Section 3

Project Description

PREAMBLE

This section describes the Project's objectives, approvals required and defines the land to which any approval would apply. The section also describes the proposed site establishment / construction, realignment of public roads, mining, waste rock management, processing operations, residue and water management and transportation operations. The proposed non-production waste management, hours of operation, Project life, anticipated workforce, Capital Investment Value and proposed rehabilitation operations are also described.

*The Project is described in sufficient detail to provide the reader with an overall understanding of the nature and extent of activities proposed. A range of additional information in relation to the following is provided in **Appendix 4**.*

- *SAR Open Cut layout and design.*
- *Waste rock material characterisation.*
- *Assessment of the SAR Waste Rock Emplacement design.*
- *Mine Closure and Rehabilitation.*

*Where appropriate, specialist studies undertaken to support the Project Description are presented in **Appendices 5** to **14**.*

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3.1 Introduction

3.1.1 Project Overview

Table 3.1.1 presents an overview of the Project. **Figures 3.1.1, 3.1.2** and **3.1.3** present the approved and proposed layout for the Project.

Table 3.1.1
Project Overview

Page 1 of 3

Project Element	Description
Realignment of Public Roads	Realignment of the following public roads in accordance with the Austroads *Guide to Road Design* and the requirements of Transport for NSW and/or Narromine Shire Council. • Newell Highway. • Kyalite Road, including an overpass over the proposed Haul Road and Services Road. • Intersections with Back Tomingley West Road, Kyalite Road and McNivens Lane, including a new section of Back Tomingley West Road.
Relocation of Services/Utilities	The following services and utilities would be relocated. • 22kV transmission line operated by Essential Energy. • Fibreoptic telecommunications cable operated by Vocus. • Copper telephone cable operated by Telstra.
Mining Method	Continued mining from the approved Caloma Eastern Cutback. Continued underground mining within the Wyoming 1, Caloma 1 and Caloma 2 deposits. Proposed open cut mining of the SAR Open Cut. Proposed underground mining of the SAR deposits, rock or paste backfill of completed stopes. Access to the SAR Underground would initially be via a drive from the Wyoming 1 underground workings and, potentially late in the life of the Project, a portal within the SAR Open Cut.
Mineral Resource[1]	TGO – 8.614Mt @ 2.0g/t for 550 000oz Gold SAR – 17.378Mt @ 1.91g/t Au for 1 066 000oz
Ore Reserve[1]	TGO – 2.373Mt @ 1.9g/t for 144 000oz Gold SAR – 9.442Mt @ 1.9g/t Au for 563 000oz
Total Annual Production	Ore, low-grade and waste rock ....up to 35.25Mtpa
Mine Life	To 31 December 2032
Total Resource Recovered	1 July 2021 to 31 December 2032...up to 16.350Mt
Processing	Using the existing, approved processing plant, with an additional ball mill and associated infrastructure .... up to 1.75Mtpa

Table 3.1.1 (Cont'd)
Project Overview

Page 2 of 3

Project Element	Description
Management of Waste Rock	Placement of waste rock into the following. • Infrastructure, including for construction of the Haul Road, Services Road, SAR Amenity Bund, SAR Administration Area and other infrastructure, including public roads if of suitable quality. • Caloma Waste Rock Emplacement comprising an in-pit emplacement that would completely fill the final voids, with a maximum elevation of 277m AHD or approximately 5m above the pre-mining land surface. • SAR Waste Rock Emplacement, comprising an in-pit and out-of-pit emplacement that would completely fill the South and Central Pits, with a maximum elevation of 335m AHD or approximately 72m above the pre-mining land surface. • Wyoming 1 Open Cut, as required. • The embankment for ongoing lifts for Residue Storage Facility 2 and capping and rehabilitation of Residue Storage Facility 1 and 2. • Temporary surface stockpiles to allow material to be stockpiled for use during the Project lifetime.
Management of Residue/Tailings	• Construction and use of the approved RSF1 (to Stage 9, Cell 1) and RSF2 (to Stage 2). • Construction and use of Stages 3 to 9 of RSF2 to form an integrated landform with a maximum elevation of 286.5m AHD or approximately 21m above the pre-mining land surface. • Use for pastefill within the underground workings.
General Infrastructure	• Existing TGO infrastructure. • SAR Amenity Bund. • SAR Administration Area, including but not limited to offices, workshops, stores, a fuel store, wash bay, hardstand and carparks. • SAR Open Cut and SAR Administration Area Clean Water Diversion Bunds. • Surface water control infrastructure, including clean and dirty water diversions, sediment basins, pipelines and the SAR Site Water Storage. • SAR Site Access Road. • Pastefill Plant. • SAR Exploration Drive and Roswell ventilation rises. • Run-in-Mine (RIM) Pad.[2] • SAR Magazine. • Various site roads and hardstand areas.
Transportation	Internal Transportation • Continued use of the existing Newell Highway underpass and existing site roads and haul roads. • Construction and use of the Haul Road and Services Road linking the TGO Mine Site to the SAR Mine Site. External Transportation • Continued use of the TGO Site Access Road and intersection with Tomingley West Road. • Construction and use of the SAR Site Access Road and intersection with the realigned Kyalite Road.

Table 3.1.1 (Cont'd)
Project Overview

Page 3 of 3

Project Element	Description
Water Management	• Continued use of the approved water supply pipeline from the "Woodlands" bore near Narromine. • Construction and use of an approximately 2.4km pipeline from the "Dappo" bore to the approved water supply pipeline. • Transfer of up to 1 400MLpa of water from the above two bores to the TGO Mine Site under existing licences. • Continued separation of process, mine, dirty, raw and clean water, with process, mine and dirty water retained on site for mining-related purposes and clean water permitted to flow to natural watercourses. • Continued collection and management of groundwater inflows to the open cuts and underground operations and licencing under the relevant Water Sharing Plan. • Construction and use of additional water management structures, including the SAR Water Storage Dam and SAR Open Cut and Administration Clean Water Diversion Bunds. • Construction and use of dirty water diversion bunds and associated SAR sediment basins and use of the captured water for mining-related purposes. • Construction of one or more pipelines between the SAR and TGO Mine Site to permit two-way transfer of water.
Hours of Operation	• Construction, including road construction • Principal construction operations ....7am to 6pm/7 days per week • Selected, low impact activities...24-hours/7 days per week • Mining, processing, waste rock management ....24-hours/7 days per week • Rehabilitation ....7am to 6pm/7 days per week
Operational workforce	Up to approximately 363 full direct time equivalent positions, plus contractors and indirect employment.
Capital Investment Value	$281.39 million.
Final Landform	• One bunded and fenced final void (Wyoming 1 Open Cut). • One partially backfilled final void (SAR Open Cut). • Three fully backfilled open cuts (Caloma 1 and 2 and Wyoming 3 Open Cuts). • Three shaped and rehabilitated Waste Rock Emplacements (Waste Rock Emplacements 2 and 3 and the SAR Waste Rock Emplacement). • A capped, free draining integrated Residue Storage Facility. • All infrastructure not required for the final land use removed or reduced in size.
Final Land Use	Agriculture and native ecosystem, with active investigation of alternative post-mining industrial uses.
Rehabilitation	Rehabilitation would occur progressively throughout the life of the Project, with the outer faces of the SAR Waste Rock Emplacements to be progressively shaped and revegetated, indicatively annually.

Note 1: Source – ASX announcement *Resource and Reserve Statements FY21* dated 7 September 2021.
Note 2: A Run-in-Mine Pad is a hardstand area used to temporarily store ore or low-grade material prior to transportation to the Run-of-Mine (ROM) Pad.

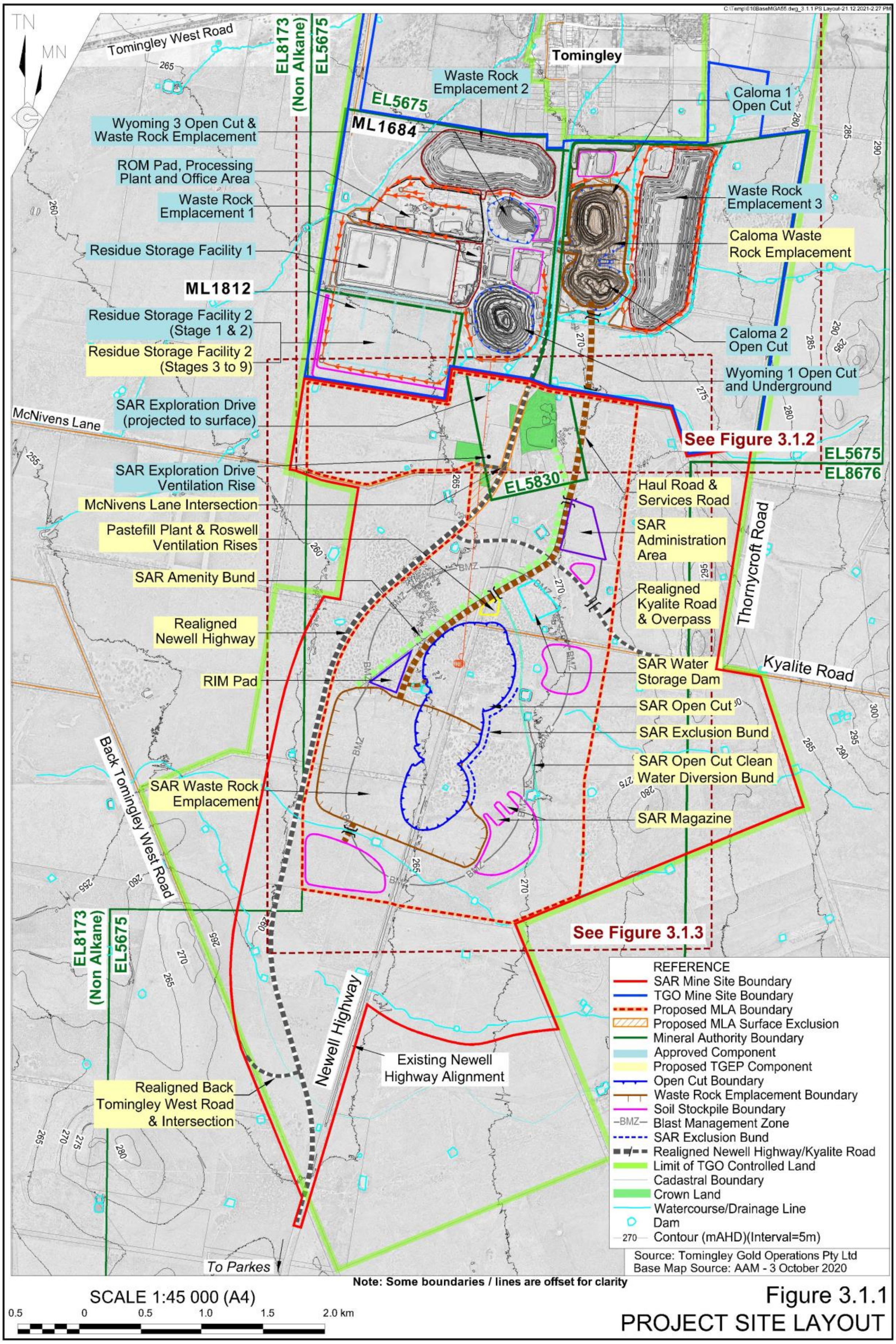
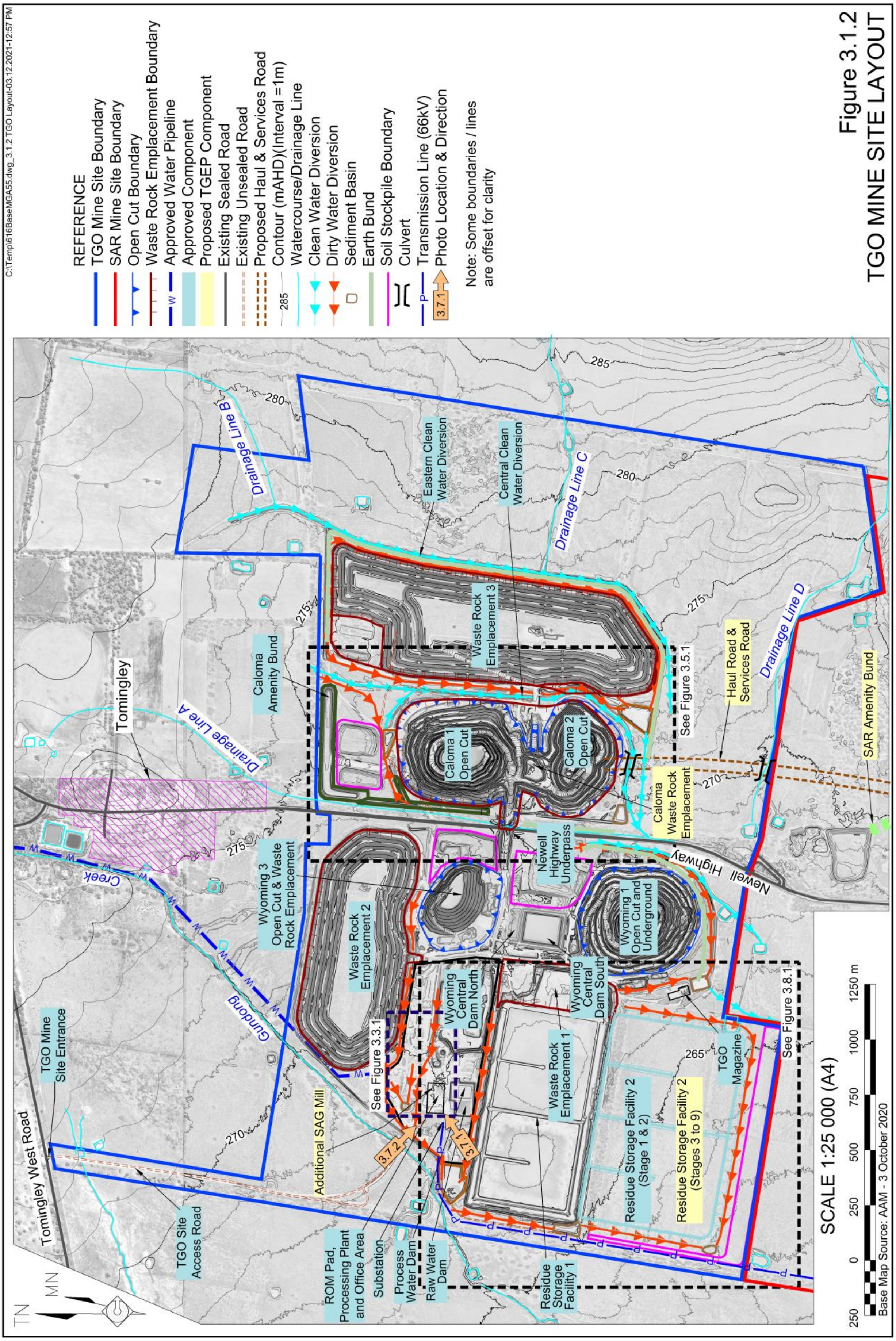


Figure 3.1.1
PROJECT SITE LAYOUT


C:\Temp\616BaseMGA55.dwg_3.1.2 TGO Layout-03.12.2021-12:57 PM
REFERENCE
TGO Mine Site Boundary
SAR Mine Site Boundary
Open Cut Boundary
Waste Rock Emplacement Boundary
Approved Water Pipeline
Approved Component
Proposed TGEP Component
Existing Sealed Road
Existing Unsealed Road
Proposed Haul & Services Road
Contour (mAHD)(Interval =1m)
Watercourse/Drainage Line
Clean Water Diversion
Dirty Water Diversion
Sediment Basin
Earth Bund
Soil Stockpile Boundary
Culvert
Transmission Line (66kV)
Photo Location & Direction
Note: Some boundaries / lines are offset for clarity
Figure 3.1.2
TGO MINE SITE LAYOUT
Tomingley
Drainage Line A
Drainage Line B
Drainage Line C
Drainage Line D
Eastern Clean Water Diversion
Central Clean Water Diversion
Waste Rock Emplacement 3
Caloma Amenity Bund
Caloma 1 Open Cut
Caloma 2 Open Cut
Caloma Waste Rock Emplacement
See Figure 3.5.1
Haul Road & Services Road
SAR Amenity Bund
Newell Highway
Newell Highway Underpass
Wyoming 3 Open Cut & Waste Rock Emplacement
Waste Rock Emplacement 2
Wyoming 1 Open Cut and Underground
Wyoming Central Dam North
Wyoming Central Dam South
Gundong Creek
TGO Mine Site Entrance
Tomingley West Road
TGO Site Access Road
Additional SAG Mill
See Figure 3.3.1
Waste Rock Emplacement 1
Residue Storage Facility 2 (Stage 1 & 2)
Residue Storage Facility 2 (Stages 3 to 9)
TGO Magazine
See Figure 3.8.1
ROM Pad, Processing Plant and Office Area
Substation
Process Water Dam
Raw Water Dam
Residue Storage Facility 1
SCALE 1:25 000 (A4)
Base Map Source: AAM - 3 October 2020
TN
MN

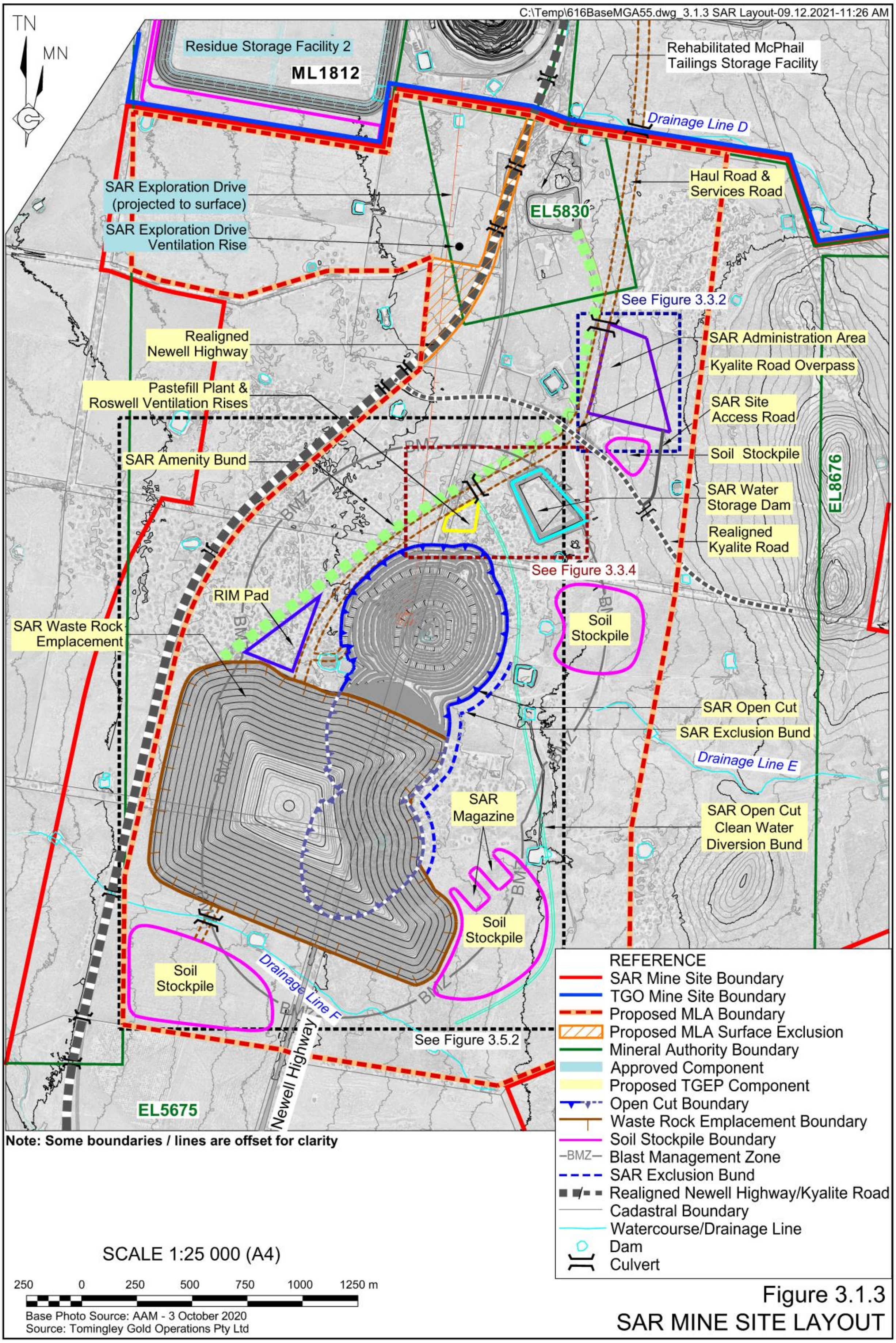


Figure 3.1.3
SAR MINE SITE LAYOUT

3.1.2 Approvals Required

The following approvals would be required for the Project. Consistent with Section 4.42 of the EP&A Act, once Development Consent has been received the following approvals cannot be refused and must be consistent with the development consent, as granted.

