licence
ESCP	Erosion and Sediment Control Plan
MOD 1	Modification 1
NSS	Noise and Sound Services
POEO Act	*Protection of the Environment Operations Act 1997*
PSM	Pells Sullivan Meynink
ROM	run-of-mine
RWC	R.W. Corkery & Co. Pty Limited
SB	Sediment Basin
SEEC	Strategic Environmental and Engineering Consultants
SEPP	State Environmental Planning Policy
TGO	Tomingley Gold Operations
WHS Act	*Work Health & Safety Act 2011*

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EXECUTIVE SUMMARY

Project Approval (PA) 09_0155 was originally granted on 24 July 2012 for the development and operation of the Tomingley Gold Mine, immediately to the south of the village of Tomingley in central western NSW (see **Figure 1**). PA 09_0155 was modified in November 2013 under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to modify the timetable for road upgrades surrounding the Mine.

This submission has been prepared to support an application for a second modification to PA 09_0155 under Section 75W of the EP&A Act. The Proposed Modification would enable the Caloma Open Cut on the eastern side of the Newell Highway to be cut back along the eastern and western perimeter (see **Figure 4**). The cut back is proposed on the advice of specialist geotechnical consultants, Pells Sullivan Meynink, to ensure the stability of the upper section of the wall, caused by unanticipated hydrostatic pore pressure in the alluvium, saprolite and highly weathered waste rock.

The Proposed Modification would also provide for the use of the additional waste rock in the enhancement of an amenity bund between the Caloma Open Cut and Tomingley village to the north. The amenity bund is currently approximately 3m in height and 2m wide across the top. It is proposed to increase the size of this bund to between 6m and 10m high and 24m across the top, with final slopes not exceeding 18° (1V:3H). This enhancement of the amenity bund would provide for additional noise attenuation at receivers within Tomingley.

An environmental assessment of the proposed modification to PA 09_0155 has been prepared to identify those issues likely to be of greatest significance to the local environment, surrounding and nearby landowners and the wider community, namely noise, air quality, surface water and visual amenity.

The modified open cut would require some minor revision to erosion and sediment control of the Mine, however, would not impact on any additional native vegetation, cultural heritage or involve the addition of any new noise or dust emitting activities. On this basis, the small extension to the Caloma Open Cut to accommodate the cut back is assessed to be without additional adverse impact on the local environment.

A specialist assessment providing predictions as to the effectiveness of the enhanced noise amenity bund in reducing noise levels within the village of Tomingley and resultant construction noise was commissioned. This assessment predicts that noise levels at receivers within Tomingley would be reduced by between 1dB(A) and 4dB(A) depending on the final height of the bund and depth of mining within Caloma Open Cut. A temporary increase in construction noise of up to 11dB(A) is predicted. However, as construction would be restricted to the day shift and managed to minimise the period over which receivers might be exposed to this maximum noise increase, it is assessed as acceptable given the overall benefit provided by the enhanced noise bund.

On the basis that the activities associated with the Proposed Modification represent a minor variation to existing activities, which are managed in accordance with a comprehensive *Site Specific Procedure – Dust Control*, it is assessed that any additional adverse impacts on air quality are unlikely.

The impact of the enhanced amenity bund on local visual amenity has also been considered and deemed to be acceptable give the proposed design of the outer slope (<18°) which would be conducive to revegetation and the existing screening provided by native woodland to the immediate north of the Mine on the eastern side of the Newell Highway.

It is concluded that the proposed modification would result in minor changes to the disturbance footprint of the Mine, a small change to the visibility of the Mine Site and short-term increases in noise levels received during the day. These very minor impacts are considered to be outweighed by the benefits generated by the Proposed Modification, namely the improved safety of operations and reduced night-time noise levels received in Tomingley. On balance, it is assessed that the Proposed Modification could be undertaken in a manner which meets relevant environmental criteria and meet reasonable community expectations.

1. INTRODUCTION

1.1 SCOPE

This *Environmental Assessment* has been prepared by R.W. Corkery & Co. Pty. Limited to support the application to modify Project Approval (PA) 09_0155 for the Tomingley Gold Mine (the Proposed Modification). PA 09_0155 has been amended once previously in November 2013 to adjust a range of commitments made during the original application which were no longer appropriate. This application has been prepared on behalf of Alkane Resources Ltd ("the Proponent").

The Tomingley Gold Mine (the Mine) is located immediately to the south of the village of Tomingley in central western NSW (see **Figure 1**). The Mine is operated by Tomingley Gold Operations Pty Ltd, a wholly owned subsidiary of the Proponent. The Mine comprises the following components (**Figure 2**).

- Three open cut mines and one underground mine.
- A processing plant and associated residue storage facility.
- Three waste rock emplacements
- An underpass under the Newell Highway.
- A range of ancillary infrastructure, including offices, amenity bunds, soil stockpiles, surface water management structures, a water supply pipeline and an electricity transmission line.

The Proposed Modification seeks consent to permit the following.

- Enhancement of the existing amenity bund to the north of the Caloma Open Cut to provide further noise attenuation for the residents of the village of Tomingley.
- A cut back of the Caloma Open Cut to ensure the ongoing stability of the upper sections of the open cut.

The application to modify PA 09_0155 is to be made under Section 75W of the *Environmental Planning & Assessment Act 1979* (EP&A Act), in accordance with the transitional arrangements of the Act associated with the repeal of Part 3A.

The information contained in this document relates only to those components of the Mine that would be the subject of the Proposed Modification. Aspects of the Mine that would not be modified would continue to be undertaken in accordance with the following.

- The conditions of PA 09-0155, including the Statement of Commitments and plans appended to the approval.
- The original *Environmental Assessment* (RWC, 2011) and associated documentation prepared to support the original application for development consent.
- Modification 1 (MOD 1) application and supporting documentation.

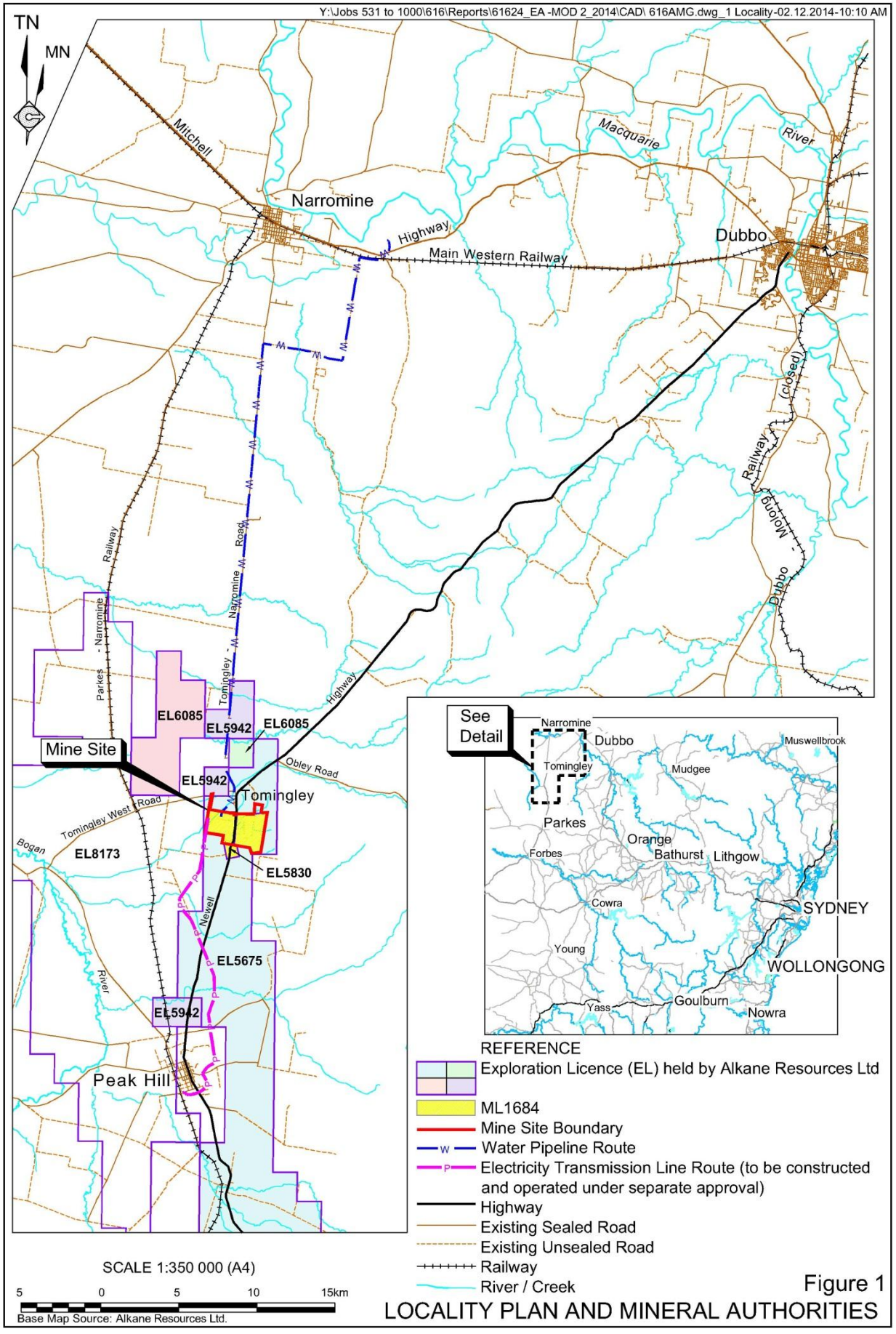

Figure 1
LOCALITY PLAN AND MINERAL AUTHORITIES

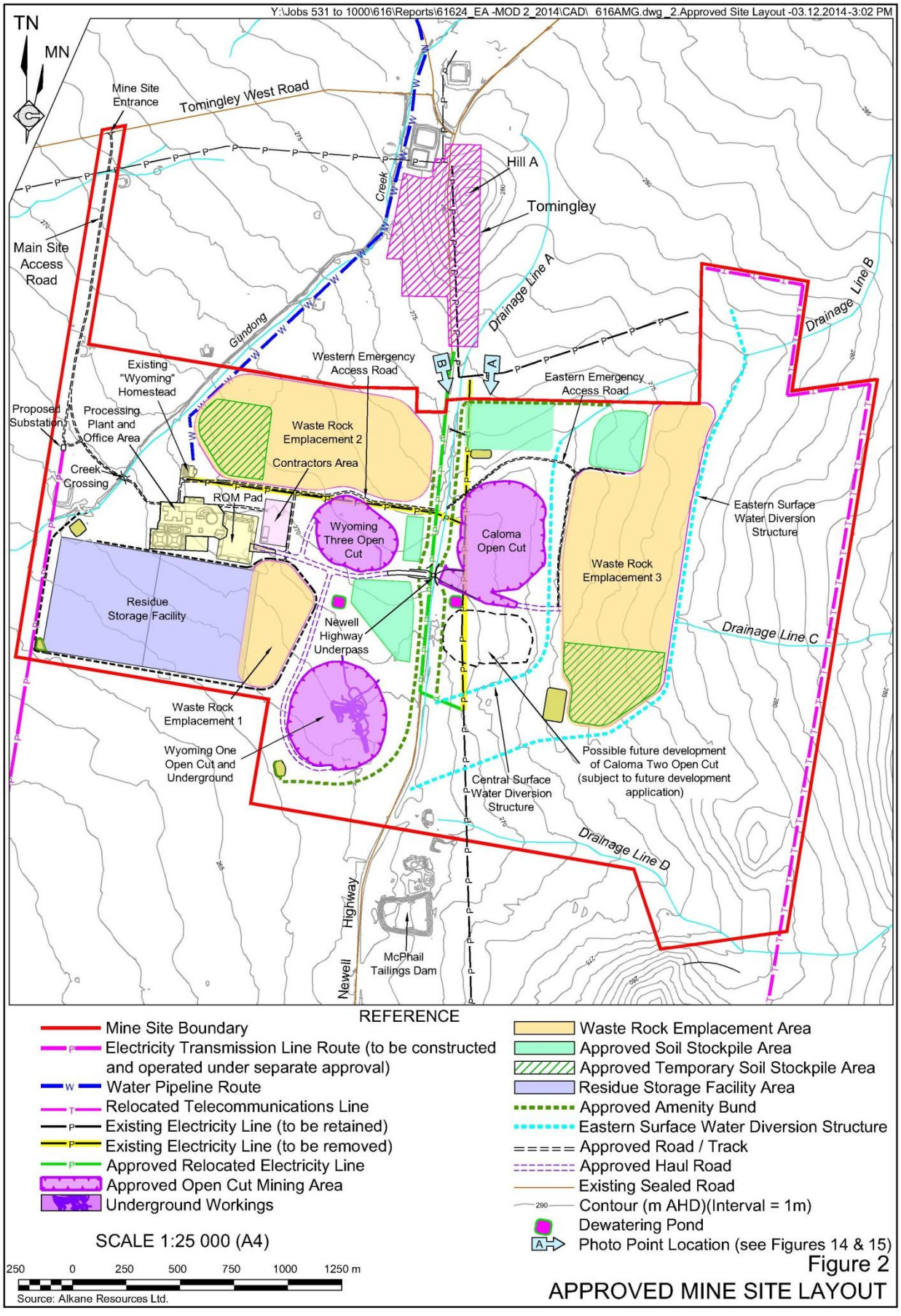

Figure 2
APPROVED MINE SITE LAYOUT

The information provided in this document is presented to a level of detail which adequately addresses all relevant issues associated with the Proposed Modification. Emphasis has been placed upon comprehensively addressing the key issues and limiting coverage of those issues that are not central to the determination of the project approval application.

1.2 PROPONENT AND MINE SITE

1.2.1 The Proponent

Alkane Resources Ltd is an Australian, publicly listed mining and exploration company which has been in existence since 1969 and has approximately 6 300 shareholders. The Company has a long term involvement and ongoing commitment to the Central West of New South Wales and has substantial investment in the people and resources of the region. Alkane Resources Ltd developed and operated the Peak Hill Gold Mine on the outskirts of Peak Hill from 1996 to 2005 and has now largely rehabilitated that mine site. The Company, through its subsidiary, Australian Zirconia Ltd, has made an application for Development Consent for the Dubbo Zirconia Project, located at Toongi, approximately 25km south of Dubbo.

1.2.2 The Mine Site

All activities associated with the Proposed Modification would be undertaken within the approved Mine Site. The relevant land associated with the approved Mine Site is identified in *Table 1.1* and *Figure 1.5* of RWC (2011).

1.3 BACKGROUND TO THE PROPOSED MODIFICATION

1.3.1 Existing Approvals, Licences and Leases

Table 1 presents the approvals, licences and leases held by the Proponent for the Mine.

Table 1
Approvals, Licences and Leases

Title	Legislation	Regulatory Authority
Project Approval 09_0155	*Environmental Planning & Assessment (EP&A) Act 1979*	NSW Department of Planning and Environment
Environment Protection License (EPL) 20169	*Protection of the Environment Operations (POEO) Act 1997*	NSW Environment Protection Authority
Mining Lease 1684	*Mining Act 1992*	NSW Division of Resources and Energy
Groundwater licences WAL20270, WAL28643 and WAL29266	*Water Management Act 2000*	NSW Office of Water
Groundwater licences (extraction from open cut areas) 80WA715323, 80WA715324 and 80WA715325	*Water Management Act 2000*	
Notification of Dangerous Goods NDG200150	*Work Health & Safety Act (WHS) 2011*	WorkCover NSW
Source: Alkane Resources Ltd		

1.3.2 Approved Activities

The Tomingley Gold Mine received Project Approval on 24 July 2012. The approval was subsequently modified on 7 November 2013. Activities approved under PA 09_0155, as modified, include the following (**Figure 2**).

- Establishment of infrastructure required for the Project, including a water supply pipeline, an underpass beneath the Newell Highway, and revegetated amenity bunds.
- Extraction of waste rock and ore from thee open cut areas, namely:
  - Caloma Open Cut;
  - Wyoming Three Open Cut; and
  - Wyoming One Open Cut.
- Extraction of waste rock and ore from the Wyoming One Underground.
- Construction of three waste rock emplacements.
- Construction and use of various haul roads, including an underpass under the Newell Highway, and a run-of-mine (ROM) pad.
- Construction and use of a processing plant and office area, incorporating a crushing and grinding circuit, a standard carbon-in-leach processing plant, site offices, workshops, ablutions facilities, stores, car parking, and associated infrastructure.
- Construction and use of a residue storage facility.
- Construction and use of a water pipeline from a licensed bore located approximately 7km to the east of Narromine to the Mine Site.
- Construction and use of a transformer and electrical distribution network within the Mine Site.
- Relocation of pre-existing items of infrastructure, including a 22kV power line and fibre optic telecommunications cable.
- Construction and use of ancillary infrastructure, including the Main Site Access Road and intersection with the Tomingley West Road, soil stockpiles and surface water structures.

1.3.3 Project Status

Construction of the Mine commenced in February 2013 with mining commencing in November 2013 and the plant commissioned (fully) in February 2014.

Figure 3 presents the layout of the Mine as of November 2014. At that time, construction of the principal fixed components of the Mine was complete, including the processing plant and residue storage facility, the site access and other roads and the Newell Highway underpass, and mining had commenced within the Caloma and Wyoming 3 Open Cuts and pre-stripping within the Wyoming One Open Cut.. The first gold was poured in February 2014, with the processing plant reaching full capacity of approximately 1.2Mtpa in May 2014.

