TOMINGLEY
GOLD OPERATIONS PTY LTD
(A wholly owned subsidiary of Alkane Resources Ltd)
ABN 53 149 040 371

Tomingley Gold Extension Project

Gateway Certificate Application Supporting Documentation

Major Project Application
No. MP 09_0155





August 2021

R.W. CORKERY & CO. PTY. LIMITED

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Gateway Certificate Application Supporting Document

Major Project Application No. MP 09_0155

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Ref No. 616/43

August 2021

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CONTENTS

Page

ACRONYMS VII

1. INTRODUCTION 1
1.1 SCOPE 1
1.2 TERMINOLOGY 1
1.3 BACKGROUND 4
1.3.1 Site History 4
1.3.2 Mineral Resources 4
1.3.3 Approved TGO Operations 5
1.3.4 Approved SAR Exploration Decline Activities 7
1.4 PROJECT OVERVIEW 8
1.5 THE APPLICANT 10
1.6 GATEWAY CERTIFICATE APPLICATION AREA 10
1.7 MANAGEMENT OF INVESTIGATIONS 12

2. PROJECT DESCRIPTION 13
2.1 INTRODUCTION 13
2.2 SITE ESTABLISHMENT 13
2.3 MINING OPERATIONS 14
2.3.1 Open Cut Mining 14
2.3.2 Underground Mining 14
2.4 TRANSPORTATION OPERATIONS 15
2.5 WASTE ROCK MANAGEMENT 15
2.6 WATER MANAGEMENT 16
2.7 HOURS OF OPERATION AND PROJECT LIFE 16
2.8 FINAL LANDFORM, LAND USE, REHABILITATION AND MINE CLOSURE 16
2.9 ALTERNATIVES CONSIDERED 17
2.9.1 Introduction 17
2.9.2 Underground vs open cut mining operations 18
2.9.3 Design and Location of the Waste Rock Emplacements 18
2.9.4 Location of Relocated Public Roads 19
2.9.5 Consequences of not Proceeding with the Project 20

3. LOCAL AND REGIONAL SETTING 21
3.1 LAND OWNERSHIP 21
3.2 LAND USE 21
3.3 GROUNDWATER 21
3.4 SURFACE WATER 26

4. BIOPHYSICAL STRATEGIC AGRICULTURAL LAND 27
4.1.1 Introduction 27
4.1.2 Assessment Methodology 27
4.1.3 Assessment Results 29

CONTENTS

Page

5. MITIGATION AND MANAGEMENT MEASURES 37
5.1 AVOIDANCE 37
5.2 MITIGATION AND MANAGEMENT 37
5.3 REHABILITATION 38
5.4 OFFSET RESIDUAL IMPACTS 38
5.4.1 LSC Class 4 Land 38
5.4.2 Agricultural Productivity 38

6. ASSESSMENT OF GATEWAY CRITERIA 40
6.1 INTRODUCTION 40
6.2 SURFACE DISTURBANCE IMPACTS 40
6.3 SOIL PHYSICAL AND CHEMICAL PROPERTY IMPACTS 42
6.4 GROUNDWATER IMPACTS 42
6.5 FRAGMENTATION OF AGRICULTURAL LAND USES 43
6.6 REDUCTION IN THE AREA OF BSAL 44

7. CONCLUSION 45

8. REFERENCES 47

APPENDICES

Appendix 1 Landholder Notification
Appendix 2 Guideline for Gateway Applicants – Key Matters and Where Addressed
Appendix 3 Agricultural Impact Statement
Appendix 4 Biophysical Strategic Agricultural Land Assessment

FIGURES

Figure 1 Locality Plan and Mineral Authorities 2
Figure 2 Project Site Layout 3
Figure 3 TGO Mine Site Layout 6
Figure 4 SAR Mine Site Layout 9
Figure 5 Mining Lease Application and BSAL Application Areas 11
Figure 6 Land Ownership and Residences 22
Figure 7 Surrounding Land Uses 23
Figure 8 Surrounding Registered Bores 25
Figure 9 BSAL Decision-making Flow Chart 30
Figure 10 Soil Mapping Units and BSAL Classification 31
Figure 11 Pre, During and Post-Mining Land and Soil Capability 41

CONTENTS

Page

TABLES

Table 1 Summary of Mineral Resources 5
Table 2 Mining Lease Application Area 12
Table 3 Chromosol and Andesite Chromosol SMU BSAL Assessment 33
Table 4 Sodosol SMU BSAL Assessment 34
Table 5 Gilgai SMU BSAL Assessment 35
Table 6 Disturbed SMU BSAL Assessment 36
Table 7 BSAL Areas within the MLA Area 40
Table 8 Land and Soil Capability – Pre, During and Post-mining 42

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ACRONYMS

AHD	Australian height datum
AEP	annual exceedance probability
BSAL	Biophysical Strategic Agricultural Land
EM	electromagnetic
JORC	Joint Ore Reserve Committee
LSC	land and soil capability
MLA	Mining Lease Application
NSW	New South Wales
NCST	National Committee on Soil and Terrain
RIM	run-in-mine
ROM	run-of-mine
RWC	R.W. Corkery & Co. Pty Limited
SALIS	Soil and Land Information System
SAR	San Antonio and Roswell
SARED	San Antonio and Roswell Exploration Drive
SEPP	State Environmental Planning Policy
SMU	soil mapping units
SSD	State Significant Development
SSM	Sustainable Soils Management Pty Ltd
TfNSW	Transport for New South Wales
TGO	Tomingley Gold Operations

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1. INTRODUCTION

1.1 SCOPE

This document has been prepared by R.W. Corkery & Co. Pty Limited on behalf of Tomingley Gold Operations Pty Ltd (the Applicant) to support an application for a Gateway Certificate (the Gateway Application) for the proposed Tomingley Gold Extension Project (the Project). The Project is located immediately to the south of the village of Tomingley in central western NSW (**Figure 1**).

The Project is classified as State Significant Development (SSD) and an application for development consent is in preparation. As the Project would extract a mineral under the *Mining Act 1992*, a Mining Lease will also be required. As a result, Part 4AA of *the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) applies. As identified in Section 4, sections of the proposed Mining Lease Application Area (MLA Area) include land classified as Biophysical Strategic Agricultural Land (BSAL) in accordance with the *Strategic Regional Land Use Policy – Interim Protocol for Site Verification and Mapping of Biophysical Strategic Agricultural Land* (Interim BSAL Protocol) (NSW Government, 2013a). As a result, under Part 4AA of the Mining SEPP, a Gateway Certificate is required prior to submission of the application for development consent.

This Application is made under Clause 17F of the Mining SEPP and applies to all land within the MLA Area (**Figure 2**).

The Application is to be made to the Gateway Panel. The Applicant owns all land within the MLA Area, with the exception of parcels of Crown land and land within the Newell Highway and Kyalite Road road reserves and a number of unformed road reserves (see Section 3.1). Written notice in accordance with Clause 17F(3)(a) of the Mining SEPP has been provided to Crown Lands, Narromine Shire Council, the road authority for each of the road reserves, together with Transport for NSW (**Appendix 1**).

This document has been prepared in a manner that is consistent with the *Strategic Regional Land Use Policy – Guideline for Gateway Applicants* (Gateway Certificate Guideline) (NSW Government, 2013b). **Appendix 2** presents the requirements of the Gateway Certificate Guideline and where each has been addressed in this document.

1.2 TERMINOLOGY

Throughout this document a range of terminology has been used to describe key aspects of the Project, as follows.

The Project	All approved activities that are currently the subject of MP 09_0155 as well as those additional activities that would be the subject of any new development consent to be granted.
The Applicant	Tomingley Gold Operations Pty Ltd.
TGO	The existing mining operations referred to as Tomingley Gold Operations. These operations are undertaken in accordance with the requirements of development consent MP 09_0155.

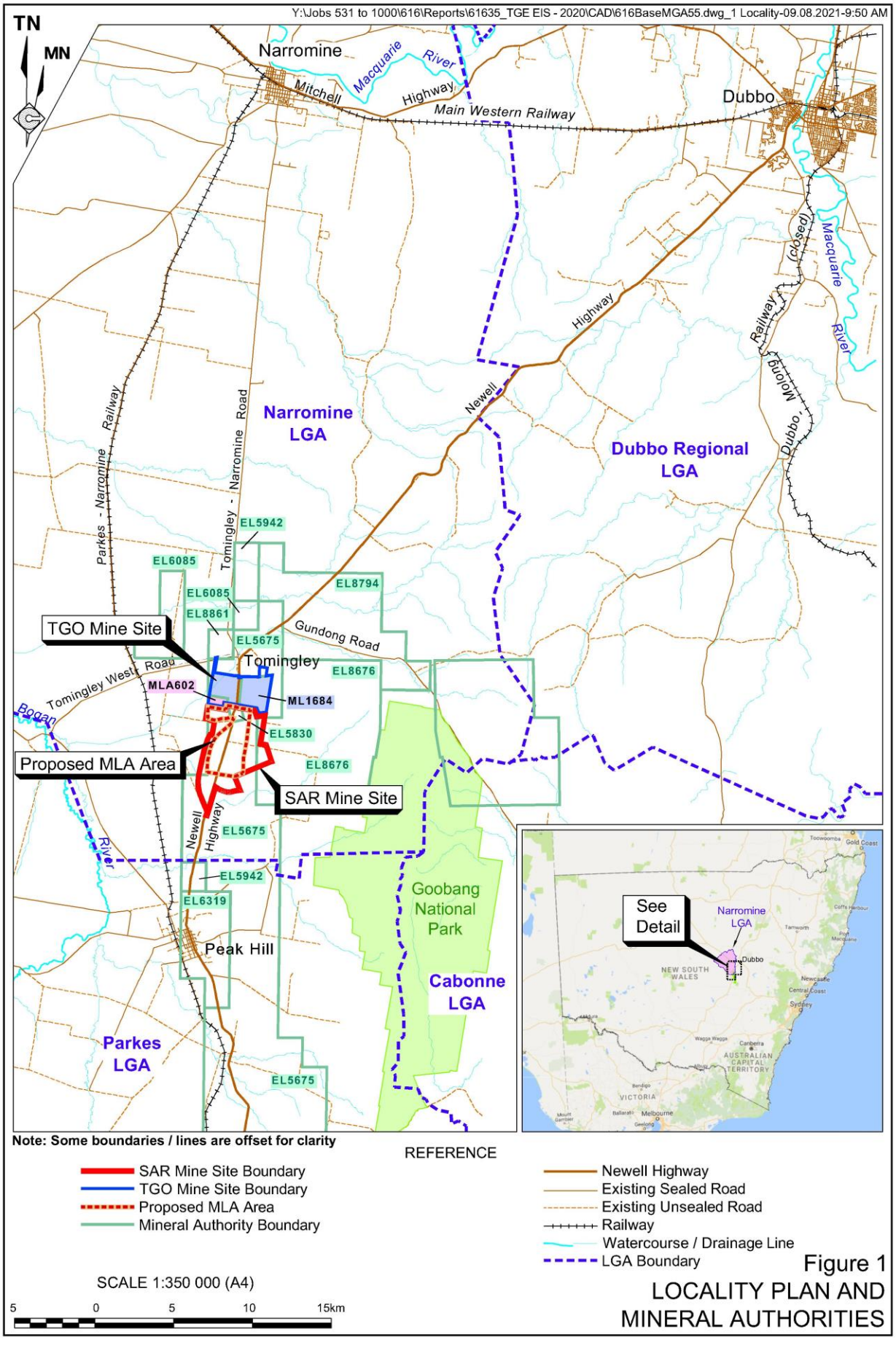


Figure 1
LOCALITY PLAN AND MINERAL AUTHORITIES

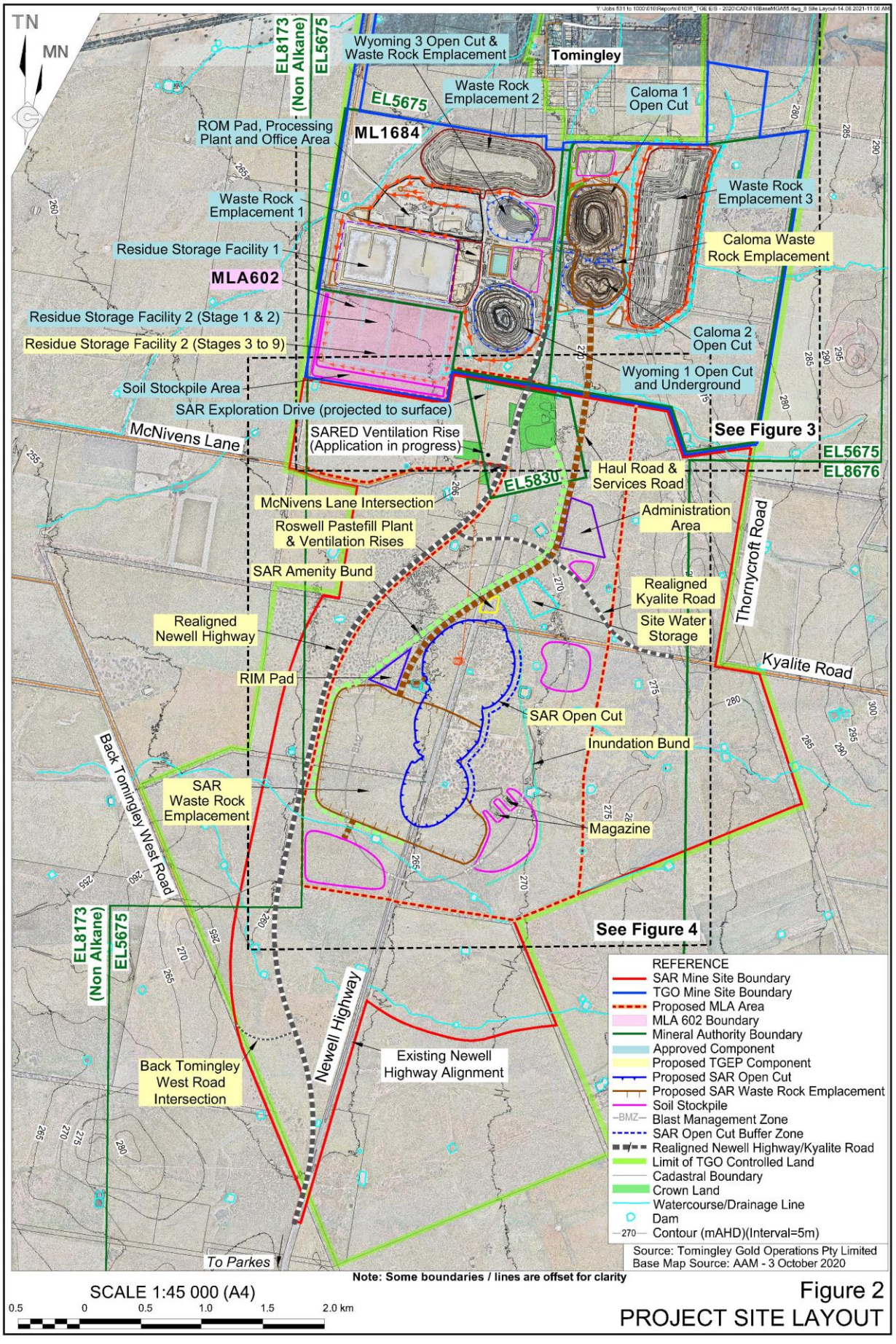


Figure 2
PROJECT SITE LAYOUT

SAR	San Antonio and Roswell deposits – the subject of the proposed mining operations.
TGO Mine Site	Comprising the area the subject of MP 09_0155 and shown with a solid blue line on **Figures 1** and **2**.
SAR Mine Site	Comprising the additional area to be incorporated within any new development consent to be granted and shown with a solid red line on **Figures 1** and **2**.
The Project Site	The combined area of the TGO and SAR Mine Sites and the area to be the subject of any new development consent to be granted.
MLA Area	That area the subject of the proposed Mining Application and shown with a dashed red line on an orange background on **Figures 1** and **2**. The MLA Area comprises the area over which the Gateway Certificate is to be sought.
SAR Soil Study Area	The area the subject of the Soil and Land Capability Assessment (SSM, 2021a).
BSAL Assessment Area	The area in which the soils were assessed in accordance with the *Interim protocol for site verification and mapping of biophysical strategic agricultural land.* This area includes the MLA Area, plus a 100m buffer on agricultural land only (**Figure 2**).