- Environment Protection Licence (EPL) under the *Protection of the Environment Operations Act 1997*.

  A modification of EPL20169 would be required to incorporate additional land associated with the SAR Mine Site and the proposed activities.

- Mining Lease under the *Mining Act 1992*.

  The Applicant currently holds Mining Lease (ML) 1684 and ML1812 for TGO (**Figure 3.1.1**). A new Mining Lease would be required over a section of the SAR Mine Site (**Figures 3.1.1** and **3.1.3**). The Applicant has limited the extent of the proposed Mining Lease Application (MLA) Area to that required for mining operations only. To the extent practicable, the MLA Area excludes the realigned Newell Highway and land that would be used for non-mining related purposes. Where the proposed realigned Highway would be constructed within the proposed MLA Area, the Applicant proposes to exclude the surface of the land in the MLA. The proposed MLA Area occupies sections of Exploration Licence (EL) 5830 and EL5675, both held by Alkane Resources Limited, the Applicant's parent company.

- A consent under section 138 of the *Roads Act 1993.*

  Permits (and an associated Works Authority Deed) would be required from Transport for NSW and/or Narromine Shire Council for the relocation of public roads and associated intersections.

The following additional approvals would be required.

- A range of approvals under the *Water Management Act 2000,* including the following.
  - Bore licences – Licences for additional monitoring bores that have or would be constructed.
  - Water Access Licence(s) – for water that would flow into the existing and proposed open cut and underground workings.

The following approvals would not be required because of the operation of Section 4.41 of the EP&A Act.

- Aboriginal Heritage Impact Permit under Section 90 of the *National Parks and Wildlife Act 1974.*
- Water use approval under Section 89, a water management works approval under section 90 or an activity approval under section 91 of the *Water Management Act 2000*.

3.2 Project Site

3.2.1 Project Site Land Titles

The Project Site is the land to which any development consent granted in relation to the Project would apply. As identified in Section 1.2, the Project Site comprises the combined area of the TGO and SAR Mine Sites. Land associated with the "Woodlands" and "Dappo" bores also form a component of the Project Site. **Table 3.2.1** and **Figure 3.2.1** present the land titles within the Project Site.

Table 3.2.1
Project Site Land Titles

Lot	DP	Lot	DP	Lot	DP
TGO Mine Site					
156	755093	2	1151198	122	755110
1623	1178801	161	755110	112	755110
1621	1178801	160	755110	95	755110
105	755110	162	755110	94	755110
104	755110	163	755110	111	755110
103	755110	1	1151198		
3	1151198	1	254193		
Road reserve associated with the Newell Highway					
SAR Mine Site					
3	1213503	1622	1178801	1	820746
4	1213503	7003	1020605	122	755110
101	1271511	7300	1151814	2	254193
44	755093	176	722842	43	755093
86	755093	157	755093	2	1157935
1	1273565	175	755093	1623	1178801
127	755093	169	755093		
Road reserves associated with the Newell Highway, McNivens Lane, Kyalite Road, Back Tomingley West Road and various unformed paper roads.					
"Woodlands" and "Dappo" bores and pipelines					
"Woodlands" bore		18	755119	7002	1032703
"Dappo" bore		235	755131	1	1181773
Road reserves associated with the Mitchell Highway, Webbs Siding Road, Dappo, Wallaby, Bootles, Pinedean and Tomingley Roads.					

3.2.2 Disturbance Area

Figure 3.2.1 presents the land that is currently approved to be disturbed as well as the land that would be disturbed as a result of the Project.

3.2.3 Land with Environmental Constraints

Figure 3.2.1 presents land with environmental constraints as identified by the *Narromine Local Environment Plan 2011*. Section 6 identifies land with environmental constraints identified by the specialist consultant team.

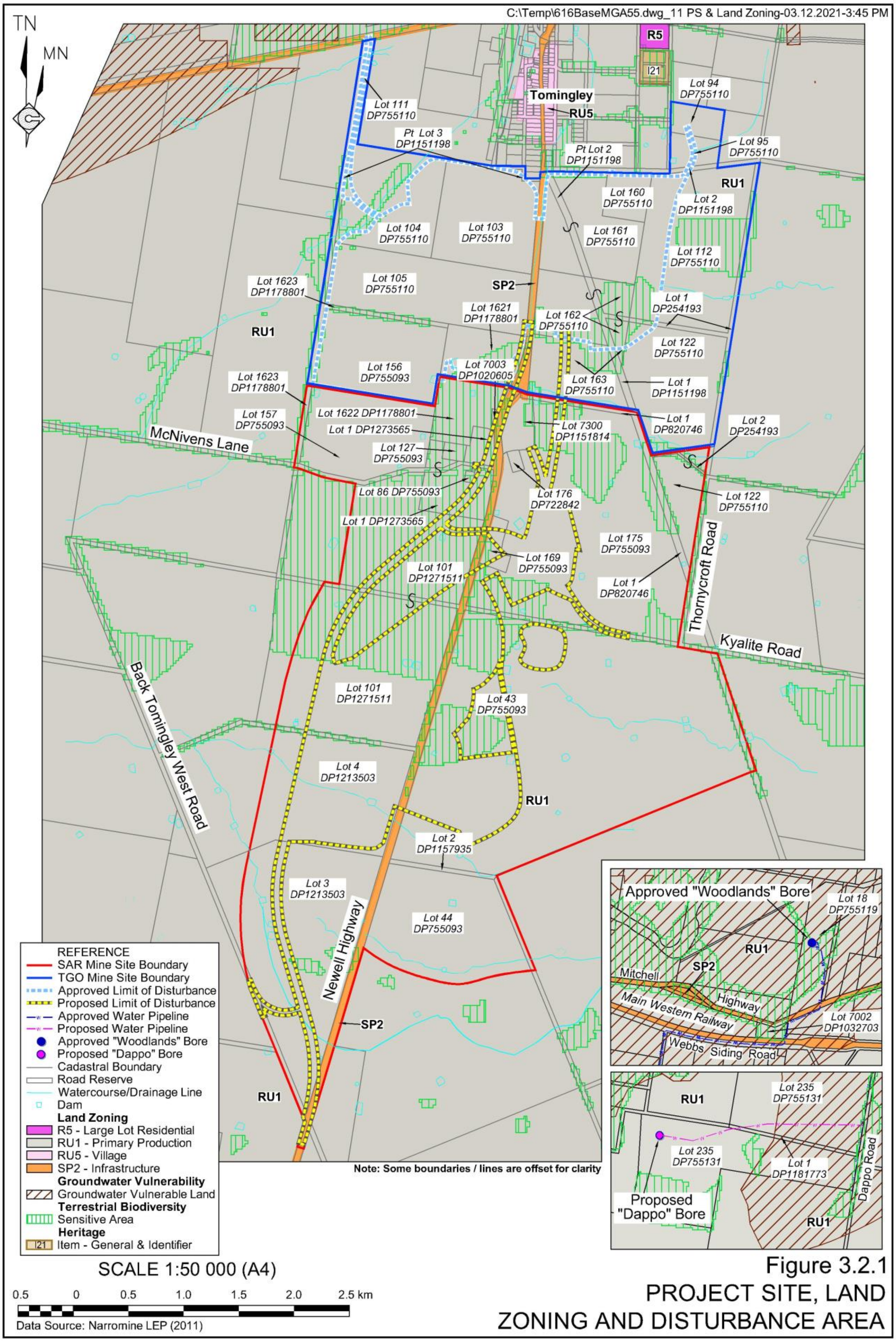


Figure 3.2.1
PROJECT SITE, LAND ZONING AND DISTURBANCE AREA

3.3 Infrastructure, Services and Site Establishment

3.3.1 Introduction

The following subsections present the locations of key infrastructure within the Mine Site that has previously been approved and would continue to be used for Project-related activities, as well as additional infrastructure that would be constructed to facilitate the proposed activities. A description of the site preparation activities that would apply to all areas of proposed disturbance is also provided.

Section 3.4 presents a description of the proposed realigned public roads.

3.3.2 Infrastructure and Services

3.3.2.1 Infrastructure to be Retained

Figures 3.1.2 and **3.3.1** present the approved infrastructure within the TGO Mine Site that would be retained for the Project. Each of the identified items, as well as ancillary infrastructure, would continue to be used under any new development consent to be granted for the Project.

3.3.2.2 Services to be Relocated

Figure 3.3.2 presents the services that would be required to be relocated for the Project. In summary, the following infrastructure would be relocated. Public roads to be realigned are presented in Section 3.4.

- 22kV transmission line operated by Essential Energy.
- Fibreoptic telecommunications cable operated by Vocus.
- Copper telephone cable operated by Telstra.

In each case, the Applicant has and would continue to consult with the relevant service managers in relation to relocation of the relevant service. Separate approvals would be obtained as required for relocation of each of the identified items. Relocated services would be constructed to the satisfaction of the relevant services manager.

3.3.2.3 Structures to be Removed

Figure 3.3.2 presents the structures and other items that would be removed as a result of the Project. In summary, this would include the following.

- "Rosewood" homestead and associated buildings and agricultural infrastructure not required for ongoing agricultural operations on Applicant-controlled land.
- "Kenilworth" homestead (to be relocated) and associated buildings and agricultural infrastructure not required for ongoing agricultural operations on Applicant-controlled land.
- Ruins of "Old Thornycroft."
- Advertising signage along the current alignment of the Newell Highway.

Figure 3.3.1
TGO INFRASTRUCTURE AREA

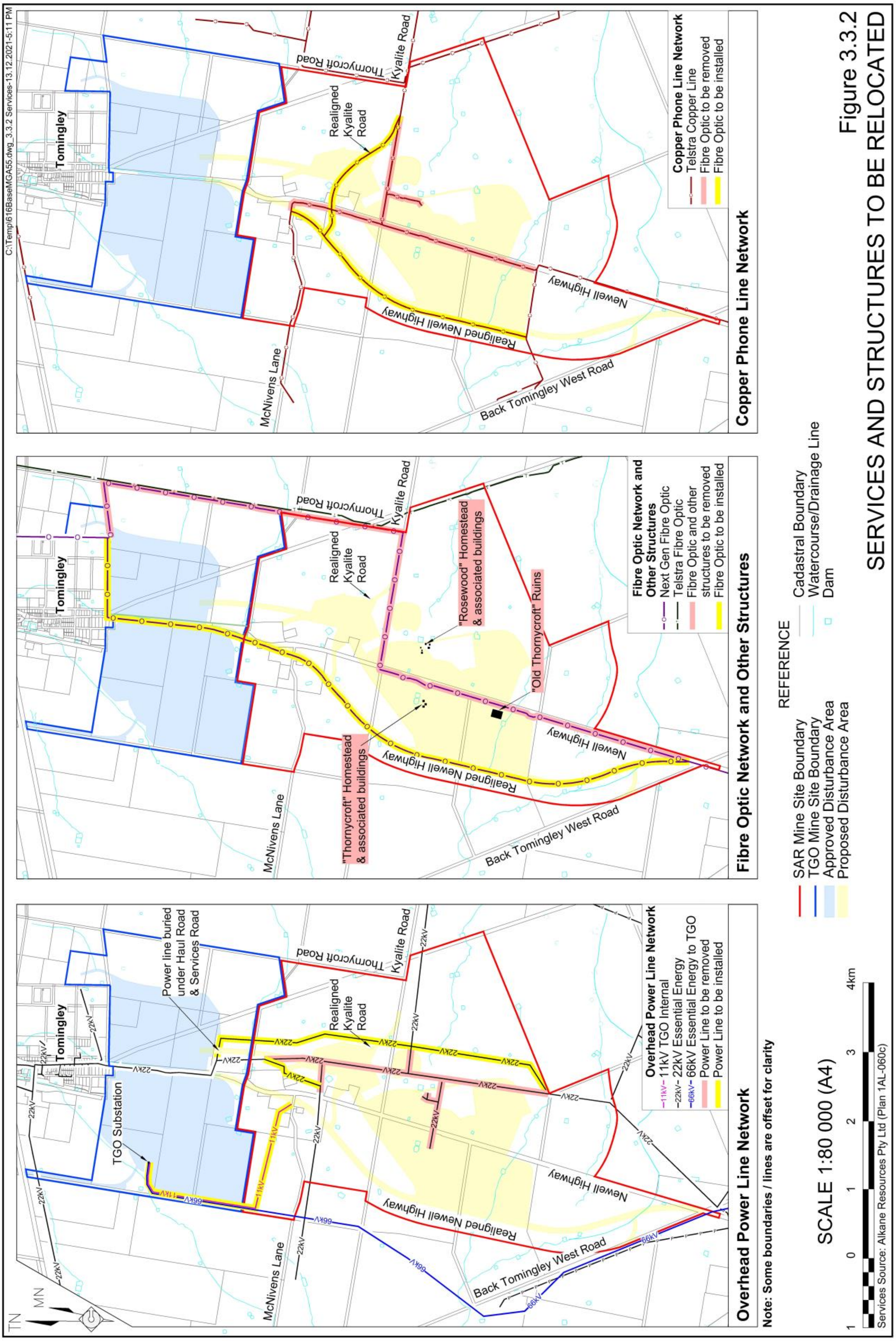


Figure 3.3.2
SERVICES AND STRUCTURES TO BE RELOCATED

Where practicable, removed items would be reconstructed or reused on site or recycled. Where reuse or recycling is not practicable, material that may be classified as General Solid Waste (non-putrescible) under the EPA's *Waste Classification Guidelines,* including demolition waste, would be placed into the SAR Waste Rock Emplacement. All other waste would be transported to a licenced waste management facility for disposal.

3.3.2.4 Haul Road, Services Road and SAR Amenity Bund

Figures 3.1.1 to **3.1.3** present the location of the proposed Haul Road, Services Road and SAR Amenity Bund. **Figure 3.3.3** presents the indicative design criteria of each of these items.

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.

The Services Road would be constructed adjacent to the Haul Road and would permit use by smaller vehicles, including light vehicles and service vehicles. The Services Road would be sufficiently wide to permit two-way use by vehicles travelling in opposite directions.

A pipeline corridor would be installed between the Haul Road and Services Road. The pipeline corridor would permit the installation of a range of infrastructure to facilitate transfer of water (and potentially residue – see Section 3.5.3.2) between the SAR Mine Site and TGO Mine Site. Pipelines transferring residue or process water would be bunded and fitted with leak detection equipment and automatic pump shutdown mechanisms. These mechanisms, together with the proposed bunding, would ensure that any leakage or rupture of those pipelines would not result in discharge of material to natural drainage.

Culverts would be installed under the Haul Road and Services Road as shown on **Figures 3.1.2** and **3.1.3**. The culverts would permit water from upslope of disturbed sections of the SAR Mine Site to pass under the Haul Road and Services Road without mixing with water from disturbed areas. In addition, road-side drainage would be installed on both the Haul Road and Services Road to convey and manage surface water in a manner consistent with *Managing Urban Stormwater Volume 2C – Unsealed Roads.*

An amenity bund would be constructed on the western side of the Haul Road. The SAR Amenity Bund would be approximately 7m high, with side slopes of approximately 1:3 (V:H). Once constructed, soil would be spread and the landform revegetated with grass species as described in Section 3.14.8. The bund would be constructed in a manner that would ensure that vehicles operating on the Haul Road would, to the extent practicable, not be visible to motorists using the Newell Highway, limiting the potential for driver distraction on the Highway, as well as minimising visual amenity impacts from public and private vantage points to the west of the SAR Mine Site.

The SAR Amenity Bund would tie into the SAR Waste Rock Emplacement at the southern end and the rehabilitated McPhail Tailings Storage Facility at the northern end. It would also tie into the proposed embankment for the Kyalite Road overpass (see Section 3.4.2.2). Gaps would be left in the bund in the vicinity of the proposed Haul Road and Services Road culverts to permit surface water flows as well in the vicinity of the rehabilitated McPhail Tailings Storage Facility for powerline maintenance access.

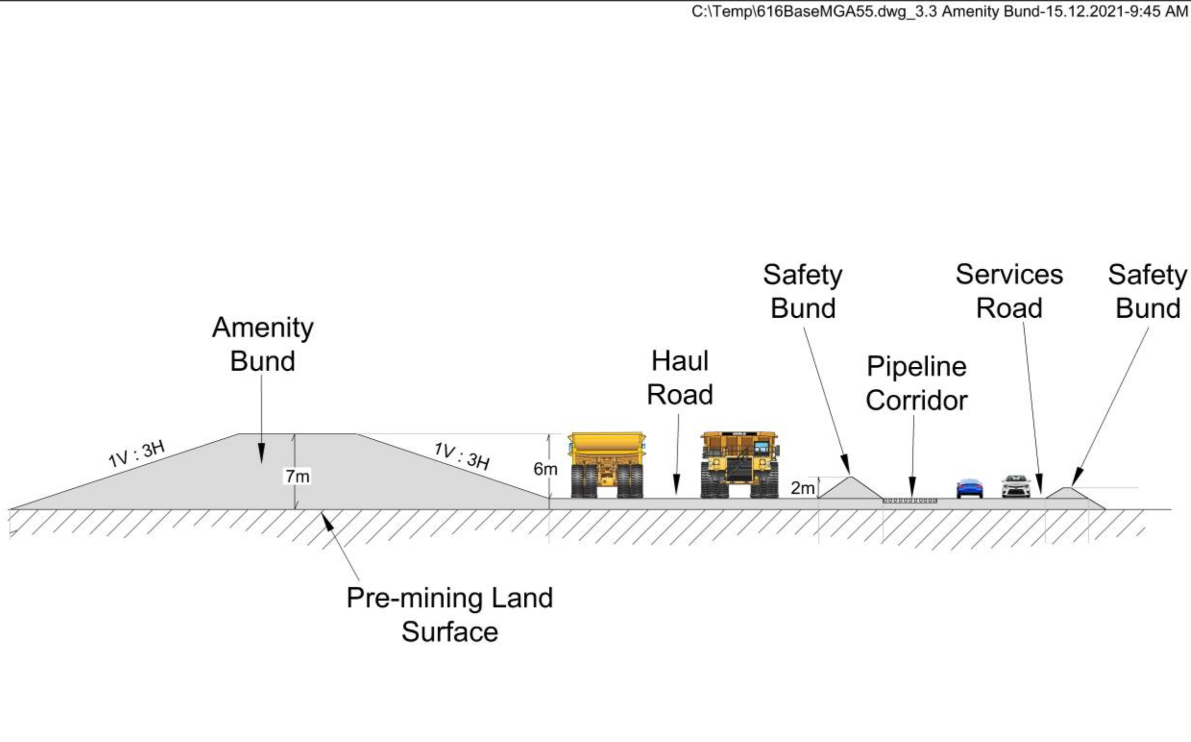


Figure 3.3.3
INDICATIVE SAR AMENITY BUND, HAUL ROAD, PIPELINE CORRIDOR AND SERVICES ROAD

Finally, a temporary amenity bund would be constructed between the Haul Road and Tomingley village from the southern boundary of the Caloma Waste Rock Emplacement to the Newell Highway underpass. Alternatively, the haul road may be constructed in-pit, below natural ground surface, during in-pit waste rock placement operations.

3.3.2.5 Internal Roads

Existing internal roads within the TGO Mine Site would continue to be used for mining-related purposes, including the Newell Highway underpass (**Figure 3.1.2**). In addition, a range of additional internal roads within the SAR Mine Site would be constructed and used as follows.

- The SAR Site Access Road. This road would permit access from the realigned Kyalite Road to the SAR Administration Area. The road would permit two-way access for all road-registered vehicles likely to access the SAR Mine Site. The intersection of the SAR Site Access Road and the realigned Kyalite Road would be a T-intersection with a Basic Auxiliary Left turn treatment (see Section 3.4.2.3). The intersection would be controlled by a Stop sign for traffic entering Kyalite Road.
- Perimeter and access roads and tracks would be constructed as required within the proposed limit of disturbance, including within the proposed SAR Open Cut Buffer Zone. These roads and tracks would permit access for mine-related vehicles to active sections of the SAR Mine Site.

3.3.2.6 SAR Administration Area

Figure 3.3.4 presents the indicative layout of the Administration Area. In summary, the Administration Area would include the following.