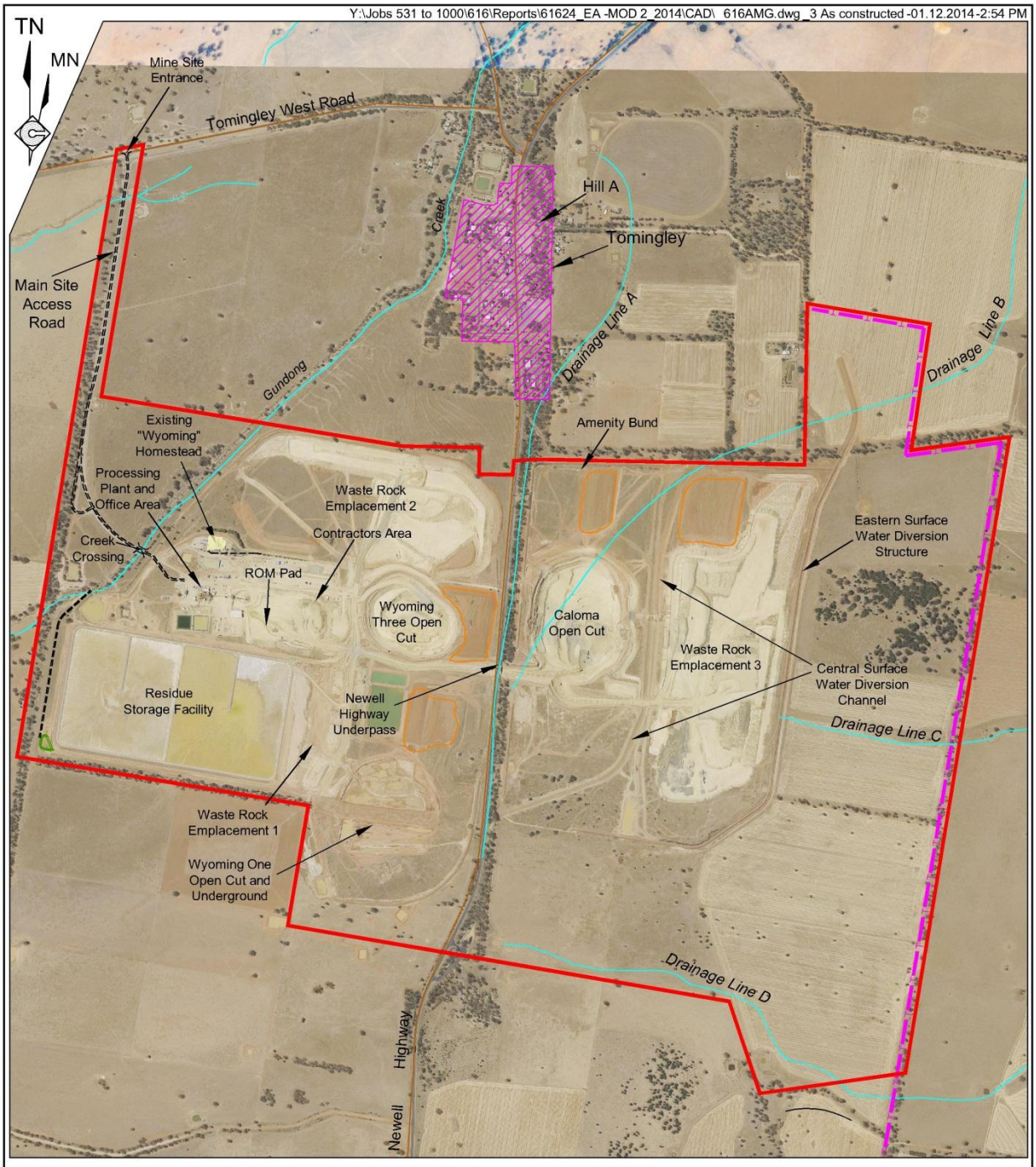

Figure 3
AS CONSTRUCTED MINE SITE LAYOUT

1.3.4 Environmental Performance

1.3.4.1 Introduction

This subsection provides an overview of the environmental performance of the Mine. Unless stated otherwise, the information presented in Sections 1.3.4.3 to 1.3.4.9 has been sourced from the Mine's *Annual Environmental Review 2013* which presents the environmental performance of the Mine between 1 February 2013 and 31 January 2014.

1.3.4.2 Environmental Management System and Plans

The Proponent has prepared a range of Environmental Management Plans, as well as an overarching *Environmental Management System*, to guide day-to-day environmental management of the Mine. The following presents a complete list of management plans that have been prepared for the Mine.

- *Environmental Management System.*
- *Mining Operations Plan.*
- *Noise Management Plan.*
- *Blast Management Plan.*
- *Air Quality and Greenhouse Gas Management Plan.*
- *Water Management Plan.*
- *Biodiversity Management Plan.*
- *Cultural Heritage Management Plan.*
- *Hazardous Materials Management Plan.*
- *Traffic Management Plan.*
- *Waste Management Plan.*
- *Pollution Incident Response Management Plan.*

1.3.4.3 Noise

A *Noise Compliance Report* was completed by Noise and Sound Services in October 2014. That document, referred to hereafter as NSS (2014a) describes the results of an attended noise survey undertaken at seven residences during the evening and night over three days from 22 to 24 September 2014. That assessment identified that Mine-related noise was less than the relevant criteria at all locations, with the exception of Residence R3 (see **Figure 7** in Section 4.2).

Mine-related noise levels at Residence R3 were measured at between 40dB(A) and 51dB(A) during breaks in B-Double truck traffic on the Newell Highway. However, there were no breaks in the traffic that were sufficiently long enough to enable the Mine-related noise level to be accurately determined over the 15 minutes required by the NSW *Industrial Noise Policy* (INP). Notwithstanding this, the Proponent acknowledges that the Mine is likely to be exceeding the evening and night-time noise criteria at Residence R3.

In addition, the Proponent has recorded 27 noise-related comments or complaints between February and October 2014. The vast majority of comments and complaints related to night-time noise, particularly associated with operation of bulldozers and sudden, sharp noises such as horns, banging or reversing alarms. In each case, the Proponent spoke with the complainant and implemented measures to minimise the adverse impacts of noise.

In light of the above, the Proponent engaged Noise and Sound Services to provide a range of recommendations to mitigate the impact of Mine-related noise. The resulting recommendations included the following.

- Noise attenuation works on the Proponent's bulldozers that will be used at night. The Proponent has accepted this recommendation and these works are currently being trialled.
- Construction of an enhanced noise bund. The Proponent has accepted this recommendation and proposes to fully implement the recommendation, subject to the granting of the required modification to PA 09_0155.
- Noise attenuation works of haul trucks. The cost of this recommendation is very significant. As a result, the Proponent proposes to determine the effectiveness of the above measures, and any potential noise treatment to potentially affected residences, before deciding whether to implement this recommendation.

1.3.4.4 Air Quality

The Proponent has installed the following monitoring equipment in the vicinity of the Mine Site, including within the village of Tomingley.

- One Tapered Element Oscillating Microbalance measuring PM_{10} continuously.
- One High Volume Air Sampler measuring Total Suspended Particulates every 6 days.
- Five depositional dust gauges measuring total insoluble deposited dust.
- One automated meteorological station.

The results of the air quality monitoring program presented in the *Annual Review 2013* may be summarised as follows.

- Monthly deposited dust levels were typically less that than the required annual average compliance criteria of $4g/m^2$/month, with one exception. In November 2013, one deposited dust gauge recorded a monthly deposited dust level of approximately $7g/m^2$/month. This isolated spike in the deposited dust

levels was associated with a slight increase in deposited dust levels in other gauges at the same time and is attributed to a combination of southwesterly winds blowing from the Mine Site towards the village of Tomingley and an increase in disturbed areas and earthmoving activities within the Mine Site.

- Continuous PM_{10} monitoring indicated three exceedances of the short-term compliance criteria, namely 50µg/m^3 over 24-hours.

In addition, the Proponent has recorded five dust-related comments or complaints between January and May 2014. Of these, three related to dust emissions from the soil stripping operations, one from dust emissions from the primary crusher and one from dust emissions from the site access road. In each case, the Proponent contacted the complainant and either ceased work immediately or implemented measures to minimise dust generation. In addition, the Proponent has significantly increased dust management operations, with approximately 150ML of water per year used for dust suppression compared with the budgeted 60ML per year. Rehabilitation of exposed areas including soil stockpiles has also been undertaken to reduce the potential for dust lift-off. Finally, the Proponent has recently developed and implemented the document *Site Specific Procedures – Dust Control* (TGO, 2014) which identifies a range of triggers and adaptive management measures to control dust emissions.

1.3.4.5 Water

The *Annual Review 2013* identified that no water was discharged from the Mine Site. See however, Section 1.3.4.8 in relation to a range of unplanned discharges of surface water from the Mine Site.

Surface water and groundwater monitoring is ongoing.

1.3.4.6 Biodiversity

The Proponent implemented the requirements of the *Biodiversity Management Plan* during site preparation activities, with pre- and post-clearing surveys being undertaken and a qualified fauna handler present during tree felling operations. A small number of birds identified during the surveys were taken to the wildlife clinic at the Taronga Western Plans Zoo, with one death recorded.

Weed management programs for Boxthorn, as well as six monthly weed inspection programs have been undertaken.

Finally, components of the *Biodiversity Offset Plan* were implemented, with approximately 35ha of Proponent-owned land was prepared and seeded with species consistent with the following endangered ecological communities.

- Fuzzy Box – Inland Grey Box on alluvial brown loam soils.
- Inland Grey Box-Polar Box – White Cypress Pine tall woodland on red loams.

1.3.4.7 Aboriginal Heritage

Prior to the commencement of construction operations, the Proponent completed a salvage program for all identified objects of Aboriginal heritage significance in accordance with the *Cultural Heritage Management Plan* and in consultation with the Aboriginal community.

1.3.4.8 Environmental Incidents and Compliance

The following environmental incident and compliance issues have arisen since commencement of construction operations.

- Use of water from the Peak Hill Gold Mine.

  During the initial stages of construction operations, the Proponent was using water from the Peak Hill Gold Mine for construction and dust suppression purposes. The EPA queried this activity. While it was later established that the water was not contaminated, and therefore no corrective actions were required, the Proponent has since undertaken a sampling process prior to water being used from the Peak Hill Gold Mine storage pond.

- Dust emissions.

  During construction operations, in particular soil stripping operations, dust emissions from the Mine adversely impacted on motorists using the Newell Highway. In response to this issue, the Proponent reviewed its dust management activities and undertook a range of measures to minimise dust emissions, including increasing water cart operations and educating employees in relation to minimising and monitoring dust emissions.

  The EPA issued a caution notice in relation to this issue and the use of water from the Peak Hill Gold Mine on 20 December 2013.

- Sediment and erosion control.

  The Proponent reported discharge of sediment laden water from the Mine Site to the Newell Highway road reserve to the EPA during wet weather on eight occasions in March and April 2014. Officers from the EPA inspected the site on six occasions during that period. As a result of these discharges, the EPA issued a prevention notice on 19 June 2013 requiring immediate implementation of short-term measures to prevent pollution of Gundong Creek, completion of the permanent water control structures and a review of the surface water management system. The Proponent completed each of these actions by 19 June 2014. Following completion of the identified actions, sediment-laden water has not discharged from the Mine Site.

  The EPA issued a request for information in relation to this issue on 25 September 2014, with all information requested provided on 24 October 2014.

1.4 FORMAT OF THE ENVIRONMENTAL ASSESSMENT

The format of the Environmental Assessment is as follows.

Section 1: introduces the Proposed Modification, the Proponent and background information in relation to the current status and performance of the Mine. The section concludes with information on the structure of the document and management of investigations.

Section 2: describes the Proponent's objectives in modifying PA 09_0155 and the proposed modified activities, including the modified Mine Site layout and final landform.

Section 3: describes the consultation undertaken during preparation of the *Environmental Assessment* and reviews a range of State and local planning issues.

Section 4: provides an assessment of the environmental impacts associated with the Proposed Modification. Particular focus has been placed on those aspects of the approved environmental impacts that would be changed as a result of the modification to the Caloma Open Cut and amenity bund between the Caloma Open Cut and Tomingley village.

Section 5: provides a justification of the Proposed Modification, records the consequences of not proceeding with the Project and concludes the document.

References: lists the various source documents referred to for information and data used during the preparation of the Environmental Assessment.

Appendices: present the following additional information.

1. Noise Assessment prepared by Mr Ken Scannell of Noise and Sound Service.
2. Site Specific Procedure – Dust Control, Version 1.0, January 2014

1.5 MANAGEMENT OF INVESTIGATIONS

This document has been prepared by Mr Mitchell Bland (B.Sc (Hons), MEconGeol, LLB (Hons)), Principal Environmental Consultant and Mr Alex Irwin (B.Sc (Hons)), Senior Environmental Consultant, both with R.W. Corkery & Co Pty. Limited (RWC).

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

- Mr Mark Williams (B.AppSc.(Env Hlth)) – Environment and Community Manager;
- Ms Ady Watson (BEnvSc)(Grad Dip CAP.Vert.Man)) – Environmental Officer; and
- Mr Stephen Jones (BE Mining AUSIMM CP (Min, Man)) – Mining Manager.

A *Noise Bund Assessment* was also prepared for the application by Mr Ken Scannell (MSc, MAAS, MIOA) of Noise and Sound Services.

2. DESCRIPTION OF THE PROPOSED MODIFICATION

2.1 INTRODUCTION

2.1.1 Objectives of the Modification

The Proponent's original objectives in developing the Mine are identified in Section 2.1.1 of RWC (2011). The Proponent's objectives in modifying PA 09_0155 are as follows.

- To ensure the geotechnical stability of the upper section of the Caloma Open Cut and the safety of workers and others within the open cut.
- To facilitate further noise attenuation for the residents of the village of Tomingley.

2.1.2 Overview of the Modification

The Proposed Modification would include the following (see **Figure 4**).

- Cut back of the upper sections of the eastern and western walls of the Caloma Open Cut.
- Enhancement of the existing amenity bund between the Caloma Open Cut and the village of Tomingley using material to be removed from the proposed Caloma cut back. The bund would be enlarged to approximately 6m to 10m above the natural surface and approximately 60m to 70m wide.
- Construction of a range of haul roads to permit transportation of material from the proposed cut backs to the proposed enhanced amenity bund.
- Minor modifications to the final landform to reflect the proposed cut back and amended amenity bund.

2.1.3 Modifications Required

The Proponent anticipates that the following modifications to PA 09_0155 will be required. The proposed additions are <u>underlined</u> and the proposed deletions are in ~~strikeout~~. Text included in square brackets is for information only and is not proposed to be included in the modified Project Approval.

DEFINITIONS

Department	Department of Planning and ~~Infrastructure~~ <u>Environment</u>
~~Director-General~~	~~Director-General of the Department, or nominee~~
<u>Secretary</u>	<u>Secretary of the Department, or nominee</u>

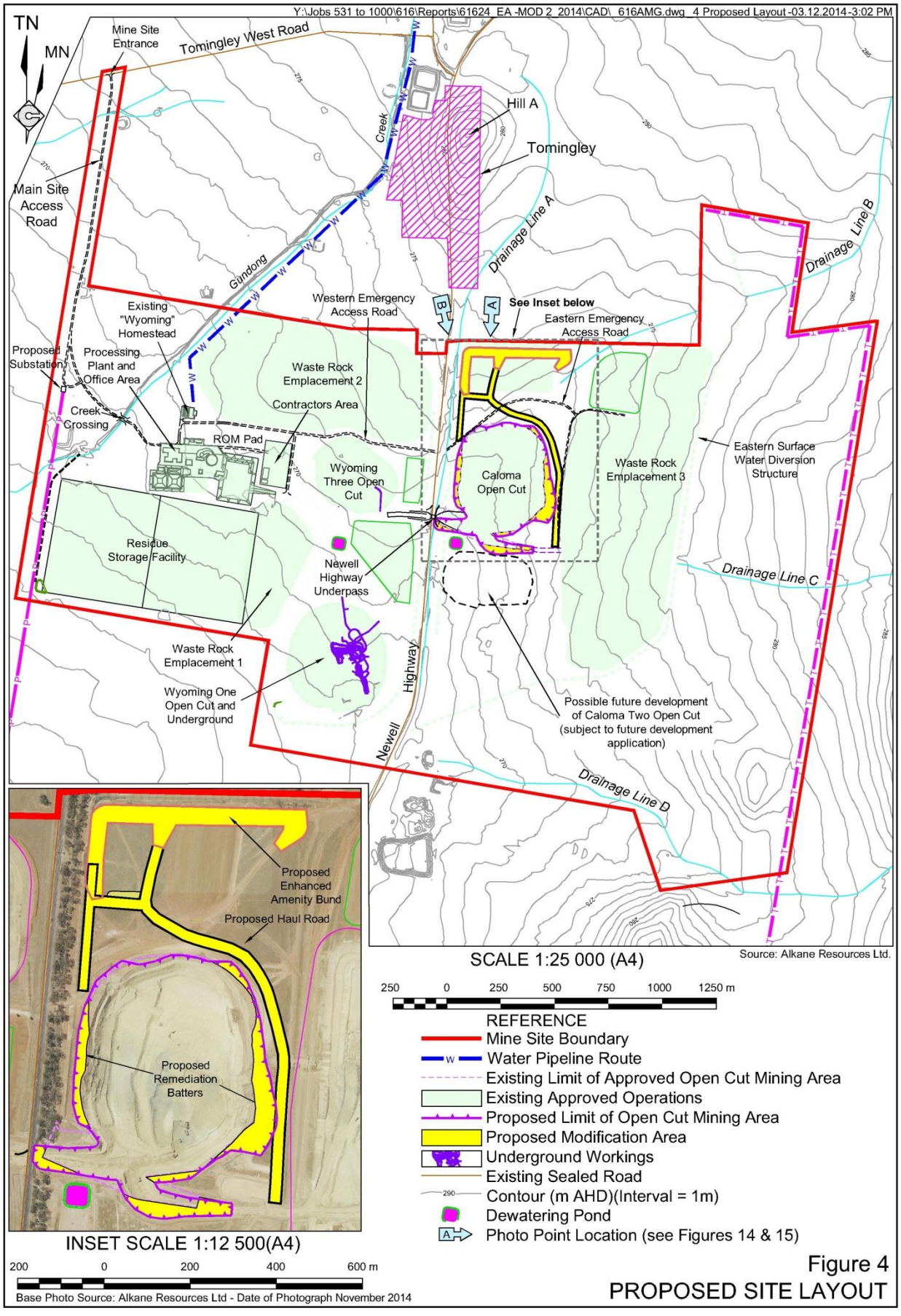

Figure 4
PROPOSED SITE LAYOUT

EA	Environmental Assessment titled 'Tomingley Gold Project: Environmental Assessment' dated November 2011 and associated response to submissions titled 'Tomingley Gold Project: Response to Submissions', dated March 2012, as modified by letter dated 11 May 2012 from Alkane Resources Ltd; modification application dated 14 September 2013 and the supporting documentation; and correspondence from Tomingley Gold Operations Pty Ltd to the Department dated 21 October 2013, Environmental Assessment titled "Tomingley Gold Project Environmental Assessment - Modification 2" dated December 2014 and associated documentation
Minister	Minister for Planning ~~and Infrastructure~~, or delegate

SCHEDULE 3, CONDITION 4

The Proponent shall comply with the operating hours in Table 3.