1.3 BACKGROUND

1.3.1 Site History

Gold was first discovered at Tomingley in 1879, with the Tomingley Goldfield proclaimed on 19 June 1882 and the village of Tomingley proclaimed on 15 June 1894. A number of underground mining operations were located adjacent to the village and in the McPhail area within EL5830 (**Figure 2**). One of these, the Myall United Gold Mine, produced approximately 70 000 ounces of gold over a 30-year period from 1883.

In 1913, mining ceased at McPhail, with tailings and slimes re-treated until 1924. These materials were again re-treated in the late 1990s by Tailings Treatment Pty Ltd during which time a new tailings dam, the McPhail Tailings Dam, was constructed and subsequently rehabilitated.

In 2001, the Applicant entered into an agreement with Compass Resources NL in relation to EL 5675 and Golden Cross NL in relation to EL 5830 to earn 100% of both tenements **(Figures 1** and **2**). The Applicant identified the Wyoming One deposit in 2001, followed by the Wyoming Three deposit in 2002, the Caloma deposit in 2006 and the Caloma Two deposit in 2010. MP 09_0155 for the operation of TGO was granted on 24 July 2012. Section 1.3.3 describes the operation of the approved Mine.

1.3.2 Mineral Resources

The Applicant has completed a number of Joint Ore Reserve Committee (JORC) compliant resources and reserves statements for TGO and SAR. **Table 1** presents an overview of the most recent estimates.

Table 1
Summary of Mineral Resources[1]

Deposit	Measured		Indicated		Inferred		Total		
	Tonnage (Mt)	Grade (g/t Au)	Tonnage (Mt)	Grade (g/t Au)	Tonnage (Mt)	Grade (g/t Au)	Tonnage (Mt)	Grade (g/t Au)	Total Gold (oz)
Tomingley Gold Operations[2]									
Open cut	1.653	1.6	2.272	1.6	0.990	1.2	4.915	1.5	238 000
Underground	0.868	2.8	2.328	2.7	1.338	2.2	4.534	2.6	372 000
TGO Total	**2.521**	**1.8**	**4.600**	**2.2**	**2.328**	**1.5**	**9.449**	**1.9**	**610 000**
San Antonio and Roswell[3]									
Roswell			7.880	2.07	2.190	1.93	10.100	2.04	660 000
San Antonio			5.930	1.82	1.390	1.32	7.320	1.72	406 000
SAR Total			**13.800**	**1.96**	**3.580**	**1.69**	**17.400**	**1.90**	**1 066 000**

Note 1: A 'Mineral Resource' is a concentration or occurrence of solid material of economic interest in or on the Earth's crust in such form, grade (or quality), and quantity that there are reasonable prospects for eventual economic extraction (JORC, 2012). A Mineral Resources does not take into account limitations associated with mining of the material and may be considered a "global" estimate of the mineral endowment.

Note 2: Source – ASX announcement *Resource and Reserve Statements FY20* dated 18 August 2020.

Note 3: Source – ASX announcement *Updated San Antonio Resource Estimation Shows Contained Ounces for Tomingley Extension of ~1.1Moz* dated 16 February 2021.

1.3.3 Approved TGO Operations

TGO operates under State Significant Development Consent MP 09_0155 originally granted on 24 July 2012. MP 09_0155 has been modified five times, most recently on 5 May 2021. Approved activities at TGO include the following (**Figure 3**). All activities approved under MP 09_0155 would continue under any new development consent granted, with MP 09_0155 to be surrendered once that consent is operative.

- Mining of four open cuts, with underground mining under three of the approved open cuts, namely Wyoming 1, Caloma 1 and Caloma 2.
- Placement of waste rock into three out-of-pit waste rock emplacements (Waste Rock Emplacements 1, 2 and 3) and two in-pit waste rock emplacement (Wyoming 3 and Caloma 2). Waste Rock Emplacements 2 and 3 are complete and, with the exception of a small area on the upper surface of Waste Rock Emplacement 3, are under rehabilitation.
- Construction and use of a carbon-in-leach Processing Plant and associated infrastructure, including a run-of-mine (ROM) pad, crushing, grinding and cyanide leaching circuits, workshops, ablutions facilities, stores, office area and car parking. The maximum approved rate of processing is 1.5Mtpa.
- Construction and use Residue Storage Facility 1 (to Stage 9 or 286.5m AHD) and Residue Storage Facility 2 (to Stage 2 or 272m AHD) for the storage of process residues.
- Construction and use of infrastructure, including:
  - dewatering ponds;
  - a water pipeline, from a licensed bore located approximately 7km to the east of Narromine;

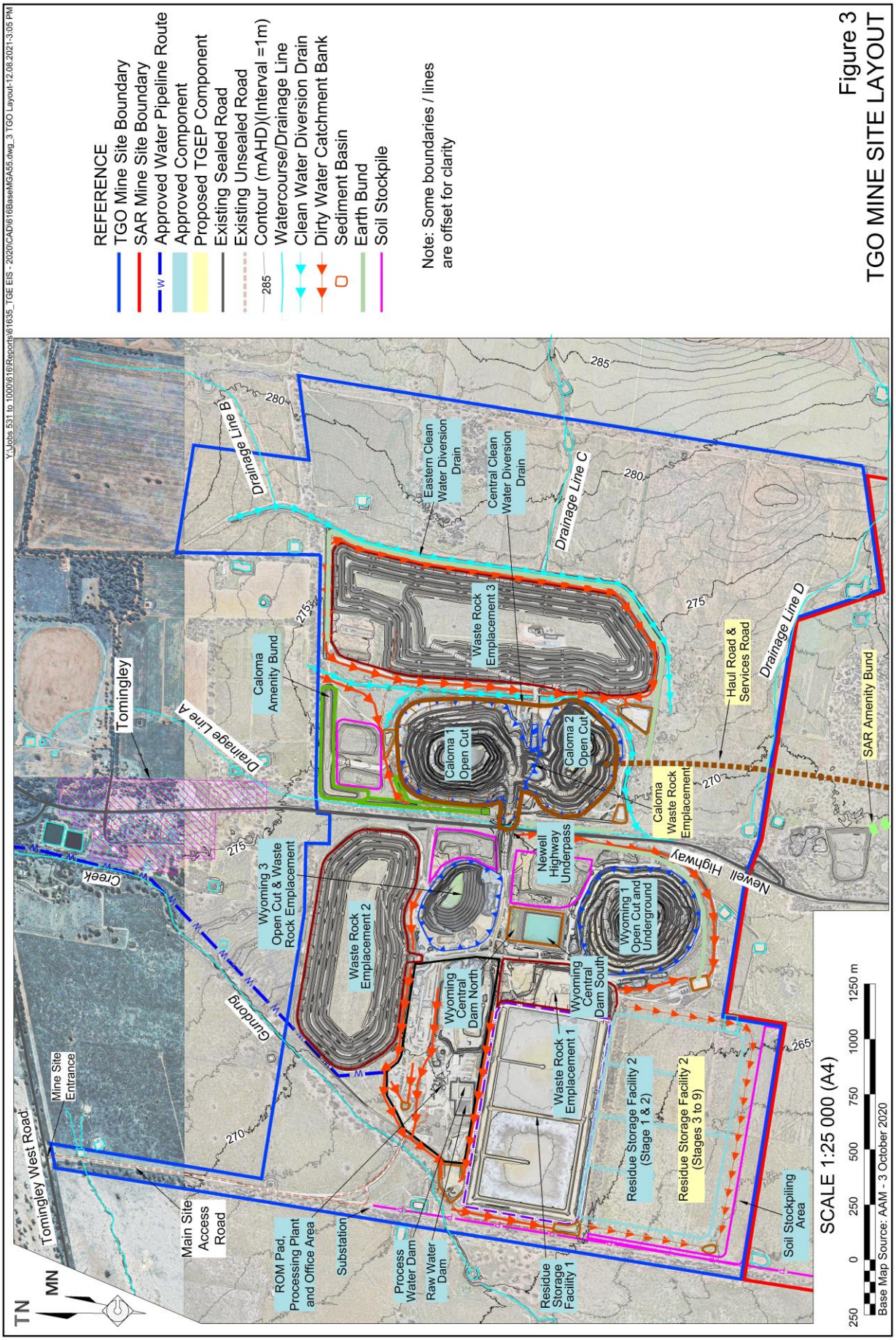


Figure 3
TGO MINE SITE LAYOUT
REFERENCE
TGO Mine Site Boundary
SAR Mine Site Boundary
Approved Water Pipeline Route
Approved Component
Proposed TGEP Component
Existing Sealed Road
Existing Unsealed Road
Contour (mAHD)(Interval =1m)
Watercourse/Drainage Line
Clean Water Diversion Drain
Dirty Water Catchment Bank
Sediment Basin
Earth Bund
Soil Stockpile
Note: Some boundaries / lines are offset for clarity
Y:\Jobs 531 to 1000\616\Reports\61635_TGE EIS - 2020\CAD\61BaseMGA55.dwg_3 TGO Layout-12.08.2021-3:05 PM
TN
MN
SCALE 1:25 000 (A4)
250 0 250 500 750 1000 1250 m
Base Map Source: AAM - 3 October 2020
Tomingley West Road
Mine Site Entrance
Main Site Access Road
ROM Pad, Processing Plant and Office Area
Substation
Process Water Dam
Raw Water Dam
Residue Storage Facility 1
Waste Rock Emplacement 1
Wyoming Central Dam South
Wyoming Central Dam North
Waste Rock Emplacement 2
Wyoming 3 Open Cut & Waste Rock Emplacement
Wyoming 1 Open Cut and Underground
Residue Storage Facility 2 (Stage 1 & 2)
Residue Storage Facility 2 (Stages 3 to 9)
Soil Stockpiling Area
Newell Highway Underpass
Newell Highway
Caloma 1 Open Cut
Caloma 2 Open Cut
Caloma Waste Rock Emplacement
Waste Rock Emplacement 3
Haul Road & Services Road
Caloma Amenity Bund
SAR Amenity Bund
Eastern Clean Water Diversion Drain
Central Clean Water Diversion Drain
Drainage Line A
Drainage Line B
Drainage Line C
Drainage Line D
Tomingley
Gundong Creek
265
270
275
280
285

- various internal and external roads, including an underpass beneath the Newell Highway and upgrades to Tomingley West Road and associated intersections;
- a transformer and electrical distribution network within the Mine Site and 20km 66kV electricity transmission line from Peak Hill substation;
- various clean and dirty water management structures; and
- fenced and unfenced biodiversity offsets and vegetated amenity bunds.

Mining operations are approved until 31 December 2025.

Construction of TGO commenced in February 2013 with open cut mining commencing in November 2013. Underground mining development from a portal in the Wyoming 1 Open Cut commenced in January 2019, with ore production from stopes commencing in December 2019.

TGO operates up to 365 days per year and 24 hours per day using two 12 hour shifts and processes up to 1Mtpa of gold ore. A total of 215 personnel were employed at the Mine in May 2021, with an annualised salary and wages expenditure of $25.0 million. During FY2021/2022 this is expected to increase to 250 personnel employed at the mine, with an annualised salary and wages expenditure of $29.2 million.

It is anticipated that during the FY2021/2022 between $4 million and $5 million will be spent on products and services with local businesses.

Narromine Shire Council would receive approximately $151,980 per year in payments under the current Planning Agreement (currently under renegotiation) and approximately $290,000 per year in rates for the TGO Mine Site, with a similar amount for the SAR Mine Site once approved. It is also understood that Narromine Shire Council has received substantial funds from the Resources for Regions funding grants for mining-affected communities, with future grants likely to be forthcoming over the life of the Project.

The State government would receive approximately $150,000 per annum in Land Tax (with an expected increase once the SAR Mine Site is approved for mining operations) and approximately $3 million per year in royalties.

1.3.4 Approved SAR Exploration Decline Activities

The Proponent was granted approval for the SAR Exploration Drive under the *Mining Act 1992* by the Resources Regulator on 7 May 2020. The approved activities include the following (**Figure 2**).

- Development of an underground exploration drive from the existing Wyoming 1 underground workings to an underground position to the west of the SAR deposits.
- Establishment and use of ancillary infrastructure, including a single ventilation rise. The SARED Ventilation Rise will be the only surface disturbance associated with the exploration program. An application to modify the approved location of the SARED Ventilation Rise is in progress will be submitted to the Resources Regulator.

- Drilling of approximately 72 000m of exploration drill holes.
- Extraction of one or more bulk samples totalling no greater than 20 000t.
- Collection of data that for mine planning and environmental assessment purposes.