- A range of hardstand and laydown areas suitable for all weather access by light and heavy vehicles.
- An unsealed car park for employees and visitors suitable for up to approximately 75 vehicles. The car park would incorporate an Emergency Muster Point.
- A security fence and gate separating the publicly accessible car park from the active sections of the SAR Mine Site.
- An office and associated crib or break room.
- Load and haul workshop and drillers workshop, including hydrocarbon storage facilities constructed in accordance with Australian Standard *AS 1940-2017 - The Storage and Handling of Flammable and Combustible Liquids.*
- A stores facility for receipt and storage of consumables.
- A fuel store comprising storage for up to 500 000L of diesel in accordance with AS1940-2017.
- A wash bay, including a concrete sealed washdown area equipped with a sump that would collect wash water. Accumulated water from the wash bay would be recycled or passed through an oil-water separator to ensure oily water is not permitted to be discharged from the Mine Site.
- Separate road networks for mine and non-mine traffic, with only authorised vehicles and drivers permitted to access the mine road network.
- A substation and associated SAR Mine Site electrical distribution network.
- One or more wastewater treatment system(s) installed in accordance with the requirements of Narromine Shire Council.
- A Reverse osmosis plant to produce potable water, with the produced wastewater recycled into the mine water system.
- All buildings, whether temporary or permanent, would be constructed to comply with the Building Code of Australia and, where required, construction and occupation certificates would be obtained prior to use.

3.3.2.7 SAR Power, Water and Communications

Power for operations within the TGO Mine Site would continue to be provided by the existing 66kV transmission line and substation.

Power for surface operations within the SAR Mine Site, would be provided by the relocated 22kV powerline and a proposed substation within the Administration Area.

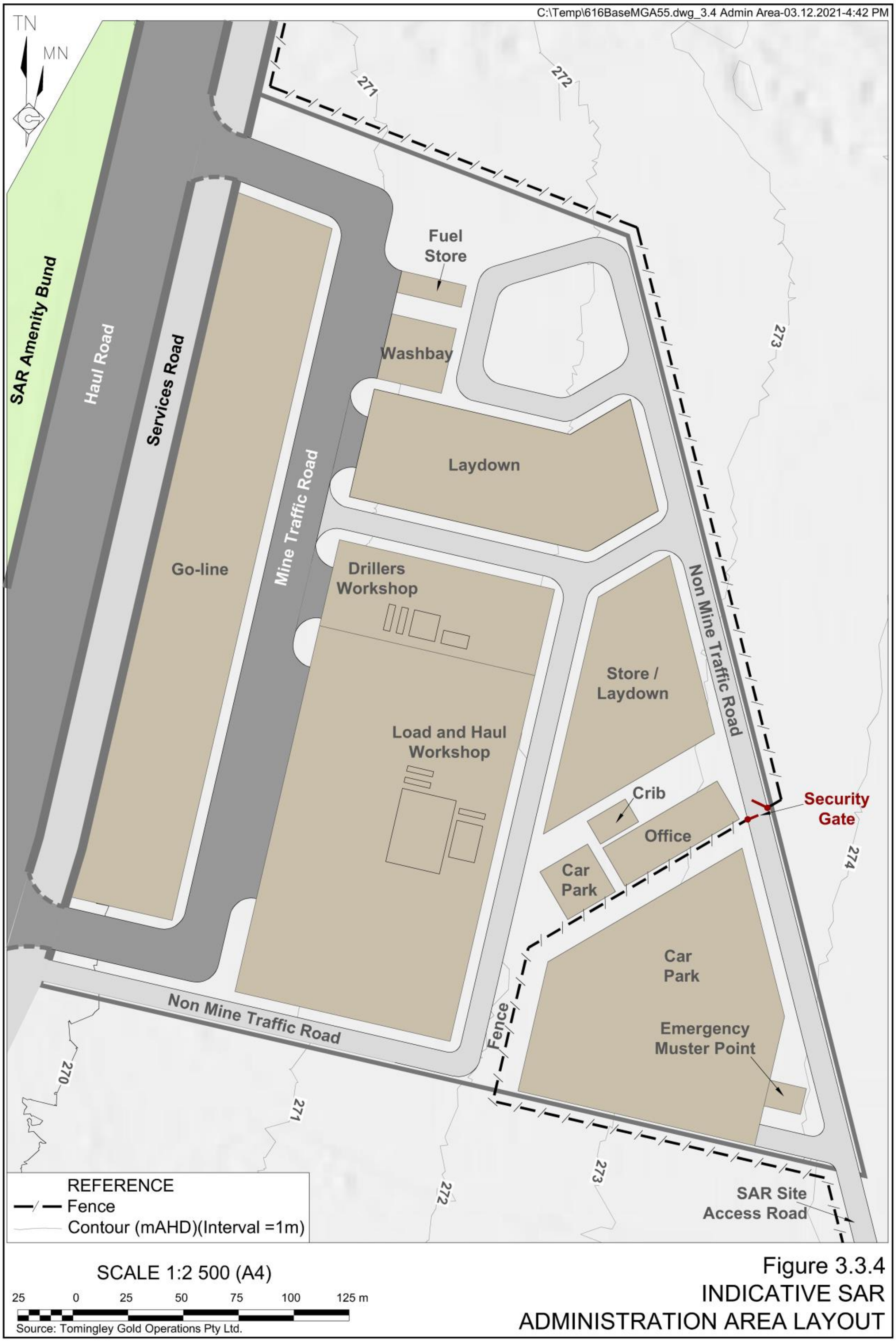


Figure 3.3.4
INDICATIVE SAR ADMINISTRATION AREA LAYOUT

Power for the SAR Underground operations may be provided via a proposed 11kV distribution line from the existing TGO Substation to a location near the SAR Exploration Decline ventilation rise (**Figure 3.3.2**). Alternatively, power for the SAR Underground may be provided from an upgraded TGO Underground power supply.

Water management infrastructure within the TGO Mine Site would remain unchanged as a result of the Project and is described in the approved TGO *Water Management Plan*. Water management infrastructure within the SAR Mine Site is described in Section 3.9.2 and would, in summary, include the following (**Figure 3.1.3**).

- Water transfer pipeline(s) installed within the pipeline corridor adjacent to the Services Road. The pipeline(s) would permit water to be transferred in either direction between the SAR Mine Site and the TGO Mine Site, as required.
- The SAR Water Storage Dam. This dam would be constructed as an off-stream "turkey's nest" dam with no surface catchment (**Figure 3.3.5**). The dam would have an indicative capacity of approximately 180ML.
- Clean water diversion bunds that would divert clean water around the proposed disturbance areas.
- A range of dirty water catch catchment banks and sediment basins constructed in accordance with *Managing Urban Stormwater* (Landcom, 2004) and associated guidelines.

Potable water for the TGO Mine Site would continue to be sourced from the existing reverse osmosis plant. Potable water for the SAR Mine Site would be sourced from a suitably sized reverse osmosis plant located within the SAR Administration Area.

Telephone, internet and data services requirements within the TGO Mine Site would continue to be provided via the existing or an upgraded fibre optic connection. Within the SAR Mine Site, these services would be provided by a proposed fibre optic connection from the relocated Vocus or existing Telstra fibre optic networks. Mobile phones and 2-way radio would also be used.

3.3.2.8 Explosive Storage

Bulk explosives, emulsion and other blasting products would be transported to the TGO and SAR Mine Sites as required by a licensed contractor and stored within the existing TGO magazine or the proposed SAR magazine (**Figures 3.1.2** and **3.1.3**). The magazines are (in the case of the TGO magazine) and would be (in the case of the SAR magazine) located, constructed, secured and licenced in accordance with the relevant guidelines.

3.3.2.9 Flexible Elements – Infrastructure and Services

Table 3.3.1 presents the infrastructure-related flexible elements that cannot be described with certainty at this stage of the Project, together with clear limits on the flexibility sought and a justification of each element. Elements that may be smaller or have lesser impacts than that proposed are not described.

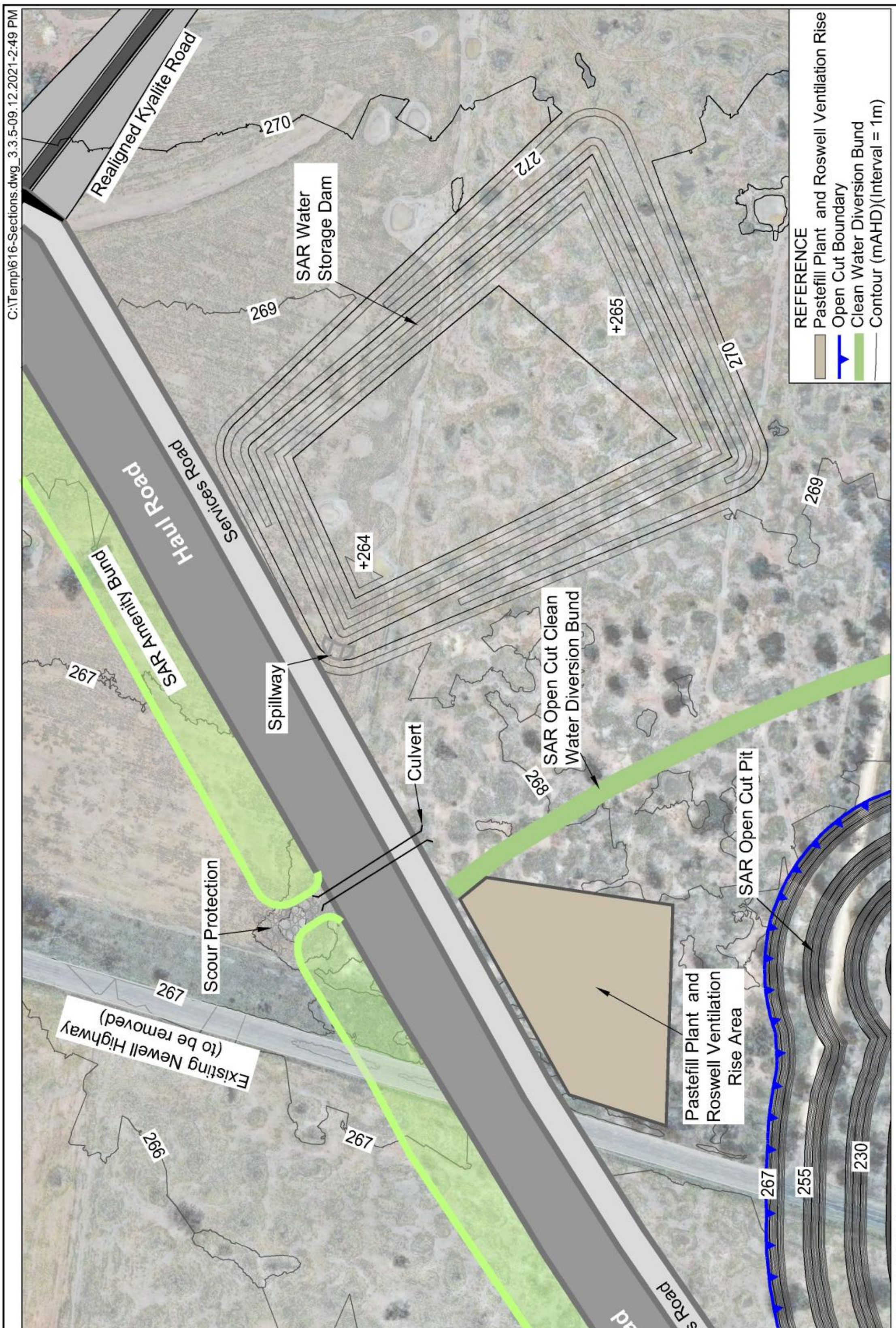


Figure 3.3.5
SAR WATER STORAGE DAM AND PASTEFILL PLANT AND VENTILATION RISES

SCALE 1:4 000 (A4)

50 0 50 100 150 200 m

Source: Tomingley Gold Operations Pty Ltd.
Base Photo Source: AAM - 3 October 2020

Table 3.3.1
Flexible Elements – Mining Operations

Flexible Element	Limit on Flexibility	Justification
Location and size of proposed infrastructure	All infrastructure-related surface disturbance, including surface tracks, to be located within the proposed limit of disturbance. All buildings and structures to be constructed in accordance with the Building Code of Australia and appropriate construction and operation certificates obtained.	Detailed design for aspects of the infrastructure required for the Project was ongoing at the time of finalisation of this document. As a result, it is possible that the location and size of infrastructure described in this subsection may vary from that described. Notwithstanding this, all infrastructure would be constructed within the approved limit of disturbance and in accordance with the relevant guidelines.

3.3.3 Site Preparation

3.3.3.1 Introduction

The site preparation activities for all key components for the Project would be sequenced to achieve the commencement of mining operations approximately 9 months after all pre-conditions to Project commencement have been satisfied. A brief description of general SAR site establishment activities is provided in the following subsections. A description of the site establishment and construction components for the public road network is described in Section 3.4.

The Applicant would prepare a *Mine Site Construction Environmental Management Plan* that would address all relevant construction-related environmental management measures to be implemented during construction of on-site infrastructure in accordance with the conditional requirements of any development consent that may be issued for the Project.

3.3.3.2 Site Mark Out

The approved boundaries of areas to be disturbed during the site preparation stage would be surveyed and marked out prior to the commencement of disturbance.

3.3.3.3 Installation of Initial Site Infrastructure

Erosion and sediment controls for each operational area would be established in accordance with one or more *Erosion and Sediment Control Plans* to be prepared for the Project. No substantial vegetation clearing or earthworks would commence until all required erosion and sediment controls are in place.

A mine construction laydown area, comprising a hardstand area, a range of transportable buildings, a temporary workshop and materials management facilities would be established within the SAR Administration Area.

The SAR Water Storage Dam and water supply pipeline from the TGO Mine Site would be installed to ensure adequate supply of water for dust suppression and other purposes.

3.3.3.4 Vegetation Clearing

Vegetation clearing would be undertaken in accordance with an approved Biodiversity Management Plan. In summary, available seed would be collected where practicable prior to clearing of vegetation. Larger vegetation would be removed using a bulldozer. Larger trees with hollows would be gently nudged to allow nesting or roosting fauna to escape prior to clearing. Cleared timber would either be mulched or used for biochar, habitat reconstruction or off-site beneficial uses such as saw logs, firewood or fencing.

Ground cover vegetation would be removed with the topsoil.

3.3.3.5 Soil Mapping Units and Soil Balance

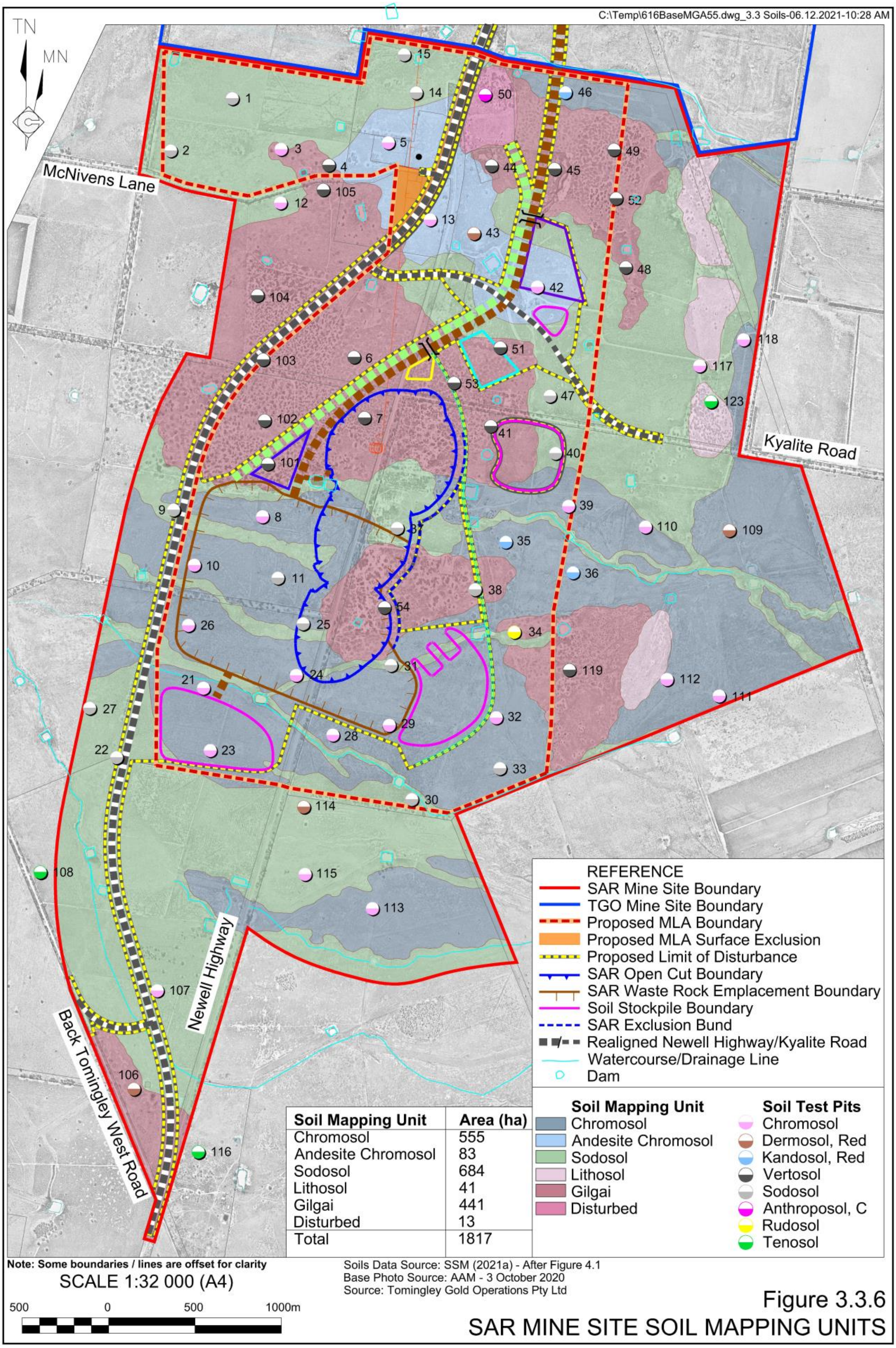
Soil for rehabilitation of the TGO Mine Site has either already been stripped and is in existing soil stockpiles or, in the case of Residue Storage Facility 2, would be stripped and stockpiled in accordance with the existing development consent and approved Mining Operations Plan. In summary, between 0.4m and 0.6m of soil would be stripped from the footprint of Residue Storage Facility 2 and stockpiled immediately to the south of the facility. Approximately 760 000m^3 of soil would be available for rehabilitation of the TGO Mine Site, with approximately 641 000m^3 required for rehabilitation operations.

Soil for rehabilitation of the SAR Mine Site would be stripped, stockpiled and respread over the rehabilitated landform in accordance with the procedures described in Section 6.8. In summary, six Soil Mapping Units (SMUs) were identified within the SAR Mine Site (**Figure 3.3.6**). **Table 3.3.2** presents the soil stripping depths and volume of soil available to be stripped **Table 3.3.3** presents proposed soil placement depths and volume of soil required to be placed. In summary, approximately 2.88Mm^3 of soil would be available to be stripped and 0.83Mm^3 of soil would be required for rehabilitation operations.

Table 3.3.2
SAR Mine Site Soil Stripping Depths and Volume

Soil Mapping Unit	Area to be disturbed (ha)	Recommended Stripping Depth (cm)		Volume available to be stripped (m^3)	
		Topsoil	Subsoil	Topsoil	Subsoil
Chromosol	189	30	50	567 000	945 000
Andesite Chromosol	28		70	84 000	196 00
Sodosol	111		50[1]	333 000	555 000
Gilgai	133	30[2]	Nil	199 500	Nil
Disturbed	1	Nil	Nil	Nil	Nil
Total	**462**			**1 183 500**	**1 696 000**

Note 1: Sodosol subsoil would require the addition of gypsum at a rate of 2 t/ha for each 10cm of subsoil stripped during stripping operations.
Note 2: Topsoil would only be stripped from the elevated sections of the Gilgai SMU, conservatively assumed to be 50% of the available area.
Source: SSM (2021a) – modified after Table 8.2



Soil Mapping Unit	Area (ha)
Chromosol	555
Andesite Chromosol	83
Sodosol	684
Lithosol	41
Gilgai	441
Disturbed	13
Total	1817

Figure 3.3.6
SAR MINE SITE SOIL MAPPING UNITS

Table 3.3.3
SAR Mine Site Soil Placement Depths and Volume

Final Landform Element	Area to be rehabilitated	Recommended Minimum Placement Depth	Volume to be Placed
SAR Waste Rock Emplacement	140ha[1]	30cm	420 000m³
All other mining-related disturbance	209ha	20cm	418 000m³
		Total	**838 000m³**

Note 1: Footprint of the SAR Waste Rock Emplacement = 136ha. Surface area of the constructed SAR Waste Rock Emplacement = 140ha.

Source: SSM (2021a) – modified after Table 8.4

3.3.3.6 Borrow Pits

Finally, the Applicant would establish a number of borrow pits within the footprint of the proposed SAR Waste Rock Emplacement and SAR Open Cut (see **Figure 3.5.8** in Section 3.5.4.3). Material would be extracted and used for the establishment of infrastructure within the SAR Mine Site, including the Haul Road, Services Road, SAR Amenity Bund, Administration Area and RIM Pad, as well as the realigned public road network. Borrow material would only be used for purposes for which it would be fit for purpose, with imported material or TGO waste rock used for purposes for which the borrow material would not be suitable.