Table 3: Operating hours

Activity	Operating Hours
Vegetation clearing, ~~and~~ topsoil stripping and amenity bund construction	6:30am-6:30pm, 7 days per week
Construction	24 hours, 7 days per week
Mining, maintenance and processing operations	
Rehabilitation	7am-10pm, 7 days per week

APPENDICES

Replace the plans on pages 24, 28, 29, 30 with updated versions.

2.2 PROPOSED CALOMA OPEN CUT CUT BACK

2.2.1 Need for the Cut Back

During the initial mining operations within the Caloma Open Cut, a number of geotechnical failures in the eastern and western sections of the upper wall of the Caloma Open Cut were identified (**Plates 1** to **4**). The Proponent engaged specialist geotechnical consultants, Pells Sullivan Meynink, to advise on suitable pit wall slopes prior to operations commencing and complete a geotechnical assessment of the failures and ongoing stability. That study, referred to hereafter as PSM (2014), identified that the failures were the result of unanticipated hydrostatic pore pressure in the alluvium, saprolite and highly weathered waste rock that was weaker than design parameters. Due to the clay-rich nature of this material, and the nature of perched water, depressurising it ahead of mining is not feasible. As a result, PSM (2014) have recommended that the upper sections of the eastern and western walls of the Caloma Open Cut should be laid back to ensure the ongoing stability of the open cut and the safety of workers and others within the open cut.

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Plate 1: Failure in the western wall looking to the southeast
(Source: PSM (2014) Photo 5)

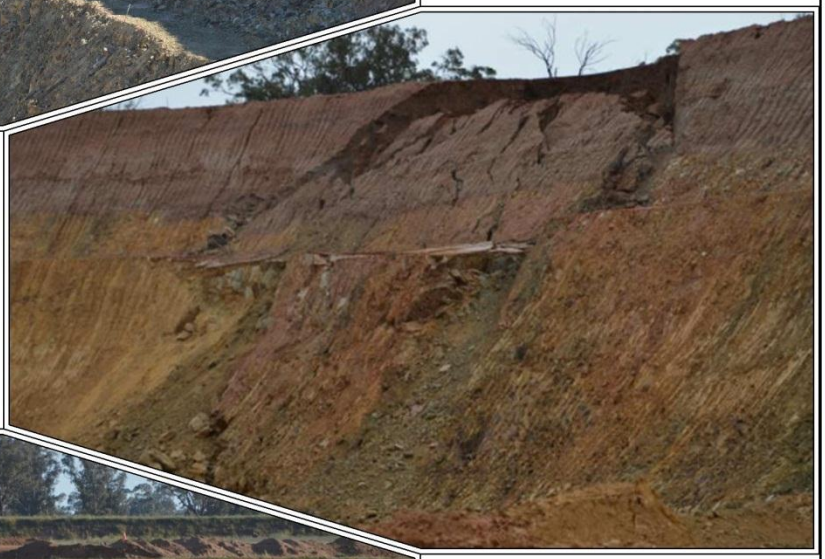


Plate 2: Failure in the northwestern wall looking to the west
(Source: PSM (2014) Photo 8)

Plate 3: Failure in the southeastern wall after remediation
(Source: PSM (2014) Photo 13)

Plate 4: Failure in the eastern wall looking to the east
(Source: PSM (2014) Photo 14)

2.2.2 Design of the Cut Back

The Proponent, in response to recommendations provided in PSM (2014) proposes to reduce the existing Caloma Open Cut wall angles to the angles identified in **Table 2**. It is noted that the proposed wall angles apply to those sections of the open cut wall in alluvium, saprolite and highly weathered material only.

Table 2
Proposed Modified Wall Angles

Section of Open Cut	Recommended Overall Slope Angle
Southeastern Wall	20º
Eastern Wall	22º
Northwestern Wall	24º
Western Wall	30º
Source: Alkane Resources Ltd	

2.2.3 Proposed Mining Method

The Proponent would undertake the mining operations required to complete the cutback as described in Sections 2.4.3.3 and 2.4.3.4 of RWC (2011). In summary, friable material would be extracted using conventional free dig load and haul techniques. Where required, limited fragmentation would be implemented using drill and blast techniques.

Mining operations would be undertaken using the Proponent's existing mining fleet.

2.3 PROPOSED ENHANCED AMENITY BUND

2.3.1 Need for the Modification

As identified in Section 1.3.4.3, NSS (2014a) identified during an attended noise survey over three days in September 2014 that the Mine was exceeding the evening and night-time noise criteria at Residence R3 (see **Figure 7** in Section 4.2). In addition, noise has been a common issue of concern for the residents of the village of Tomingley, with 27 noise-related comments or complaints received.

As a result, the Proponent sought from its noise consultant, Noise and Sound Services, a range of recommendations to mitigate noise emissions from the Mine Site. These included the following.

- Noise attenuation works on the Proponent's bulldozers. The Proponent has accepted this recommendation and these works are currently being implemented.

- Construction of an enhanced noise bund. The Proponent has accepted this recommendation and proposes to fully implement the recommendation, subject to the granting of the required modification to PA 09_0155.
- Noise attenuation works of haul trucks. This recommendation is discussed further in Section 2.6.

2.3.2 Layout and Design of the Enhanced Amenity Bund

Figure 4 presents the layout the enhanced amenity bund and **Figure 5** presents the proposed design. In summary, the enhanced amenity bund would include the following design features.

- Height ..... between 6m and 10m above natural surface.
- Width at base ..... between 60m and 85m.
- Width at top ..... approximately 24m.
- Final side slopes..... 1:3 (V:H) or 18º maximum.

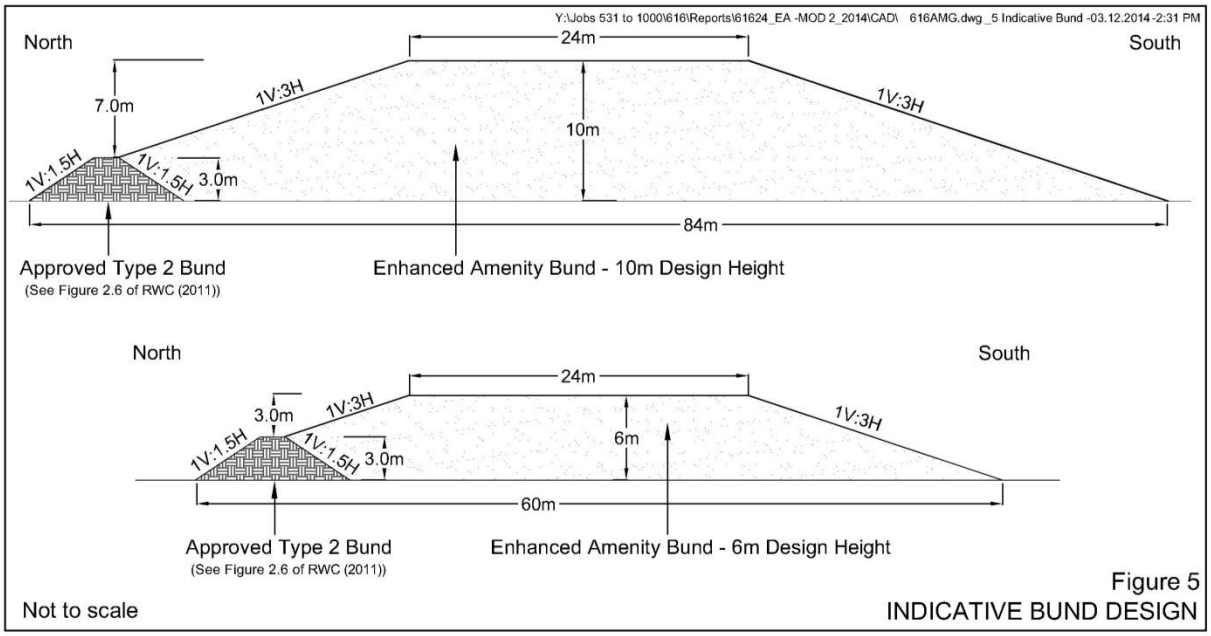


Figure 5
INDICATIVE BUND DESIGN

2.3.3 Construction of the Enhanced Amenity Bund

Initially, the footprint of the enhanced amenity bund would be stripped of topsoil to a depth of 30cm, with a further 20cm to 70cm subsoil to be stripped as described in Section 2.3.3 of RWC (2011). Soil would initially be stripped using a bulldozer and stockpiled adjacent to the proposed bund footprint. This would facilitate placement of the soil on the completed bund. As the footprint of the enhanced amenity bund is cleared pasture or cropping land, the vegetation would be stripped with the topsoil. An existing soil stockpile within the footprint of the proposed bund would be relocated.

Following stripping of vegetation and soil, the enhanced amenity bund would be constructed using material from the proposed cut back of the Caloma Open Cut. In summary, up to approximately 500 000m^3 of friable and highly weathered waste rock would be extracted as described in Section 2.2.3. That material would be placed into haul trucks with approximately half transported to WRE 3 and the remainder to the enhanced amenity bund via one of two proposed haul roads (**Figure 4**).

Transported material would paddock dumped and progressively shaped using a bulldozer. Where practicable, the Proponent would establish and shape the outer face of the bund initially to provide a degree of visual and noise attenuation during construction operations.

Once completed, the enhanced amenity bund would be shaped to achieve an outer face with slopes no steeper that 1:3 (V:H). Following installation of final surface water controls (see Section 3.3.5.1), subsoil and topsoil would be respread on the final landform which would be revegetated with species consistent with the pasture species listed in the MOP

The Proponent anticipates that the proposed cut back and enhanced amenity bund construction operations would take between 1 and 4 months to complete.

The Proponent acknowledges that a range of dust-related issues that arose during initial construction operations for the Mine in 2013. In light of the potential for similar issues to arise during soil stripping and construction operations for the enhanced amenity bund, the Proponent would ensure that all personnel, including supervisory personnel, are aware of the requirements and measures identified in the *Air Quality and Greenhouse Gas Management Plan* and the *Site Specific Procedures – Dust Control* (TGO, 2014) and that those measures are strictly implemented.

In addition, it is noted that while the enhanced amenity bund is intended to mitigate noise emissions from the Mine for residents of the village of Tomingley, potential exists for short-term increase in noise emissions. This issue is addressed in detail in Section 4.2. However, in summary, the Proponent would implement the following measures to limit adverse noise-related impacts on residents during construction of the enhanced amenity bund.

- Establish and shape the outer face of the bund initially to provide a degree of visual and noise attenuation during construction operations.
- Ensure that construction operations are limited to 6:30am to 6:30pm, Monday to Sunday.
- Undertake community consultation to advise the residents of the village of Tomingley of the proposed enhanced amenity bund and anticipated noise mitigation benefits. In addition, seek feedback on additional management measures that could be implemented to minimise anticipated temporary adverse impacts associated with the proposed activities and implement those measures that are reasonable and feasible.
- Manage operations to take into account weather conditions, avoiding periods when source to receiver winds prevail where practicable.

2.3.4 Effect of the Noise Bund

Noise modelling to assess the effectiveness of the enhanced noise bund, if constructed at heights of 6m and 10m, has been undertaken by NSS (2014a). The assessment predicted that a reduction in noise levels received at the closest receiver to the Mine of between 1dB(A) (6m bund with noise sources operating at the top of the Caloma Open Cut) and 4dB(A) (10m bund with noise sources operating at mid-pit elevation and deeper). Section 4.2 provides a more detailed review of the existing noise environment, the scenario's considered in assessing the effectiveness of the bund and the modelling results of NSS (2014b).

2.4 PROPOSED HOURS OF OPERATION

The Proponent notes that the noise environment surrounding the Mine Site during the day (between 7:00am and 6:00pm) is significantly noisier that during the evening (between 6:00pm and 10:00pm) or night-time (between 10:00pm and 6:00am). This is reflected in the noise criteria embodied in Schedule 3, Condition 3 of PA 09_0155 being between 5dB(A) and 11dB(A) higher than the evening or night-time criteria for Noise Assessment Groups C and D, namely for those residences within the village of Tomingley.

As a result, the Proponent proposes to limit cut back and enhanced amenity bund construction to between 6:30am and 6:30pm Monday to Sunday (in line with current day shift operations at the Mine). It is noted that the proposed hours of operations extend 30 minutes outside the INP-defined day time period of 7:00am to 6:00pm. However, given that these shoulder periods would be of limited duration and that the duration of the proposed works would be limited, the Applicant contends that the proposed hours of operation are appropriate.

2.5 SITE DECOMMISSIONING AND REHABILIATION

2.5.1 Rehabilitation Objectives

The rehabilitation objectives for the Project are identified in the *Mining Operations Plan* for the Mine (TGO/RWC, 2014). The rehabilitation objectives for the Proposed Modification would remain unchanged

2.5.2 Final Landform and Land Use

Figure 6 presents the proposed modified final landform. In summary, the modified final landform would comprise the following components.

- A rehabilitated enhanced amenity bund, with faces of 1:3 (V:H) or less.
- A bunded and fenced open cut that would be slightly larger than the approved, partially water-filled final Caloma Open Cut.

The final land use for the enhanced amenity bund would be nature conservation, with the bund revegetated with grassland species on the side slopes and woodland species on the top, consistent with the current approved MOP..

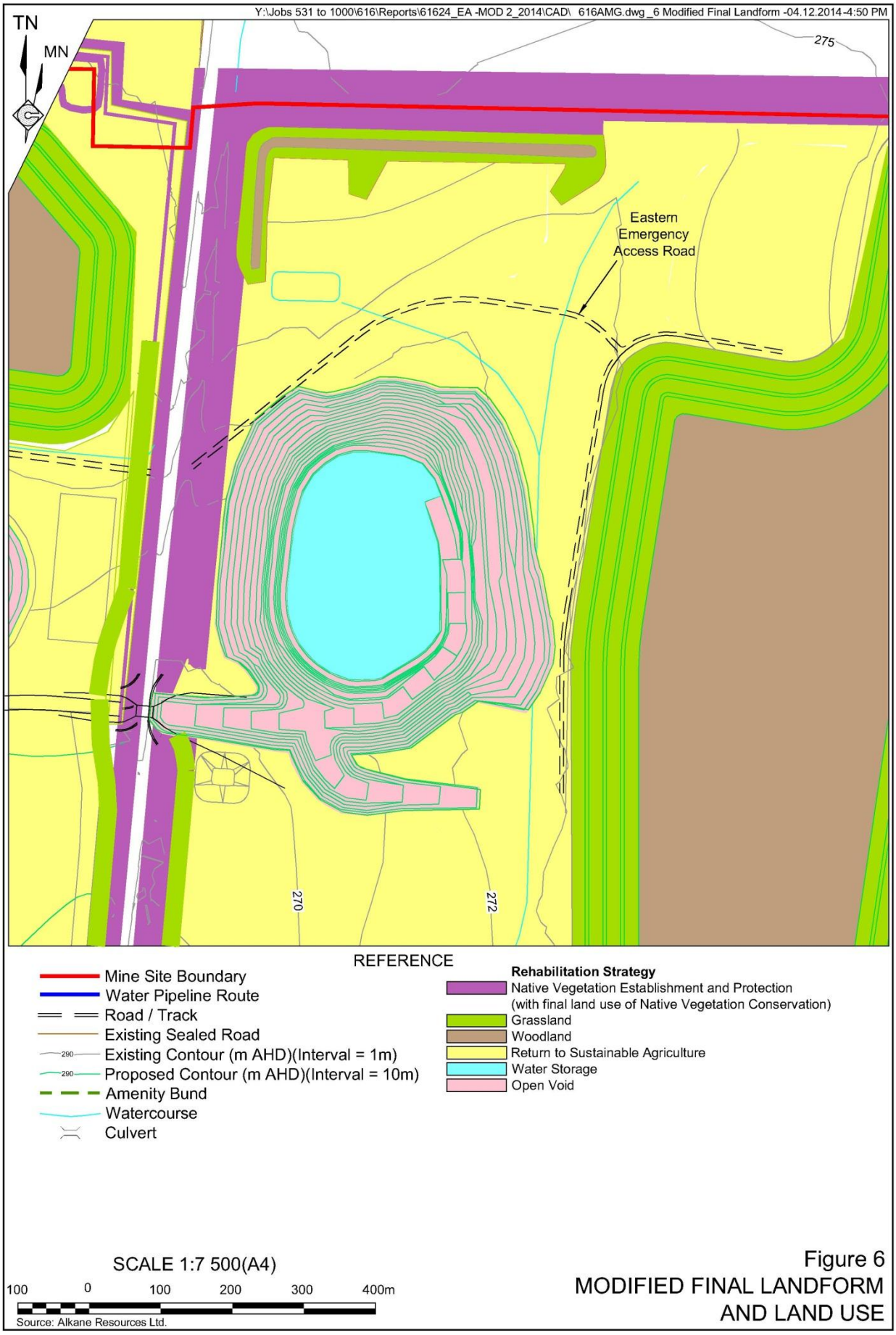


Figure 6
MODIFIED FINAL LANDFORM
AND LAND USE

2.5.3 Rehabilitation Methods and Procedures

Rehabilitation methods and procedures would be consistent with the methods described in Section 2.14.6 of RWC (2011). In summary, rehabilitation of the enhanced amenity bund would comprise the following activities.