The SAR Exploration Drive would, following receipt of development consent, be converted from an exploration drive to a production drive and all activities approved under the *Mining Act 1992* approval would be incorporated into any subsequent development consent.

An application to modify the approved exploration activities to permit construction of the SAR Exploration Drive in a different location is currently in progress.

1.4 PROJECT OVERVIEW

The Project comprises two components as follows.

- Approved and modified TGO mining operations (**Figure 3**). These activities are undertaken in accordance with development consent MP 09_0155 (see Section 1.3.3). The approved activities would continue under any new development consent, with MP 09_0155 to be surrendered following receipt of the new development consent and all required approvals for the Project. The approved activities include the following.
  - Extraction of ore and waste rock from four open cuts, with underground mining beneath three of those open cuts.
  - Construction of three out-of-pit waste rock emplacements and two in-pit waste rock emplacements.
  - Construction and use of various haul roads, a run-of-mine (ROM) pad and associated stockpiles.
  - Construction and use of a Processing Plant to process up to 1.5 million tonnes per annum (Mtpa).
  - Construction and use of two residue storage facilities comprising Residue Storage Facility 1 (to Stage 9 or a maximum elevation of 286.5m AHD) and Residue Storage Facility 2 (to Stage 2 or a maximum elevation of 272m AHD).
  - Construction and use of ancillary infrastructure.
- The proposed SAR operations and additional or modified TGO operations, including the following (see **Figures 2, 3** and **4**).
  - Realigned Newell Highway and Kyalite Road and associated intersections with Back Tomingley West Road and McNivens Lane and Kyalite Road overpass.
  - The SAR Open Cut and Underground Mine.
  - Construction of two waste rock emplacements, namely the Caloma Waste Rock Emplacement, within the Caloma 1 and Caloma 2 Open Cuts, and SAR Waste Rock Emplacement, within the southern and central sections of the SAR Open Cut.

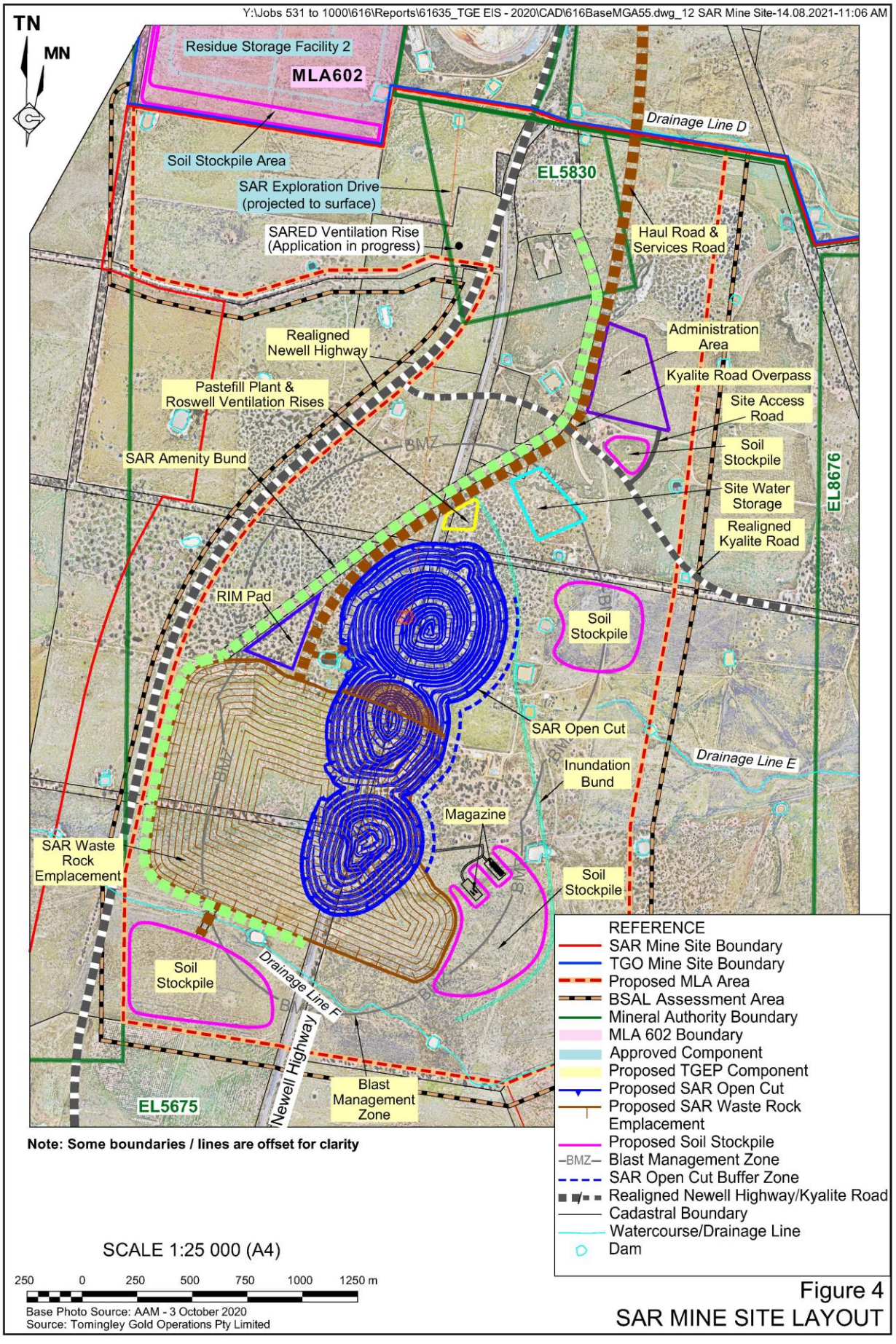


Figure 4
SAR MINE SITE LAYOUT

- The SAR Amenity Bund, Haul Road and Services Road between the SAR Open Cut and the Caloma 2 Open Cut.
- Minor modifications to the Processing Plant to increase the approved maximum processing rate from 1.5Mtpa to 1.75Mtpa and use of the Plant to process ore from the SAR Open Cut and SAR and TGO underground mining operations.
- Increased capacity for Residue Storage Facility 2, from Stage 2 to Stage 9, with a maximum elevation of 286m AHD).
- Associated surface and underground activities and infrastructure.

In addition, the Project would include an extension of the approved mine life, from 31 December 2025 to 31 December 2032.

1.5 THE APPLICANT

The Applicant, Tomingley Gold Operations Pty Ltd, is the operator of TGO and is a subsidiary company of Alkane Resources Ltd (Alkane). Alkane is an Australian, publicly listed mining and exploration company which has been in existence since 1969. Alkane 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 developed and operated the Peak Hill Gold Mine on the outskirts of Peak Hill from 1996 to 2005 and has now largely rehabilitated that site.

Alkane also developed and is currently operating TGO, as well as discovering and successfully obtaining all required approvals for the Dubbo Project (SSD-5251), located at Toongi, approximately 25km south of Dubbo. That project is now held by Australian Strategic Materials Limited which demerged from Alkane in July 2020.

Alkane also undertook the early exploration work on the McPhillamys prospect, currently the subject of a State Significant Development application by Regis Resources.

Finally, Alkane has an extensive package of exploration tenements throughout the Central West of NSW, with a recent discovery at Boda, north of Wellington, a significant focus for Alkane.

1.6 GATEWAY CERTIFICATE APPLICATION AREA

The Gateway Certificate Application Area is coincident with the MLA Area (**Figure 5**).

The MLA Area was selected to:

- adjoin ML1684 and MLA602;
- include all mining-related activities, including adequate buffer zones;
- exclude, to the extent practicable, non-mining related activities such as the proposed realigned Newell Highway.

Consistent with the practice adopted for ML1684, the Applicant anticipates excluding the surface of the land only within the proposed realigned Newell Highway and Kyalite Road corridors from the MLA Area.

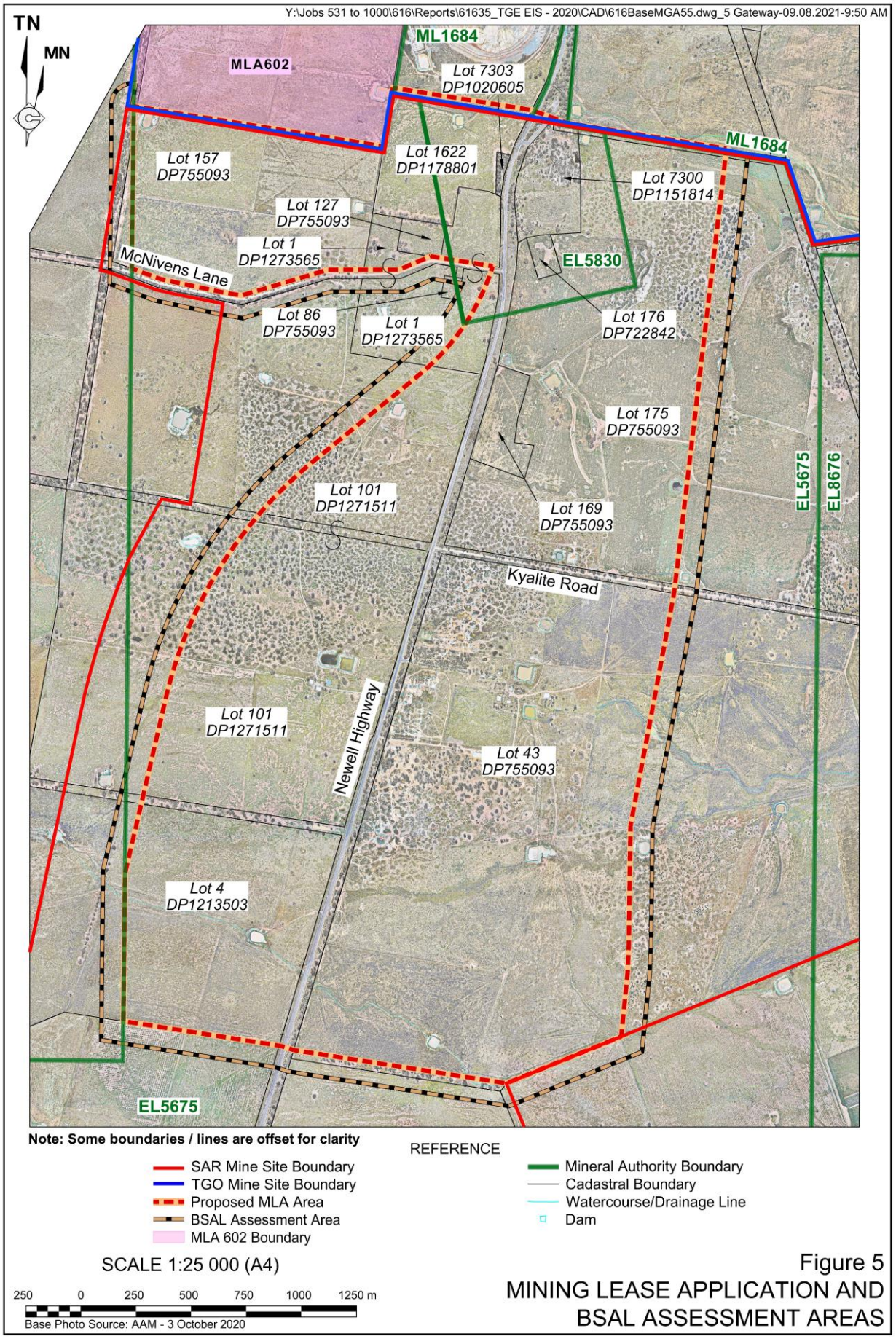


Figure 5
MINING LEASE APPLICATION AND BSAL ASSESSMENT AREAS

Table 2 and **Figure 5** present the land titles within the MLA Area.

Table 2
Mining Lease Application Area

Lot	DP	Lot	DP	Lot	DP
4	1213503	1622	1178801	157	755093
101	1271511	7003	1020605	175	755093
1	1273565	7300	1151814	169	755093
86	755093	176	722842	43	755093
127	755093				
Road reserves associated with the Newell Highway, McNivens Lane, Kyalite Road and various unformed paper roads.					

The BSAL Assessment Area, consistent with Step 1 of the requirements of the Interim BSAL Protocol, comprises the MLA Area plus a 100m buffer on surrounding agricultural lands (**Figure 5**).

1.7 MANAGEMENT OF INVESTIGATIONS

The preparation of this document has involved a study team managed by Mr Mitchell Bland (BSc(hons), MEconGeol, LLB(hons)), Principal and Managing Director of R.W. Corkery & Co. Pty Limited (RWC).

Design of the Project has been led by the following employees of the Applicant, supported by an extensive group of technical advisors and consultants.

- Mr Simon Parsons, Executive General Manager – Operations.
- Mr Dan Short, TGO Open Cut Manager.
- Mr Michael Sutherland, General Manager NSW.

The *Agricultural Impact Statement*, presented as **Appendix 3**, was prepared by Tomingley Gold Operations Pty Ltd in conjunction with RWC and Toongi Pastoral Company Pty Ltd.

The *Land and Soil Capability Assessment* (SSM 2021a), presented as Annexure 2 of the TGO (2021) and *Biophysical Strategic Agricultural Land Assessment* (SSM, 2021b), presented as **Appendix 4,** were completed by Dr Pat Hulme (PhD (UNE), B Sci Ag (Hons)), Principal with Sustainable Soils Management.

2. PROJECT DESCRIPTION

2.1 INTRODUCTION

This subsection provides a brief description of the proposed activities within the MLA Area. Activities approved under MP 09_0155 or not within the MLA Area, including construction of the realigned Newell Highway, are described in Sections 1.3.3 and 1.4 and are not relevant for this application. The proposed activities are described in sufficient detail to allow the reader to gain a general understanding of the activities proposed within the MLA Area. The EIS to accompany the application for development consent will include additional detailed descriptions of the proposed activities.

2.2 SITE ESTABLISHMENT

Site establishment activities would include the following.

- Key boundaries and locations would be marked on the ground and recorded on relevant site construction plans and documents.
- Existing infrastructure within the disturbance area, including communication lines, powerlines, fences, buildings and sheds would be progressively demolished and/or relocated.
- Additional services required for the Project, including powerlines, communication lines and pipelines would be established.
- Erosion and sediment control structures, including clean and dirty water structures and the Inundation Bund, would be established.
- Suitable fences, including warning signs, would be established to separate active mining areas from areas that would continue to be used for agricultural purposes.
- Construction laydown and equipment parking areas, as well as office/amenity buildings would be established.
- Vegetation clearing followed by stripping and stockpiling of soil would be undertaken.
- Borrow pits would be established within the footprint of the Waste Rock Emplacement and / or SAR Open Cut for the supply of construction materials.
- Construction of the Haul Road, Services Road, SAR Amenity Bund, Administration Area (including offices, workshops, diesel store, equipment parking, vehicle washdown bay, etc), internal site roads, hard stands, explosives magazines, water storages and other site infrastructure.