The borrow pits would be internally draining and following completion, would be incorporated into the proposed SAR Open Cut or backfilled with waste rock during mining operations.

3.4 Realigned Public Roads

3.4.1 Introduction

The current alignment of sections of the Newell Highway and Kyalite Road are within the proposed SAR Open Cut (**Figure 3.1.1**). The Applicant proposes to realign the Newell Highway and Kyalite Road to ensure that the realigned roads are outside the blast management zone for the SAR Open Cut and therefore do not need to be closed during surface blasting operations. In addition, a section of Back Tomingley West Road would be realigned and the intersections of Kyalite Road, McNivens Lane and Back Tomingley West Road would be reconstructed.

This subsection presents a brief description of the proposed realigned public roads and modified intersections. The Applicant has appointed Constructive Solutions Pty Ltd (Constructive Solutions) to prepare the designs for the realigned public roads and modified intersections. Those designs are being prepared in consultation with the roads authorities, namely Transport for NSW and Narromine Shire Council, with a Works Authority Deed currently in negotiation with Transport for NSW.

The road design process is an iterative one, with conceptual designs submitted to Transport for NSW and Narromine Shire Council, with feedback then incorporated into the next design round. For the purpose of this EIS, the Applicant has adopted the 100% concept design (Rev 0).

Appendix 5 presents the 100% Concept Design Report (Constructive Solutions, 2021a) relied upon in preparing the following description. Reliance was also placed upon the Integrated Transport Assessment (Constructive Solutions, 2021b) presented as Part 1 of the Specialist Consultant Studies Compendium.

Finally, the Applicant would prepare a *Public Road Construction Environmental Management Plan* that would address all relevant construction-related environmental management measures to be implemented during construction of the realigned Newell Highway and Kyalite Road and associated intersections. That Plan would be prepared in accordance with:

- Transport for NSW QA Specification G36 – Environmental Protection; and
- any conditional requirements of any development consent that may be issued for the Project.

3.4.2 Layout and Design

3.4.2.1 Newell Highway

Table 3.4.1 and **Figures 3.4.1** and **3.4.2** present an overview of the 100% concept design for the proposed realigned Newell Highway. In summary, the realigned Highway would have the same or improved design criteria as the existing Highway.

Table 3.4.1
Newell Highway Design Criteria

Parameter	Design Criteria
Design speed	120km/h
Posted speed limit	110km/h
Number of lanes	One in each direction, with an overtaking lane approximately 1 500m long in each direction.
Lane width	3.5m
Shoulder	2.0m (sealed)
Fill batter slopes	1:6 (V:H) except in the vicinity of culverts.
Safety Barrier	Over culverts and where batters steeper than 1:2 (V:H).
Design vehicle	B-triple (36.5m)
Distance from SAR Open Cut	Minimum 650m
Flood protection	Underside of pavement above 20% AEP flood level 1.
Road reserve	80m wide, except where constrained by Crown land or non-Applicant owned land.
Note 1: AEP = Annual Exceedance Probability or the probability of a rainfall event occurring in any 12 month period. A 5% AEP flood event would have a 5% probability of occurring each year. Such a flood event is colloquially known as a 1 in 20 year flood event.	
Source: Constructive Solutions (2021a) – modified after Table 3 and Constructive Solutions (2021b) – after Section 4.4.	

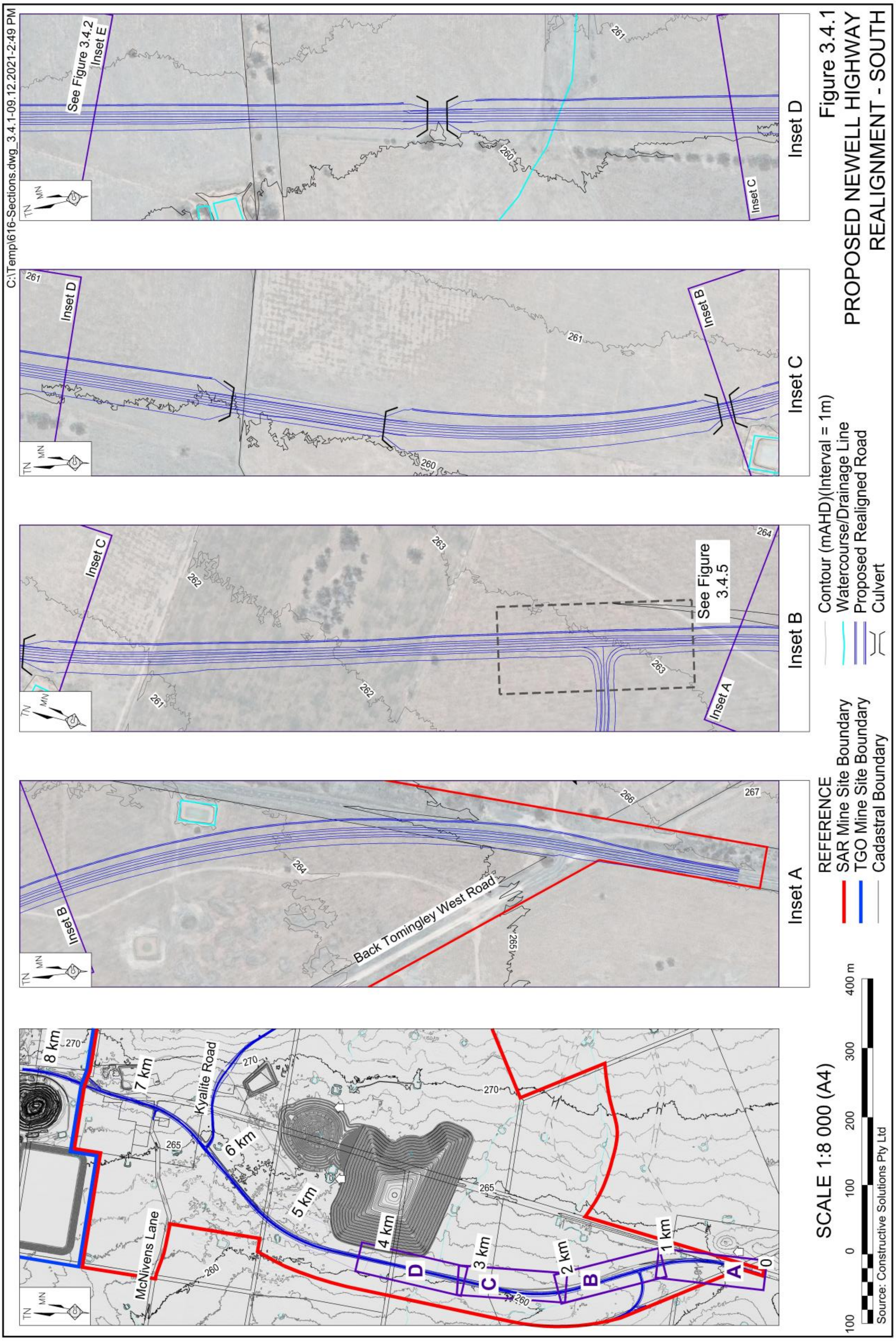


Figure 3.4.1
PROPOSED NEWELL HIGHWAY REALIGNMENT - SOUTH

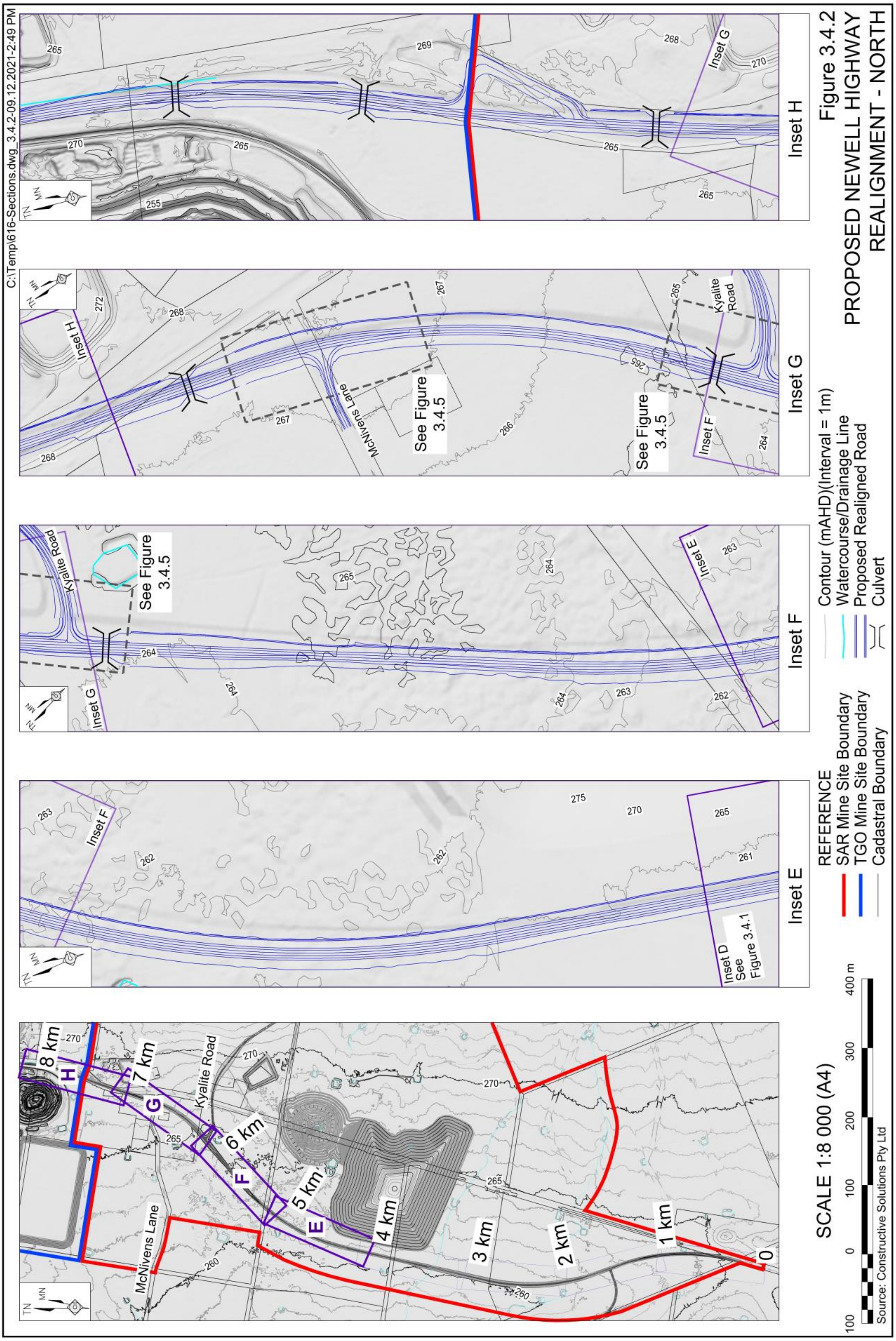


Figure 3.4.2
PROPOSED NEWELL HIGHWAY REALIGNMENT - NORTH
Inset E
Inset F
Inset G
Inset H
See Figure 3.4.5
Inset D See Figure 3.4.1
Kyalite Road
McNivens Lane
0
1 km
2 km
3 km
4 km
5 km
6 km
7 km
8 km
REFERENCE
SAR Mine Site Boundary
TGO Mine Site Boundary
Cadastral Boundary
Contour (mAHD)(Interval = 1m)
Watercourse/Drainage Line
Proposed Realigned Road
Culvert
SCALE 1:8 000 (A4)
100
0
100
200
300
400 m
Source: Constructive Solutions Pty Ltd
C:\Temp\616-Sections.dwg_3.4.2-09.12.2021-2:49 PM

3.4.2.2 Local Roads

Table 3.4.2 and **Figures 3.4.3** and **3.4.4** present an overview of the design for the proposed realigned local roads, namely Kyalite Road and Back Tomingley West Road. The principal works required for McNivens Lane would involve reconstruction of the intersection with the Newell Highway which is described in Section 3.4.2.3.

Table 3.4.2
Local Roads Design Criteria

Parameter	Design Criteria
Design speed	110km/h
Posted speed limit	100km/h
Pavement	
• Kyalite Road – Newell Highway to 30m east of SAR Site Access Road	Sealed
• Kyalite Road –30m east of SAR Site Access Road to existing	Unsealed
• Back Tomingley West Road	30m from highway – sealed, Remainder – unsealed.
Number of lanes	2
Lane width	3.5m
Shoulder	1.0m (unsealed)
Crossfall	3%
Fill batter slopes	1:4 (V:H) where less than 2m high and 1:6 (V:H) where greater than 2m high, except in the vicinity of culverts.
Safety Barrier	Where batters steeper than 1:2 (V:H)
Design vehicle	B-triple (36.5m)
Distance from SAR Open Cut	Minimum 650m
Source: Constructive Solutions (2021a) – modified after Table 6 and Constructive Solutions (2021b) – after Section 4.5	

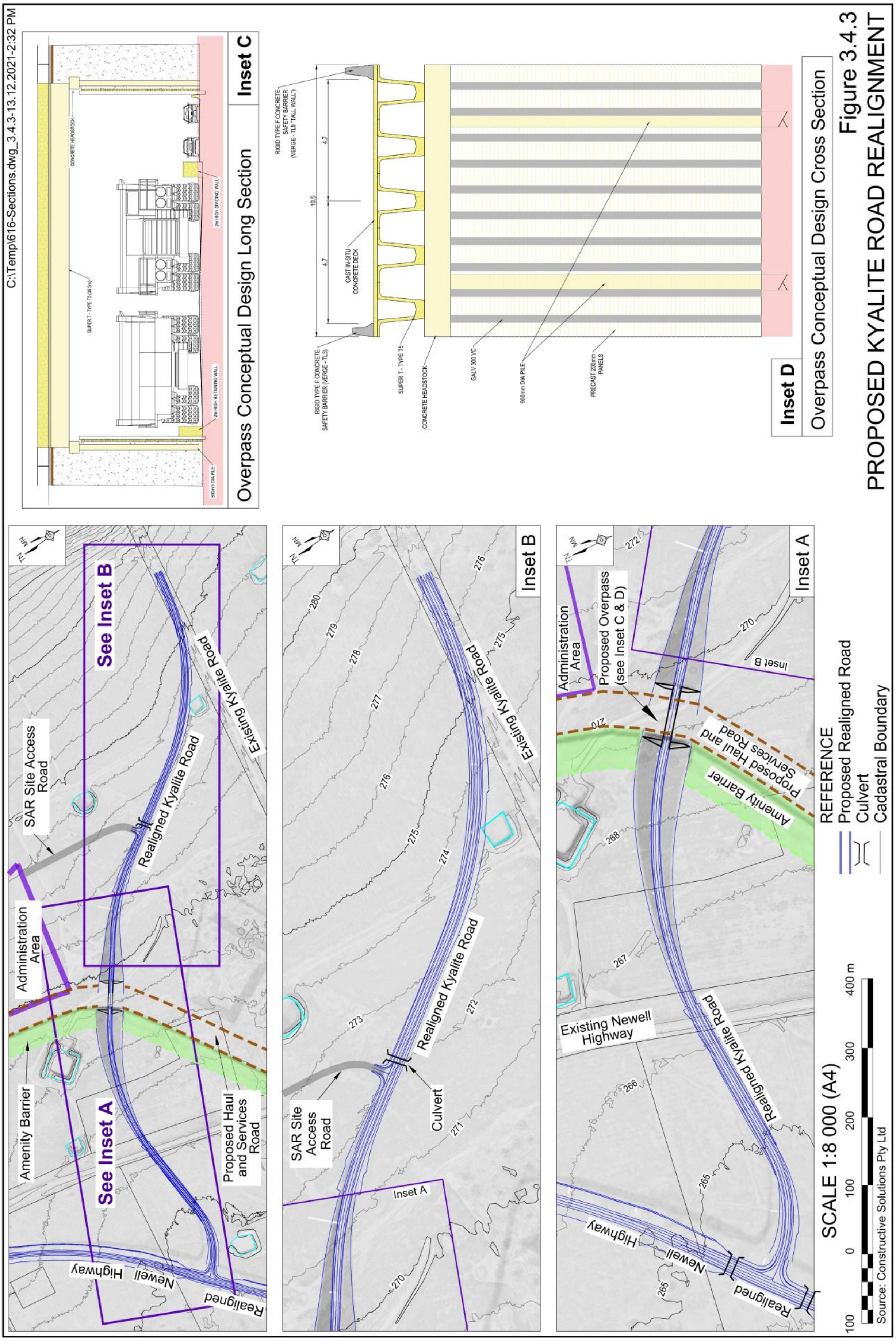


Figure 3.4.3
PROPOSED KYALITE ROAD REALIGNMENT

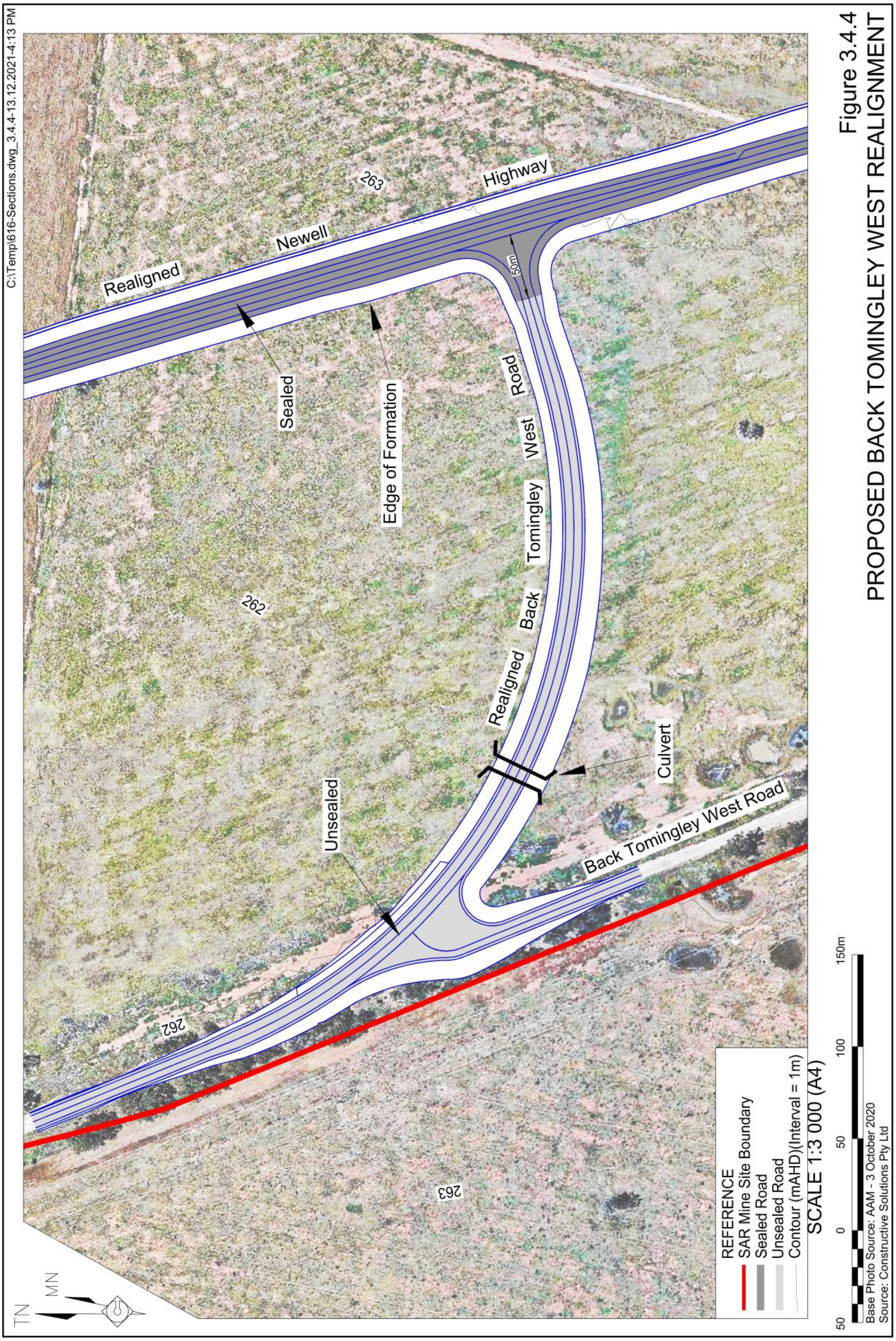


Figure 3.4.4
PROPOSED BACK TOMINGLEY WEST REALIGNMENT

In addition, the proposed realigned Kyalite Road would include an overpass over the proposed Haul Road and Services Road. **Table 3.4.3** and **Figure 3.4.3** present an overview of the design for the proposed overpass. Constructive Solutions (2021b) state that the proposed overpass would cater for any oversize vehicles required to access the SAR Mine Site or oversize agricultural equipment associated with rural properties along Kyalite Road. The overpass approaches would be constructed to ensure safe access to the overpass, including safety barriers, and, where required, visual screens.