- Following completion of final shaping of the bund, surface water control structure would be installed.
- Subsoil and topsoil stripped and stockpiled adjacent to the footprint of the bund would be respread over the surface of the bund.
- Pasture species seed would be spread or planted on the final landform and fences would be established, if required, to limit the potential for grazing by stock or other fauna to adversely impact on the establishment of the vegetation.
- Ongoing monitoring of the success of rehabilitation would be undertaken in accordance with the procedures outlined in the *Mining Operations Plan*, and remedial action would be implemented should the progression of rehabilitation not be satisfactory.

2.6 ALTERNATIVES CONSIDERED AND REJECTED

2.6.1 Introduction

As identified in Section 1.3.4.3, a range of alternative noise mitigation alternatives were considered. This subsection describes those alternatives and identifies why each was rejected. This subsection also describes the alternative of not undertaking the cutback of the Caloma Open Cut.

2.6.2 Noise Attenuation of Haul Truck Fleet

NSS (2014a) identified that noise attenuation of the haul truck fleet could result in an overall reduction to the sound power level of the Mine. At this stage, based on the significant cost associated with noise attenuation of the truck fleet, the Proponent proposes to assess the effectiveness of the mitigation provided by the enhanced amenity bund before considering this option further.

2.6.3 Mitigation at Receiver

The Proponent has previously undertaken noise mitigation at two residences surrounding the village of Tomingley. Those works cost approximately $45 000 to $55 000 per residence. The Proponent remains committed to providing at receiver mitigation where warranted, however, considers this a complimentary rather than alternative mitigation method.

2.6.4 Higher Amenity Bund

NSS (2014b) identified that the additional benefit of a higher bund, namely approximately 15m above natural surface, with a top width of approximately 10m, would not provide for significantly greater noise mitigation (≤1dB(A)). The Proponent determined that the additional visual amenity impacts associated with the higher bund could not be justified based on the similar noise mitigating performance of the two designs.

2.6.5 Alternative Location of the Amenity Bund

The Proponent considered alternative locations closer to the Caloma Open Cut for the enhanced amenity bund. However, these locations would have required establishment of a stand-alone bund, resulting in a final landform that would consist of a narrow corridor of essentially flat land between two elevated bunds. This would limit the potential for subsequent agricultural use of the land.

In addition, PSM (2014) identified that elevated pore pressure in the alluvium, saprolite and highly weathered rock was a contributing factor to the observed instability of that material. Loading the near-pit surface with a substantial bund would exacerbate that problem and could potentially result in further failures of the open cut wall.

2.6.6 Use of Acoustic Hoardings (with or without a bund)

The Proponent considered the use of acoustic hoardings instead of a bund. However, risks associated with the hoardings being blown down or into the village of Tomingley, as well as the visual amenity impacts of the hoardings, were considered to outweigh the potential cost savings associated with the use of such hoardings.

2.6.7 24-hour Bund Construction

The Proponent considered undertaking cut back and bund construction operations 24-hours per day. However, as identified in Section 1.3.4.3, the noise environment in the village of Tomingley is considerably quieter during the evening and night-time. As a result, the Proponent elected to limit these activities to the day time period only.

3. ISSUE IDENTIFICATION AND PRIORITISATION

3.1 INTRODUCTION

In order to undertake a comprehensive *Environmental Assessment* of the Proposed Modification, appropriate emphasis needs to be placed on those issues likely to be of greatest significance to the local environment, neighbouring landowners and the wider community.

Issue identification was completed through a combination of the following methods.

- Targeted community and government consultation in order to identify environmental issues of concern or relevance.
- A review of environmental planning documentation in order to identify relevant environmental constraints and/or issues.
- A review of the environmental performance at the Mine in order to identify those aspects of the environment that are, have been or are likely to be affected by mining operations.
- The experience of Mine personnel and the authors of this *Environmental Assessment* in relation to the likely impacts.

Section 3.2 provides the results of the issue identification.

On identification of those environmental issues that could be affected by the Proposed Modification, an analysis of the potential for impact on each of these has been undertaken in order to identify the priority and scale of assessment required (see Section 3.3).

3.2 ISSUE IDENTIFICATION

3.2.1 Consultation

3.2.1.1 Community Consultation

The original *Environmental Assessment* for the Tomingley Gold Project (RWC, 2011) documents the comprehensive community consultation program undertaken prior to the commencement of operations to identify the issues of greatest concern to the local community. Issues associated with noise, air quality, land use, social impacts and economic opportunities were common issues raised and identified as part of that consultation.

The Proponent maintains an ongoing dialogue with the local community. A Community Consultative Committee (CCC) has been established and meets quarterly. The function of the CCC is to provide a forum for the Proponent to inform the local community of ongoing or notable operations and the local community an opportunity to raise issues of concern or relevance. The most notable issues raised during CCC meetings relates to the noise generated by operations at the Mine.

Representatives of the Proponent also meet with, or correspond with by phone or email, local and other concerned stakeholders on an ad hoc basis, i.e. opportunistically or as issues are identified. Further, a community information / complaints line is maintained by the Proponent

with personnel available to respond 24 hours a day, seven days a week. As complaints or requests for information are received, the Proponent responds as quickly and comprehensively as possible. Over the life of the Mine, and notably since operations within the Caloma Open Cut have commenced, concerns have been raised over the noise levels received at some receivers in Tomingley village.

Noting the potential visual impact of the Proposed Modification, the Proponent contacted the residents of Receivers R3 (Christine Sonter) and R26 (Barry & Christine Unger) (See **Figure 7** in Section 4.2) to discuss the potential impacts of the bund enhancement and the potential benefits on noise levels. Although noise and dust emissions were raised as an issue by Ms Sonter, and noise was raised as an issue of concern by Mrs Unger, no objection to the Proposed Modification was noted. The Proponent has also discussed noise issues with another resident, Mr Gavin Dart, of Burrell Street, Tomingley, on a number of occasions, most recently on 27 November 2014. Mr Dart has made a number of complaints regarding noise and the Proponent has discussed noise mitigation options with Mr Dart on each occasion.

3.2.1.2 Government Agency Consultation

Once it was confirmed that modification to the Caloma Open Cut would be required and enhancement of the amenity bund endorsed by senior management of the Proponent, the Department of Planning & Environment (DPE) was consulted by Mr Mitchell Bland (of RWC) as to the appropriate assessment pathway. The DPE confirmed that application to modify PA 09_0155 could be made under Section 75W of the *Environmental Planning & Assessment Act 1979* (EP&A Act), in accordance with the transitional arrangements associated with the repeal of Part 3A.

On 14 November 2014, the Proponent provided a summary of the Proposed Modification to the following government agencies.

- The DPE: as the consent authority for PA 09_0155.
- The NSW Environment Protection Authority (EPA): as the licensing authority for Environmental Protection Licence (EPL) 20169 under the *Protection of the Environment Operations Act 1999* (POEO Act).
- The Division of Resources & Energy (DRE) (of the Department of Trade & Investment, Regional Infrastructure & Services): as the authority responsible for the issuing and regulation of mineral authorities held by the Proponent.

The responses of each agency to this correspondence is summarised below.

Department of Planning & Environment

On the basis of the information provided, Mr Kane Winwood of the DPE suggested (in a phone conversation with Mr Bland of RWC) that the following environmental issues warrant assessment.

- Noise. Both during construction of the enhanced amenity bund and once completed.
- Air Quality. In particular the emissions associated with the construction of the enhanced amenity bund.

- Visual Amenity. With particular focus on any changes visible from the closest receivers as well as the Newell Highway.
- Final Landform / Rehabilitation. Consideration required of the affect of any change in the final landform and implication for future land use.

The DPE also indicated that a description and assessment of viable alternatives to the Proposed Modification would be required. These assessment requirements were reiterated in a phone conversation between Mr Alex Irwin (of RWC) and Mr Winwood on 26 November 2014.

NSW Environment Protection Authority

On 21 November 2014, Mr Brad Tanswell of the EPA responded by email to the Proponent indicating no major concerns other than to ensure that appropriate erosion and sediment controls are in place to ensure water pollution is prevented and compliance with EPL 20169 is maintained. The EPA also noted general support for works aimed at reducing noise impacts.

Division of Resources & Energy

Mr Mark Buchan of the DRE responded to the Proponent by phone confirming no issues of concern over the Proposed Modifications to operations with the assessment to discuss changes to rehabilitation and the final landform. Continued compliance with the conditions of mining leases was implied.

3.2.2 Review of Planning Issues

3.2.2.1 Introduction

A number of planning instruments apply to the operations at the Mine. These planning instruments were reviewed to identify any environmental aspects requiring consideration in the *Environmental Assessment*. A brief summary of each relevant planning instrument, relevance to the Proposed Modification and how these have been considered in the *Environmental Assessment*, is provided in Sections 3.2.2.2 and 3.2.2.3 for State and local planning issues respectively.

3.2.2.2 State Planning Issues

Application of Part 3A of the EP&A Act

A modification to PA 09_0155 is required under Section 75W of the EP&A Act as the proposed extension of the Caloma Open Cut and additional disturbance associated with the amenity bund and haul roads would change the terms of the determination made by the Minister (clause 75W(1)(b) (repealed)). As noted in Section 3.2.1.2, the DPE has confirmed that an application to modify PA 09_0155 may be lodged in accordance with the transitional arrangement of the EP&A Act associated with the repeal of Part 3A. No formal Secretary's Environmental Assessment Requirements or Director-General's Requirements were deemed necessary by the DPE.

Mining SEPP

This SEPP was gazetted on 17 February 2007 in recognition of the importance to NSW of mining, petroleum production and extractive industries. The SEPP specifies matters requiring consideration in the assessment of any mining, petroleum production and extractive industry development as defined in NSW legislation.

Table 3 presents a summary of the matters that the Minister or his/her delegate needs to consider when assessing a new or modified Proposal (Part 3 – Clauses 12 to 17 of the SEPP) and a reference to the section(s) in this *Environmental Assessment* where each relevant element of the SEPP is addressed.

Table 3
Application of Mining SEPP

Relevant SEPP Clause	Description	EA Section
12: Compatibility with other land uses	Consideration is given to: - the existing uses and approved uses of land in the vicinity of the development; - the potential impact on the preferred land uses (as considered by the consent authority) in the vicinity of the development; and - any ways in which the development may be incompatible with any of those existing, approved or preferred land uses.	3.3.11
	The respective public benefits of the development and the existing, approved or preferred land uses are evaluated and compared.	5.2, 5.3
	Measures proposed to avoid or minimise any incompatibility are considered.	N/A[1]
12AA: Significance of resource	Consideration is given to the significance of the resource that is the subject of the application, having regard to: • the economic benefits, both to the State and the region; and • the advice provided by the DG of DTIRIS as to the relative significance of the resource in comparison with other mineral resources across the State.	NR[1]
12AB: Non-discretionary development standards for mining	Consideration is given to development standards that, if complied with, prevents the consent authority from requiring more onerous standards for those matters	Noted
13: Compatibility with mining, petroleum production or extractive industry	Consideration is given to whether the development is likely to have a significant impact on current or future mining, petroleum production or extractive industry and ways in which the development may be incompatible. Measures taken by the applicant to avoid or minimise any incompatibility are considered. The public benefits of the development and any existing or approved mining, petroleum production or extractive industry must be evaluated and compared.	NR[1]
14: Natural resource and environmental management	Consideration is given to ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure: - impacts on significant water resources, including surface and groundwater resources, are avoided or minimised;	3.3.3, 3.3.4 & 4.4
	- impacts on threatened species and biodiversity are avoided or minimised; and	3.3.5
	- greenhouse gas emissions are minimised and an assessment of the greenhouse gas emissions (including downstream emissions) of the development is provided.	3.3.8

Table 3 (Cont'd)
Application of SEPP (Mining, Petroleum Production and Extractive Industries) 2007

Relevant SEPP Clause	Description	EA Section
15: Resource recovery	The efficiency of resource recovery, including the reuse or recycling of material and minimisation of the creation of waste, is considered.	2.2
16: Transportation	The following transport related issued are considered. - The transport of some or all of the materials from the site by means other than public road. - Limitation of the number of truck movements that occur on roads within residential areas or roads near to schools. - The preparation of a code of conduct for the transport of materials on public roads.	3.3.9
17: Rehabilitation	The rehabilitation of the land affected by the development is considered including: - the preparation of a plan that identifies the proposed end use and landform of the land once rehabilitated; - the appropriate management of development generated waste; - remediation of any soil contaminated by the development; and - the steps to be taken to ensure that the state of the land does not jeopardize public safety, while being rehabilitated or at the completion of rehabilitation.	**Figure 6** 2.5.4 3.3.10 2.5
Note 1: NR = Not relevant N/A = Not Applicable		

Clauses 12AA and 13 are not considered relevant on the basis that the Mine has already been approved and as such the significance of the resource and economic benefits to the State have already been considered.

3.2.2.3 Local Planning Issues

The Mine Site lies entirely within Narromine Shire Local Government Area on land zoned RU1 – Primary Production or, for those section of the Mine Site within the Newell Highway road reserve, SP2 Infrastructure, under the *Narromine Local Environment Plan 2011* ("Narromine LEP").

All land that would be disturbed in by the Proposed Modification is zone RU1. The Proposed Modification would not alter the proposed activities, i.e. mining and ancillary activities, which are permissible with consent in in this zone.

3.2.3 Environmental Performance

Section 1.3.4 reviews the environmental management and performance of the Mine and while the Proponent has implemented environmental controls and management to reduce impacts, complaints have been received and incidences of non-compliance with existing criteria recorded. Recorded complaints and non-compliance issues relate primarily to the following features of the local environmental setting and indicate that these require particular attention in the assessment of impacts.

- Noise. A number of complaints have been received by the Proponent, primarily related to evening and night-time noise. The Proponent has also confirmed through monitoring noise levels exceeding criteria at Receiver R3 within the village of Tomingley. Notably, the amenity bund enhancement of the Proposed Modification is aimed at reducing the noise received at residences within Tomingley.
- Air Quality. A small number of exceedances of 24 hour PM_{10} criteria and moderate number of recent complaints (five) suggest dust emissions require consideration in the assessment of the Proposed Modification.
- Surface Water. On the basis of the official caution issued by the EPA in relation to erosion and sediment control at the Mine, the affects of the Proposed Modification on Mine surface water requires assessment.

3.2.4 Summary

On the basis of the consultation undertaken, review of planning instruments and assessment of environmental performance, the environmental issues identified as requiring assessment are as follows.

- Noise (refer to Sections 3.2.1.1, 3.2.1.2, 3.2.2.2.2 and 3.2.3)
- Air Quality (including greenhouse gases) (refer to Sections 3.2.1.1, 3.2.1.2, 3.2.2.2.2 and 3.2.3).
- Visual Amenity (refer to Section 3.2.1.2).
- Water Resources (including erosion and sedimentation) (refer to Sections 3.2.1.2, 3.2.2.2.2 and 3.2.3).
- Rehabilitation (refer to Sections 3.2.1.2 and 3.2.2.2.2).
- Biodiversity (refer to Section 3.2.2.2.2).
- Transportation (refer to Section 3.2.2.2.2).
- Land Use (refer to Section 3.2.2.2.2).

3.3 ISSUE PRIORITISATION AND COVERAGE

3.3.1 Introduction

For each of the environmental issues identified (refer to Section 3.2), an analysis of the possible impacts was undertaken to determine the specific assessment requirements and level of priority associated with each. This analysis was undertaken in conjunction with a review of the original *Environmental Assessment* (RWC, 2011), prepared to support the original application for project approval, to determine whether the Proposed Modification would result in any material change to the impacts assessed originally (and therefore warrant further assessment).

3.3.2 Noise

It is noted that the proposed cut back of the Caloma Open Cut would not result in the operation of equipment any closer to Tomingley village and therefore it is not anticipated that this aspect of the Proposed Modification would result in additional or increased noise generation. It is recognised, however, that the proposed cut back forms part of the overall and ongoing operation of the Mine for which managing noise generation remains an issue of high priority given the recorded exceedance of noise criteria at one residence (R3 – NSS, 2014a) and significant number of complaints related to noise (refer to Section 1.3.4.3). **Figure 7** illustrates the proximity of the Mine Site to the village of Tomingley, identifies the residences within the village, and references the different Noise Assessment Groups assigned to the residential receivers in the development and confirmation of noise limits (criteria).

By reviewing real time noise monitoring, and completing attended monitoring during the evening and night, the Proponent has identified that noise sources associated with loading of trucks and drill rig operation are the most audible and therefore have the greatest potential to exceed both the $L_{eq(15\ minute)}$ and L_{max} (sleep disturbance criteria). Preliminary investigations as to the effectiveness of enhancing the amenity bund suggest that this will reduce the noise level received at residences in Tomingley.

*On the basis of the completed issue identification and prioritisation, noise is considered to be a **high priority** issue with further assessment to include.*

- *the predicted noise reduction provided by enhancement of the amenity bund; and*
- *potential noise impacts associated with the construction of the enhanced amenity bund.*

3.3.3 Air Quality

Adverse effects associated with dust and other particulate emissions have been identified as a result of complaints received and monitoring results. The Proposed Modification would require additional surface disturbance (to widen the Caloma Open Cut) and additional earthworks in relative close proximity to the village of Tomingley (to raise and widen the amenity bund), both of which are likely to generate dust emissions.