The Project would require realignment of the following public roads.

- Newell Highway and Kyalite Road and the intersections of McNivens Lane and Back Tomingley West Road.
- Kyalite Road, including an overpass over the Haul Road and Services Road.

Concept designs for the realigned Newell Highway and Kyalite Road have been provided to Transport for NSW and Narromine Shire Council and consultation with each will be ongoing.

2.3 MINING OPERATIONS

2.3.1 Open Cut Mining

Open cut mining operations would commence in the southern section of the SAR Open Cut. Mining of the near surface material would be undertaken using conventional free dig, load and haul techniques. Once more competent material is exposed, it would be extracted using conventional drill, blast, load and haul techniques. Open cut ore would be transported to the TGO Mine Site via the proposed Haul Road. Alternatively, ore may be stockpiled within the Run-in-Mine (RIM Pad) from where it would be transported to the TGO Mine Site via the proposed Haul Road.

Waste rock would be placed into the Caloma and SAR Waste Rock Emplacements (see Section 2.5).

Scheduling of open cut mining operations is in progress and the proposed schedule and rate of open cut mining will be presented in the EIS.

2.3.2 Underground Mining

Underground mining operations would be undertaken using the approved SAR Exploration Drive (SARED) (**Figures 2** and **4**). The drive would permit access from the Wyoming 1 underground workings to the SAR deposits. The drive and a single ventilation rise were approved under the *Mining Act 1992* as exploration-related activities by the Resources Regulator on 7 May 2020 (see Section 1.3.4). That approval permits exploration drilling from underground and extraction of a bulk sample.

Following receipt of development consent, the SAR Exploration Drive would become the SAR Production Drive. Additional development for production purposes would be undertaken using traditional jumbo-based drill, blast, load and haul techniques. Stoping operations would indicatively rely upon long hole open stoping or similar methods. No surface subsidence, with the possible exception of breakthrough into the base of the open cuts, would occur. This is because the proposed underground mining method, namely long-hole open stoping with rock or paste backfilling of completed stopes, does not typically result in ground collapse or surface subsidence.

Ore would initially be transported to the TGO Mine Site via the underground drive and Wyoming 1 Portal. An additional portal may be established within the SAR Open Cut and ore may be bought to the surface via the SAR Portal and stockpiled within the Run-in-Min (RIM Pad) from where it would be transported to the TGO Mine Site as described in Section 2.4.

Scheduling of underground mining operations is in progress and the proposed schedule and rate of underground mining will be presented in the EIS.

2.4 TRANSPORTATION OPERATIONS

A Haul Road and Services Road would be constructed between the Caloma 2 and SAR Open Cuts (**Figures 2**, **3** and **4**). The Haul Road would permit surface haul trucks to transport ore and waste rock from the SAR Open Cut to the TGO Mine Site. The road would be sufficiently wide to permit two-way use by haul trucks travelling in opposite directions.

Ore would be transported to the ROM Pad via the Haul Road and existing TGO Newell Highway Underpass using haul trucks or road trucks. Alternatively ore, including low grade ore, may be transported via the Haul Road and temporarily stockpiled within the footprint of the Caloma Waste Rock Emplacement.

Waste rock from the SAR Open Cut would be transported via the Haul Road and placed within the Caloma Waste Rock Emplacement. Alternatively, waste rock may be placed within the SAR Waste Rock Emplacement, including in-pit and out-of-pit placement.

A Services Road would be constructed adjacent to the Haul Road and would permit use by smaller vehicles, including light vehicles, service vehicles and heavy vehicles transporting tailings/residue to the Pastefill Plant. The Services Road would be sufficiently wide to permit two-way use by vehicles travelling in opposite directions. The Services Road would be separated from the Haul Road by a bund that would prevent vehicles crossing between the two roads.

Where the Haul Road and Services Road cross the proposed realigned Kyalite Road, an overpass for vehicles using Kyalite Road would be constructed.

Finally, an amenity bund would be constructed on the western side of the Haul Road. The SAR Amenity Bund would be constructed in a manner that would ensure that views of active sections of the SAR Mine Site would, to the extent practicable, be limited for motorists using the Newell Highway. This would limit the potential for driver distraction on the Highway.

In addition to constructing the Haul Road and Services Road, the Applicant would realign Kyalite Road. SAR personnel and consumables required for the proposed SAR operations would access the SAR Mine Site via the Newell Highway, the realigned Kyalite Road and the proposed Site Access Road.

2.5 WASTE ROCK MANAGEMENT

Waste rock, including alluvial and weathered material, from the SAR Open Cut would initially be used for site establishment operations, including construction of the SAR Amenity Bund. Subsequently, waste rock would be transported to the TGO Mine Site via the Haul Road and placed into the Caloma Waste Rock Emplacement. Following that, waste rock would be placed into the SAR Waste Rock Emplacement, initially in an out-of-pit location, with in-pit placement of waste rock commencing following completion of the southern and central sections of the SAR Open Cut. The southern and central sections of the SAR Open Cut would also be completely backfilled to form an integrated SAR Waste Rock Emplacement.

The SAR and Caloma Waste Rock Emplacements would be designed as geomorphic landforms, with side slopes substantially less steep than the existing Waste Rock Emplacements within the TGO Mine Site. The proposed Waste Rock Emplacements would also, to the extent practicable,

be designed without benches, steps or a large, flat upper surface. The intention of the design of the Waste Rock Emplacement would be to replicate a natural landform that would be less visually intrusive than "traditional" waste rock emplacement designs.

2.6 WATER MANAGEMENT

The Project Site and surrounding areas generally slope gently from east to west, with occasional low rises. Surface water flows are typically limited to small, indistinct watercourses. Surface water primarily flows east to west as sheet flow, with water pooling on the eastern side of the current Newell Highway. In extreme rainfall events, the Highway floods, typically once every 3 to 4 years.

Surface water diversion structures would be constructed during the initial site establishment phase of the Project. The Applicant would construct a series of low, grass covered contour banks to the east of the proposed disturbance area. The contour banks would be designed to convey water at non-erosive velocities. An Inundation Bund would be constructed to the east of the SAR Open Cut to provide protection from extreme rainfall events.

Culverts would be installed under the relocated Newell Highway, Haul Road and Services Road and gaps would be left in the SAR Amenity Bund for water to flow. Where existing culverts under the section of the Newell Highway to be decommissioned are inadequate, sections of the decommissioned road would be removed.

Potentially sediment-laden or dirty water would be retained within the disturbed section of the Mine Site and would be used for mining-related purposes. Dirty water would not be permitted to be discharged from site.

Water removed from both the open cut and underground workings would be pumped to a surface storage facility and would be used for mining-related purposes. Mine water would not be permitted to be discharged from site.

A pipeline would be installed between the TGO and SAR Mine Sites to allow transfer of water as required.

2.7 HOURS OF OPERATION AND PROJECT LIFE

The Project would operate 24 hours, 7 days per week. The Applicant proposes to seek development consent for the Project until 31 December 2032.

2.8 FINAL LANDFORM, LAND USE, REHABILITATION AND MINE CLOSURE

The proposed final landform within the MLA Area would include the following (**Figures 2** and **4**).

- One bunded and fenced final void, namely the northern section of the SAR Open Cut.

- One shaped and rehabilitated Waste Rock Emplacement, namely the SAR Waste Rock Emplacement which would also backfill the central and southern sections of the SAR Open Cut.
- Water management structures.
- The realigned Newell Highway and Kyalite Road would be retained. The Haul Road overpass on Kyalite Road would be removed or retained in consultation with Narromine Shire Council.

All infrastructure not required for the final land use would be removed or reduced in size, indicatively including the following.

- The Haul Road Amenity Bund and Haul Road would be removed. The Services Road would be reduced in size to facilitate ongoing management of the land post-mining.
- The Administration Area would be largely removed, with those structures suitable for the final land use retained. This may include sheds and limited hardstand areas.
- The magazines, RIM Pad, Pastefill Plant and other infrastructure would all be removed.
- All entrances to the underground workings would be sealed.

The final land use would comprise a mixture of agriculture and nature conservation.

Rehabilitation would be undertaken progressively, with the outer face of the SAR Waste Rock Emplacement rehabilitated as each lift is established, indicatively annually, throughout the life of the Project. Rehabilitation of other sections of the Project Site would be undertaken at the end of mine life. A *Rehabilitation Management Plan* describing the proposed rehabilitation operations and providing detailed completion criteria would be prepared in accordance with the guidelines relevant at the time.

Following completion of all rehabilitation operations and confirmation that the relevant completion criteria have been achieved, the Applicant would relinquish the Mining Lease.

2.9 ALTERNATIVES CONSIDERED

2.9.1 Introduction

The design and layout of the Project is the result of over 18 months of research, technical investigations, consultation and high-level design. In addition, the Applicant is continuing to evaluate the Project and will continue to assess and refine the design and layout throughout preparation of the EIS. The Applicant is also engaging in detailed consultation with a range of government agencies and the community. As a result, the EIS to be prepared to support the application for development consent will include a detailed description and analysis of alternatives considered by the Applicant and the reasons why the Project, as proposed, is the preferred alternative. Notwithstanding the above, the following alternatives have been or are currently under consideration.

2.9.2 Underground vs open cut mining operations

The Project includes both open cut and underground operations. The Project overview presented in Section 1.3 is, based on the current understanding of the deposits, market conditions and mining costs as well as the most efficient and effective mining scenario.

The Applicant has considered the option of an underground-only mining operation. This would have the following advantages.

- No relocation of the Newell Highway or Kyalite Road.
- No surface waste rock emplacement.
- Reduced disturbance of agricultural land and native vegetation.
- No requirement to remove "Rosewood" or "Kenilworth" homesteads.
- No loss of agricultural land.
- Reduced noise, air quality, blasting and visual impacts.

Notwithstanding the above, an underground only option would have the following disadvantages.

- Substantially reduced gold production.
- Sterilisation of a State-owned resource, in particular oxide and lower grade ore that would not be amenable to underground mining.
- Substantially reduced workforce and economic contributions and associated benefits.
- Substantially reduced royalties as a result of reduced gold production.
- Substantially reduced internal rate of return for the Applicant, thereby reducing the economic resilience of the Company and potentially impacting on the Director's duty to the shareholders.

Similarly, open cut mining operations only would result in deeper ore not being extracted, with similar sub-optimal outcomes for the State and the Applicant.

In light of the above, a combined open cut and underground operation provides the preferred Project outcome. Notwithstanding this, the Applicant will continue to assess the optimal combination of open cut and underground mining operations, including the point of transition between open cut and underground mining methods, in order to maximise utilisation of the resources.

2.9.3 Design and Location of the Waste Rock Emplacements

The Project would require removal of large volumes of waste rock. The Applicant initially considered placing all waste rock out-of-pit. This would have resulted in very substantial out-of-pit waste rock emplacements and associated loss of agricultural land and productivity. As a result, the Applicant determined to backfill the Caloma Open Cuts and the southern section of the SAR Open Cut, thereby minimising the area of agricultural land that would be disturbed.

In addition, the Applicant originally considered multiple out-of-pit options for out-of-pit waste rock emplacements, including substantial emplacements to the east of the SAR Open Cut. Following identification of high value native vegetation within the footprint of the proposed eastern waste rock emplacements, the SAR Waste Rock Emplacement was modified to minimise the area of native vegetation to be disturbed.

Alternate designs for the final Waste Rock Emplacements have also been assessed, including "traditional" bench and batter designs similar to those used for Waste Rock Emplacements 2 and 3 within the TGO Mine Site, and geomorphic designs, with final slopes substantially flatter than the current Waste Rock Emplacement 2 and 3 landforms. "Traditional" waste rock emplacement designs have the advantage of disturbing less land and being lower than geomorphic designs, but are more prone to soil erosion and look less "natural" than geomorphic designs. The Applicant has determined to use a geomorphic design for the proposed waste rock emplacements, with studies ongoing to determine final design criteria.

2.9.4 Location of Relocated Public Roads

The proposed SAR Open Cut would impact on the Newell Highway and Kyalite Road (**Figures 2**, **3** and **4**).

Newell Highway

The proposed realignment of the Newell Highway has been the subject of extensive consultation with Transport for NSW (TfNSW). Earlier versions included:

- realignment to the east of the SAR Open Cut (rejected because of the potential for mineralisation in that area); and
- various alignments to the west of the SAR Open Cut to optimise curve radii and road safety within the northern section of the realigned Highway.

The proposed realignment has been agreed with TfNSW and is the subject of ongoing discussion in relation to the required Work Authority Deed. Additional refinements to the Highway design and associated intersections will continue to be made through the detailed design process.

Kyalite Road

Two options for realignment of Kyalite Road were considered as follows.

- Option 1 – realignment as shown on **Figure 4**.
- Option 2 – diversion of Kyalite Road via Thornycroft Road, the eastern section of the TGO Mine Site and Cemetery Road, with the intersection with the Newell Highway within the village of Tomingley in a 50km/h zone.

Option 2 would have the following advantages compared with Option 1.

- Substantially lower construction costs as no overpass over the Haul Road and Services Road would be required.
- The intersection with the Newell Highway would be within a 50km/h zone, resulting in reduced risk of serious accident.

Option 2 would however result in an increased travel distance of up to 10km compared with Option 1 for users of Kyalite Road travelling south on the Newell Highway towards Peak Hill.

The Applicant consulted with users of Kyalite Road and the overwhelming preference was for Option 1. As a result, the Applicant has adopted that Option for the Project. Additional refinements to the road design will continue to be made through the detailed design process.

2.9.5 Consequences of not Proceeding with the Project

Should the Project not proceed or not receive all required approvals.

- Tomingley Gold Operations would likely cease operations at the end of 2025.
- Additional land would not be disturbed by mining and would continue to be used for agricultural activities.
- The Newell Highway and Kyalite Road would not need to be realigned.
- Noise, vibration, air quality, traffic and related amenity impacts would not occur.
- No surface waste rock emplacement would be required.
- No requirement to remove "Rosewood" or "Kenilworth" homesteads.