Table 3.4.3
Kyalite Road Overpass Concept Design Criteria

Parameter	Design Criteria
Deck length	36.5m
Deck width	9.4m between barriers
Width between abutments for mine vehicles	Approximately 33m
Height clearance for mine vehicles	Approximately 15m
Design traffic loading	SM1600 in accordance with the Australian Standard AS5100 Bridge Design Code.
Design Vehicle	B-triple

3.4.2.3 Modified Intersections

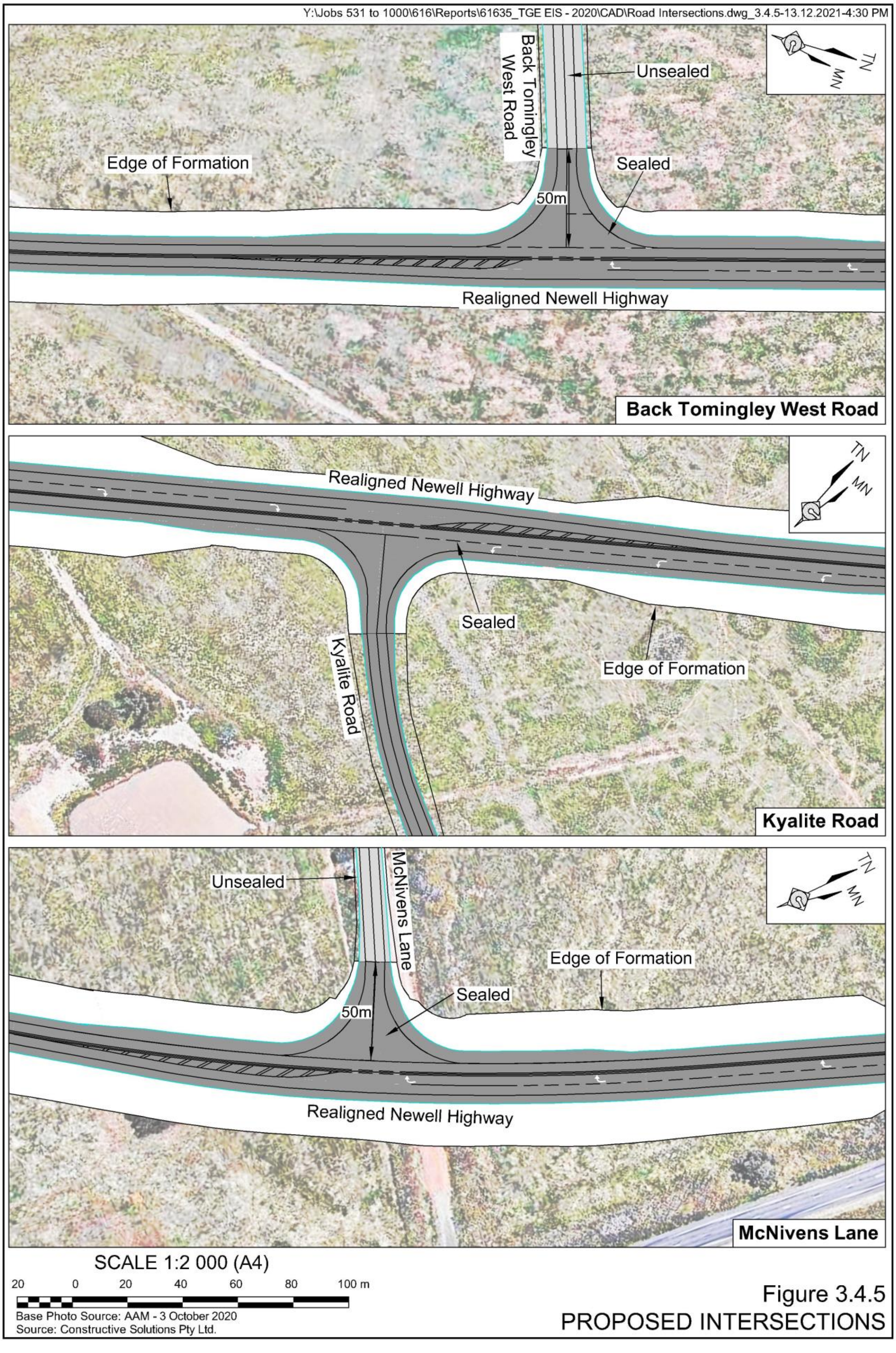
The proposed realignment of the Newell Highway and Kyalite Road would require modification to the intersections between the Newell Highway and the following roads.

- Back Tomingley West Road.
- Kyalite Road.
- McNivens Lane.

Constructive Solutions determined, based on existing and proposed traffic volumes, that the Kyalite Road intersection would require a Channelised Right (CHR) and Auxiliary Left (AUL) turn treatment.[1] By contrast, the Back Tomingley West Road and McNivens Lane intersections would simply require a Basic Auxiliary Left (BAL) and Basic Auxiliary Right (BAR) turn treatment.[2] Following consultation with the local community and Transport for NSW, the Applicant determined to apply a CHR/BAL treatment to each of the proposed intersections.

Table 3.4.4 presents an overview of the design criteria for the proposed modified intersections and **Figure 3.4.5** presents the indicative layout of the intersections.

[1] A CHR / AUL treatment includes a dedicated right-hand turn lane and left-hand deceleration lane for traffic turning off the Newell Highway onto the adjoining road.
[2] A BAL/BAR treatment simply requires widening of the shoulders of the Newell Highway, with no dedicated turning lanes.



Base Photo Source: AAM - 3 October 2020
Source: Constructive Solutions Pty Ltd.

Figure 3.4.5
PROPOSED INTERSECTIONS

Table 3.4.4
Modified Intersection Design Criteria

Parameter	Kyalite Road Intersection	Back Tomingley West Road Intersection	McNivens Lane Intersection	SAR Site Access Road Intersection
Turn treatment	CHR and AUL	CHR and BAL	CHR and BAL	BAR and BAL
Design speed	110km/h	110km/h	110km/h	110km/h
Lane widths	3.5m	3.5m	3.5m	3.5m
Shoulder	2.0m (sealed)	2.0m (sealed)	2.0m (sealed)	2.0m (sealed)
Crossfall	3%	3%	3%	3%
Sealed distance from Newell Highway	To 75m past SAR Site Access Road	50m	50m	-
Signage	Give way sign and sight board	Give way sign and sight board	Give way sign and sight board	Give way sign and sight board
Source: Constructive Solutions (2021a) – modified after Table 4				

3.4.3 Public Road Construction

Construction of the proposed realigned public roads would be undertaken concurrently with site establishment activities within the SAR Mine Site. Construction operations would initially be undertaken off-line, with those sections of the realigned public roads largely completed before undertaking works within the existing road reserves.

Prior to the commencement of road construction operations, one or more detailed *Construction Environmental Management Plans* would be prepared to meet the requirements of Transport for NSW (for the Newell Highway construction) and Narromine Shire Council (for the local road construction). The Plan(s) would require approval by the respective roads authorities.

The Plan(s) would likely include a range of sub-plans including the following. These Plans would be implemented throughout the road construction operations.

- *Spoil and Fill Management Subplan.*
- *Flora and Fauna Management Subplan.*
- *Soil and Water Management Subplan*, incorporating an *Erosion and Sediment Control Plan* prepared in accordance with the requirements of *Managing Urban Stormwater*.
- *Construction Traffic Management Subplan.*
- *Construction Noise and Vibration Management Subplan.*
- *Construction Air Quality Management Subplan.*
- *Construction Heritage Management Subplan* incorporating both Aboriginal and Historic Unexpected Finds Protocols.
- *Waste Management Subplan.*
- *Hazards and Risk Management Subplan.*

For the purposes of this application for development consent, the following activities would be undertaken during road construction operations (see **Figure 3.5.8** in Section 3.5.4.3).

- Establish the major works compound to the west of the existing Newell Highway within areas of proposed mining-related disturbance. A minor works compound would be established near the Kyalite Road overbridge site.
- Establish suitable entrances for each works compound, including the following.
  - A temporary CHR / BAL intersection on the Newell Highway at the entrance to "Kenilworth" property to permit light and heavy vehicles to enter and light vehicles only to exit.
  - Temporary intersections onto Back Tomingley West Road and McNivens Lane to permit heavy vehicles to exit. Such vehicles would then use the existing intersections of these roads with the Newell Highway.
  - A temporary intersection with Kyalite Road to permit light and heavy vehicles to enter and exit. No works are proposed for the Kyalite Road and Newell Highway intersection as all construction-related traffic movements would be left into Kyalite Road. Construction-related traffic approaching from the south would be required to travel to the existing South Tomingley Rest Area to complete a U-turn before returning to Kyalite Road.
- Clearly mark all areas of disturbance and no-go areas on the ground.
- Install Erosion and sediment control measures prior to any substantive earthworks or culvert construction commencing.
- Establish traffic control measures as required.
- Remove vegetation and strip and stockpile soil in accordance with the procedures described in Section 3.3.3.
- Establish borrow pits as described in Section 3.3.3.6.
- Construct required culverts, including ensuring that suitable temporary erosion and sediment control measures have been implemented.
- Construct and shape the road formation, including table drains, in accordance with detailed designed approved by the relevant roads authority, using material sourced from the on-site borrow pits as well as off-site sources, where required.
- Construct the Kyalite Road overpass.
- Re-establish rural property entrances to the public road network.
- Construct the pavement, including sealed and unsealed surfaces.
- Apply line marking, and install signage and road safety infrastructure as required.
- Fence the proposed road reserves.
- Remove traffic controls, works compounds, stockpile areas and erosion and sediment controls.

- Commission the realigned roads and close and decommission the existing alignment, including transferring ownership of the new road reserves to the roads authorities and ownership of the former road reserves to the Applicant.
- Remove redundant sections of the existing road formations, as required.

Section 3.10.3.1 describes the anticipated construction-related traffic movements and Section 3.12.1 the proposed construction hours of operation. The Applicant anticipates that road construction operations would require approximately 9 months to complete.

3.4.4 Public Road Operation

Following commissioning of the realigned public roads, responsibility for ongoing management of the roads would fall to the road authorities. The Applicant anticipates that a range of warranties would remain in place to remediate any construction-related issues following commissioning.

In addition, the Applicant anticipates that the Planning Agreement negotiated with Narromine Shire Council would include a clause providing for the maintenance of Kyalite Road between the Newell Highway and the SAR Site Access Road at the Applicant's cost for the duration of the Project.

Finally, the Applicant would retain or remove the Kyalite Road overpass at the end of the life of the Project at the direction of Narromine Shire Council.

3.4.5 Flexible Elements

Table 3.4.5 presents the public road-related flexible elements that cannot be described with certainty at this stage of the Project, together with clear limits on the flexibility sought and a justification of each element. Elements that may be smaller or with lesser impacts with lesser impacts than that proposed are not described.

Table 3.4.5
Flexible Elements – Mining Operations

Flexible Element	Limit on Flexibility	Justification
Detailed design of the public road network	Location of the road alignment and design of the proposed roads and intersections as approved by the relevant roads authority.	The design process for the realigned Newell Highway, and therefore the local roads that connect with the Highway, requires preparation of 100% concept and 50%, 80% and 100% detailed designs, each of which require consultation with Transport for NSW. Narromine Shire Council has been provided with 50% Concept Design and will be provided with 50% and 100% Detailed Design. Detailed contractual and legal agreements also need to be finalised. The 100% concept design was complete at the time of finalisation of this document, with the remaining steps expected to be finalised during exhibition and assessment of the application for development consent.
Timing of construction	± 3 months	The proposed road construction operations are expected to require 9 months to complete. However, construction operations may take more or less time than anticipated, due to factors such as inclement weather, materials availability, etc.

3.5 Mining Operations

3.5.1 Introduction

Given the planned interaction of the existing approved and proposed mining operations, this subsection describes the approved Caloma Eastern Cutback and TGO Underground mining operations as well as the layout and design of the proposed SAR Open Cut and Underground mining operations. The anticipated sequencing and scheduling of the proposed mining operations are also described, as well as flexible elements relevant to the described activities.

3.5.2 Open Cut Mining Operations

3.5.2.1 Approved Open Cut Mining Operations

Caloma Open Cuts

Figure 3.5.1 presents the approved layout for the Caloma 1 and 2 Open Cuts, including the Caloma Eastern Cutback. Mining of the Caloma Eastern Cutback, approved as part of MOD3 for MP09_0155, is currently in progress. Ore is transported via the Newell Highway Underpass to the TGO ROM Pad and processed using the TGO Processing Plant. Waste rock is placed in pit within the Caloma 2 Open Cut or stockpiled within Waste Rock Emplacement 1 for use in construction or capping of residue storage facilities.

Mining of the Caloma Eastern Cutback will complete open cut mining within the Caloma 1 Open Cut. No other open cut mining operations are ongoing or are proposed within the TGO Mine Site at the time of finalisation of this document.

The Caloma Open Cuts would be backfilled to surface with waste rock from the SAR Open Cut (see Section 3.6.4). As a result, no assessment of the long-term geotechnical stability of the Caloma Open Cuts has been undertaken.

Wyoming 1 Open Cut

Approved Mining Operations

Figure 3.5.2 presents the approved layout for the Wyoming 1 Open Cut. Open cut mining operations are complete within the Wyoming 1 Open Cut, with access to the TGO Underground via portals located within the open cut.

Geotechnical Assessment

The Wyoming 1 Open Cut is proposed to be retained within the final landform as a final void. As a result, the Applicant engaged AMC Consultants Pty Ltd to prepare a geotechnical assessment of the long-term stability of the open cut. That report, referenced hereafter as AMC (2021a), is presented as **Appendix 6**.

AMC (2021a) identify that the most likely long-term failure mechanism within the Wyoming 1 Open Cut is the ongoing deterioration of the alluvium and saprolite, as well as rock mass style failures. AMC (2021a) identified that risk of rock mass failures would increase if transient or high groundwater pressures occur in the slope and that rainfall and surface water flows also promote ongoing instability.

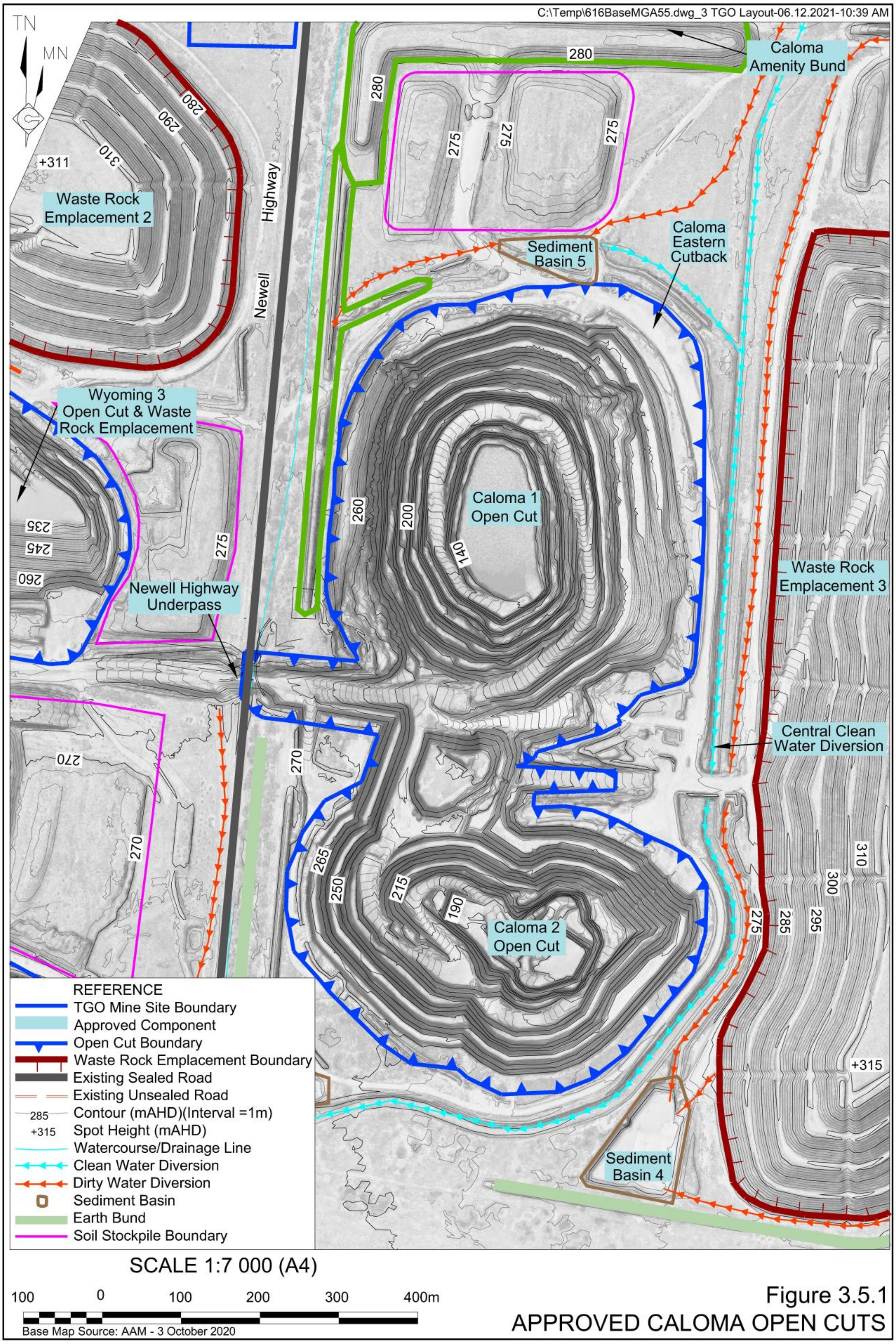


Figure 3.5.1
APPROVED CALOMA OPEN CUTS

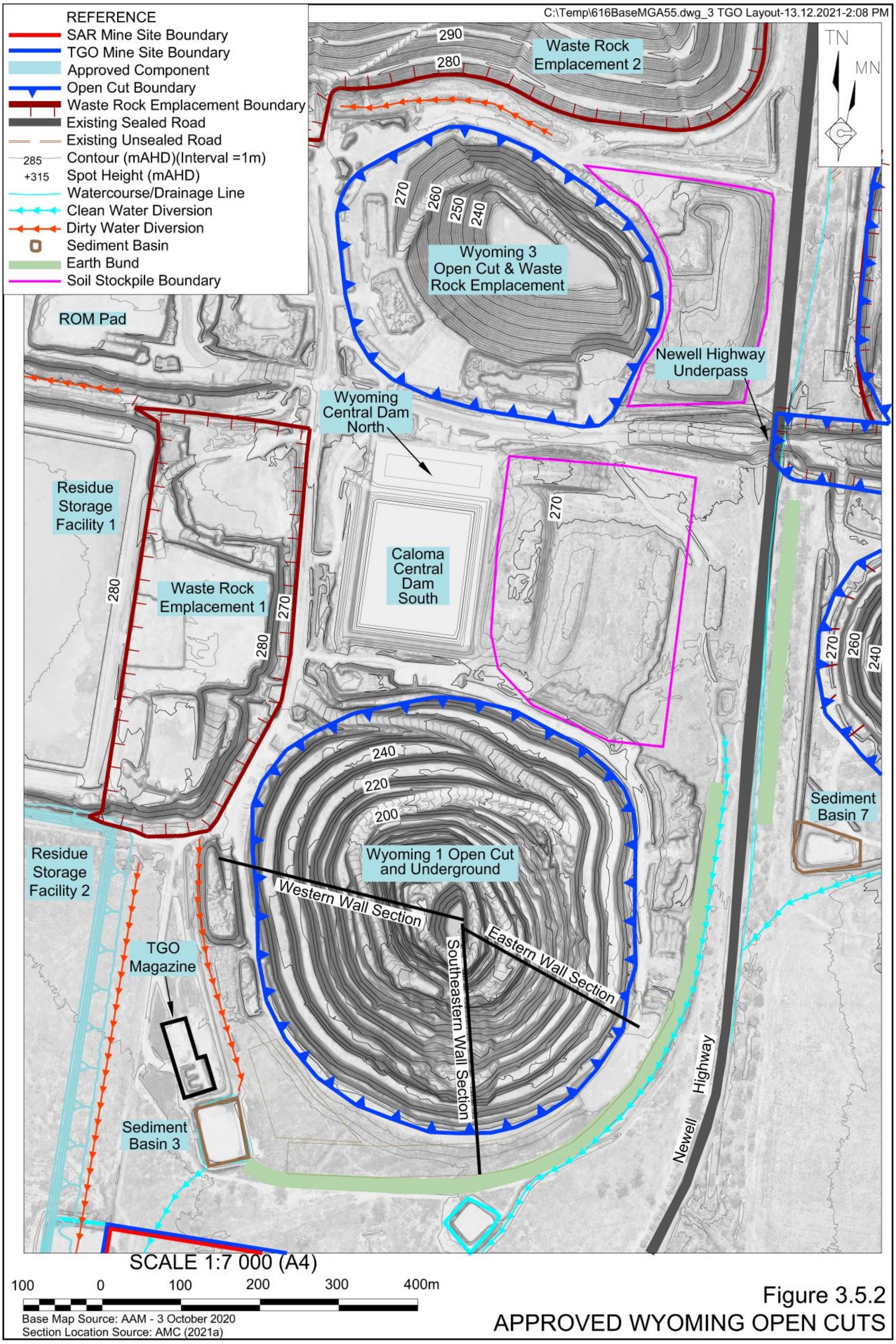


Figure 3.5.2
APPROVED WYOMING OPEN CUTS

AMC (2021a) undertook an assessment of the stability of three key sections through the Wyoming 1 Open Cut walls (**Figure 3.5.2**) using SLIDE, a limit equilibrium analysis software package developed by Rocscience. The results of the analysis are summarised as follows.