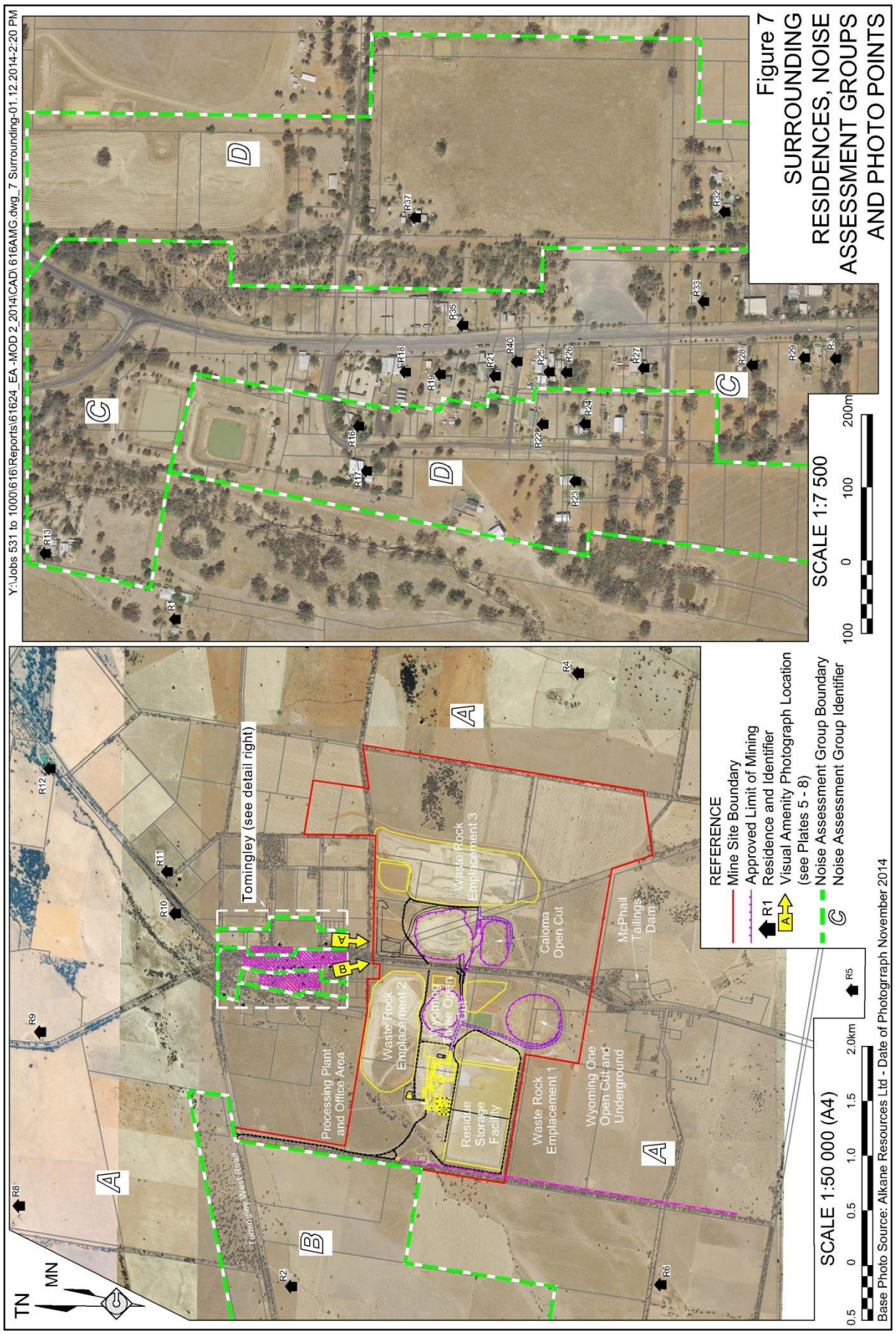


Figure 7
SURROUNDING RESIDENCES, NOISE ASSESSMENT GROUPS AND PHOTO POINTS
Y:\Jobs 531 to 1000\616\Reports\61624_EA -MOD 2_2014\CAD\ 616AMG.dwg_7 Surrounding-01.12.2014-2:20 PM
SCALE 1:7 500
100 0 100 200m
SCALE 1:50 000 (A4)
0.5 0 0.5 1.0 1.5 2.0km
TN
MN
Tomingley (see detail right)
Tomingley West Road
Processing Plant and Office Area
Waste Rock Emplacement 2
Tomingley Open Cut
Residue Storage Facility
Waste Rock Emplacement 1
Wyoming One Open Cut and Underground
Caloma Open Cut
Waste Rock Emplacement 3
McPhail Tailings Dam
REFERENCE
Mine Site Boundary
Approved Limit of Mining
R1 Residence and Identifier
A Visual Amenity Photograph Location (see Plates 5 - 8)
Noise Assessment Group Boundary
C Noise Assessment Group Identifier
Base Photo Source: Alkane Resources Ltd - Date of Photogrraph November 2014

The potential impacts of the Proposed Modification, if unmitigated, would be an increase in the concentration of dust received at surrounding residences and properties as a result of the Mine. However, on the basis that the proposed additional earthworks represent a relatively small extension of ongoing works, would be restricted to a relatively short period of time, and the adherence of the Proponent to *Site Specific Procedure – Dust Control* (TGO, 2014) introduced in January 2014 (refer to Section 1.3.4.4 and **Appendix 2**), the potential for significant increase in dust emissions as a result of the Proposed Modification is considered relatively low.

*Air Quality is considered to be a **moderate priority** issue with further assessment to include a review of the effectiveness of the Site Specific Procedure for Dust Control to provide an acceptable level of control over emissions, in particular during construction of the enhanced amenity bund).*

The Proposed Modification would not require any additional equipment to that already in operation at the Mine and as a result would not have any influence on greenhouse gas emissions generated. On the basis of the preceding, no further assessment of greenhouse gas emissions is warranted.

3.3.4 Visual Amenity

Views of the existing amenity bund, from locations in the southern sections of the village of Tomingley just beyond the mining lease (see **Figure 7**), are provided as **Plates 5** to **8**. These illustrate two things.

1. The bund is effective in limiting views of the mining operations which occur behind it.
2. The existing amenity bund is relatively inconspicuous, especially those sections with an established cover of grass, (see **Plates 5** to **7**) and practically imperceptible when viewed at greater distance (see **Plate 8**).

While the proposed increase in height of the amenity bund (from 3.5m to between 6m and 10m) is considered quite modest, this could result in this structure being more conspicuous and has the potential to impact adversely on the local amenity currently afforded residences at the southern end of Tomingley.

*On the basis of the above, Visual Amenity is considered to be of **moderate priority** with further assessment to include interpretation of the likely change in the visual amenity, review of acceptability and consideration of further mitigation.*

2014\CAD\ 616AMG.dwg_Plates 5-8-01.12.2014-1:21 PM

Plate 5: View of northern face of amenity bund from Point A (obscured by vegetation)
(Source: TGO DSCN0132)

Plate 6: View of northern face of amenity bund from Point A (with grass coverage)
(Source: TGO DSCN0133)

Plate 7: View of northwestern corner of amenity bund from Point A
(Source: TGO DSCN0136)

Plate 8: View of amenity bund from Point B
(Source: TGO DSCN0153)

3.3.5 Water Resources

3.3.5.1 Surface Water

The Mine currently operates in accordance with an *Erosion and Sediment Control Plan* (ESCP) prepared by Strategic Environmental and Engineering Consultants (SEEC, 2012). As the Proposed Modification would result in relatively small changes to the area of disturbance on the Mine Site, this would likely result in a slight modification to the catchments considered in the design, construction and management of the various features of the ESCP, e.g. diversion drains, sediment basins, grass buffer strips. **Figure 8** overlays the proposed modified site layout over the relevant sheet of the ESCP to illustrate the required changes.

On the basis of the relatively minor changes to areas of disturbance and catchments of the Mine Site, and identification by the EPA as an issue requiring consideration, surface water is considered to be of ***moderate priority****. Further assessment is to include review of the ESCP and assessment of required changes to accommodate the Proposed Modification.*

3.3.5.2 Groundwater

All earthworks associated with the Proposed Modification are to be undertaken well above the groundwater table. As a result, the Proposed Modification would not result in any additional impacts on groundwater resources.

No further assessment is warranted.

3.3.6 Rehabilitation

As a result of the changes to the Caloma Open Cut and amenity bund, the final landform would be slightly modified from that presented in the 2011 *Environmental Assessment* (RWC, 2011) and *Mining Operations Plan* (TGO/RWC, 2014). As discussed in Section 2.5, however, no changes to the proposed rehabilitation objectives and methods or anticipated final land use would result.

On the basis of the above, rehabilitation is considered to be of ***low to moderate priority****, with consideration and assessment completed in Section 2.5.*

3.3.7 Biodiversity

Figure 9 illustrates the extent of the proposed modified operations in relation to native vegetation mapped on the Mine Site and surrounds (OzArk, 2011a). Notably, the additional disturbance is restricted to previously cleared land without an identifiable native vegetation community or significant habitat for native species. No additional impacts on biodiversity are considered likely as a result of the Proposed Modification and no change to the Biodiversity Offset Strategy for the Mine required.

No further assessment is warranted.

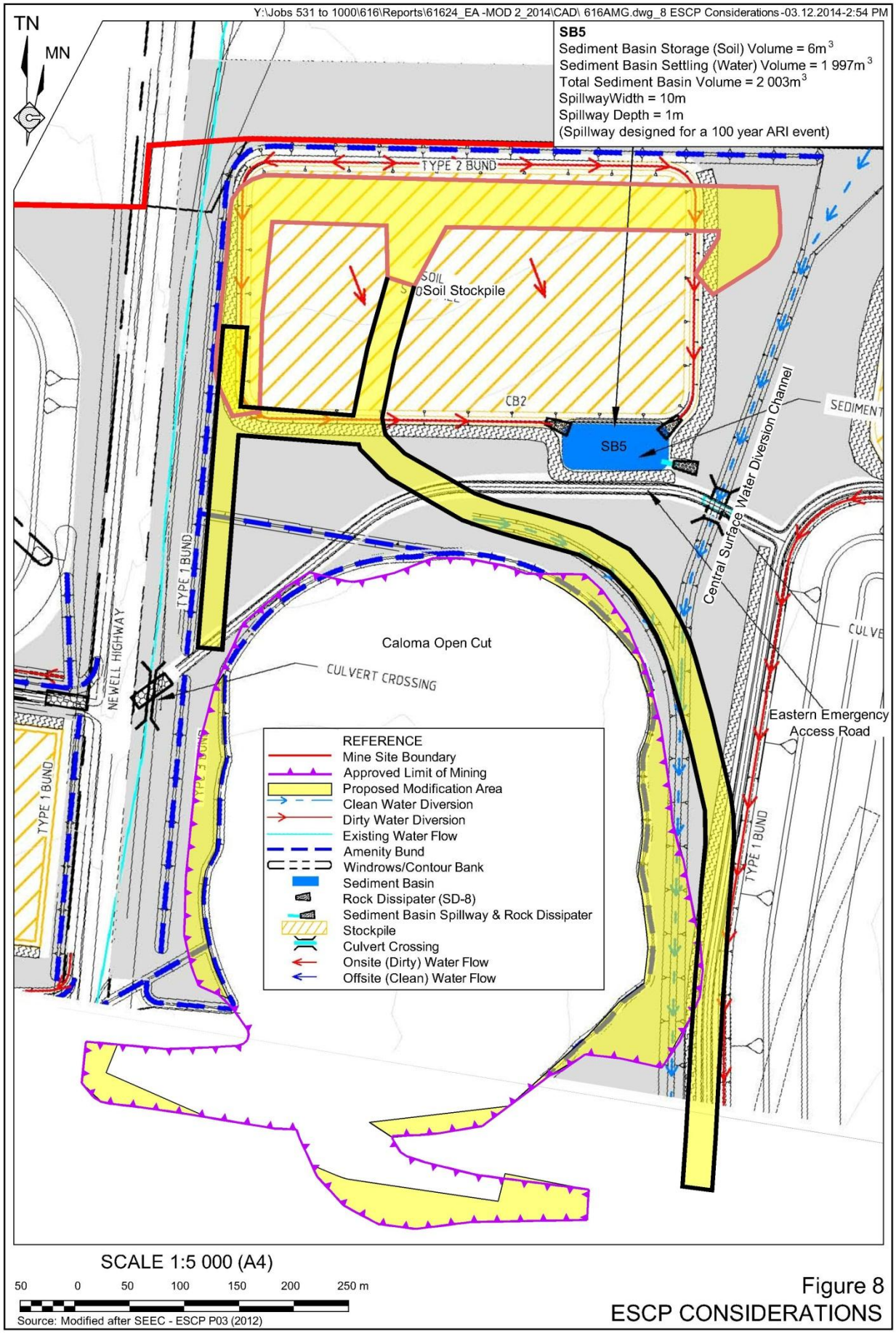
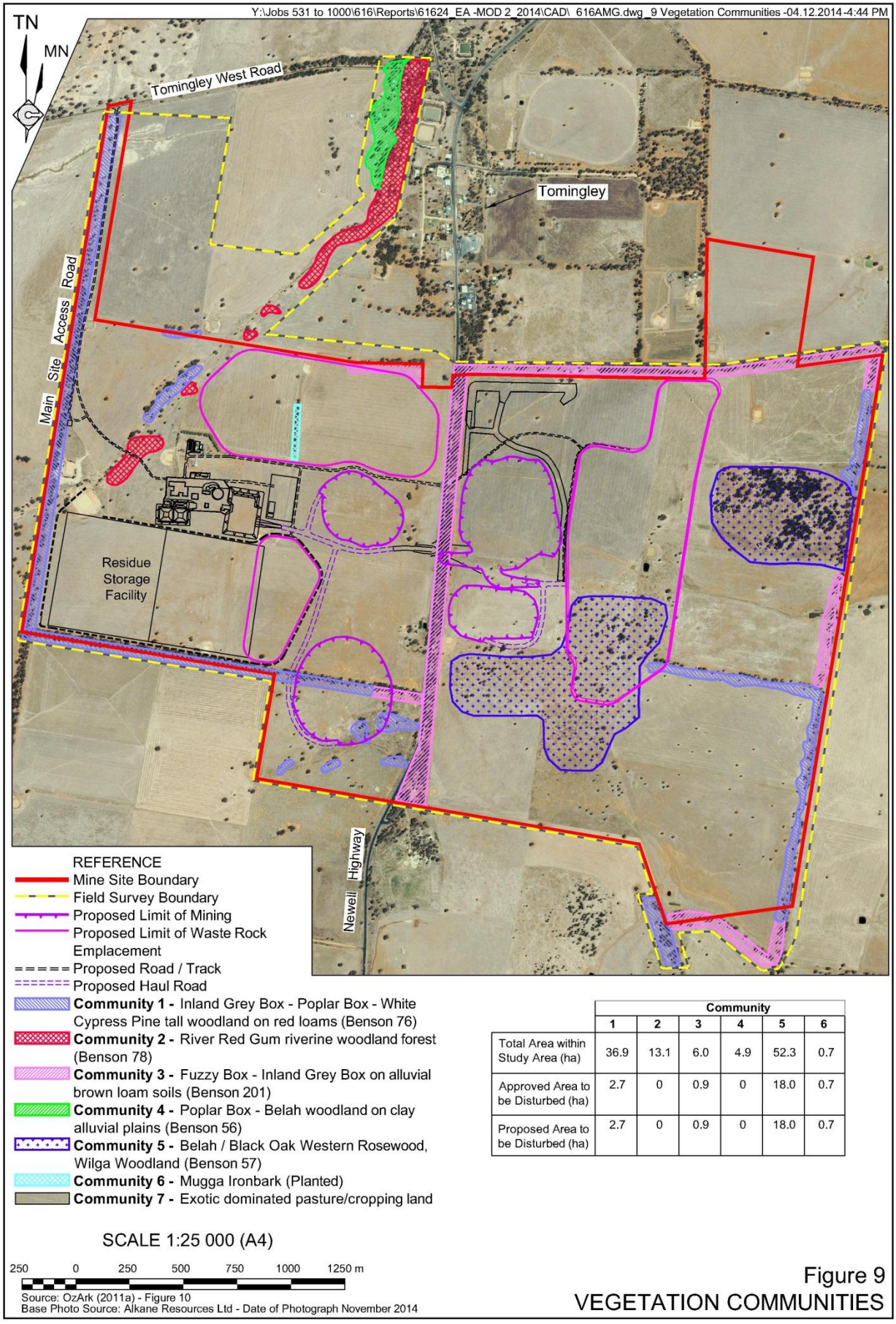


Figure 8
ESCP CONSIDERATIONS



	Community					
	1	2	3	4	5	6
Total Area within Study Area (ha)	36.9	13.1	6.0	4.9	52.3	0.7
Approved Area to be Disturbed (ha)	2.7	0	0.9	0	18.0	0.7
Proposed Area to be Disturbed (ha)	2.7	0	0.9	0	18.0	0.7

Figure 9
VEGETATION COMMUNITIES

3.3.8 Transportation

The Proposed Modification requires no change to the current transport operations and the proposed earthworks would be undertaken solely on the Mine Site.

No further assessment is warranted.

3.3.9 Land Use

The preferred land uses in the vicinity of the Mine Site are agriculture and village residential (Tomingley village). As all additional disturbance associated with the Proposed Modification would be restricted to the Mine Site, and assuming the Proposed Modification can be undertaken without adverse impact on the environmental parameters influencing these land uses, e.g. noise and air quality for urban land use and water resources for agriculture, the Mine will remain compatible with these land uses.

No further assessment is warranted.

3.3.10 Other Environmental Issues

3.3.10.1 Cultural Heritage

Figure 10 illustrates the extent of the proposed modified operations in relation to identified sites of Aboriginal and non-Aboriginal heritage (OzArk, 2011b). The additional disturbance associated with the Proposed Modification would not result in disturbance to any of the identified sites. Furthermore, the Proponent is cognisant of its responsibilities to protect Aboriginal heritage under the *National Parks and Wildlife Act 1974* and instructs its workforce accordingly.