Notwithstanding the above, should the Project not proceed, the following benefits would not eventuate.

- The recoverable gold resource would not be mined. Such an outcome would be contrary to the objects of the NSW Government and the Applicant's obligation to maximise resource utilisation.
- The option to extend the life of TGO by a further 7 years would be lost, resulting in a loss of employment, contributions to economic activity and payment of taxes and royalties over that period.

3. LOCAL AND REGIONAL SETTING

3.1 LAND OWNERSHIP

Figure 6 presents landownership within and surrounding the MLA Area. In summary, the Applicant owns all land within and immediately surrounding the MLA Area, with the exception of parcels of Crown land and land within the Newell Highway, Kyalite Road, McNiven's Lane and a number of unformed road reserves.

Land to the east, south and west of the MLA Area is owned by a range of landholders with primarily large agricultural holdings. Land to the north of the MLA Area is owned by the Applicant.

3.2 LAND USE

Figure 7 presents land uses, as defined by the NSW Land Use and Management database within and surrounding the MLA Area. In summary, the dominant land use is agriculture, predominantly cropping with intermittent grazing (see Section 3.6). Other land uses include the following.

- Mining associated with the Tomingley Gold Mine.
- Road transportation associated with the Newell Highway and surrounding local roads.
- Rail transportation associated with the Inland Rail (under construction).
- Village residential associated with the village of Tomingley.
- Nature conservation and "other minimal use" associated with areas of native vegetation.

3.3 GROUNDWATER

A Groundwater Assessment to support the application for development consent is in preparation. That document is referred to hereafter as Jacobs (in prep). The following provides an overview of the groundwater system within and surrounding the MLA Area.

The groundwater environment within and surrounding the MLA Area is dominated by three broad groundwater systems as follows.

- Perched aquifer: A shallow and localised perched water table system associated with the larger drainages, particularly Gundong Creek. These systems are not located close to the MLA Area and as such will have no significant interaction from a groundwater perspective.
- Cainzoic alluvial groundwater system: The Cainzoic alluvial system comprises a relatively thick layer of generally low permeability fluvial sediments. In the vicinity of the MLA Area this unit has been shown to be unsaturated and does not locally represent an aquifer.

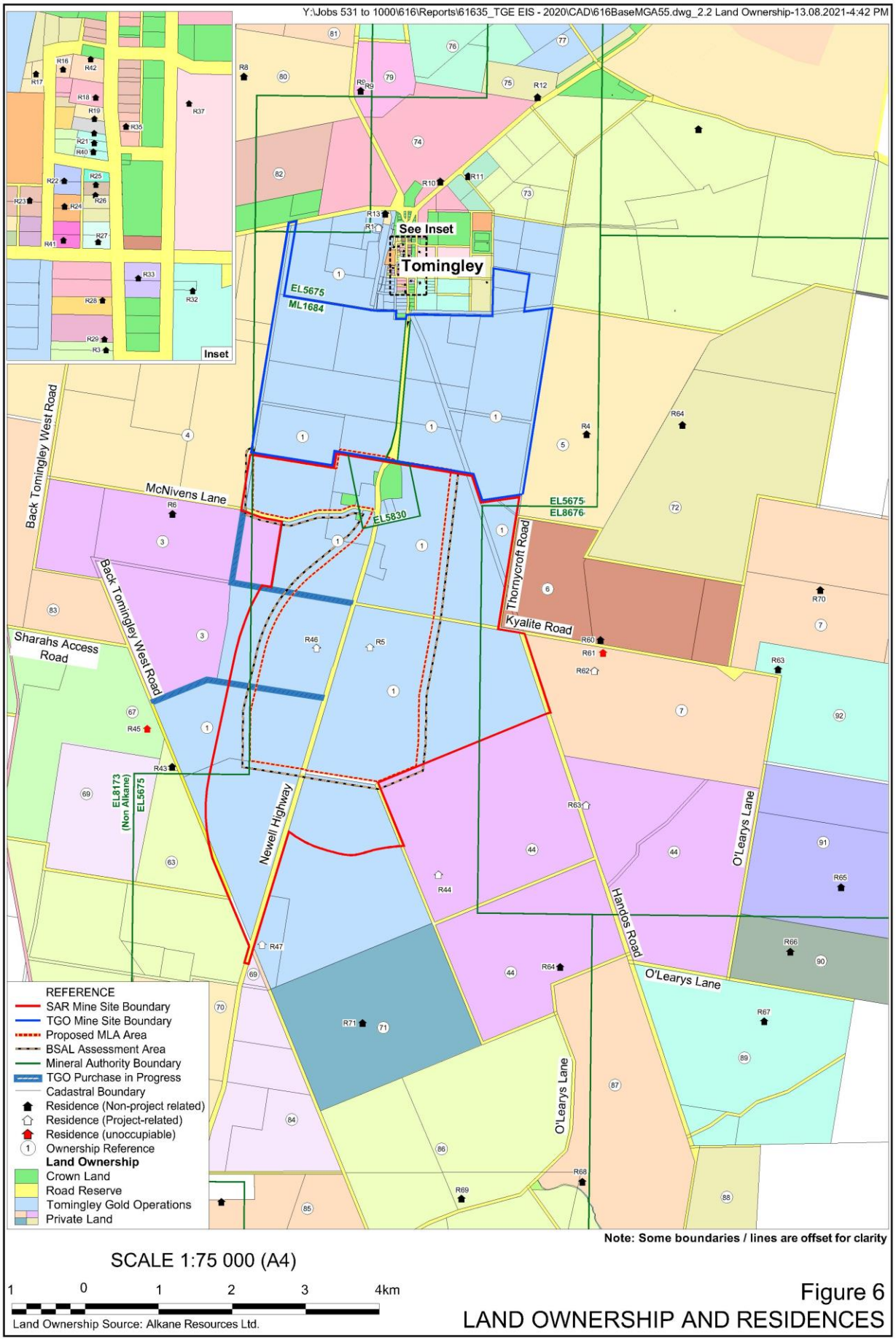


Figure 6
LAND OWNERSHIP AND RESIDENCES

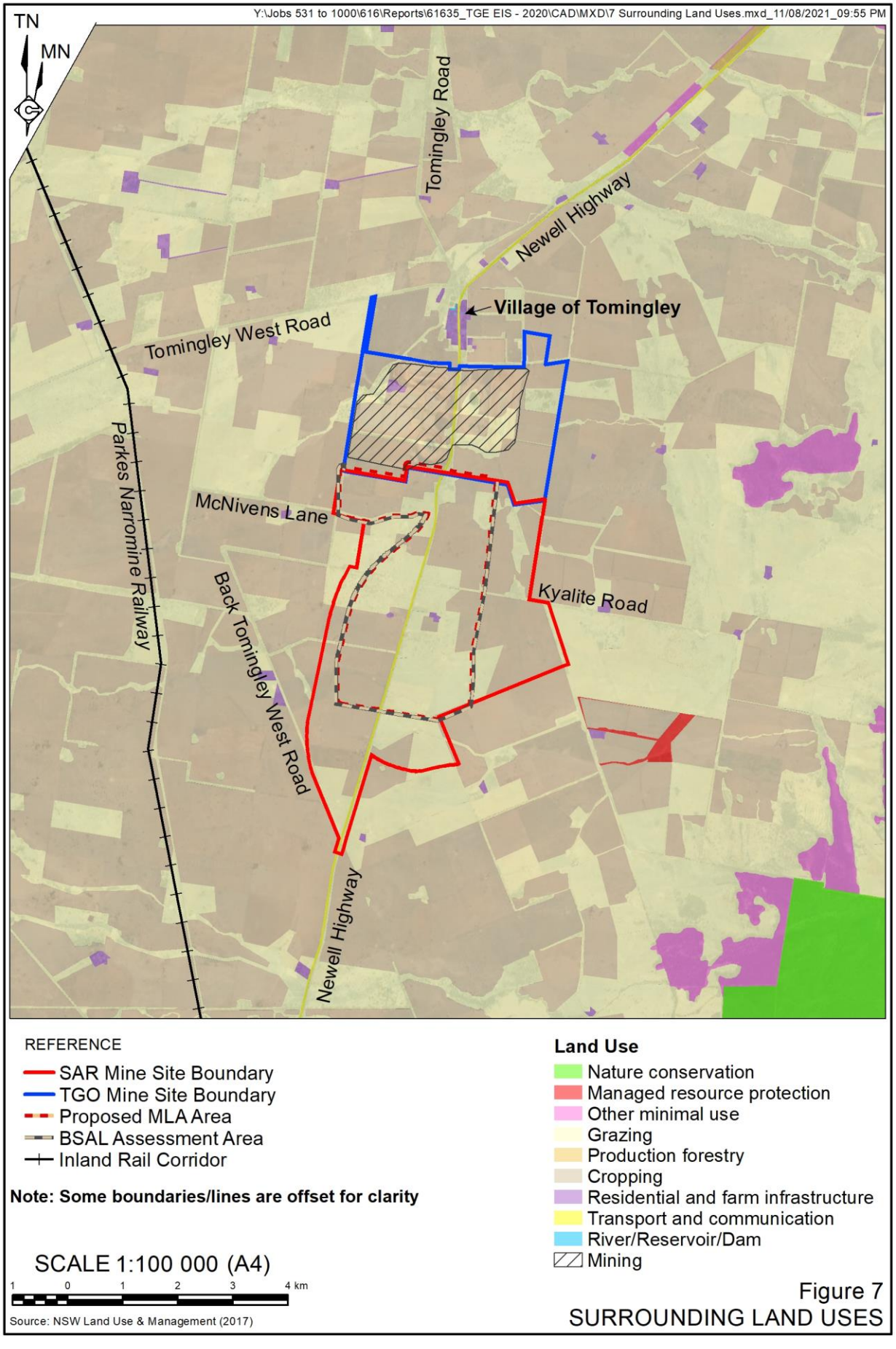


Figure 7
SURROUNDING LAND USES

- Fractured rock groundwater system: Locally, in the vicinity of the MLA Area, the regional water table is expressed within the basement lithologies. The primary permeability of these basement lithologies is likely to be very low, however there is potential for enhanced permeability associated with structural deformation and discontinuities, zones of mineralisation, and chemical weathering within the transition zone from completely oxidised saprolite to moderately weathered formation.

Jacobs (in prep) identify that the shallow perched aquifer is hydrologically separated from the deeper fractured rock aquifer.

Figure 8 presents all registered bores within approximately 7.5km of the SAR Open Cut. In summary, five are listed as "Water Supply" bores and one as "commercial and industrial." The remaining are identified as "monitoring bores." Of the five registered bores identified as water supply/commercial:

- two (GW04534 and GW541137) are 18.3m and 12.2m deep respectively and are presumed to be screened in the perched alluvial aquifer;
- two (GW054594and GW802842) are 61.6m and 83.0m deep respectively and are screened in the fractured rock aquifer; and
- two (GW801568 and GW068651) are identified as "proposed" and "removed" respectively on the Bureau of Meteorology Groundwater Explorer Database.

Jacobs (in prep) note the following in relation to the groundwater aquifers within and surrounding the MLA Area.

- Resource drilling data indicates that:
  - the alluvial cover material is typically unsaturated; and
  - first water is commonly identified between 60m and 100m below ground level.
- Groundwater quality in the fractured rock aquifer is generally saline, with electrical conductivities ranging between 11 393 µS/cm to 28 567 µS/cm.
- Monitoring bore EPA10 located immediately adjacent to the Wyoming 1 Open Cut registered a reduction in groundwater levels from mid-2016, approximately 2 ½ years after mining operations commenced withing the TGO Mine Site. Monitoring bores EPA11 and EPA12, located approximately 700m from the mining operations have yet to show evidence of reduced standing water levels as a result of the approved TGO mining operations.
- The regional groundwater contours indicate an east to west groundwater flow direction.
- Hydraulic conductivity of the fractured rock groundwater system is generally very low, between $1x10^{-3}$ and $1x10^{-5}$ m/d, with higher conductivities likely associated with local fracture zones.
- Observed groundwater inflows within the TGO Mine Site are very low and do not present any issues or require active dewatering.
- There is no significant surface water/groundwater interaction.

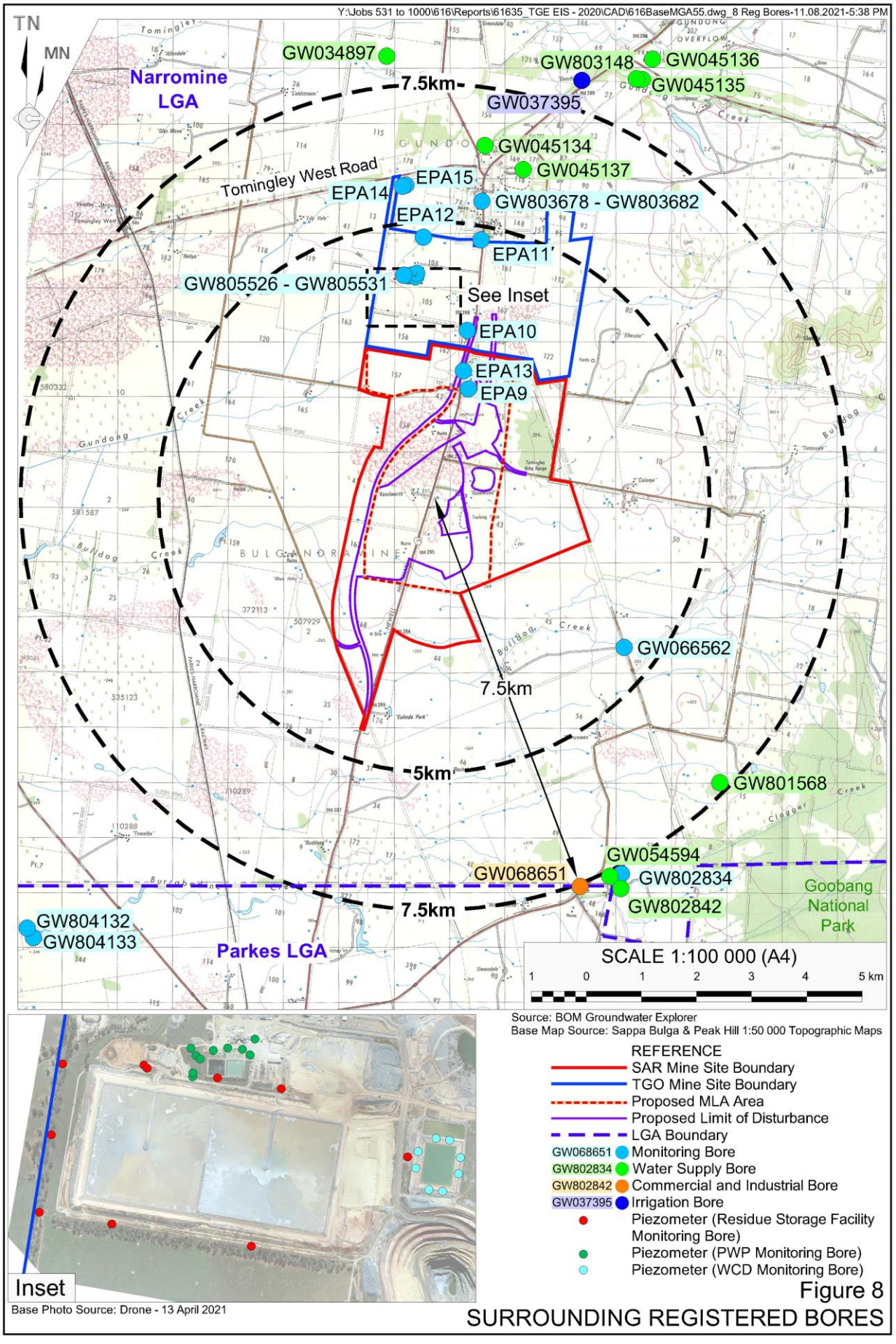


Figure 8
SURROUNDING REGISTERED BORES

3.4 SURFACE WATER

Surface water flows typically occur as sheet flows, with occasional, poorly to moderately defined, west flowing watercourses, including, from north to south, Tomingley, Gundong and Bulldog Creeks, as well as a number of unnamed water courses. The Newell Highway in the vicinity of the SAR Mine Site has substantially altered surface water flows, with the Highway flooding under rainfall events of between 25% and 33% Annual Exceedance Probability (AEP), i.e. every 3 to 4 years.