- Southeastern Wall Section – this section of wall has a current Factor of Safety[3] of 1.0. The Applicant is closely monitoring and managing this section of the Open Cut.
- Eastern Wall Section – this section of wall has a current Factor of Safety of 1.3. with a low potential for rock mass failure during the life of the Project.
- Western Wall Section – this section of wall has a current Factor of Safety of 1.3. with a low potential for rock mass failure during the life of the Project.

Erosion and Landform Stability Assessment

The Applicant engaged Landloch Pty Ltd to prepare an assessment of the long-term erosional stability of the Wyoming 1 Open Cut. That report, referenced hereafter as Landloch (2021a), is presented as **Appendix 7.**

Landloch (2021a) utilised the SIBERIA, a 3-dimensional topographic model that predicts the long-term development of channels and hillslopes in a catchment, based on runoff, erosion, and deposition. The SIBERIA model was used to determine the likely effect of erosion on the upper benches of the Wyoming 1 Open Cut over 10, 100 and 1 000 year time frames. Landloch (2021a) derived erodibility parameters for three materials within the open cut walls, namely alluvium and two saprolite materials, based on an ultra-high resolution LiDAR survey of the Wyoming 1 Open Cut from August 2021.

The results of that analysis are presented in Section 4 of Landloch (2021a) and are summarised as follows.

- Saprolite was the most erodible material.
- Open cut expansion due to erosion is expected to have an average rate of approximately 2m/100 years or 20m over 1 000 years.
- The open cut crest is not expected to erode back far enough to impact on critical infrastructure, including the realigned Newell Highway or the RFS 1 or 2.

Long-term Stabilisation of the Wyoming 1 Open Cut

The Applicant would continuously monitor and manage the geotechnical stability of each of the approved and proposed open cuts, including the Wyoming 1 Open Cut. If required, sections of the Wyoming 1 Open Cut would either be cutback or be covered with waste rock to ensure the long-term stability of the final landform.

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[3] Factor of Safety (FoS) is a measure used to represent how much greater the resisting capacity of a structure or component is relative to an assumed load. A FoS greater than 1.0 implies the available shear strength to resist failure is greater than the driving force to initiate failure. FoS is used to quantify safety, but it is not directly correlated to the risk (i.e. the likelihood and consequence) of failure (Source: After https://www.klohn.com/blog/geotechnical-factor-of-safety-and-risk/ - accessed 26/10/21).

The document *Guidelines for Open Pit Slope Design* (Read and Stacey, 2009) recommend a FoS of between 1.3 and 1.5 for final voids with a high consequence in the event of a failure.

Wyoming 3 Open Cut

Mining operations within the Wyoming 3 Open Cut have been completed. The Open Cut is partly backfilled with waste rock and is currently used for storage of water within the TGO Mine Site, with a capacity in excess of 1 000ML (**Figure 3.5.2**).

The Wyoming 3 Open Cut would be backfilled to surface with waste rock that has been used to construct the ROM Pad and other infrastructure within the TGO Mine Site. As a result, no assessment of the long-term geotechnical stability of the Wyoming 3 Open Cut has been undertaken.

3.5.2.2 Proposed SAR Open Cut

Open Cut Layout and Design

The design of the SAR Open Cut comprising three separate, but connected pits, has been an iterative process with three principal inputs as follows.

- Open Cut optimisation using the Whittle optimisation software package.
- Geotechnical assessment undertaken by geotechnics and ground engineering firm WSP. The resulting report is presented as **Appendix 8** and is referred to hereafter as WSP (2021).
- Analysis of the long-term, post-closure stability of the SAR North Pit final void undertaken by AMC based on drill hole information only. That report, referenced hereafter as AMC (2021b), is presented as **Appendix 9**.
- Erosional stability assessment and analysis of the post-closure SAR Open Cut North Pit final void undertaken by Landloch. The resulting report is presented as **Appendix 7** and is referred to hereafter as Landloch (2021a).

Appendix 4 presents an overview of the results of those studies. **Figure 3.5.3** and **Table 3.5.1** present the proposed layout and design criteria for the three pits within the SAR Open Cut based on the optimisation and geotechnical studies. Bench heights and angles, bench heights, berm widths and inter ramp angles would be as recommended by WSP (2021).

Table 3.5.1
Proposed SAR Open Cut Design Criteria

Component	South Pit	Central Pit	North Pit	Total
Area	24.9ha	25.5ha	40.8ha	91.2ha
Wall Angles	As determined by WSP (2021) – see **Appendix 4**			
Maximum Depth	167m or 100m AHD	207m or 60m AHD	294m or -27m AHD	-
Indicative Volume	13.2Mm^3	17.1Mm^3	37.4Mm^3	67.7Mm^3
Source: Tomingley Gold Operations Pty Ltd				

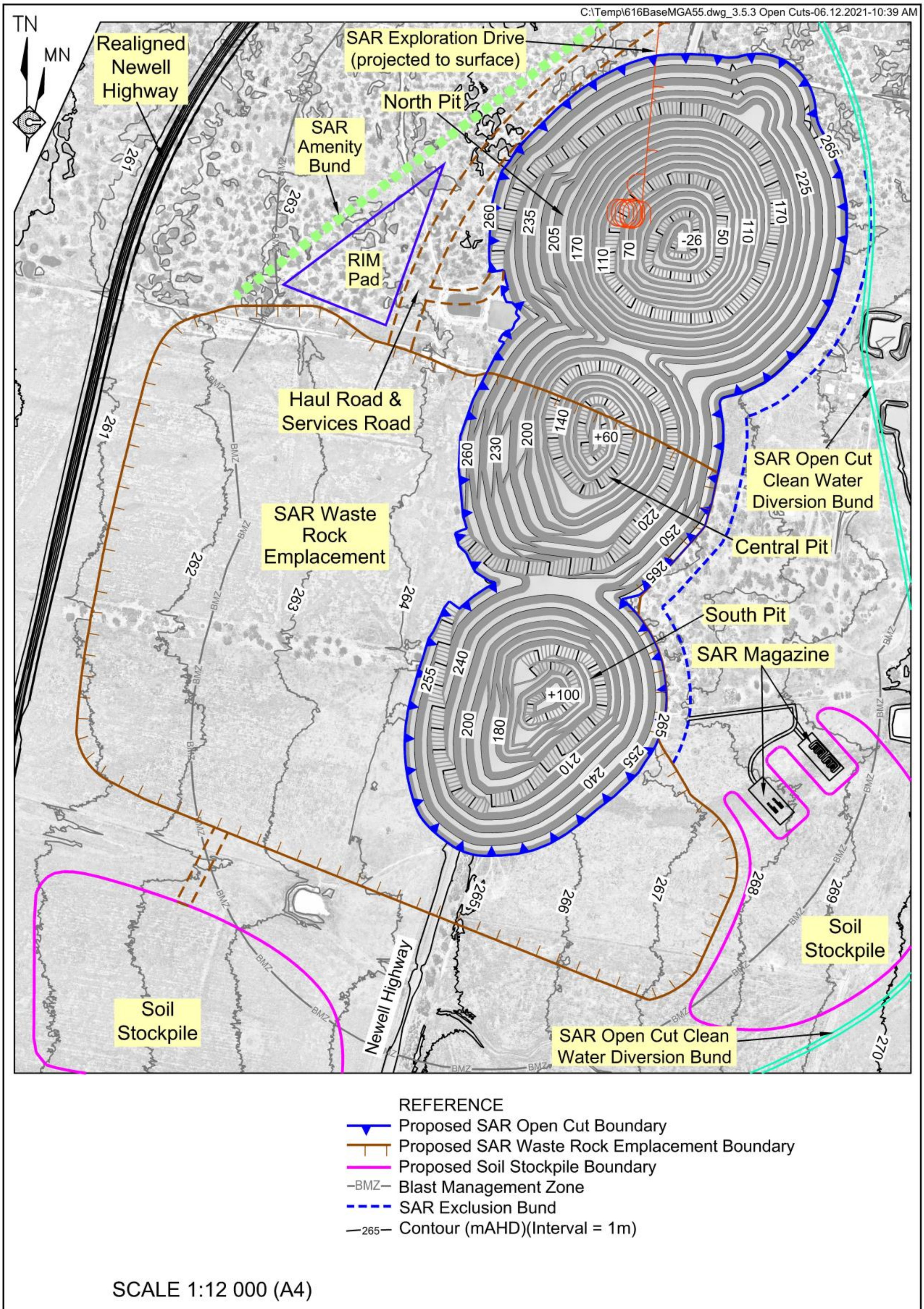


Figure 3.5.3
PROPOSED SAR OPEN CUT

In addition, the Applicant would implement the following throughout the life of the Project to ensure that the long-term footprint of the SAR North Pit final void would remain within the approved limit of disturbance.

- Establish a minimum 50m offset distance between the SAR North Pit crest and SAR Open Cut Clean Water Diversion Bund.
- Engage a suitably qualified and experienced geotechnical engineer to review the performance of the SAR South and Central Pits, as well as Stage 1 of the North Pit and provide recommendations in relation to the long-term stability of the SAR Open Cut North Pit.

Proposed Open Cut Mining Operations

Extraction of Friable Material

Following removal of vegetation and soil materials as described in Section 3.3.3, mining would commence with the removal of alluvium and saprolite. These materials would be extracted using an excavator or ripped and pushed up using a bulldozer and loaded into haul trucks using an excavator or front-end loader or removed using scrapers. Waste rock would be managed as described in Section 3.6 and ore would be transported to the TGO ROM Pad.

Drill and Blast

Where the material becomes too competent to be extracted using the above methods, it would be extracted using traditional drill and blast methods. All blasts would be designed by a suitably qualified and experienced blast engineer to ensure the following.

- Appropriate fragmentation of the in-situ material.
- Compliance with required blasting parameters at surrounding sensitive receptors and key infrastructure locations.
- All fly rock is contained within the identified blast management zone and that there is no impact on the operation of surrounding public roads (**Figure 3.5.2**).

Blast holes would be drilled using hydraulic blast holes drill rigs operating 24-hours per day, 7 days per week. The blast holes would be loaded with detonators, pre-packaged boosters and bulk explosives. The Maximum Instantaneous Charge would be approximately 400kg or less. Blasts would be initiated under the supervision of a suitably licenced and experienced shot firer. Detonators, boosters and bulk explosives would be stored within approved structures within the SAR Magazine Area in accordance with *Australian Standard AS2187:2006 – Explosives Storage, Transport and Use*. The Magazine Area would be secured by a security fence and a lockable gate and would be the subject of regular inspections.

Open cut blasting would be undertaken between the hours of 9:00am to 5:00pm, Monday to Saturday. No blasting operations would be undertaken on Sundays or Public Holidays[4].

[4] It is possible that blasting outside of the nominated hours of operation may be required to alleviate a safety or other hazard.

Signs advising employees, contractors and visitors to the SAR Mine Site of the date and time of the next blast would be positioned at one or more appropriate locations. In addition, the Proponent would consult with surrounding residents to determine the most appropriate method to notify them of blast times and would implement the agreed notification methods.

Finally, all blasts would be monitored in accordance with the procedures identified in an updated *Blast Management Plan* to be prepared in the event development consent is granted. In summary, however, blasts would be monitored at the closest non-Project related residences surrounding the SAR Mine Site, as well as adjacent to key public infrastructure, including the Newell Highway and Kyalite Road overpass.

Load and Haul

Following completion of each blast, boundaries between ore and each type of waste rock would, if required, be identified and marked out on the fragmented materials. Fragmented material would then be loaded into haul trucks using an excavator.

Ore and low-grade material would be transported directly to the TGO ROM Pad or temporarily stockpiled within the RIM Pad, the Caloma Temporary Stockpile Area or elsewhere within the approved or proposed limit of disturbance. Waste rock would periodically be directly used for or temporarily stockpiled for use for construction of Project-related infrastructure or placed within the Caloma or SAR Waste Rock Emplacements (see Section 3.6) or used for rehabilitation purposes.

Section 3.5.4.4 identifies the mining equipment that would be utilised for open cut mining. In summary, however, two classes of haul trucks would be used, larger CAT785 trucks (or equivalent) and smaller CAT777 trucks (or equivalent). The larger trucks, which are more efficient at moving large volumes of material longer distances, would primarily be used for transporting material to the Caloma Waste Rock Emplacement or Temporary Stockpile Area. The Kyalite Road underpass has been designed to cater for these larger vehicles.

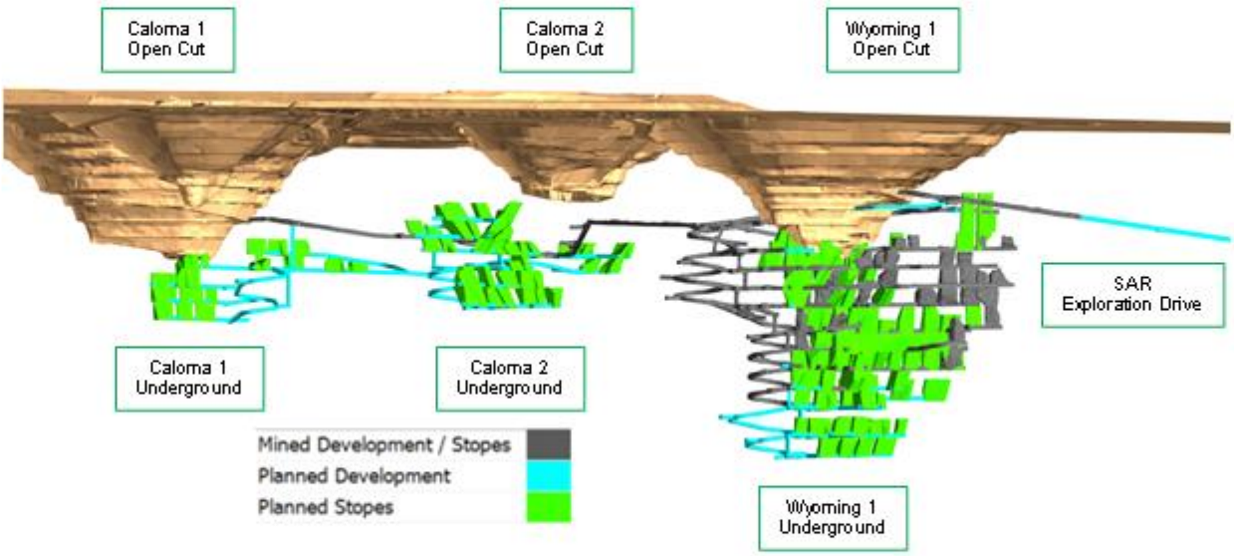
The smaller trucks would primarily be used for transporting ore and waste rock. The smaller trucks would also be used for transportation of material through the existing Newell Highway underpass as the larger trucks are too large to pass through the underpass safely.

3.5.3 Underground Mining Operations

3.5.3.1 Approved TGO Underground Mining Operations

The Wyoming 1 Underground mine was approved as part of the original application for development consent in 2011. The Caloma 1 and Caloma 2 Underground mines were approved in MOD3 of MP09_0155. For the purposes of this document, these operations are collectively referred to as the TGO Underground Mine.

Figure 3.5.4 presents an isometric view of the TGO Underground Mine. Access and ventilation is provided via a number of portals in the Wyoming 1 Open Cut. A portal has also been established within the southern wall of the Caloma 1 Open Cut, primarily for ventilation and emergency egress.



Source: Tomingley Gold Operations Pty Ltd

Figure 3.5.4
TGO Underground Mining Operations – Looking East

Underground development currently utilises a jumbo, or underground drill rig, to drill a pattern of holes which are loaded with explosives and the in-situ material fragmented. Underground blasting operations are undertaken 24-hours per day, 7 days per week. Fragmented material is loaded into underground haul trucks using an underground loader.

Ore is extracted using long-hole open stoping (see Section 3.5.3.2) and is transported to the TGO ROM Pad and processed using the TGO Processing Plant. Waste rock is either used to backfill completed stopes or is transported to the surface and placed within the Wyoming 1 Open Cut or Waste Rock Emplacement 1.

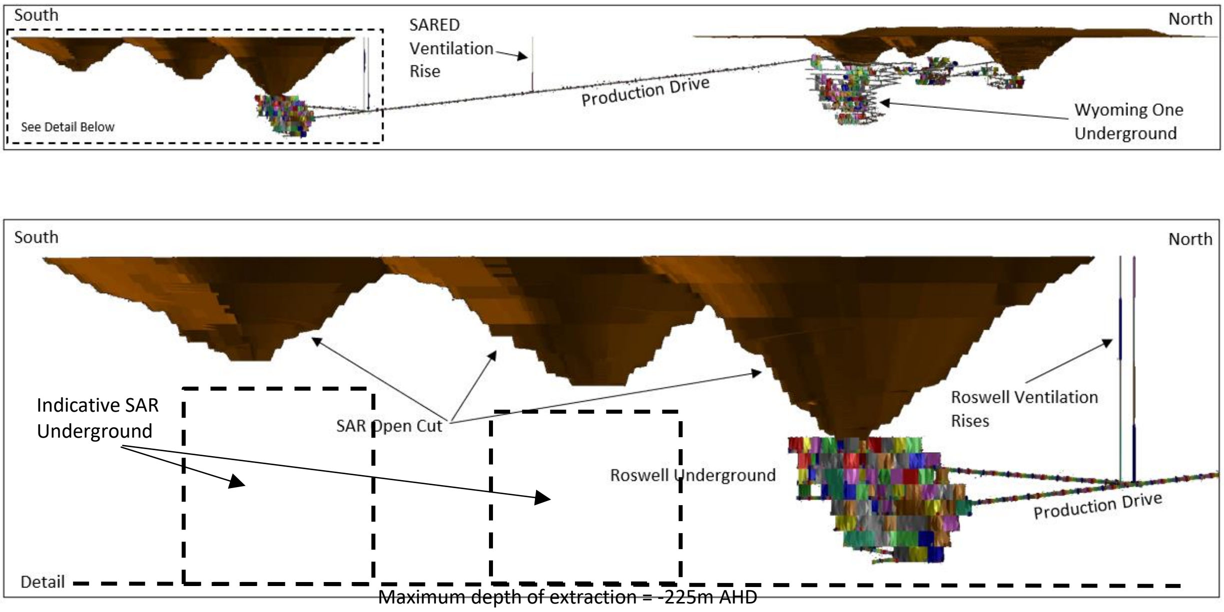
3.5.3.2 Proposed SAR Underground Mining Operations

Proposed SAR Underground Layout

Underground mining would be undertaken utilising the SAR Exploration Drive (**Figures 3.1.1**, **3.1.3** and **3.5.5**). The drive was approved by the Resources Regulator for exploration activities on 7 May 2020, with further approval granted on 13 September 2021. The approved activities included the following.

- Development of an exploration drive from the existing TGO Underground Mine.
- Establishment and use of ancillary infrastructure, including a ventilation rise to the north of McNivens Lane.
- Drilling of approximately 72 000m of exploration drill holes.
- Extraction of one or more bulk samples totalling no greater than 20 000t.

In the event development consent is granted, the SAR Exploration Drive would be converted into a haulage drive between SAR and TGO Mine Sites. As the drive would be well established prior to granting of development consent, it would permit early access to the SAR deposits for underground mining operations, likely before open cut mining commences.



Source: Tomingley Gold Operations Pty Ltd

Figure 3.5.5
Proposed SAR Underground Mining Operations

At the time of preparation of this document, detailed exploration drilling and mine planning had yet to be competed. As a result, the Applicant has only designed underground mining operations within the Roswell deposit (see Section 1.4.2). Underground mining withing the San Antonio deposit would also be undertaken. In addition, mineralisation within the SAR deposits remains open at depth. As a result, it is very likely that additional underground ore will be identified. As a result, for the purpose of this application, the SAR Underground Mine would be no deeper than 490m below surface or -225m AHD. This maximum depth of extraction has been used by Jacobs (2021c) when modelling potential groundwater impacts. The Applicant has committed to reviewing the groundwater model in 2024 based on groundwater monitoring data collected in the intervening period. In the event that a revised groundwater model is required, the Applicant may, based on exploration data collected, extend the maximum depth of extraction in consultation with the Secretary of the Department of Planning and Environment.