No further assessment is warranted.

3.3.10.2 Soils and Land Capability

Soil resources would be managed in accordance with approved methods and with the *Mining Operations Plan* for the Mine. No additional impacts on soil or land capability are anticipated.

No further assessment is warranted.

3.3.10.3 Bushfire

RWC (2011) concluded that while mining and ancillary activities associated with the Mine would increase the number and type of ignition sources in the local area, the proposed controls and safeguards and general clearing activities would ensure that the potential for fire initiation and spread on the Mine Site is minimised. The Proposed Modification would not introduce any new ignition sources nor impact on the controls in place and therefore would not have any affect on the bushfire hazard of the Mine.

No further assessment is warranted.

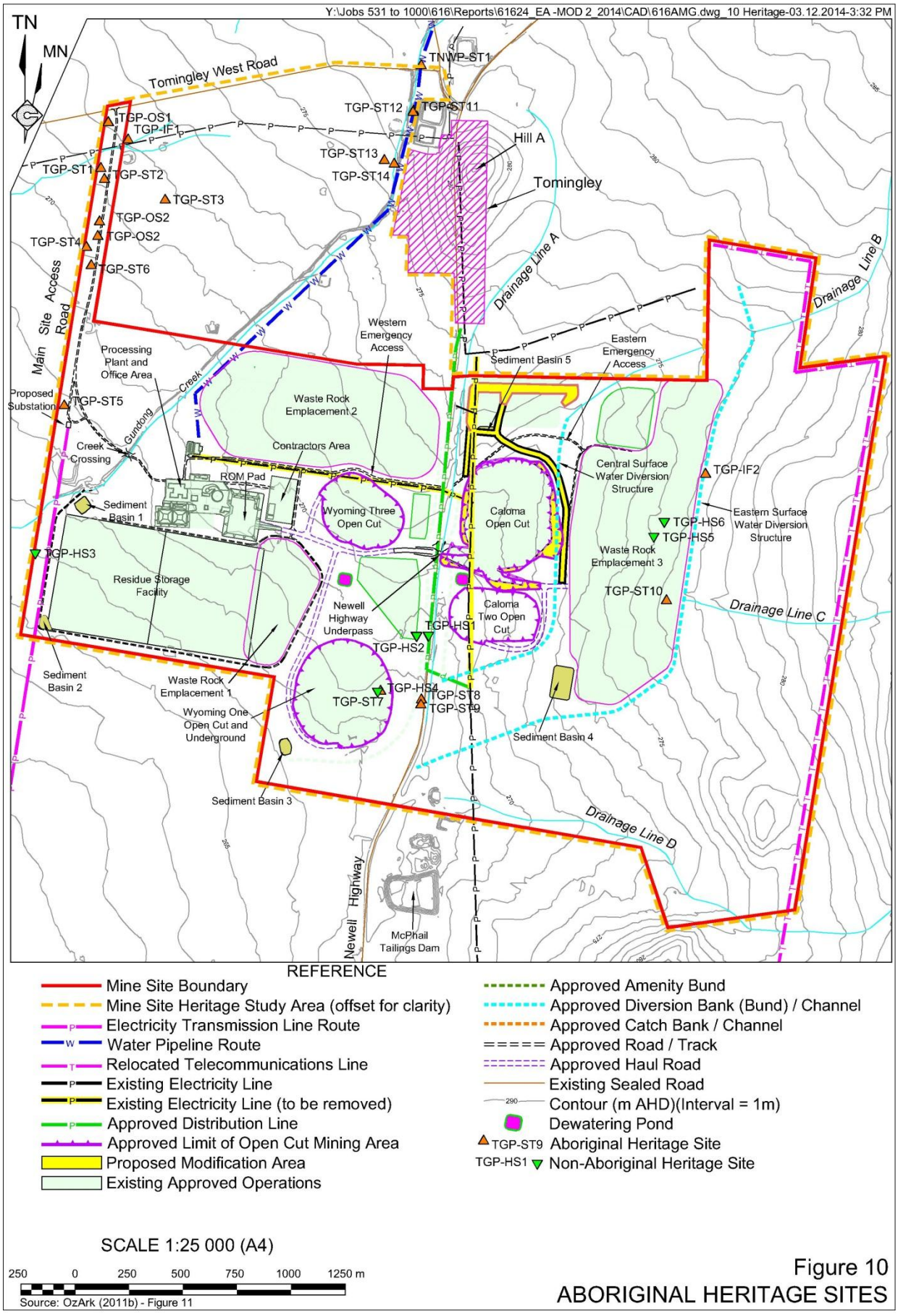


Figure 10
ABORIGINAL HERITAGE SITES

3.3.10.4 Socio-Economic Setting

The Proposed Modification has the potential for minor impacts upon the socio-economic setting of the surrounding environment.

*The changes are likely to be, on balance, positive as a result of additional noise attenuation and as a result Socio-economic Setting is considered to be of **low priority** for further assessment.*

3.3.11 Summary of Assessment Priority

Based on a review of the likely impacts associated with the identified issues, these have been ranked in order of priority.

1. Noise (high priority).
2. Air quality (moderate priority).
3. Visual amenity (moderate priority).
4. Surface water/erosion and Sedimentation (moderate priority).
5. Rehabilitation (low to moderate priority).
6. Socio-economic setting (low priority).

As noted in Section 3.3.6, rehabilitation of the Mine is considered in Section 2.5. Assessment of the remaining issues is provided in Section 4.

4. ASSESSMENT AND MANAGEMENT OF KEY ENVIRONMENTAL ISSUES

4.1 INTRODUCTION

This section provides an assessment of the impacts associated with those features of the local environment which could potentially be affected by the Proposed Modification. The proposed design and/or operational safeguards and an assessment of the level of impact the Proposed Modification may have after implementation of these safeguards is also described.

4.2 NOISE

4.2.1 Introduction

As noted in Section 3.3.2, current mining operations are audible within Tomingley village and the Proponent proposes the enhancement of the existing amenity bund from 3m to between 6m and 10m to reduce the contribution of the Mine to noise levels received. The Proponent has commissioned Noise and Sound Service (NSS) to complete an assessment of the reduction in noise that may be provided by an increase in the elevation and width of the amenity bund, as well as assess the impacts on local noise of the construction activities. The following sub-sections summarise the *Noise Bund Assessment* of NSS (2014b), a complete copy of which is provided as **Appendix 1**.

4.2.2 Existing Environment

4.2.2.1 Local Noise Environment

Non-mining related noise levels in the vicinity of the Mine are influenced by a range of sources including traffic on the Newell Highway and local roads, agricultural equipment, stock, wind in trees, insects and birds. In order to characterise the local variation in noise levels, SLR (2011) undertook attended and attended noise monitoring at seven residences surrounding the Mine Site.

At those residences potentially most-affected by noise generated by the Mine, i.e. NAG C and NAG D (see **Figure 7**), SLR (2011) confirmed that background noise levels, in particular during the day were impacted by traffic on the Newell Highway. Background noise levels ($L_{A90(15minute)}$) within NAG C (including receiver R3) exceed 40dB(A) during the day and exceed 38dB(A) within NAG D (including receiver R23) (see **Table 4**).

The results of background (pre-mining) noise monitoring illustrates that the residences of Tomingley village are already noise affected by Newell Highway traffic during the day time.

Table 4
Summary of L_{A90} Rating Background Levels (dB(A) re 20µPa)

Receiver	Rating Background Level[1] (LA90(15minute) Level All Noise Sources		
	Day	Evening	Night
R1	30	30	30
R2	31	30[2]	30[2]
R3	40	30	30
R4	30	30	30
R5	30	30	30
R6	30	30	30
R23	38	33	31

Note 1: Rating Background Level (RBL) determined in accordance with the procedures specified in the Industrial Noise Policy, 2000 (INP).

Note 2: It has been determined from the attended noise monitoring results that the LA90 noise levels measured by the unattended noise logger were controlled by local domestic activity at Residence 2. The evening and night-time RBLs at this receptor have been adjusted accordingly.

Source: SLR (2011) – Table 12

4.2.2.2 Meteorological Conditions

Noise received at a receiver is influenced by meteorological conditions, with some conditions including gentle winds from source to receiver and inversion conditions enhancing noise levels received, while other conditions including high wind speeds or winds from receiver to source reducing noise levels received. Winds from the south or southeast at speeds of between 0.5m/s to 3.0m/s are likely to enhance the noise levels received in Tomingley.

Local Wind Conditions

As part of the 2011 *Environmental Assessment* (RWC, 2011), annual and seasonal wind conditions were reviewed using data collected at the Peak Hill Gold Mine weather station, approximately 15km to the south of the Mine, for the period January 2003 to December 2003. The dominant seasonal wind speeds and directions are presented in **Table 5** for the daytime (7:00am to 6:00pm), evening (6:00pm to 10:00pm) and night-time (10:00pm to 7:00am) periods.

Notably, there are no prevailing winds of velocity less than (or equal to) 3m/s, with a frequency of occurrence greater than (or equal to) 30% of the time.

Inversion Conditions

Inversions conditions are observed at the Mine, in particular during the cooler months of May to August. This confirms the interpretation of temperature data from the Peak Hill Gold Mine weather station which recorded stable conditions (Pasquill-Gifford stability classes F and G) on greater than 50% of evenings and nights during the winter months (SLR, 2011). Inversions of at least 3˚C/100m are therefore likely to be features of the local setting.

Table 5
Seasonal Frequency of occurrence Wind Speed Intervals - Daytime

Period	Calm (<0.5m/s)	Wind Direction ±45°	Wind Speed		
			0.5 to 2m/s	2 to 3m/s	0.5 to 3m/s
Day (7:00am to 6:00pm)					
Summer	7.5%	ENE	5.3%	4.4%	9.7%
Autumn	28.5%	S	13.6%	3.3%	16.8%
Winter	33.9%	SSW	11.6%	3.8%	15.4%
Spring	11.6%	S	5.4%	3.0%	8.4%
Evening (6:00pm to 10:00pm)					
Summer	1.0%	ESE	4.4%	3.4%	7.8%
Autumn	0.4%	E	11.7%	5.8%	17.5%
Winter	1.1%	NW	8.0%	12.2%	20.2%
Spring	1.5%	NW	1.7%	3.9%	5.7%
Night (10:00pm to 7:00am)					
Summer	7.5%	ENE	6.5%	5.2%	11.7%
Autumn	18.7%	E	11.9%	6.1%	18.0%
Winter	23.8%	SSW	10.2%	5.1%	15.4%
Spring	14.9%	SSE	7.1%	3.8%	10.8%
Source: Modified after SLR (2011) – Tables 13, 14 & 15					

4.2.3 Design Features, Operational Controls and Management Measures

4.2.3.1 Design Features

The enhancement of the amenity bund itself is the primary design feature for the attenuation of noise generated by the Mine. To assist in review of the relative benefits of a modest increase in bund height (to 6m) which would be less visible from vantage points north of the Mine Site (refer to Section 4.4) against those of a higher bund (10m) which would be slightly more visible, both bund designs are considered.

4.2.3.2 Operational Controls and Management Measures

Construction Noise

The enhanced amenity bund would be constructed such that the outer slope is constructed initially, with subsequent construction to be undertaken on the Mine side of this barrier. This would allow the outer slope to provide attenuation of the noise created by the construction of the remainder of the bund.

The Proponent has also committed to restricting construction of the enhanced noise bund to day shift (6:30am to 6:30pm).

Operational Noise

Once constructed, the enhanced amenity bund would provide for a reduction in the noise level received at receivers within Tomingley under calm or non-noise enhancing conditions (NSS, 2014b). The effectiveness of the enhanced amenity bund may be less significant under noise enhancing conditions, i.e. southerly / southeasterly winds or inversion conditions (NSS, 201b), and the Proponent would continue to rely on proactive operational controls to ensure noise levels remain at compliant levels. These operational controls would include the following.

- Consideration of weather forecasting prior to the scheduling of operations at night. Where source to receiver winds or inversion conditions are predicted, operations would as far as practicable be located where attenuation by existing mine features, e.g. open cut walls, constructed waste rock emplacements, is provided.
- Real-time noise monitoring would be regularly reviewed to identify increasing noise levels within Tomingley village. As noise level approach criteria, mine management would either relocate equipment or reduce the number of operating equipment to minimise the noise generated by the Mine.

The Proponent plans to prepare and implement a Site Specific Procedure – Noise Management which would include these controls as well as identify the specific meteorological trigger conditions to implement.

Finally, the Proponent is committed to providing at-receiver mitigation where required to mitigate noise levels received further. As already provided at several residences, these at receiver mitigation measures would be negotiated with the affected resident and could include air conditioning and improvements to noise mitigation through upgrading of glazing in the bed rooms to 6.38mm acoustic glass.

4.2.4 Assessment Methodology

4.2.4.1 Noise Bund Attenuation

NSS (2014b) used formulae included in the International Standard ISO 9613-2 (1996(E)) '*Acoustic – Attenuation of sound during propagation outdoors Part 2 General method of calculation*' to model the noise level received at the closest receiver to the Mine (Receiver R3 – see **Figure 7**). In total, 10 scenarios were modelled as follows.

- Existing amenity bund (3m high and 2m wide across the top).
    1. Mining operations at the most elevated point in the Caloma Open Cut (245m AHD).
    2. Mining operations at the bottom of Caloma Open Cut (100m AHD).
    3. Mining operations at the mid-pit level (185m AHD).

- Moderate enhancement of the amenity bund (6m high and 24m across the top).
    4. Mining operations at the most elevated point in the Caloma Open Cut (245m AHD).
    5. Mining operations at the bottom of Caloma Open Cut (100m AHD).
    6. Mining operations at the mid-pit level (185m AHD).
- Increased enhancement of the amenity bund (10m high and 24m across the top).
    7. Mining operations at the most elevated point in the Caloma Open Cut (245m AHD).
    8. Mining operations at the bottom of Caloma Open Cut (100m AHD).
    9. Mining operations at the mid-pit level (185m AHD).
- Comparison enhanced amenity bund (15m high and 10m across the top).
    10. Mining operations at the bottom of the Caloma Open Cut (100m AHD).

Figures 11 and **12** provide an illustration in plan and section view of the locations of mining noise sources within the Caloma Open Cut in comparison to the enhanced noise bund and Receiver R3.

4.2.4.2 Construction Noise

NSS (2014b) considered two scenarios to compare noise which could be received during construction of the enhanced noise bund when compared to noise associated with the placement of additional overburden within Waste Rock Emplacement 3.

1. Bund construction: One D10 bulldozer and one 777F haul truck operating at 280m AHD (top of 6m bund) and one 777F haul truck on approach to the bund (272m AHD).
2. Placement within Waste Rock Emplacement 3: One D10 bulldozer and one 777F haul truck operating on top of first lift (290m AHD) and one 777F haul truck on approach to Waste Rock Emplacement 3 (280m AHD).

Noise enhancing wind conditions were assumed, namely:

- wind blowing from source to receiver; and
- wind speed between approximately 1m/s and 5m/s measured at a height of 3m to 11m above the ground.