4. BIOPHYSICAL STRATEGIC AGRICULTURAL LAND

4.1.1 Introduction

The Applicant engaged Sustainable Soils Management Pty Ltd to prepare the following assessments.

- *Land and Soil Capability Assessment*, referred to hereafter as SSM (2021a) and presented as Annexure 1 of the *Agricultural Impact Assessment.* That document is referred to hereafter as TGO (2021) and is presented as **Appendix 3** of this document.
- *Biophysical Strategic Agricultural Land Assessment*, referred to hereafter as SSM (2021b) and presented as **Appendix 4** of this document.

The following subsection provides an overview of the results of SSM (2021b). Section 2.1 of the *Agricultural Impact Assessment* (TGO, 2021) presents an overview of the *Land and Soil Capability Assessment* presented in SSM (2021a).

4.1.2 Assessment Methodology

4.1.2.1 Screening Assessment

SSM (2021b) was prepared in accordance with the Interim BSAL Protocol. In summary, the Protocol identifies a four-step process as follows for verifying the presence/absence of BSAL.

Step 1 - Identify the project area which will be assessed for BSAL

Interim BSAL Protocol identifies that the BSAL Assessment Area should include the "entire project area" plus a 100m buffer. As the Strategic Regional Land Use Policy does not apply to land that is within existing Mining Leases or linear infrastructure that will not be the subject of a Mining Lease, the MLA Area has been defined as the "entire project site" for the purpose of the assessment, with the BSAL Assessment Area to include a 100m buffer (**Figure 5**).

Step 2 - Confirm access to a reliable water supply

The Interim BSAL Protocol identifies those areas mapped by the Bureau of Meteorology as having 350mm of rain and above in 9 out of 10 years as having reliable rainfall. SSM (2021b) state that the MLA Area in within an area mapped by the Bureau as having reliable rainfall. In addition, SSM (2021b) note that rainfall at the Bureau of Meteorology-operated Peak Hill Post Office station exceeds 350mm per year in 116 of 128 years from 1891 to 2018 or 90.6% of years.

As a result, in accordance with the Interim BSAL Protocol, the MLA Area has a "reliable water supply."

Step 3 - Choose the appropriate approach to map the soils information

The Interim BSAL Protocol identifies that where the Applicant has access to the MLA Area, a soils survey should be undertaken in accordance with the steps identified in Sections 6 to 9 of the Protocol. SSM undertook an assessment in accordance with those Sections.

Step 4 - Risk assessment

This step requires that a risk assessment be undertaken to inform the density of soil sampling required. SSM (2021) determined that the soils within the MLA Area are at high risk of disturbance and, as a result, soil sampling at a scale of 1:25 000 was undertaken.

4.1.2.2 Detailed Assessment

The BSAL Assessment described by SSM (2021b) was undertaken in parallel with the *Land and Soil Capability Assessment* described in SSM (2021a). In undertaking these assessments, SSM undertook the following.

- Desktop review and assessment of existing information relating to soils and landforms in the Mine Site.
- Field surveys, including an electromagnetic induction (EM) survey, soil sampling and laboratory analysis.
- Analysis of results of the above to assess the presence or absence of BSAL and its distribution.

Desktop Assessment

The desktop assessment reviewed a range of soil and landscape information across the SAR Soil Study Area, including the MLA Area, including:

- aerial imagery and detailed topography;
- published soil landscapes and soil properties;
- geology; and
- radiometrics (natural radiation emitted by the soil).

This information was used to inform the correlation of field survey data to better define the soil mapping units.

EM Survey

An EM survey measures the apparent electrical conductivity of the soil at a range of depths. Electrical conductivity in soil will vary depending on the salinity of the soil, with more saline soils having higher conductivities than less saline soils. Readings of soil conductivity were taken at approximately 5m spacings along 50m transects, resulting in an EM survey density of approximately 100 readings per hectare.

4.1.2.3 Field Assessment

SSM (2021b) undertook a field assessment within the MLA Area. The program comprised 54 survey locations, with a sampling density of one site per 19ha (see **Figure 10** in Section 4.1.3). As subsequent change to the MLA Area resulted in two of these sampling locations falling outside the BSAL Assessment Area.

At each sampling site the decision-making flow chart presented in **Figure 9** was employed to determine whether the soils present at the sampling site could classified as BSAL. For those sites that passed Steps 1 to 6, a soil test pit was excavated to a depth of 1.2m or refusal and soil data required by the Interim BSAL Protocol was collected, including soil samples.

Of the 54 survey locations, 7 did not pass Step 5 and no test pits were excavated at that location. At the remaining 47 survey locations, a test pit was excavated using a backhoe to approximately 1.5m or refusal. Selected soil properties in each test pit were described according to the Australian Soil and Land Field Survey Handbook (NCST, 2009). Each profile was classified to Suborder level of the Australian Soil Classification of Isbell (2002). Soil samples were collected at the prescribed depths of 0cm to 5cm, 5cm to 15cm, 15cm to 30cm, 30cm to 60cm and 60cm to 100cm and analysed at the NATA and ASPAC accredited Incitec Pivot Laboratories.

SSM (2021b) uploaded all soil test pit data into the New South Wales Soil and Land Information System (SALIS) database.

4.1.3 Assessment Results

SSM (2021b) identified the following five Soil Mapping Units (SMU) within the MLA Area (**Figure 10**).

- Chromosol SMU
- Andesite Chromosol SMU
- Sodosol SMU
- Gilgai SMU
- Disturbed SMU

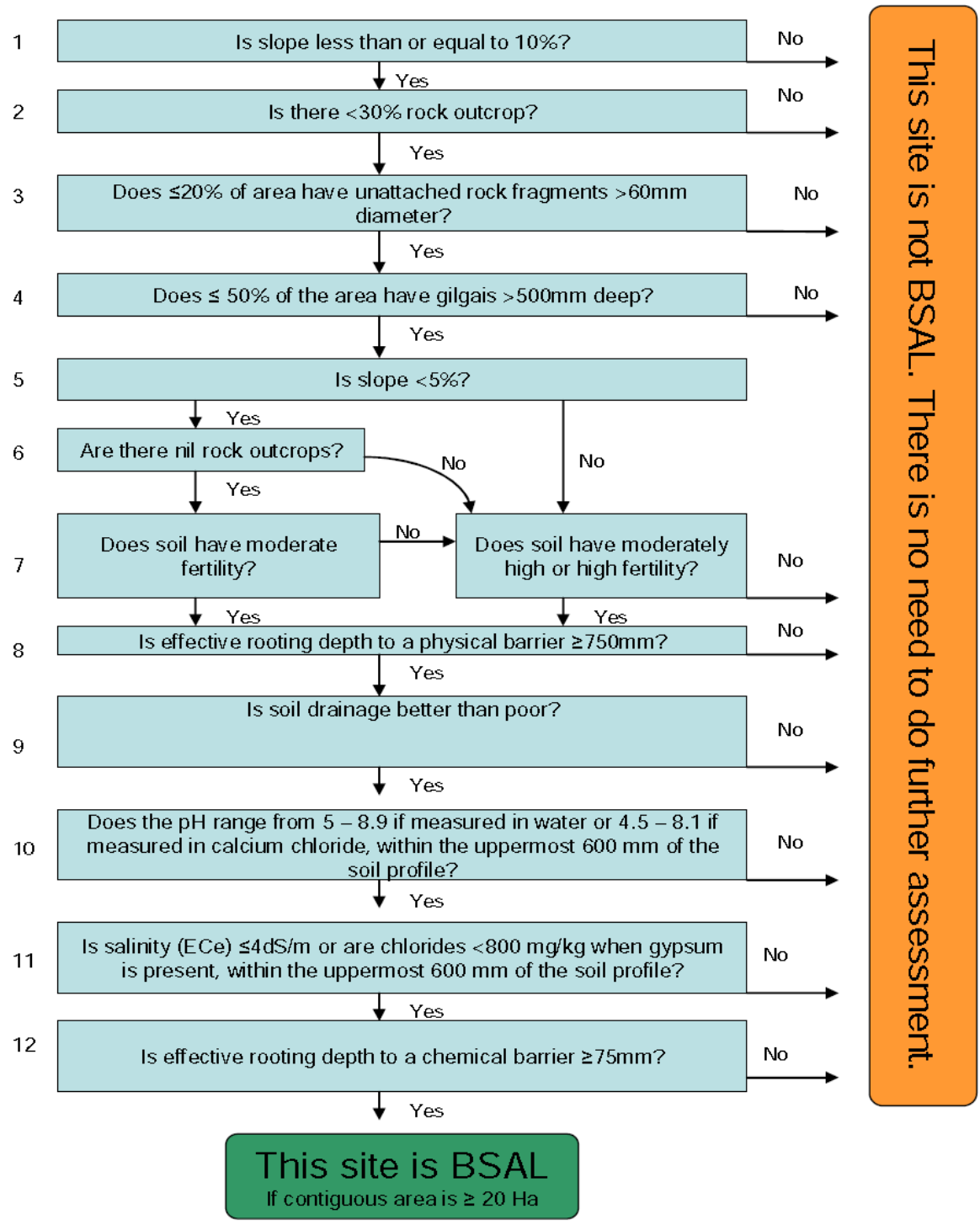
An additional SMU, namely the Lithosol SMU, was identified with the SAR Soil Study Area, but did not occur within the MLA Area.

The following presents a brief description of each of the mapped SMUs and a justification of their classification as BSAL or non-BSAL.

Chromosol and Andesite Chromosol SMU

The Chromosol SMU is characterised by a duplex profile comprising silty or sandy clay loam over clay, with parent material identified in the field as Dulladerry Volcanics. The topsoil is moderately thick, well drained and slightly acidic with desirably low exchangeable aluminium, low salinity, low cation exchange capacity and adequate levels of macronutrients and micronutrients except zinc. SSM (2021a) classified the Chromosol SMU as LSC Class 4.

The Andesite Chromosol SMU is characterised by a duplex profile comprising silty or sandy clay loam over clay, with parent material identified in the field as andesite. The topsoil is slightly acidic, with desirably low exchangeable aluminium, low salinity, exchangeable sodium percentage and cation exchange capacity and adequate levels of macronutrients and micronutrients except zinc. SSM (2021a) classified the Andesite Chromosol SMU as LSC Class 4.



Source: Interim BSAL Protocol – Figure 2

Figure 9
BSAL Decision-making Flow Chart

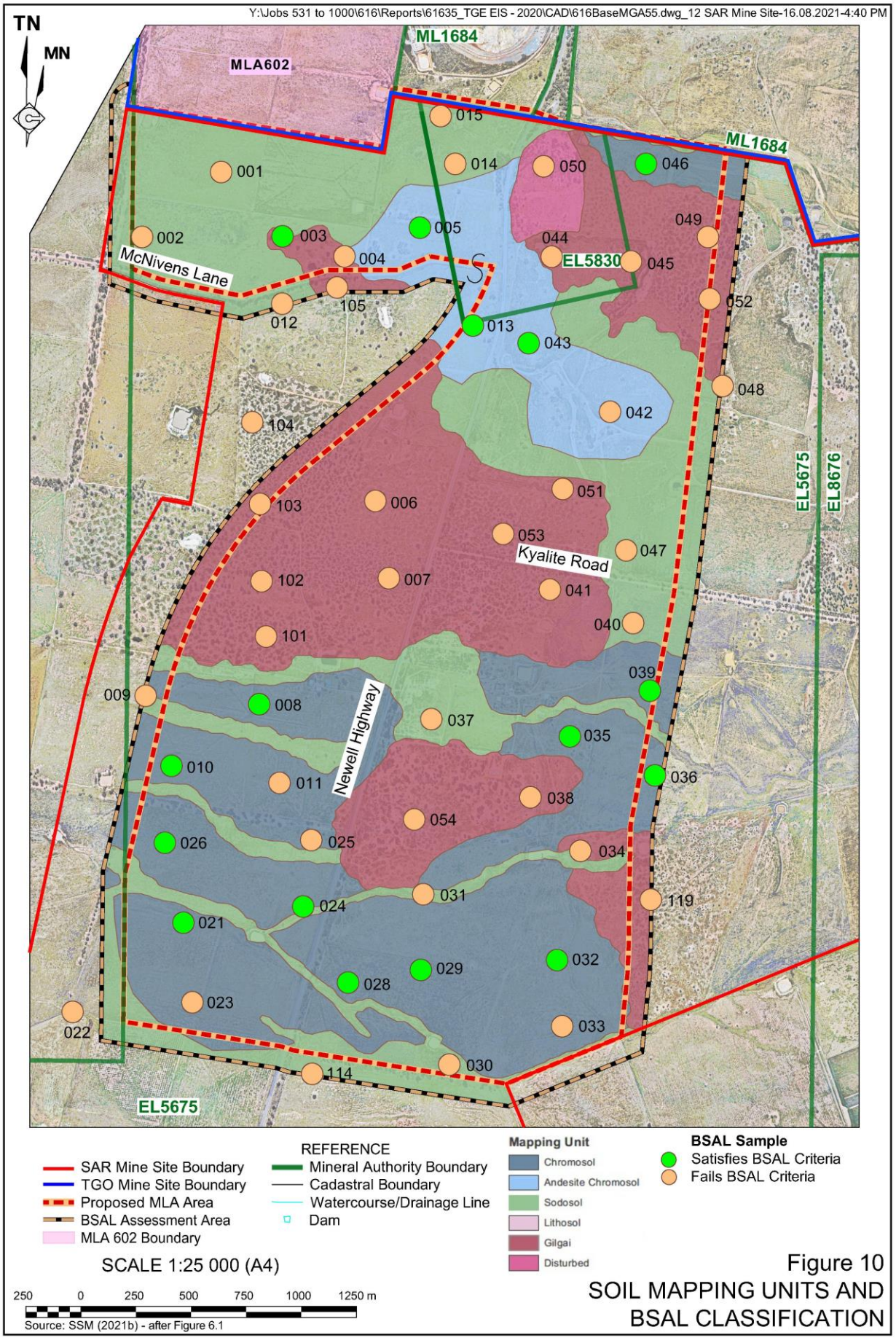


Figure 10
SOIL MAPPING UNITS AND BSAL CLASSIFICATION

Table 3 presents the results of the BSAL assessment for each sampling site within the Chromosol and Andesite Chromosol SMU. In summary, soils within 15 of the 20 sampling sites may be classified as BSAL. As a result, SSM (2021b) classified the Chromosol SMU as BSAL.