Mining Method

Underground development would utilise traditional jumbo drill and blast, with broken waste rock either used to backfill completed stopes or transported to the TGO Underground Mine where it would be managed in accordance with the Applicant's current procedures.

Underground mining of ore material would be undertaken using a long hole open stoping mining method, or similar. This would require development of a number of drives within the ore zone at regular spaced intervals. A series of holes would then be drilled in rings between each drive. These rings would then be sequentially loaded with explosives and the ore blasted.

The detailed design of each stope would be undertaken by a suitably qualified and experienced Mining Engineer. There would be no surface subsidence within the SAR Mine Site, with the exception of potential break though of the underground workings into the base of the proposed SAR Open Cut North Pit towards the end of the life of the Project.

The fragmented ore would be removed using an underground loader. Ore would be loaded into underground dump trucks and transported to the TGO ROM Pad via the SAR Exploration Drive. Alternatively, late in the life of Project, a portal may be established in the SAR Open Cut and SAR Underground ore would be transported to the surface and placed within the SAR RIM Pad, from where it would be transported to the TGO ROM Pad and Processing Plant on surface via the Haul Road.

Water that seeps or is pumped into the proposed workings would be pumped to the SAR Site Water Storage Dam.

Ventilation and Emergency Egress

Ventilation for the approved SAR Exploration Drive is provided from the Wyoming 1 Underground Mine and SAR Exploration Drive Ventilation Rise (**Figure 3.1.3**). The relocated SAR Exploration Drive ventilation rise will have a diameter of 2.4m or less and will initially act as an exhaust air rise with a ventilation rate of up to approximately 80m^3/s. The SAR Exploration Drive ventilation rise will be protected by a slightly elevated structure to prevent the entry of surface water and covered by a grate. The ventilation fan would be located at the base of the rise.

An additional ventilation rise, the Roswell ventilation rise, would indicatively be constructed to the north of the SAR Open Cut (**Figures 3.1.3** and **3.5.2**). Alternatively, the Roswell ventilation rise may be constructed elsewhere within the approved disturbance area. Construction of the ventilation rise would involve a raise-bore drill rig which would drill an initial pilot hole to intersect a ventilation drive underground. The pilot hole would then be progressively widened from the bottom up, with the drill cuttings permitted to fall to the bottom of the hole where they would be removed as described above. The ventilation rise would have a diameter of up to 4.2m and would act as an exhaust air rise, with an estimated maximum ventilation rate of approximately 225m^3/s. The ventilation fan would be located at the base of the rise. Following commissioning of the Roswell ventilation rise, the SAR Exploration Drive ventilation rise would be converted to a fresh air intake.

In addition, appropriate emergency egress infrastructure, including ladderways or hoist frame and platforms, would be installed with the SAR Exploration Drive and Roswell ventilation rises. Other mine services such as power and water may also be installed within the rises or in dedicated service holes.

Stope Backfilling and Pastefill Plant

Long hole open stoping often requires completed stopes to be backfilled to ensure stability of the completed stopes and to maximise recovery of the identified resource. Stope backfilling within the TGO Underground Mine is undertaken using waste rock, with or without the addition of a binding agent such as cement.

Given the greater width of the ore lenses and therefore the stopes within the SAR Underground Mine compared to the TGO Underground Mine, the Applicant proposes to install and use a pastefill plant adjacent to the Roswell ventilation rise (**Figure 3.3.5**). Paste fill is a type of backfill that is widely used in the mining industry in Australia and across the world. Pastefill comprises a mixture of finely crushed rock or residue and cement that is pumped underground and used to backfill completed stopes. Once cured, the paste fill is sufficiently competent to permit mining immediately adjacent or underneath the filled area, resulting in maximum extraction of the resource.

The Paste Fill Plant would indicatively comprise the following components.

- Cement/binder silo.
- A residue feed hopper with belt feeder.
- A paste mixer, including feed and discharge chutes.
- Paste distribution infrastructure, including pumps, pipeline and boreholes into the underground workings.

Two options for supply of residue for paste mixing are being considered and are as follows. The preferred option would be selected following further feasibility and optimisation studies.

- Dewatered residue would be extracted from the residue storage facilities and transported by truck via the Services Road to the Paste Fill Plant. All loads would be covered, and the Applicant would ensure that the residue transported was sufficiently dewatered to ensure that no supernatant water would seep from the vehicle during transport.
- Thickened tailings would be diverted from the thickener at the processing plant following completion of cyanide destruction and pumped to the Paste Fill Plant where it would be dewatered using a filter press or similar. The filtrate would be pumped back to the Settling Pond at the Processing Plant and used for processing operations. The residue and filtrate pipes would be located within the pipeline corridor in the vicinity of the Haul Road and Services Road and would be bunded and equipped with automatic leak/rupture detection and pump shutdown equipment.

The residue or thickened tailings would be stockpiled within bunkers adjacent to the Roswell Pastefill Plant. The storage area would be internally draining, and all accumulated water would be treated as contaminated process water and either used for the manufacture of pastefill or transported back to the TGO Mine Site and disposed of within the process water circuit there. Residue stockpiles would be managed to minimise the generation of wind-blown dust.

The Applicant anticipates that between 10 000m^3 and 30 000m^3 of pastefill per month would be required, with occasional peaks in demand in excess of this.

Cement/binder would be delivered to the SAR Mine Site in bulk via the Newell Highway and Kyalite Road. The cement/binder silo would be fitted with a filter and over filling cut-off sensors to prevent emissions during filling operations.

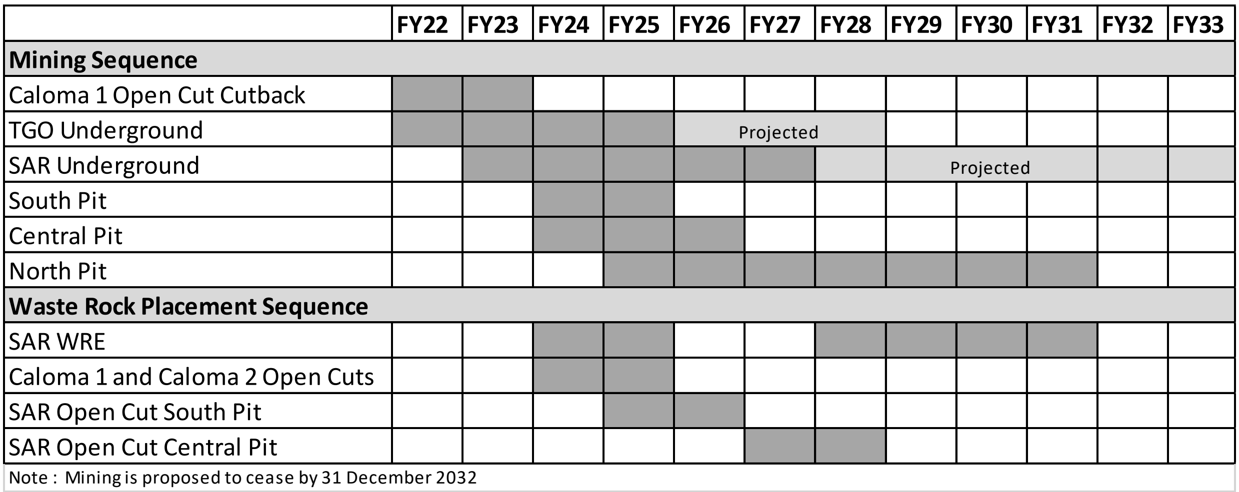
During paste manufacture, residue material would be transferred to the residue feed hopper. A belt feeder would extract the residue from the hopper at a predetermined rate. This material would be combined with between 2% and 6% cement/binder and mixed with water to produce a paste fill mix with the required composition. This material would then be passed, via one or more boreholes to the relevant underground stopes.

The Paste Fill Plant would operate on an as required basis.

3.5.4 Mine Sequencing, Schedule, Scenarios and Equipment

3.5.4.1 Mine Sequencing

Figure 3.5.6 presents the anticipated mining and backfilling/waste rock placement sequence for the life of the Project.



Source: Tomingley Gold Operations Pty Ltd

Figure 3.5.6
Indicative Mining and Backfilling Sequence

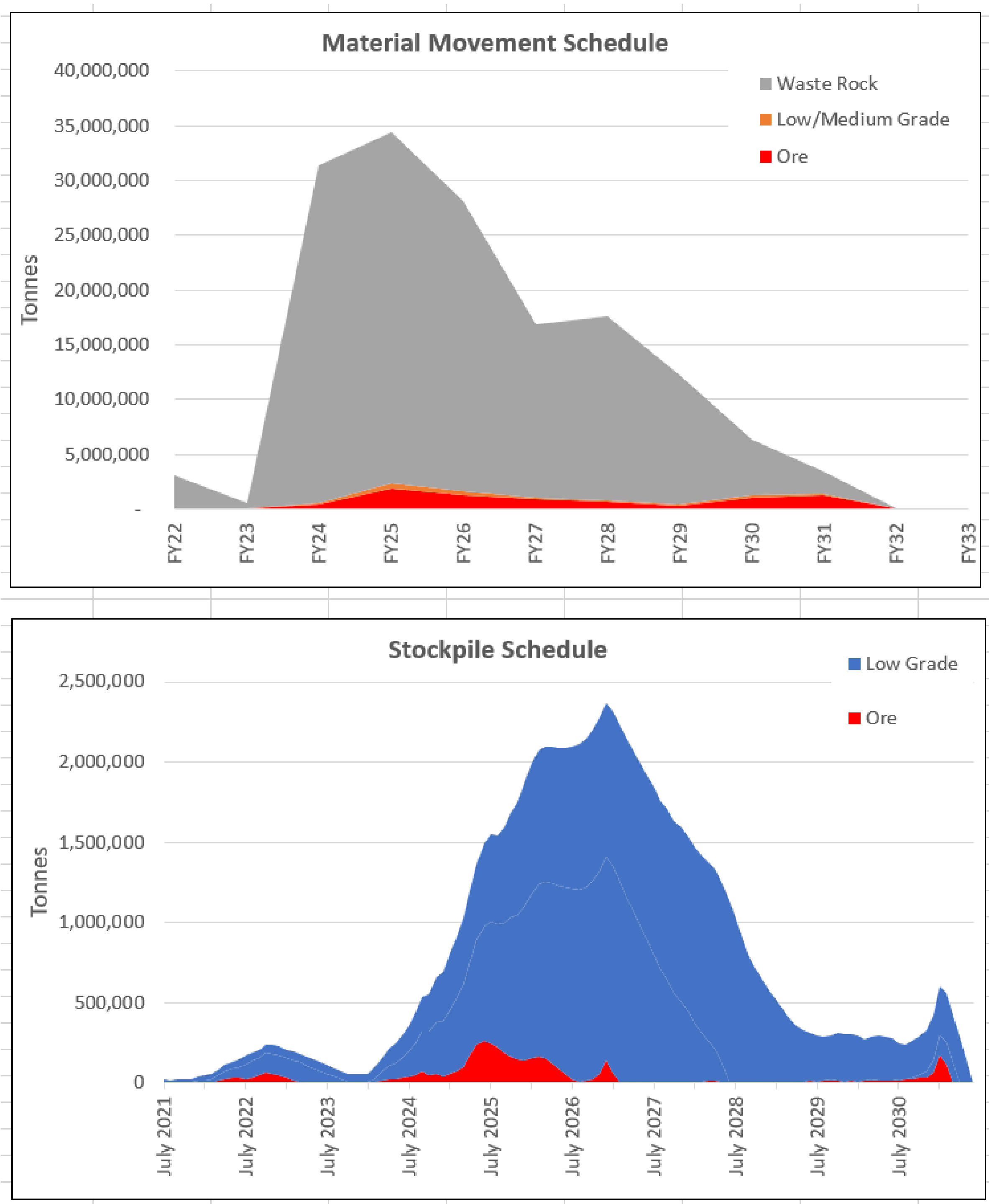
3.5.4.2 Mine Schedule

Table 3.5.2 and **Figure 3.5.7** present the anticipated life of mine maximum material movement schedule for the Project. The Applicant will continue to review and optimise the proposed material movement schedule. As a result, actual material movements may vary from those presented in **Table 3.5.2** and **Figure 3.5.7**.

It is noted that ore and low-grade material may be produced at a rate that would, at times, exceed the proposed rate at which that material would be processed. As a result, material that cannot be transported to the ROM Pad would be temporarily stockpiled within the RIM Pad, the Caloma Low-grade Stockpile Area or elsewhere within the approved or proposed limit of disturbance, before being transferred to the ROM Pad as required (see **Figure 3.6.1**). **Figure 3.5.7** presents the anticipated volume of ore and low-grade material stockpiled throughout the life of the Project.

3.5.4.3 Mining Scenarios

Figures 3.5.8 to **3.5.12** presents the indicative layout of the Project at key stages throughout the life of the Project. These layouts have been selected to represent periods of greatest potential noise, visual or air quality impacts for surrounding residents.



Source: Tomingley Gold Operations Pty Ltd

Figure 3.5.7
Anticipated Material Movement and Stockpile Schedules

Table 3.5.2
Anticipated Life of Mine Material Movement Schedule

	Units	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	Total
Ore Mined														
SAR Open Cut	t	-	-	425,000	1,925,000	1,225,000	900,000	675,000	300,000	1,000,000	1,300,000	-	-	**7,750,000**
SAR Underground	t	-	25,000	325,000	575,000	775,000	350,000	300,000	300,000	300,000	300,000	275,000	250,000	**3,775,000**
Caloma 1 Open Cut Cutback	t	300,000	175,000	-	-	-	-	-	-	-	-	-	-	**475,000**
TGO Underground	t	850,000	825,000	525,000	275,000	150,000	100,000	50,000	-	-	-	-	-	**2,775,000**
Total	**t**	**1,150,000**	**1,025,000**	**1,275,000**	**2,775,000**	**2,150,000**	**1,350,000**	**1,025,000**	**600,000**	**1,300,000**	**1,600,000**	**275,000**	**250,000**	**14,775,000**
Low Grade Mined														
SAR Open Cut	t	-	-	75,000	375,000	350,000	150,000	100,000	125,000	225,000	125,000	-	-	**1,525,000**
Caloma 1 Open Cut Cutback	t	50,000	-	-	-	-	-	-	-	-	-	-	-	**50,000**
Total	**t**	50,000	-	75,000	375,000	350,000	150,000	100,000	125,000	225,000	125,000	-	-	**1,575,000**
Waste Rock Mined														
SAR Open Cut	t	-	-	30,850,000	32,100,000	26,600,000	15,850,000	16,800,000	11,900,000	5,100,000	2,000,000	-	-	**141,200,000**
Caloma 1 Open Cut Cutback	t	3,000,000	570,000	-	-	-	-	-	-	-	-	-	-	**3,570,000**
Total	**t**	**3,000,000**	**570,000**	**30,850,000**	**32,100,000**	**26,600,000**	**15,850,000**	**16,800,000**	**11,900,000**	**5,100,000**	**2,000,000**	**-**	**-**	**144,770,000**
Processing														
Ore Processed	t	1,025,000	1,025,000	1,125,000	1,750,000	1,450,000	1,450,000	1,450,000	1,125,000	1,025,000	1,450,000	300,000	300,000	**13,475,000**
Gold Produced	Oz	60,000	50,000	70,000	115,000	105,000	115,000	65,000	35,000	55,000	95,000	-	-	**765,000**

Note 1: Units = Tonnes
Note 2: Grey Highlight = estimated production from future exploration success
Note 3: Mining is proposed to cease by 31 December 2032