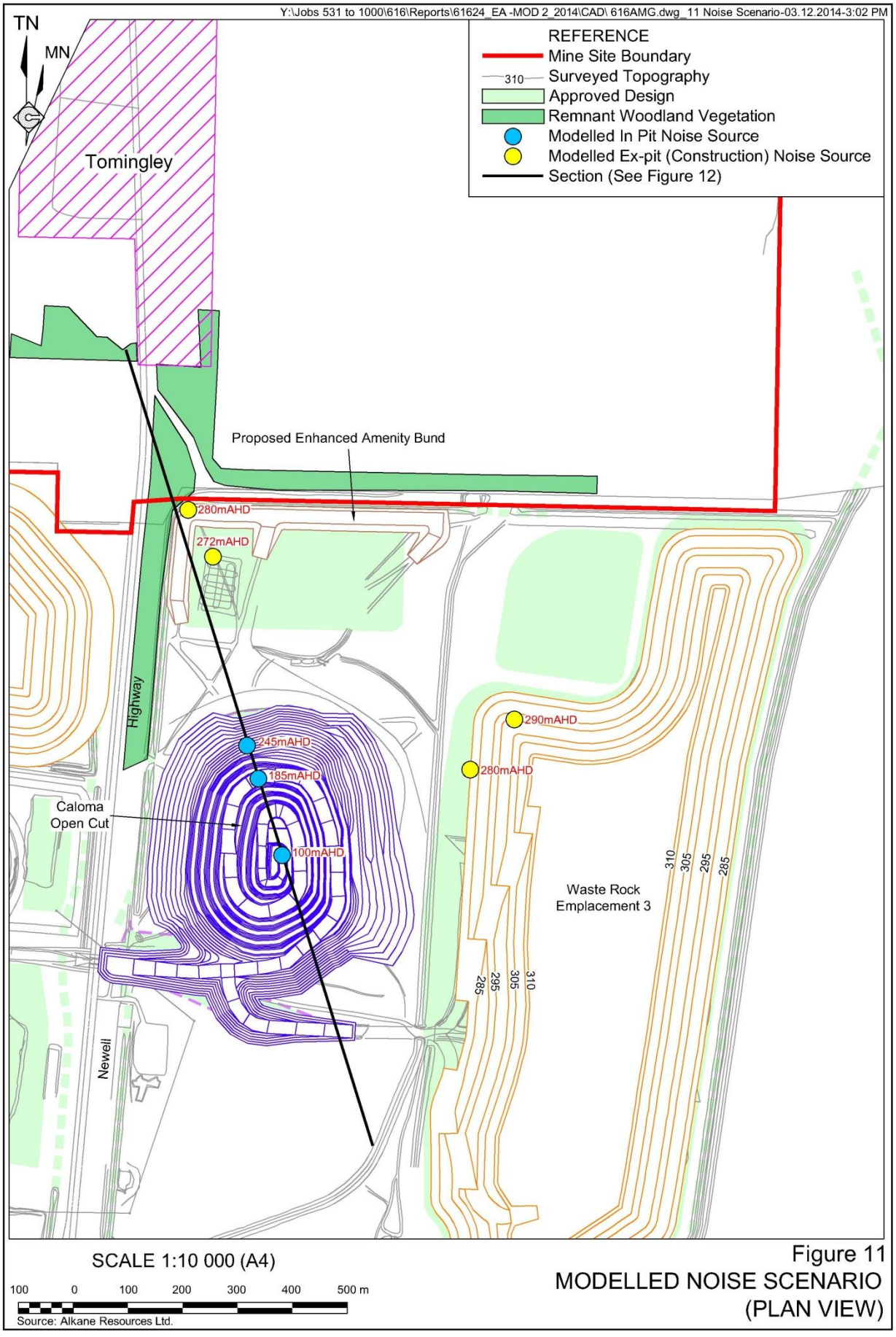
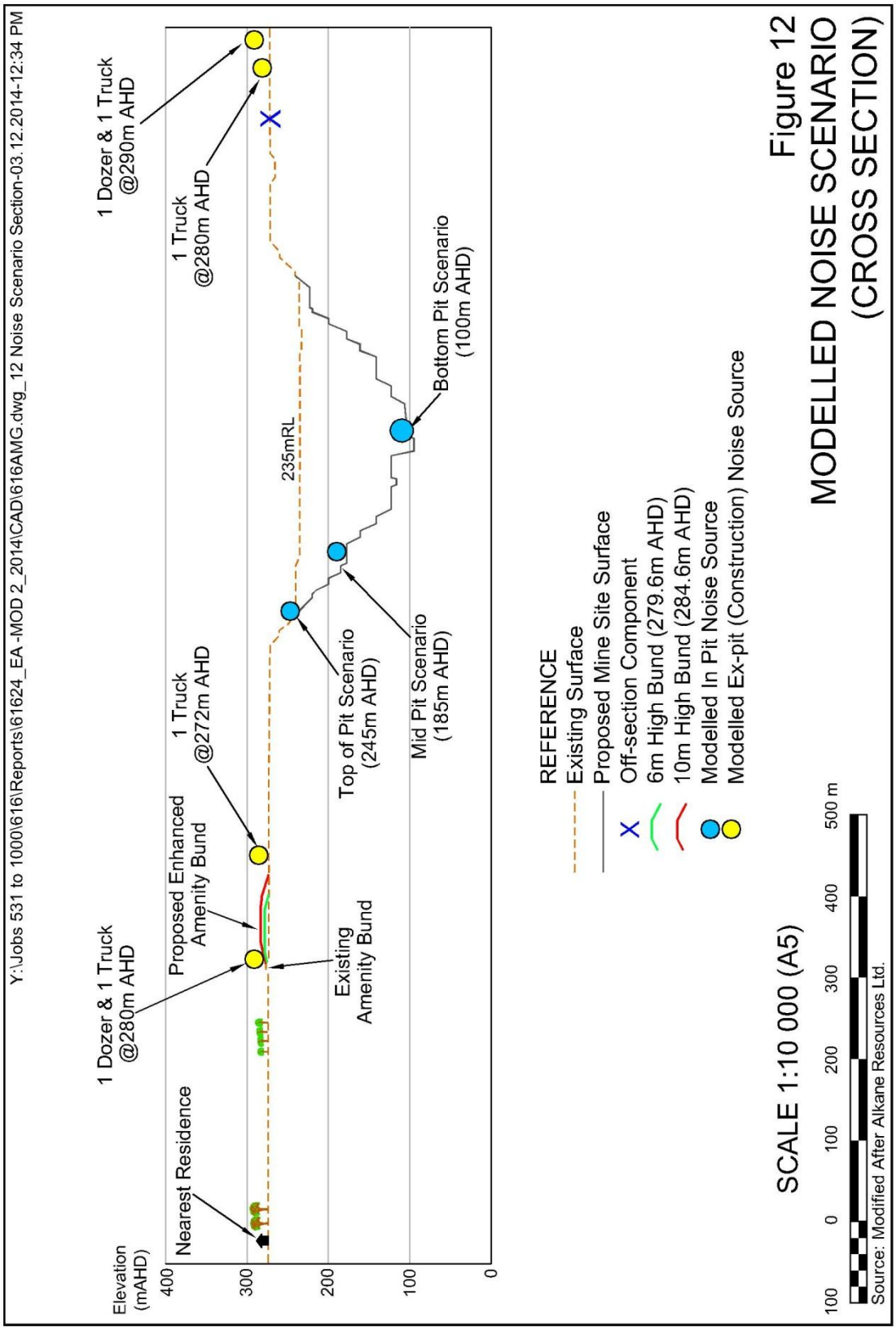


Figure 11
MODELLED NOISE SCENARIO
(PLAN VIEW)


Y:\Jobs 531 to 1000\616\Reports\61624_EA -MOD 2_2014\CAD\616AMG.dwg_12 Noise Scenario Section-03.12.2014-12:34 PM
1 Dozer & 1 Truck @290m AHD
1 Truck @280m AHD
1 Truck @272m AHD
1 Dozer & 1 Truck @280m AHD
Proposed Enhanced Amenity Bund
Existing Amenity Bund
Nearest Residence
Top of Pit Scenario (245m AHD)
Mid Pit Scenario (185m AHD)
Bottom Pit Scenario (100m AHD)
235mRL
Elevation (mAHD)
400
300
200
100
0
REFERENCE
Existing Surface
Proposed Mine Site Surface
Off-section Component
6m High Bund (279.6m AHD)
10m High Bund (284.6m AHD)
Modelled In Pit Noise Source
Modelled Ex-pit (Construction) Noise Source
SCALE 1:10 000 (A5)
100 0 100 200 300 400 500 m
Source: Modified After Alkane Resources Ltd.
Figure 12
MODELLED NOISE SCENARIO
(CROSS SECTION)

4.2.5 Assessment of Impact

4.2.5.1 Noise Bund Attenuation

6m Bund

A reduction in noise received at R3 of 1dB(A), when compared to existing amenity bund scenario, is predicted by NSS (2014b) when noise sources are operating at, or close to the top of the Caloma Open Cut. This increases to a reduction of 2dB(A) at mid-pit and 3dB(A) as the noise sources move deeper in the open cut.

It is noted that the Caloma Open Cut is approaching the mid-pit depth at the time of finalisation of this document.

10m Bund

A reduction in noise received at R3 of 1 to 2dB(A), when compared to existing amenity bund scenario, is predicted by NSS (2014b) when noise sources are operating at, or close to the top of the Caloma Open Cut. This increases to a reduction of 4dB(A) as the noise sources move to the mid-pit elevation and deeper in the open cut.

15m Bund

While not proposed, the effect of a 15m high bund was also assessed. An additional 1dB(A) reduction in noise level received at Receiver R3 is predicted when noise sources are operating at the bottom of the Caloma Open Cut.

The results of noise bund attenuation modelling completed by NSS (2014b) indicate that construction of the enhanced amenity bund would provide for a reduction in the noise levels received at receivers within Tomingley. Given the waste rock material requires removal from the Caloma Open Cut and transfer to stockpile for disposal, it is recommended that the bund be constructed to 10m in height to maximise the benefit obtained. The increased noise attenuation benefit obtained by raising the bund above 10m is limited and likely to be outweighed by the impact this might cause on local visual amenity (refer to Section 4.4).

NSS (2014b) notes that under noise enhancing conditions, the effectiveness of the enhanced noise amenity bund to reduce noise levels would be reduced, however, the Proponent has committed to managing night time operations with reference to local weather conditions and real-time noise monitoring to reduce the potential for non-compliant noise levels at receivers within Tomingley. Furthermore, the Proponent maintains a commitment to provide ‘at receiver’ mitigation to further alleviate night time noise effects of the Mine.

4.2.5.2 Construction Noise

NSS (2014b) predicts that during the initial period of bund construction, prior to completion of the outer (north facing) slope, noise levels received could be up to 11dB(A) greater at Receiver R3.

It should be noted that the period during which this maximum noise level could be received is unlikely to exceed 2 weeks, a period equivalent to the construction of the outer batter. Furthermore, the modelling assumed noise enhancing conditions including source to receiver winds of between 1m/s and 5m/s. As noted in the Section 4.2.2.2 and **Table 5**, these are not prevailing conditions locally and therefore unlikely to occur anymore than occasionally. These conditions would also be conducive to dust emissions from the Mine and bund construction site with existing management measures at the Mine requiring a review and possible cessation of operations under such conditions (refer to Section 4.3.2.2).

It is also noted that construction activities would be restricted to the day, a period during which the residences of Tomingley are affected by traffic noise of the Newell Highway (refer to Section 4.2.2.1 and **Table 4**). Any temporary increase in noise for a restricted period is therefore unlikely to be of great significance against this background noise.

On balance, the positive affect of the bund enhancement over the remaining life of the Mine would outweigh any temporary impact on day time noise levels.

4.3 AIR QUALITY

4.3.1 Introduction

As noted in Section 3.3.3, the Proposed Modification has the potential to impact upon air quality as a result of the additional surface disturbance associated with the extension of the Caloma Open Cut and enhancement of the amenity bund.

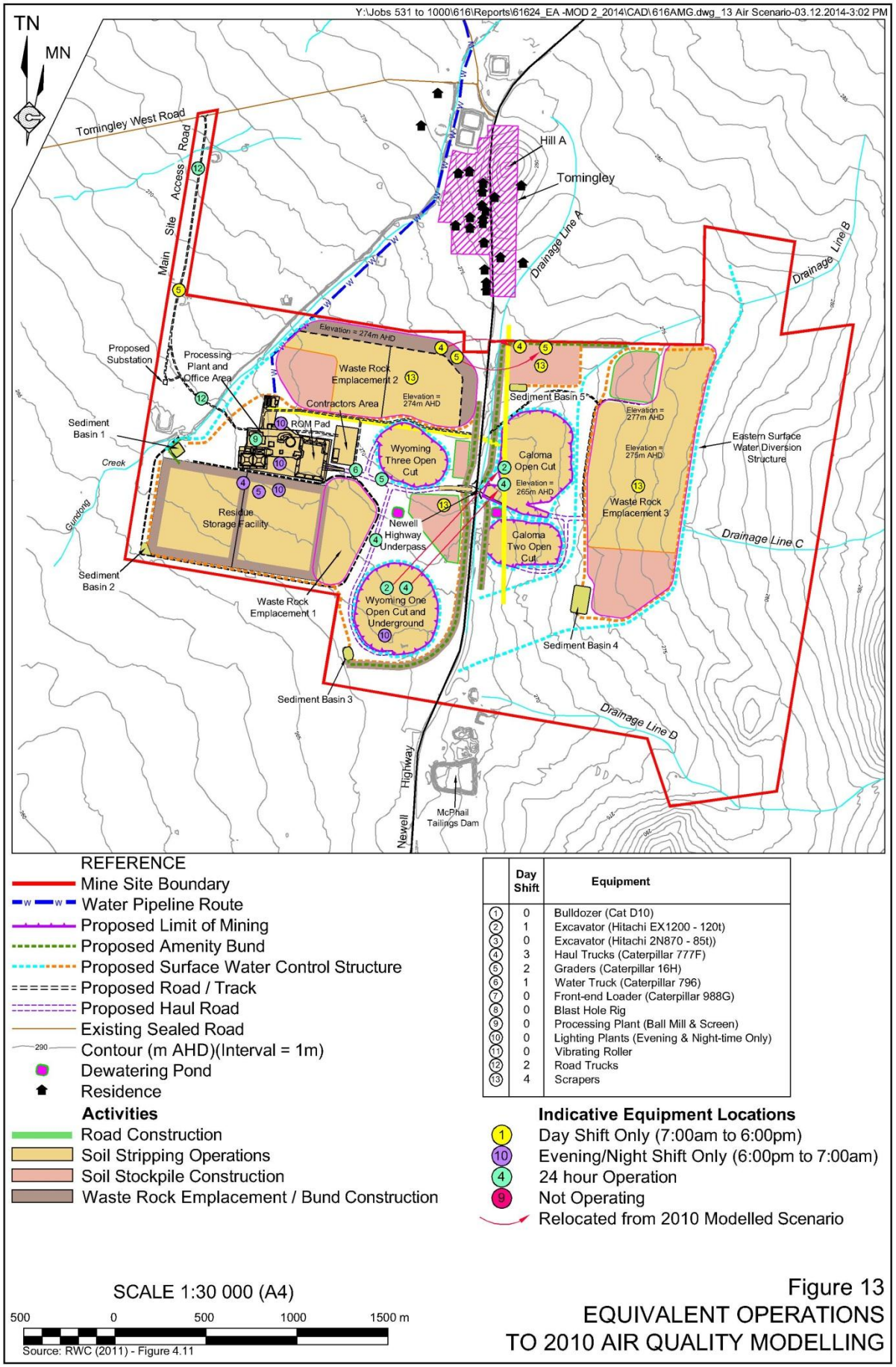
The Proponent notes that air quality monitoring for the Mine (refer to Section 1.3.4.4) largely confirms previous assessments of air quality impacts (PAEHolmes, 2011, RWC, 2011), which predicted the Mine could be operated without exceeding annual air quality criteria and with only occasional exceedances of 24 hour criteria. As the Proposed Modification represents operations equivalent to those modelled by PAEHolmes (2011) (see **Figure 13**), this assessment concentrates on management of the proposed activities.

4.3.2 Design Features, Operational Controls and Management Measures

4.3.2.1 Design Features

The amenity bund has been designed with an outer batter slope of 1V:3H (18°) to facilitate the revegetation of the outer batter. Once revegetated, the potential for wind erosion and dust lift-off would be significantly reduced.

By designing the construction of the amenity bund such that the outer slope is constructed, profiled, spread with topsoil and sown with native vegetation, a barrier to the movement of dust generated by the placement of overburden and movement of equipment would be created. This would reduce the concentration of heavier particulates, which form the ‘deposited dust’ component of air-borne particulate matter, emitted from the Mine.



	Day Shift	Equipment
1	0	Bulldozer (Cat D10)
2	1	Excavator (Hitachi EX1200 - 120t)
3	0	Excavator (Hitachi 2N870 - 85t))
4	3	Haul Trucks (Caterpillar 777F)
5	2	Graders (Caterpillar 16H)
6	1	Water Truck (Caterpillar 796)
7	0	Front-end Loader (Caterpillar 988G)
8	0	Blast Hole Rig
9	0	Processing Plant (Ball Mill & Screen)
10	0	Lighting Plants (Evening & Night-time Only)
11	0	Vibrating Roller
12	2	Road Trucks
13	4	Scrapers

Figure 13
EQUIVALENT OPERATIONS
TO 2010 AIR QUALITY MODELLING

4.3.2.2 Operational Controls and Management Measures

The Proponent has developed and implements the document *Site Specific Procedure – Dust Control* (TGO, 2014) at the Mine (see **Appendix 2**). This procedure provides instruction to the entire Mine workforce on their obligations to reduce dust generation, and includes general pre-emptive, area specific and reactive controls to prevent or minimise dust emissions.

A summary of the key controls, as related to the Proposed Modification, are provided as follows.

General Pre-emptive Controls

- Induction – All employees and contractors are informed of the need to minimise dust generation and are encouraged to report dust issues to their supervisor immediately.
- Mine Planning – The local weather forecast is considered when programing all works. Alternate work areas and tasks are planned to provide a contingency for unfavourable weather conditions (see below). Unfavourable weather conditions include the following.
  - Still conditions during the early morning and evening which result in the accumulation of dust above and around the Mine. This has the potential to impact on traffic on the Newell Highway and be an environmental nuisance for adjoining properties.
  - Hot dry conditions in excess of 35°C when it is difficult to maintain adequate surface moisture to control dust generation.
  - Wind speeds in excess of 32km/hr have an increased potential to blow dust from vehicle movements and disturbed areas off the Mine Site.
- Response to weather conditions – As unfavourable weather conditions are identified, the Mine Supervisor or Contractor Supervisor is to notify the crews at the pre-shift briefing and remind the crews to be vigilant in monitoring and reporting excessive dust.
- Visible dust monitoring and management – The Contractor Supervisor and Site Supervisor are to monitor dust generated by activities on the enhanced bund regularly during dry conditions. Visual monitoring is to include impacts on the Newell Highway and southern residences within the village of Tomingley (R3, R28, R29 and R32 – **Figure 7**). Where the supervisor considers dust is leaving the site at an unacceptable level, the task causing the dust generation is to be suspended immediately and the Mine Superintendent (or delegate) is to be notified.
- Water cart non-availability – In the circumstance where no water cart is available, all activities that may generate dust are to be suspended immediately. In accordance with EPL 20169, works will not re-commence until dust control measures are reinstated.

- Water application - When it is evident that the work area may generate dust, the area is to be watered prior to and/or during works. Water is also to be applied to work areas at the end of shift. As noted in Section 1.3.4.4, the Proponent has significantly increased dust management operations, with approximately 150ML of water per year used for dust suppression compared with the budgeted 60ML per year.
- Scraper operations – Whilst stripping topsoil and subsoil the Contractor Supervisor must ensure that the scraper bowl is not filled to a point where spillage causes dust generation. When operating in dry conditions, water carts are to be run at a ratio of one pass on the stockpile or access road for every two scraper movements (unless conditions become slippery and unsafe).

Area Specific Controls - Enhanced Amenity Bund

- When the weather forecast indicates that:
  - the wind direction maybe from the south, south/east or east;
  - the temperature is to exceed 35°C;
  - wind direction is to exceed 32km/h or the wind speed falls below 5km/hr; or
  - conditions are dry.