Sodosol SMU

The Sodosol SMU is characterised by a duplex profile, with poorer surface drainage than the Chromosol or Andesite Chromosol SMUs. The SMU is generally sandy, has slightly acidic topsoil with marginally high exchangeable aluminium, low salinity, and moderately low capacity to store nutrients. Cation rations are adequate in the surface 30cm but the soil becomes more sodic and magnesic with depth, which is associated with slow internal drainage. SSM (2021a) classified the Sodosol SMU as LSC Class 6.

Table 4 presents the results of the BSAL assessment for each sampling site within the Sodosol SMU. In summary, soils within all 12 of the sampling sites may be classified as non-BSAL. As a result, SSM (2021b) classified the Sodosol SMU as non-BSAL.

Gilgai SMU

The Gilgai SMU has a clay-rich soil, with well-developed gilgais. Gilgais are small depressions in the soil surface, typically associated with expanding clay soils. Gilgais are typically associated with substantial micro-relief comprising closely spaced mounds and depressions. Soils of the Gilgai SMU are typically clay-rich, with mildly acidic and non-saline topsoil over strongly alkaline and saline subsoil. SSM (2021a) notes that the Gilgai SMU has soil that is potentially productive, but this is constrained by poor drainage and elevated salinity, which limit agricultural productivity. SSM (2021a) classified the Gilgai SMU as LSC Class 6.

Table 5 presents the results of the BSAL assessment for each sampling site within the Andesite Chromosol SMU. In summary, soils within 18 of the 19 sampling sites may be classified as non-BSAL. As a result, SSM (2021b) classified the Gilgai SMU as non-BSAL.

Disturbed SMU

The Disturbed SMU is located on a previously rehabilitated tailings storage facility associated with reprocessing of historic tailings in the 1980's, prior to the Applicant's association with the Project. The soil is strongly alkaline and saline, is deficient in macronutrients. SSM (2021a) classified the Disturbed SMU as LSC Class 6.

Table 6 presents the results of the BSAL assessment for each sampling site within the disturbed SMU. In summary, soils within the single sampling site may be classified as non-BSAL. As a result, SSM (2021b) classified the disturbed SMU as non-BSAL.

Table 3
Chromosol and Andesite Chromosol SMU BSAL Assessment

Soil Test Pit Number	Step 1 Slope <10%	Step 2 Rock Outcrop <30%	Step 3 Rock Fragment Abundance <20%	Step 4 No Gilgai >50% and >500mm deep	Step 5 Slope <5%	Step 7 ASC Fertility Moderate or Better	Step 8 Depth to Physical Barrier >750mm	Step 9 BSAL Drainage > poor	Step 10 pH(H2)) <9 at <600mm	Step 11 Ece <4 at <600mm depth	Step12 Depth to chemistry barrier > 50mm	BSAL Status
5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	y	BSAL
8	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
10	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
11	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Non-BSAL
13	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
21	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
23	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Non-BSAL
24	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
25	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Alkalinity	Non-BSAL
26	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
28	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
29	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
32	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
33	Y	Y	Y	Y	Y	N	N	N	Y	Y	Y	Non-BSAL
35	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
36	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
39	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
42	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Non-BSAL
43	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
46	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL

Source: SSM (2021b) – after Table 6.2

Table 4
Sodosol SMU BSAL Assessment

Soil Test Pit Number	Step 1 Slope <10%	Step 2 Rock Outcrop <30%	Step 3 Rock Fragment Abundance <20%	Step 4 No Gilgai >50% and >500mm deep	Step 5 Slope <5%	Step 7 ASC Fertility Moderate or Better	Step 8 Depth to Physical Barrier >750mm	Step 9 BSAL Drainage > poor	Step 10 pH(H2)) <9 at <600mm	Step 11 Ece <4 at <600mm depth	Step12 Depth to chemistry barrier >50mm	BSAL Status
1	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Non-BSAL
2	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Non-BSAL
9	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Non-BSAL
12	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Non-BSAL
14	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Non-BSAL
15	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Non-BSAL
30	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Non-BSAL
31	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Alkalinity	Non-BSAL
37	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Non-BSAL
40	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Non-BSAL
47	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Non-BSAL
114	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Alkalinity	Non-BSAL

Source: SSM (2021b) – after Table 6.6

Table 5
Gilgai SMU BSAL Assessment

Soil Test Pit Number	Step 1 Slope <10%	Step 2 Rock Outcrop <30%	Step 3 Rock Fragment Abundance <20%	Step 4 No Gilgai >50% and >500mm deep	Step 5 Slope <5%	Step 7 ASC Fertility Moderate or Better	Step 8 Depth to physical barrier >750mm	Step 9 BSAL Drainage > poor	Step 10 pH(H2)) <9 at <600mm	Step 11 Ece <4 at <600mm depth	Step 12 Depth to chemistry barrier >50mm	BSAL Status
3	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	BSAL
4	Y	Y	Y	N	Y	Y	Y	N	N	Y	Alkalinity	Non-BSAL
6	Y	Y	Y	N	Y	Y	Y	N	N	Y	Alkalinity	Non-BSAL
7	Y	Y	Y	N	Y	Y	Y	N	N	N	Alkalinity /Salinity	Non-BSAL
38	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Non-BSAL
41	Y	Y	Y	N	Y	Y	Y	N	N	Y	Alkalinity	Non-BSAL
44	Y	Y	Y	N	Y	Y	Y	N	Y	Y	Y	Non-BSAL
45	Y	Y	Y	N	Y	Y	Y	Y	N	N	Alkalinity /Salinity	Non-BSAL
48	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Alkalinity	Non-BSAL
49	Y	Y	Y	N	Y	Y	N	N	N	N	Alkalinity /Salinity	Non-BSAL
51	Y	Y	Y	N	Y	NA	NA	NA	NA	NA	NA	Non-BSAL
52	Y	Y	Y	N	Y	NA	NA	NA	NA	NA	NA	Non-BSAL
53	Y	Y	Y	N	Y	NA	NA	NA	NA	NA	NA	Non-BSAL
54	Y	Y	Y	N	Y	NA	NA	NA	NA	NA	NA	Non-BSAL
101	Y	Y	Y	N	Y	NA	NA	NA	NA	NA	NA	Non-BSAL
102	Y	Y	Y	N	Y	NA	NA	NA	NA	NA	NA	Non-BSAL
103	Y	Y	Y	N	Y	NA	NA	NA	NA	NA	NA	Non-BSAL
105	Y	Y	Y	N	Y	NA	NA	NA	NA	NA	NA	Non-BSAL
119	Y	Y	Y	N	Y	NA	NA	NA	NA	NA	NA	Non-BSAL

Source: SSM (2021b) – after Table 6.4

Table 6
Disturbed SMU BSAL Assessment

Soil Test Pit Number	Step 1 Slope <10%	Step 2 Rock Outcrop <30%	Step 3 Rock Fragment Abundance <20%	Step 4 No Gilgai >50% and >500mm deep	Step 5 Slope <5%	Step 7 ASC Fertility Moderate or Better	Step 8 Depth to physical barrier >750mm	Step 9 BSAL Drainage > poor	Step 10 pH(H2)) <9 at <600mm	Step 11 Ece <4 at <600mm depth	Step 12 Depth to chemistry barrier >50mm	BSAL Status
50	Y	Y	Y	Y	Y	N	Y	Y	y	N	N	Non-BSAL
Source: SSM (2021b) – after Table 6.8												

5. MITIGATION AND MANAGEMENT MEASURES

5.1 AVOIDANCE

The Applicant has implemented the following measures to avoid disturbance of BSAL to the maximum extent practicable.

- Maximum use has been made of in-pit placement of waste rock, including backfilling of the Caloma 1 and Caloma 2 Open Cuts and the southern sections of the SAR Open Cut, thereby minimising the area of land disturbance required.
- Locating, to the extent practicable, Project-related infrastructure in areas of non-BSAL.

It is noted however, that the presence or absence of BSAL is merely one factor in a multifaceted decision-making process when designing the layout of the Project. Examples where other factors have influenced the placement of infrastructure include the following.

- The location and size of the SAR Open Cut is determined by the location of the mineral deposits and the NSW Government requirement to optimise extraction of a State-owned resource for the benefit of the people of NSW.
- Steeper, traditional batter and bench-style waste rock emplacements are no longer considered acceptable by the Resources Regulator or the community. Waste rock emplacements that employ geomorphic designs, such as that proposed for the SAR Waste Rock Emplacement, require a larger surface footprint than alternate designs.
- Non-BSAL lands within the MLA Area that have a low agricultural productivity have either not been cleared of native vegetation or have had native vegetation become established. Biodiversity offsetting costs for sections of non-BSAL land are prohibitively high and those non-BSAL lands have therefore been avoided.

5.2 MITIGATION AND MANAGEMENT

The Applicant would implement the following mitigation and management measures to minimise, to the extent practicable, impacts to BSAL.

- Mark out areas of approved disturbance and ensure that surface disturbing activities are limited to approved areas only.
- Strip and stockpile soils in accordance with the recommendations of SSM (2021a).
- Ensure that all surface water from disturbed sections of the SAR Mine Site is retained on site and is not permitted to flow to BSAL land except following rainfall events that exceed the approved design event.

5.3 REHABILITATION

The Applicant would implement the following rehabilitation measures within areas disturbed by the Project that are to be returned to Land and Soil Capability (LSC) Class 4 land. Areas to be rehabilitated to LSC Class 4 include rehabilitated areas with slopes less than 6%, namely all rehabilitated areas within the MLA Area with the exception of the SAR Waste Rock Emplacement.

- Engage a suitably qualified and experienced soil scientist to test stockpiled soil prior to rehabilitation operations and recommend measures to be implemented to maximise the agricultural productivity of placed soils.
- Apply ameliorants and spread stockpiled soils in accordance with the above recommendations.
- Revegetate rehabilitated areas with a cover crop to stabilise spread soil prior to establishment of the required pasture community.
- Manage and monitor rehabilitated area to ensure that the achieve LSC Class 4 status prior to Mining Lease relinquishment.

5.4 OFFSET RESIDUAL IMPACTS

5.4.1 LSC Class 4 Land

Section 6.2 identifies the area of BSAL land that would be disturbed by the Project. All BSAL land within the MLA Area is classified as LSC Class 4 land. In order to offset for the proposed disturbance of approximately 317ha of LSC Class 4 land, the Applicant would undertake the following (see also Section 2.1.3.7 of TGO (2021), presented as **Appendix 3**).

- Level, shape and till sections of Category 1, LSC Class 6 gilgai affected land to ensure a free draining surface. If required, ameliorants such as gypsum and/or lime would be added to improve soil characteristics.
- If required, place excess stripped soil not required for mine rehabilitation operations in areas that would otherwise not be free draining. Particular emphasis would be placed upon using high quality Chromosol and Sodosol topsoil for this purpose. Gilgai topsoil would be utilised should additional soil resources be required.
- Engage a suitably qualified and experienced agronomist or soil scientist to determine additional amelioration and agricultural practices required to ensure that the shaped landform achieves LSC Class 4 status.

5.4.2 Agricultural Productivity

In addition to the above the Applicant would undertake the following measures to improve agricultural productivity of land that would not be disturbed for mining-related activities (see also Section 2.5 of TGO (2021) presented as **Appendix 3**).

- Undertake the activities described in Section 2.1.3.7 to convert land that is currently classified as Class 6 land to Class 4 land.

- Apply soil ameliorants based on soil testing and advice from a suitably qualified and experienced agronomist to remove any inhibitors in grass production. This may include the application of lime and / or gypsum.
- Establish deep rooted perennial pastures, including more desirable/palatable species than those currently present. A budget of approximately $350/ha for pasture establishment has been identified.
- Intensively manage the number of livestock on particular sections of the land, providing higher stocking density than historical grazing systems.
- Use destocking and restocking to match carrying grazing capacity to available plant biomass.
- Provide periods of rest and recovery to encourage more available biomass for livestock production systems.
- Undertake fencing, stock yard construction and water supply works to account for the consolidated land ownership and realigned Newell Highway.

The Applicant, Toongi Pastoral Company Pty Ltd and their advisors anticipate that the average carrying capacity for land that would continue to be used for agricultural purposes would increase at a rate of approximately 5% per year from an average of approximately 3.1 DSE/ha in 2021 to approximately 6.0 DSE/ha in 2035. The Applicant would collect and retain adequate agricultural data throughout the life of the Project to demonstrate progression towards the target carrying capacity.

Assuming successful implementation of the above, the Agricultural Gross Margin Returns for all land owned by the Applicant would increase from approximately $784,000pa to approximately $1.2 million per year (see Section 4.2 of TGO (2021)).

6. ASSESSMENT OF GATEWAY CRITERIA

6.1 INTRODUCTION

The following subsections present an assessment of Project-related impacts to BSAL land in accordance with the criteria identified in Clause 17H of the Mining SEPP and the Gateway Guideline.

6.2 SURFACE DISTURBANCE IMPACTS

Table 7 and **Figure 10** present the areas of BSAL within the MLA Area that would be disturbed by the Project. In summary, approximately 207ha of the total 357ha of BSAL soils would be disturbed as a result of the Project.

There would be no surface subsidence associated with underground mining operations and, as a result, no BSAL land would be subject to subsidence-related impacts.

Table 7
BSAL Areas within the MLA Area

Soil Mapping Unit	Area to be disturbed (ha)	Areas to be preserved (ha)	Total Area within MLA Area (ha)
BSAL			
Chromosol SMU	182	104	286
Andesite Chromosol	25	46	71
Subtotal	**207**	**149**	**357**
Non-BSAL			
Sodosol SMU	80	163	243
Gilgai SMU	115	152	267
Disturbed SMU	1	12	13
Subtotal	**196**	**328**	**524**
TOTAL	**404**	**477**	**881**

Source: After SSM (2021b)

Table 8 and **Figure 11** presents an overview of the pre- and post-mining LSC classes within the SAR Mine Site. In summary, the Project would result in disturbance of approximately 317ha of LSC Class 4 land. As described in Section 5.3, the Applicant would reinstate approximately 209ha of land to LSC Class 4 during rehabilitation operations following the completion of mining operations. In addition, as described in Section 5.4.1, the Applicant would undertake enhancement activities within an additional 50ha of land currently classified as LSC Class 6 land to increase the classification of that land to LSC Class 4. As a result, the Project would result in a nett reduction of approximately 62ha of Class 4 land.

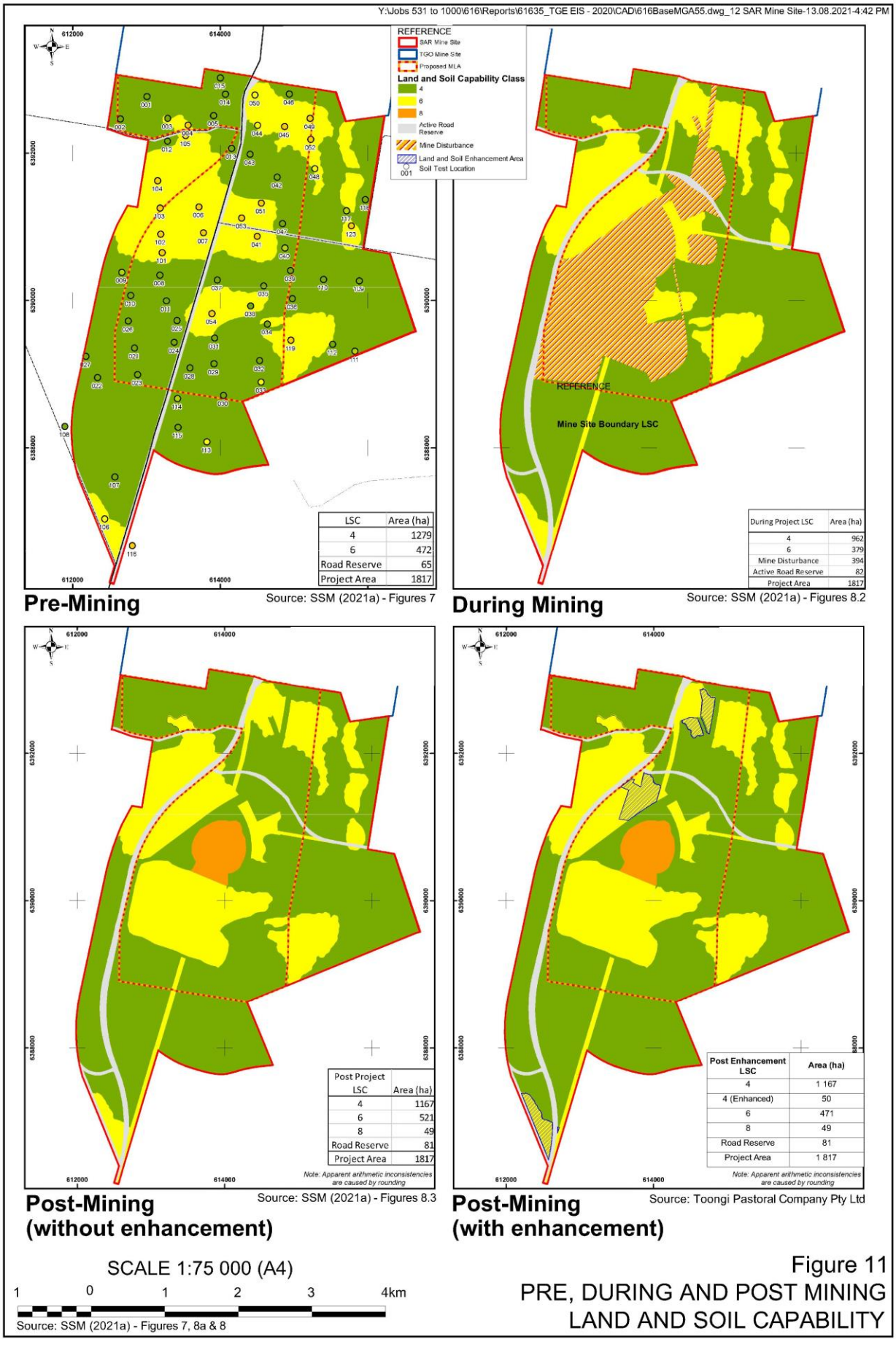


Figure 11
PRE, DURING AND POST MINING
LAND AND SOIL CAPABILITY

Table 8
Land and Soil Capability – Pre, During and Post-mining[1]

LSC Class	Pre-mining Area (ha)[4]	During Mining[4]		Post-mining (without enhancement)[4]		Post-mining (with enhancement)[5]	
		Area (ha)	Change from pre-mining (ha)	Area (ha)	Change from pre-mining (ha)	Area (ha)	Change from pre-mining (ha)
Class 4	1 279	962	-317	1 167	-112	1 217	-62
Class 6	472	379	-93	521	+49	479	-1
Class 8	-	-	-	49	+49	49	+49
Road Reserve	65	81	+16	81	+16	81	+16
Active Mining Area[2]		394	+394	-	-	-	-
Total[3]	1 817	1 817		1 817		1 817	

Note 1: Within the SAR Mine Site.
Note 2: Active mining area = all land within the proposed limit of disturbance.
Note 3: Apparent arithmetic inconsistences are associated with rounding.
Note 4: Source: SSM (2021a) – After Figure 7.2, 8.2 and 8.3
Note 5: Source: Toongi Pastoral Company Pty Ltd

6.3 SOIL PHYSICAL AND CHEMICAL PROPERTY IMPACTS

Approximately 207ha of BSAL land would be disturbed for Project-related infrastructure. Soils within the proposed area of disturbance would be stripped and stockpiled for use in rehabilitation operations. The Applicant would manage the stripping and stockpiling operations in accordance with the recommendations of SSM (2021a) and the respreading operations in accordance with the recommendations of a suitably qualified and experienced soil scientist at the time that those materials are used for rehabilitation operations. Rehabilitation operations would seek to re-establish suitable soil properties including fertility, effective rooting depth and drainage, salinity, slope, surface rockiness and soil pH to maximise the success of rehabilitation operations.

6.4 GROUNDWATER IMPACTS

As identified in Section 3.3, there are no registered production bores within the fractured rock aquifer within 7.5km of the centre of the SAR Mine Site. As a result, groundwater is not a significant water source for agricultural enterprises in the area.

Notwithstanding this, groundwater-related impacts will be quantified by Jacobs (in prep), to be submitted with the EIS prepared to support the application for development consent. Preliminary results indicate the following.

- Groundwater drawdown at the end of mining and 200 years after mining has been completed is not expected to encroach on any existing registered groundwater bores within the fractured rock aquifer. As the shallow perched aquifer and the fractured rock aquifer are not hydraulically connected, there would be no impacts on bores within the shallow perched aquifer.

- There would be no impacts on groundwater dependent ecosystems and no reduction in groundwater-related baseflow in surrounding watercourses.
- The Applicant would, if required, obtain groundwater allocations in addition to the 290MLpa currently held, for groundwater inflows to the proposed open cuts and underground operations. The quantum of those inflows has yet to be determined, however, substantial additional entitlements within the Lachlan Fold Belt MBD Fractured Rock Groundwater Source are available.
- All groundwater that would flow into the mine workings would be used for mining-related purposes and would not be permitted to discharge to natural drainage.
- The Project would not result in adverse groundwater quality-related impacts.
- The final voids within the SAR Open Cut North Pit and Wyoming 1 Open Cut would form pit lakes following the completion of mining operations. Evaporation would result in decreased water quality within these lakes with time, however, as groundwater sinks, water within the voids would not be expected to migrate away from the voids. Adequate groundwater allocations would be retained to account for evaporation from the pit lakes in perpetuity.
- The Project would not exceed the minimum impact criteria for fractured rock aquifers identified by the NSW Aquifer Interference Policy.

As a result, the Project would not have an adverse impact on a highly productive groundwater source and there would be no impacts that would exceed the Minimal Impact Considerations under the Aquifer Interference Policy.

6.5 FRAGMENTATION OF AGRICULTURAL LAND USES

The Project would result in the following within the SAR Mine Site.

- Permanent removal of approximately 130ha of land from agricultural production.
- Temporary removal of approximately 136ha of land from agricultural production with that land returned to native vegetation with targeted grazing.
- Temporary removal of approximately 209ha of land from agricultural production with that land returned to returned to pasture/cropping use.
- Continued use of approximately 1 342ha for agricultural purposes.
- Realignment of the Newell Highway and minor realignment of other local roads, principally Kyalite Road.

These changes would not result in fragmentation of agricultural land uses for the following reasons.

- The proposed disturbance areas are all located on Applicant-owned land. The Applicant would ensure that agricultural operations are continued within areas not required for mining-related purposes. The Project is not expected to result in a decrease in the production and efficiency of agriculture on land that would not be directly impacted by mining within or surrounding the MLA Area.

- The proposed Newell Highway realignment would relocate an existing barrier to movement of stock and agricultural machinery. The Applicant is currently preparing a consolidated farm plan for all of its landholdings that will provide for coordinated agricultural operations on both sides of the realigned Highway, including a network of water supply pipes, tanks and firefighting infrastructure. As a result, relocation of the Highway would be unlikely to further fragment agricultural land uses.
- The proposed realignment of the local roads, including Kyalite Road and the intersections of Back Tomingley West Road and McNivens Lane would largely re-establish existing access arrangements, with improved and safer intersections with the Newell Highway. In addition, the Applicant would ensure that continued access for all agricultural equipment, including oversize and overweight vehicles would be maintained. No other critical farm infrastructure, including access to water, regional transportation or stock reserves would be impacted.
- The Project would not impact on the nature or form of agricultural land use on land that would not be directly impacted by mining within or surrounding the MLA Area.

6.6 REDUCTION IN THE AREA OF BSAL

As identified in Section 6.2, the Applicant anticipates that the Project would disturb approximately 207ha of BSAL within the MLA Area. In order to offset that loss of BSAL, the Applicant would undertake a range of measures including the following.

- Enhancement of approximately 50ha of LSC Class 6 land to achieve LSC Class 4 status.
- Rehabilitation of approximately 209ha of disturbed land to achieve LSC Class 4 status following the completion of mining operations.
- Progressive improvement of the carrying capacity of TGO-controlled land to increase the carrying capacity from approximately 3.1 DSE/ha currently to approximately 6.0 DSE/ha following completion of the Project. This would result in an increase in the gross agricultural margin of the TGO-controlled land from approximately $784,000pa to approximately $1.2 million per year.

In light of the above, the Applicant contends that the loss of approximately 207ha of BSAL would not result in a substantial, long-term adverse agricultural impacts.

7. CONCLUSION

This Application for a Gateway Certificate is required to permit an application for development consent for the Tomingley Golds Exploration Project. The Project would result in the following benefits.

- Extension of the life of the existing TGO mining operations from 2025 to at least 2032.
- Provide continued employment for the Applicant's current approximately 250 employees, the vast majority of whom reside in surrounding rural properties, villages and towns.
- Provide continued economic stimulus in the form of:
  - wages and salaries to locally-based employees (approximately $29.2 million per annum);
  - purchase of goods and services (between $4 million and $5 million per annum); and
  - substantial payments to Narromine Shire Council ($124,000pa under the Voluntary Planning Agreement plus rates) and the State of NSW (approximately $3 million in royalties).

The Project would, however, result in the following negative impacts.

- Disturbance of approximately 207ha of BSAL.
- Permanent removal of approximately 130ha of land from agricultural production.
- Temporary removal of approximately 136ha of land from agricultural production with that land returned to native vegetation with targeted grazing.
- Temporary removal of approximately 209ha of land from agricultural production with that land returned to returned to pasture/cropping use.
- Continued use of approximately 1 342ha for agricultural purposes.

The Applicant would mitigate these negative impacts through the following.

- Management of operations to ensure that only approved areas are disturbed.
- Stripping, stockpiling and respreading of soil resources in a manner that would minimise impacts to the stripped soil and maximise the likelihood of success of the proposed rehabilitation operations.
- Enhancement of approximately 50ha of LSC Class 6 land to achieve LSC Class 4 status.
- Rehabilitation of approximately 209ha of disturbed land to achieve LSC Class 4 status following the completion of mining operations.

- Progressive improvement of the carrying capacity of TGO-controlled land to increase the carrying capacity from approximately 3.1 DSE/ha currently to approximately 6.0 DSE/ha following completion of the Project. This would result in an increase in the gross agricultural margin of the TGO-controlled land from approximately $784,000pa to approximately $1.2 million per year.

In light of the above the Applicant contends that the Project would not result in significant reduction in the agricultural productivity associated with BSAL land within and surrounding the MLA Area and that any minor reduction would be very substantially outweighed by the benefits that would accrue to the agricultural and wider community as a result of the Project.

8. REFERENCES

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National Committee of Soil and Terrain (2009) – *Australian Soil and Land Field Survey Handbook.*

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Tomingley Gold Operations Pty Ltd (2021), *Agricultural Impact Statement for the Tomingley Gold Extension Project.*

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