  Works to occur on the amenity bund would be reviewed, further pre-emptive controls implemented and the work rescheduled if necessary.
- Should weather conditions change unexpectedly to those above, the Contractor Supervisor or Mine Supervisor would review operations and contact the Mine Superintendent (or delegate) to notify of the change in weather conditions. Consideration would be given to suspending the works, in accordance with the Reactive Controls.

Reactive Controls

If, on routine visual inspections, unacceptable levels of dust are present, the Mine Manager would manage operations on a green, orange, red condition basis.

- Green conditions allow for activities to proceed subject to the implementation of appropriate pre-emptive controls. Triggers include:
  - temperature above 12°C and below 35°C; and/or
  - wind speed between 5km/hr and 32km/hr.
- Orange conditions allow for activities to proceed subject to the implementation of appropriate pre-emptive controls with hourly condition monitoring and review to be completed. Triggers include:
  - temperature in excess of 35°C;
  - night or morning temperature below 12°C;
  - wind speed in excess of 32km/hr or below 5km/hr;

  - dry ground conditions; and/or
  - wind from the south, southeast or east.
- Red conditions require suspension of operations causing the dust, determination of the primary source of dust, review of controls being implemented and recommencement only following implementation of further pre-emptive controls. Triggers include:
  - water cart unavailable;
  - assessment by Contractor Supervisor or Mine Manager (or delegate) of unacceptable dust level exiting the Mine Site; and/or
  - assessment by Contractor Supervisor or Mine Manager (or delegate) that dust levels may pose a safety hazard to traffic on the Newell Highway.

Competence Training and Awareness

- All personnel undergo an induction which includes information on the management of dust and air quality while working at the Mine.
- After completing the induction, it is required that personnel sign a statement of attendance.

Adaptive Management

The procedure is to be reviewed annually from the commencement of pre-stripping and mining activities or sooner should any deficiencies be identified. This will ensure the adequacy of the procedure and allow for opportunities for improvement.

4.3.3 Assessment of Impact

It is acknowledged that complaints have been received by the Proponent in relation to dust emissions from the Mine. However, it is noted that monitoring has confirmed compliance with annual air quality criteria and only occasional exceedance of 24 hour criteria as predicted by PAEHolmes (2011).

On the basis that the Proposed Modification would not be introducing a new source of dust emissions, and that these activities were effectively accounted for in the dispersion modelling of PAEHolmes (2011) (see **Figure 13**), it is assessed that continued compliance with air quality criteria could be achieved subject to implementation of effective dust emission controls.

On the basis of the development, implementation and continued improvement of the *Site Specific Procedures – Dust Control* (TGO, 2014) (see **Appendix 2**), it is assessed that effective dust emission controls are in place and would be implemented as part of the modified and ongoing operations at the Mine.

4.4 VISUAL AMENITY

4.4.1 Introduction

As noted in Section 3.3.4, the Proposed Modification has the potential to impact upon visual amenity from vantage points to the north of the Mine Site. It should be noted that the Proposed Modification represents an extension of an existing feature of the Mine, which itself is now an established feature of the local setting, rather than a new disturbance.

4.4.2 Design Features, Operational Controls and Management Measures

4.4.2.1 Design Features

The enhanced amenity bund has been designed with an outer batter slope of 1V:3H (18°) to facilitate rehabilitation and to ensure that the overall structure is not overly imposing when viewed from the north. The fact that the bund is predominantly east-west in alignment would also reduce the amount of shadow thrown by the structure in the morning and evening.

In addition, constructing the enhanced amenity bund with an 18° outer batter, the success of revegetation is likely to be greater than if constructed with a steeper slope. Based on the establishment of native grasses, shrubs and trees over the bund, the longer-term impact on visual amenity is likely to be improved as it would provide a more effective screen for Waste Rock Emplacement 3 to the east of the Caloma Open Cut.

4.4.2.2 Operational Controls and Management Measures

During construction of the enhanced amenity bund, the likely impacts on visual amenity and proposed management measures are as follows.

- The movement and operation of trucks and bulldozers.

  To minimise the period of exposure to operating equipment, the Proponent would construct the bund in the same manner as Waste Rock Emplacements 2 and 3. That is, the outer (north facing) batter of the bund would be constructed initially, immediately profiled, respread with topsoil and sown with native pasture species. The remaining bund construction activities would be undertaken behind the slope.

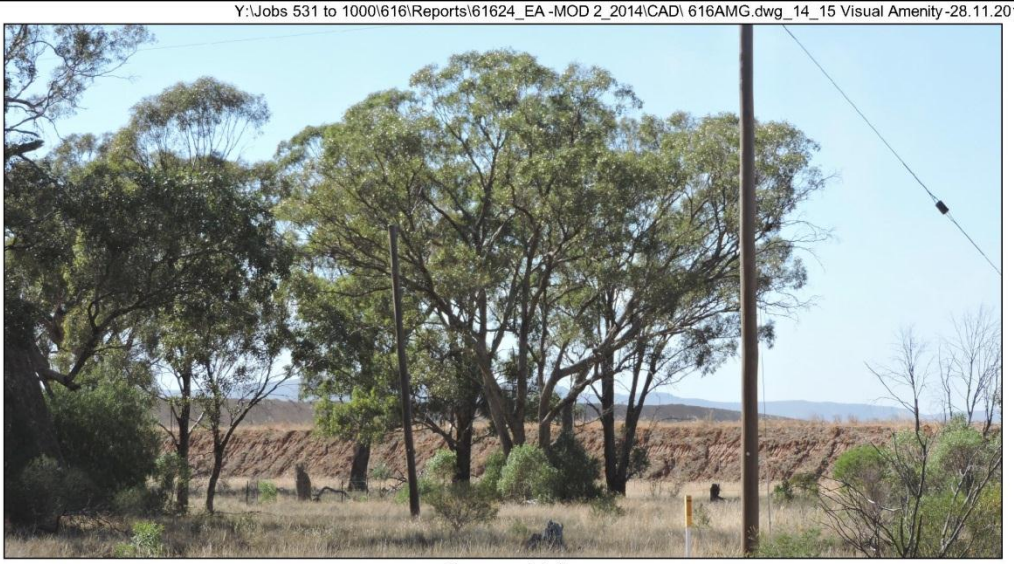
- Dust generated by the initial stripping of soil and movement of mobile equipment over the bund while under construction.

  Methods of minimising and managing dust generation are described in Section 4.3.2.

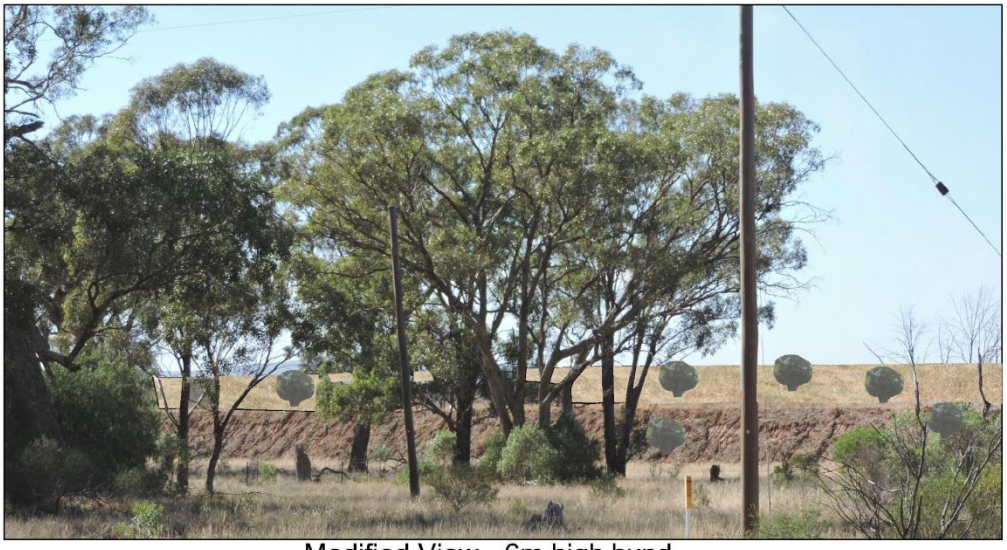
4.4.3 Assessment of Impact

Figures 14 and **15** provide an interpretation of the amenity bund at a height of 6m and 10m when viewed from the same vantage points as **Plates 5** to **8**.

Y:\Jobs 531 to 1000\616\Reports\61624_EA -MOD 2_2014\CAD\ 616AMG.dwg_14_15 Visual Amenity-28.11.2014-5:18 PM



Current View



Modified View - 6m high bund

Modified View - 10m high bund

See Figure 2 for photograph locations

Figure 14

INDICATIVE VIEW OF MODIFIED BUND (POINT A)

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Current View

Modified View - 6m high bund

Modified View - 10m high bund

See Figure 2 for photograph locations

Figure 15
INDICATIVE VIEW OF MODIFIED BUND (POINT B)

These visual montages illustrate that while already largely screened by vegetation which occurs beyond the Mine Site boundary, when revegetated the structure is not particularly intrusive and would further obscure views of Waste Rock Emplacement 3 (refer to the background of the top panel in **Figure 14**). The modified amenity bund is effectively unnoticeable when viewed from the Newell Highway to the immediate northwest (refer to **Figure 15**).

It is concluded that during construction, and prior to revegetation of the outer slope of the amenity bund, the construction of modified bund may be noticeable from a small number of locations immediately north of the Mine Site. However, any impact on visual amenity would be minimised, both in terms of scale and period, by the proposed approach to construction and rehabilitation. On balance, the very minor and temporary effects on visual amenity would be outweighed by the beneficial effects on noise levels received within Tomingley as well as the additional visual screening of Waste Rock Emplacement 3 the elevated bund would provide.

4.5 SURFACE WATER

4.5.1 Introduction

As illustrated by **Figure 8**, the Proposed Modification would result in changes to catchments within the Mine Site. It is notable, however, that as the enhanced amenity bund would not extend any further east than the existing bund, there would be no change to the catchments and drainage external to the Mine Site. As a result, the assessment completed as part of the original *Surface Water Assessment for the Tomingley Gold Project* (SEEC, 2011) and *Response to Submissions* (RWC, 2012), with respect to off-site flooding impacts, remains valid.

The following sub-sections provide a brief overview of the approach to be taken by the Proponent to ensure that appropriate modifications to the *Mine Erosion and Sediment Control Plan* (ESCP) are completed.

4.5.2 Design Features, Operational Controls and Management Measures

The Proponent has commissioned a specialist consultancy to review and update the *Water Management Plan* for the Mine as part of its continuous review of environmental performance. This review and update will include an updated ESCP to account for the Proposed Modification. Modified erosion and sediment control features would be implemented prior to disturbance being undertaken in that area.

The critical features of the ESCP requiring modification include:

- the Central Surface Water Diversion Channel;
- diversion drains / bunds around the perimeter of the Caloma Open Cut;
- dirty water diversion drains around the soil stockpile area to the north of the Caloma Open Cut;
- Sediment Basin 5 (SB5) and associated inlets and spillways; and
- Ancillary erosion and sediment control features, e.g. sediment fencing, grass buffer strips and rock check dams, surrounding the modified disturbance areas.

The likely modification of each of these features is reviewed below to illustrate that these can be accommodated within the new disturbance footprint of the Mine Site.

Central Surface Water Diversion Channel

The alignment of this feature would be moved to the east to allow for the widening of the Caloma Open Cut and construction of a haul road to the enhanced amenity bund. The exact alignment would be included in an updated ESCP with the centreline to be surveyed prior to the commencement of construction.

Importantly, as there is to be no change to the catchment which provides runoff to this channel, the design parameters as currently constructed would not require modification. These design features, as originally provided by Mintrex (2009), provide for flows generated by a 1 in 100 ARI event and approximate the following.

- Channel width: 6m.
- Channel depth: >1.3m.
- Channel wall slopes: 1V:3H.

Caloma Open Cut Diversion Drains and Bunds

Reflecting the extended impact footprint of the Caloma Open Cut, the surrounding bunds would be relocated to prevent the ingress of runoff to the void. Some minor modification to the diversion drain which directs clean water runoff from north of the Caloma Open Cut to the Central Surface Water Diversion Drain is also expected following more detailed survey of the Mine Site and observations of runoff direction.

Northern Caloma Open Cut Soil Stockpile Area Drainage

The enhanced amenity bund would encroach upon the area currently nominated for soil stockpiling resulting in some modifications to the arrangement of soil stockpiles within this area. Any runoff from the bund (both under construction and on completion) and soil stockpiles would be captured in diversion drains, constructed in accordance with Standard Drawing 5-5 of Landcom (2004), and diverted to Sediment Basin 5. The final locations of these drains would be included in an updated ESCP which is currently in preparation.

Sediment Basin 5

The catchment size producing runoff to this sediment basin would not change significantly as a result of the Proposed Modification. In effect, areas previously allocated to soil stockpiling would now form part of the enhanced amenity bund with runoff still directed to the southeast towards Sediment Basin 5.

The final capacity and location of Sediment Basin 5 is under review as part of an upgrade to the ESCP, however, the minimum storage capacity is unlikely to differ significantly from that calculated for the current ESCP (2 003m^3) (for a 5-day 90th percentile rainfall event).

Ancillary Erosion and Sediment Control Features

The current ESCP provides for grass buffer strips around stockpiles and other areas of surface disturbance as an alternative to sediment fencing. Grass buffer strips require less maintenance than sediment fencing and are less likely to result in concentration of flows which can occur if sediment fencing is allowed to accumulate sediment, vegetation or rubbish which traps water and leads to overflow. The continued use of grass buffer strips instead of sediment fencing is endorsed, however, the updated ESCP will provide further guidance on this.

Culverts would be installed where drainage traverses existing or proposed roads. The final design and location of culverts will be presented in the updated ESCP which is in preparation.

On the basis that the storage capacity of Sediment 5 does not require significant modification, the design of the rock dissipater on entry and spillway on exit (for 1 in 100 ARI flows) should not require significant alteration.

4.5.3 Assessment of Impact

On the basis that the Propose Modification would require only minor changes to internal Mine Site catchments, it is assessed that the runoff generated from these could be easily managed to ensure compliance with discharge criteria through minor modification to the Mine ESCP. This modification is in preparation and would be completed prior to the commencement of disturbance in the relevant catchment of the Mine.

5. JUSTIFICATION OF THE PROPOSED MODIFICATION

The Proposed Modification would serve two important functions.

1. Provide for a small extension to the Caloma Open Cut to enable the batter angle of the upper benches to be reduced, thereby reducing the risk of wall failure to as low as reasonably possible.
2. Enable the construction of an enhanced amenity bund between the Caloma Open Cut and Tomingley village to provide additional noise attenuation in the form of an enhanced physical noise barrier.

This *Environmental Assessment* has been prepared to assist in the assessment of the likely environmental impacts associated with the Proposed Modification to PA 09_0155. The potential impacts have been identified and carefully assessed following consideration of the design features, operational controls and management measures currently in place or proposed.

On the basis of the assessment of each potential impact, the Proposed Modification can be justified as the residual impacts on the biophysical environment can be predicted and appropriately managed, socio-economic impacts would be generally positive and the consequences of not proceeding are considered more adverse than proceeding. Each of these factors in considered in the justification of the Proposed Modification are presented below.

Biophysical Considerations

While the Proposed Modification would result in a small increase in the area of disturbance on the Mine Site (see **Figure 4**), the additional areas of disturbance only affect previously cleared land, largely devoid of native species, without significant habitat for native species and away from identified heritage sites.

As a result of the small increase in disturbance, a minor change in the final landform of the Mine Site would be required which may have some temporary impacts on visual amenity, primarily during the construction phase. As the amenity bund is revegetated, however, the impact of this modification to the final landform, in the context of the overall Mine Site, is considered very minor.

Dust is likely to be emitted during excavation of the cut back of the Caloma Open Cut and construction of the amenity bund. As discussed in Section 4.3, however, these emissions could be managed to remain below the nominated criteria and within reasonable expectations of neighbouring land owners and residents.

A minor modification to the management of runoff within the Mine Site is likely to be required, however, as changes to areas of disturbance and affected catchments would be very small, runoff could continue to be managed such that polluting discharges are prevented.

Most significantly, however, is that the Proposed Modification would provide for a reduction in the noise levels received at residences within Tomingley village (of between 1dB(A) and 4dB(A)). This reduction in the noise levels received, combined with the Proponent's commitment to provide 'at receiver' mitigation on request would more than offset any minor

disturbance caused during the construction of the bund and small addition to the Mine impact footprint.

Socio-economic Considerations

The most relevant feature of the Proposed Modification to local socio-economic conditions would be the reduction in noise levels received in the village of Tomingley. The reduction in the noise levels received within the village is likely to improve local amenity and sentiment towards the Mine. The Proponent has also reaffirmed a commitment to provide at receiver mitigation at locations where significant noise impacts are received or perceived. This improvement in the amenity of the village would be achieved without compromising the benefits to the village associated with the economic activity generated by the Mine.

Consequence of Not Proceeding

Should, the Proposed Modification not proceed, the very minor and temporary impacts on the noise and dust environment, visual amenity and water management would not eventuate.

However, should the modification to the Caloma Open Cut not proceed, there is the potential that:

- mining of the Caloma Open Cut (within the existing open cut disturbance footprint) may need to be modified to an extent that the recovery of ore is very significantly reduced; and
- reduced ore recovery may impact on the life of mine and therefore the overall contribution of the Mine to the local, regional and state economies.

Further, should the modification to the amenity bund to the north of the Caloma Open Cut not proceed, there is the potential that:

- mining operations may need to be scaled back, in order to achieve noise criteria, to an extent that economic viability of the Mine is affected; or
- noise levels received at residences within Tomingley would not be reduced leading to increased community concern and/or exceedances of the noise criteria.

On consideration of the above, the Proposed Modification would provide for a necessary modification to the Caloma Open Cut and improve the attenuation of noise generated by mining operations, while only having a very minor and largely temporary impact on other features of the local environment. On balance, the benefits of the Proposed Modification more than compensate for these minor and temporary impacts.

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