Source: Tomingley Gold Operations Pty Ltd

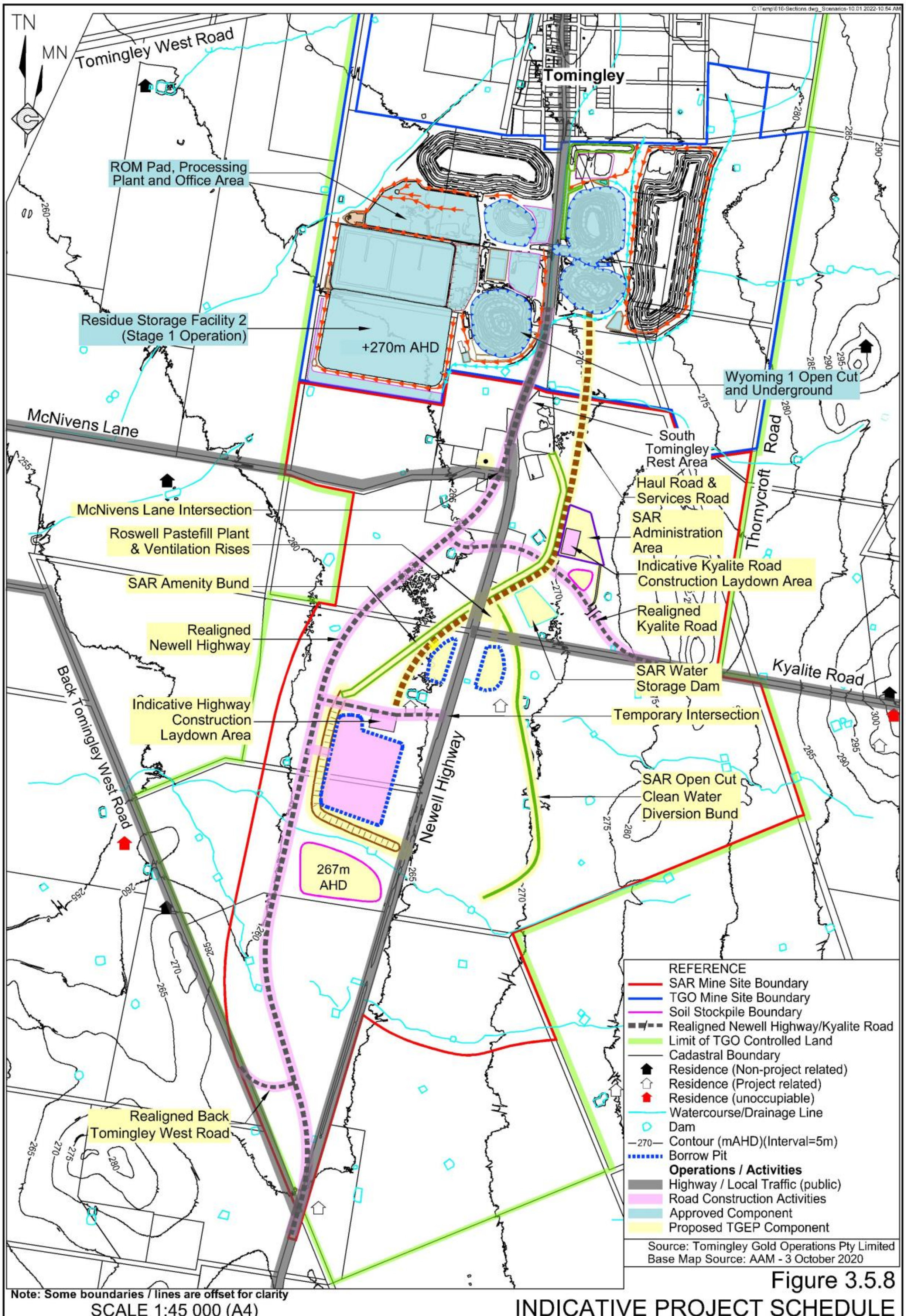


Figure 3.5.8
INDICATIVE PROJECT SCHEDULE
SCENARIO 1 - CONSTRUCTION

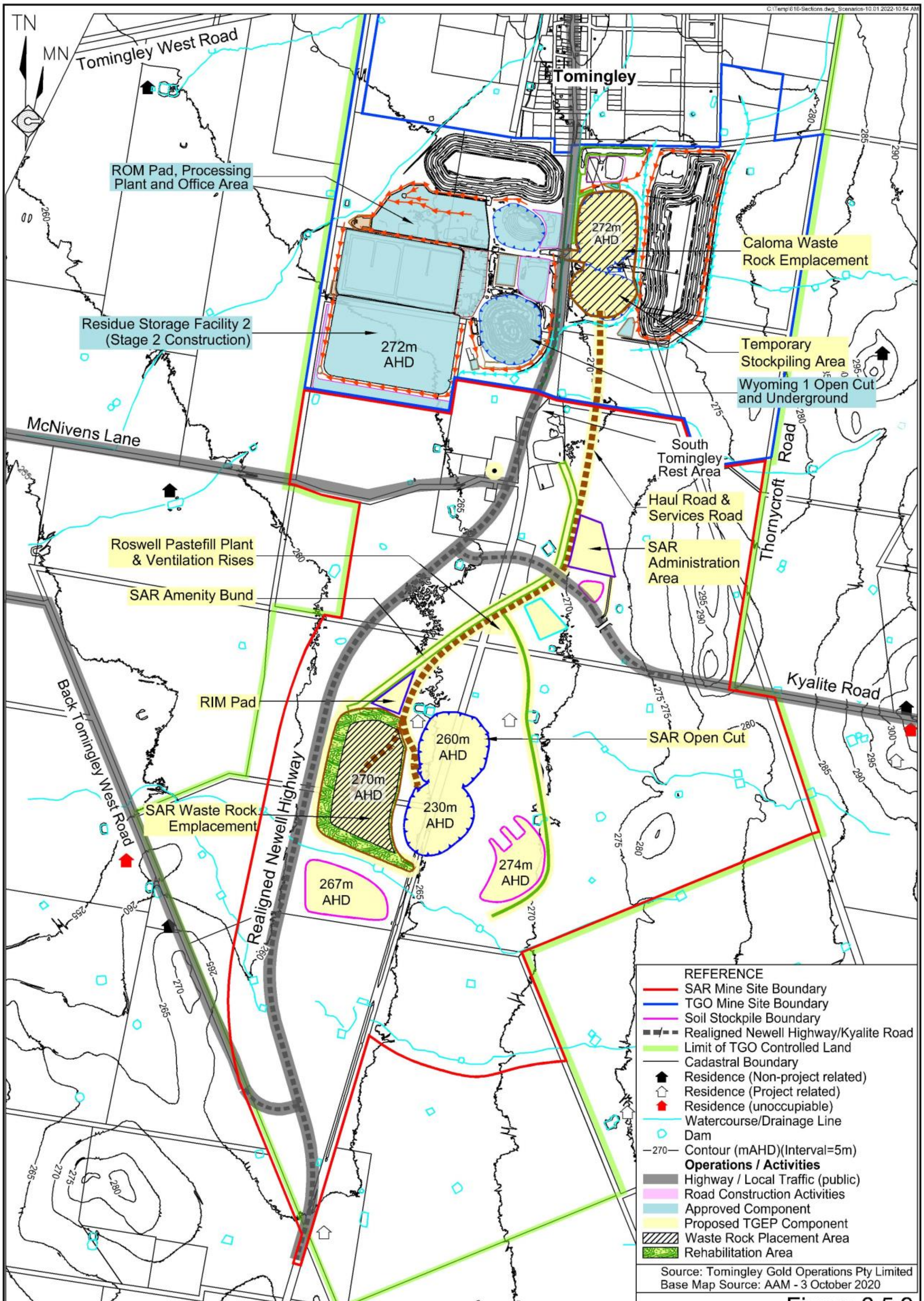


Figure 3.5.9
INDICATIVE PROJECT SCHEDULE
SCENARIO 2 - FY24

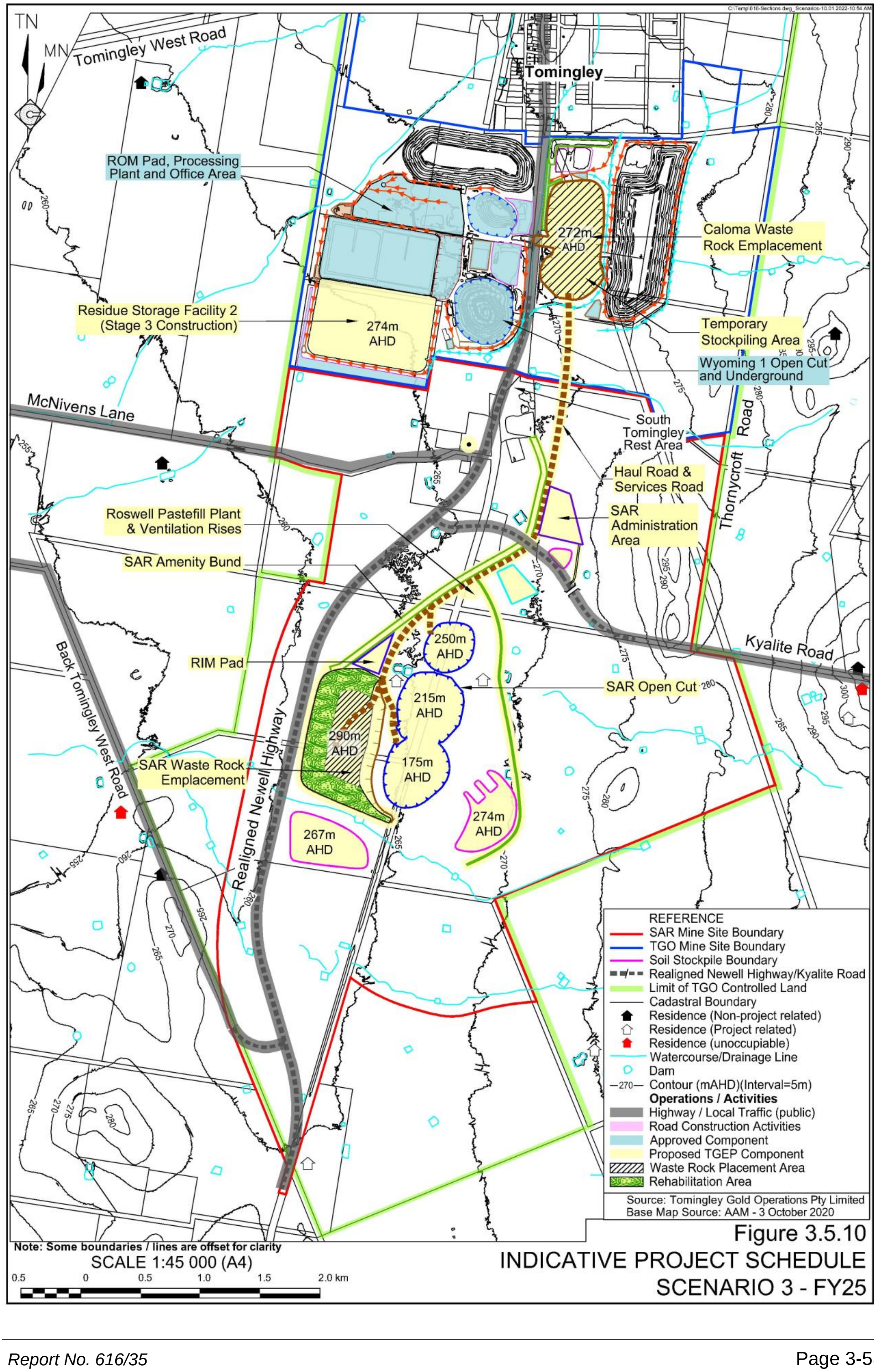


Figure 3.5.10
INDICATIVE PROJECT SCHEDULE
SCENARIO 3 - FY25

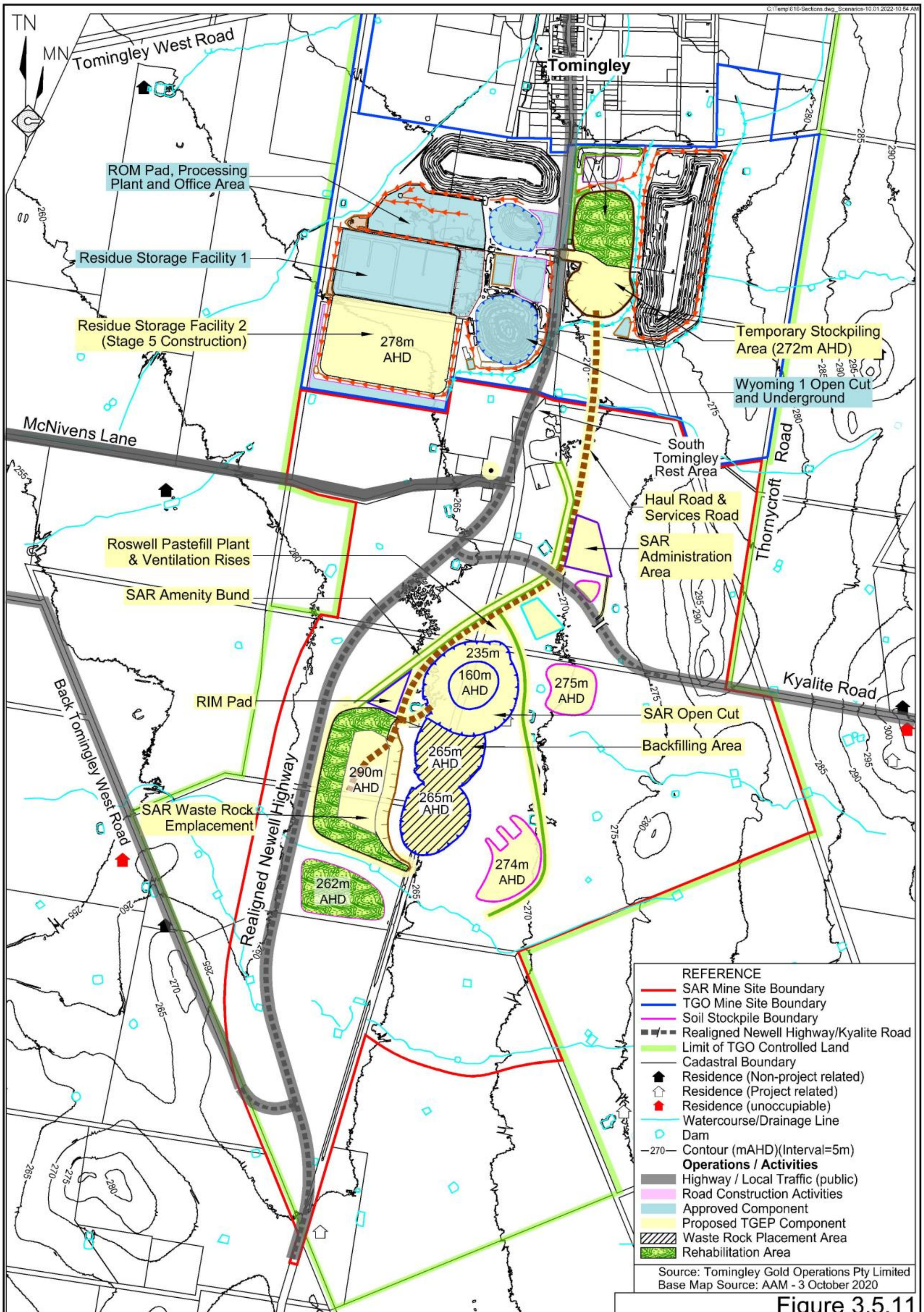


Figure 3.5.11
INDICATIVE PROJECT SCHEDULE
SCENARIO 4 - FY27

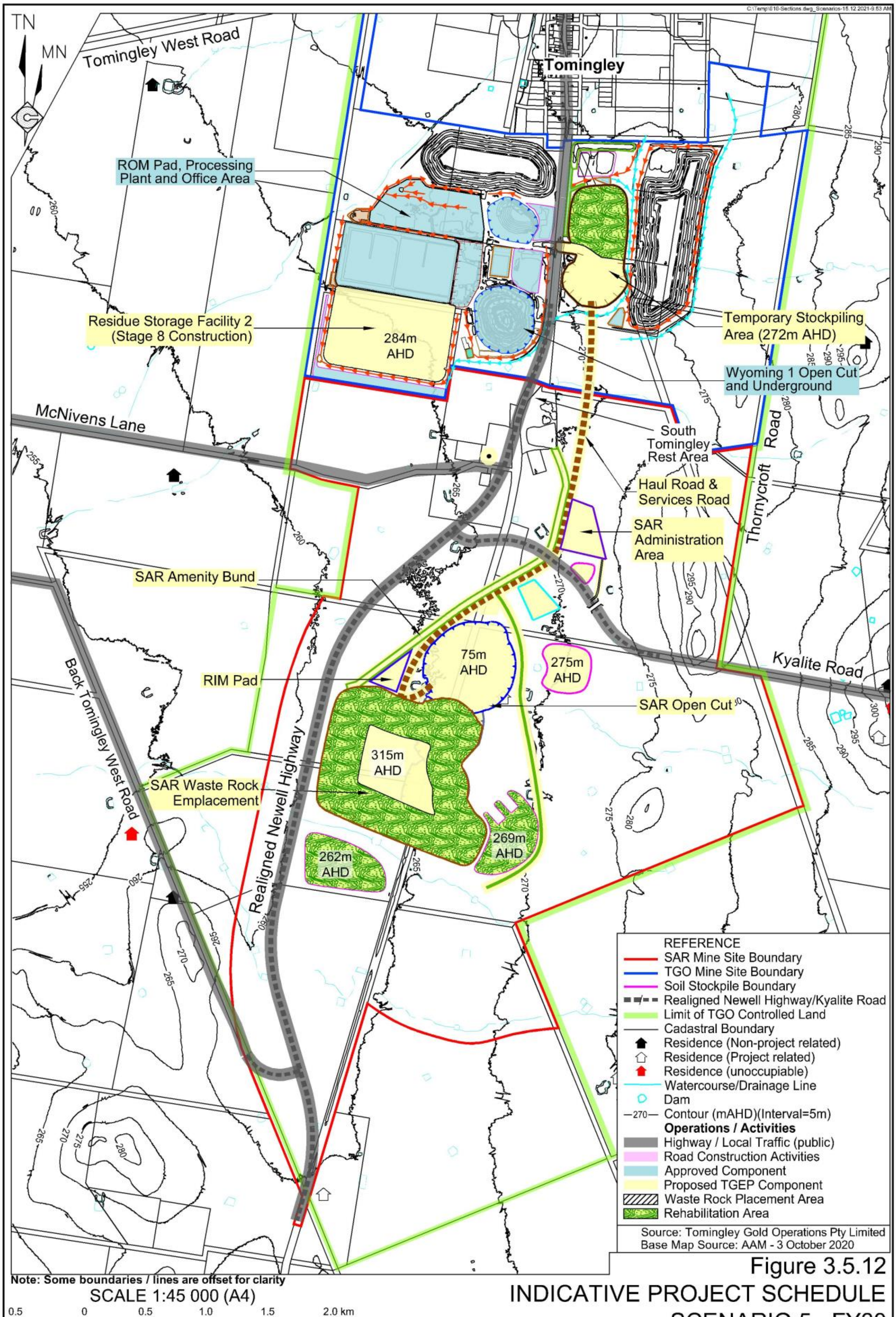


Figure 3.5.12
INDICATIVE PROJECT SCHEDULE
SCENARIO 5 - FY30

3.5.4.4 Mining Equipment

Table 3.5.3 presents the mobile open cut mining equipment, the anticipated models and indicative numbers[5] of items required throughout the life of the Project. Additional equipment, including light vehicles and service vehicles, would be used but are not identified individually because they would not contribute significantly to noise, dust or other emissions.

Underground mining equipment would include jumbos, drill rigs, haul trucks and underground loaders. These items, with the exception of an underground haul truck, have not been individually identified because they would not contribute to surface noise, dust or other emissions.

3.5.5 Flexible Elements

Table 3.5.4 presents the mining-related flexible elements that cannot be described with certainty at this stage of the Project, together with clear limits on the flexibility sought and a justification of each element. Elements that may be smaller or with lesser impacts than that proposed are not described.

[5] Listed equipment would not achieve 100% utilisation, with allowance made for equipment downtime and redundancies.

Table 3.5.3
Surface Mining Equipment

Type	Indicative Model/Capacity[1]	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33
TGO Open Cut Mining Fleet											
Front-end Loader	Komatsu WA700	1	1	1	1	1	1	1	1	1	1
Underground Haul Truck[2]	CAT AD55	1	1	1	1	1	1	1	1	1	1
SAR Open Cut Mining Fleet											
Excavator	Hatachi EX1200	2	2	2	1	1	1	1	1	-	-
Excavator	Hatachi EX1900	1	1	1	1	1	1	-	-	-	-
Excavator	Hatachi EX2600	1	1	1	-	-	-	-	-	-	-
Haul Truck	CAT785	9	6	6	-	-	-	-	-	-	-
Haul Truck	CAT 777F	18	10	13	11	11	10	7	7	-	-
Articulated Haul Truck	CAT 740	2	2	2	2	2	2	2	2	-	-
Bulldozer	CAT D11R	2	2	2	2	2	2	1	1	-	-
Bulldozer	CAT D10T	3	3	3	2	2	2	1	1	-	-
Wheel Dozer	CAT 854K	1	1	1	1	1	1	1	1	-	-
Front-end Loader	CAT 988H	1	1	1	1	1	1	1	1	-	-
Grader	CAT 18M	2	2	2	1	1	1	1	1	-	-
Grader	CAT 16M	1	1	1	1	1	1	1	1	-	-
Water Cart	CAT 773WC	2	2	2	2	2	2	2	2	-	-
Drill rig	45T	1	5	14	3	4	8	2	2	-	-

Note 1: Equipment models and numbers of items are indicative only.

Note2: Underground haul truck surface operations would be limited to transporting ore from the Wyoming 1 Portal to the ROM Pad and return and unloading operations within the Wyoming 1 Open Cut.

Source: Tomingley Gold Operations Pty Ltd

Table 3.5.4
Flexible Elements – Mining Operations

Flexible Element	Limit on Flexibility	Justification
Open Cut Layout and Design		
Outer limit of the SAR Open Cut	50m from the proposed crest of the SAR Open Cut.	WSP (2021b) identifies the recommended design criteria for the SAR Open Cut. It is possible that lower wall angles or wider berms would be required. Alternatively, minor cutbacks may be required for a range of other reasons. The proposed limit of disturbance around the SAR Open Cut has been offset by a minimum of 50m from the proposed open cut crest. The SAR Open Cut may therefore extend outwards by up to 50m without impacting on land that has not been assessed as part of the Project.
Depth of the SAR Open Cut	50m below the base of the proposed SAR Open Cut or as determined by a geotechnical assessment, without commensurate increase in the proposed area of open cut disturbance	The depth of the SAR Open Cut has been determined based on the result of the open cut optimisation and an assessment of underground mining potential. It is possible that the open cut may, depending on geotechnical limitations or other factors, extend below the proposed maximum depth in order to extract ore that would not otherwise be extracted.
Underground Layout and Design		
Depth/elevation of top level of SAR Underground	Increase above current design to the base of oxidation, associated with a commensurate reduction in the depth of the SAR Open Cut.	The upper limit of the SAR Underground has been determined based on the result of the open cut optimisation and an assessment of underground mining potential. It is possible that the open cut may not be developed to the currently proposed depth. If that were to occur, the underground operations would be extended upwards to extract the ore that would not otherwise be extracted.
Timing, including mine sequence and schedule,	End of mining – December 2032. Maximum annual rate of ore and waste extracted and transported - 35.25Mtpa. Maximum life of Project (FY22 to FY33) ore extraction – 14.775Mt.	The life-of-mine sequence has been prepared based on information available at the time of preparation of this document, including assumptions in relation to the timing of determination or granting of the required approvals and the success of the Applicant in identifying additional resources within the SAR and TGO Mine Sites. It is possible that the actual timing for particular aspects may vary from that proposed or that exploration success may be less or more successful than anticipated. Notwithstanding this, mining operations would, in the absence of further approval, cease on 31 December 2032 and annual ore and waste rock and life of Project ore production would be no greater than that identified in this document.
Mining Equipment	Equipment to be used to be of equivalent capacity/productivity to that proposed, with combined noise or dust emissions no greater than the proposed equipment	The identified equipment list has been assembled based on current equipment availability, costs and productivity. It is possible that alternate equipment may be used. Notwithstanding this, the Applicant would ensure that the combined fleet noise or dust emissions are no greater than the proposed equipment.

3.6 Waste Rock Management

3.6.1 Introduction

Material containing an insufficient concentration of gold to justify processing would be classified as waste rock and would be used for construction and site establishment, mining or rehabilitation purposes, including capping of the residue storage facilities, or would be placed into the Caloma or SAR Waste Rock Emplacements.

Similarly, material that contains insufficient gold to justify processing immediately, but enough that may justify processing at a later date may be classified as low-grade ore. Low-grade ore would be stockpiled on the ROM Pad, within the southern section of the Caloma Waste Rock Emplacement or within the approved disturbance footprint for future processing or incorporation into the final Waste Rock Emplacement landform, if not processed.

This subsection describes the characteristics of the waste rock and low-grade material that would be generated throughout the life of the Project, the anticipated quantities and uses of that material, the design of the waste rock emplacements and the procedures to be used during construction and shaping of those emplacements.

3.6.2 Waste Rock Characterisation

3.6.2.1 Introduction

Waste rock material characterisation is critical for determining the measures required to manage waste rock material throughout and following the life of the Project. The Applicant engaged RGS Environmental Consultants Pty Ltd (RGS) to undertake a material characterisation of Project-related waste rock to be generated from the Caloma Eastern Cutback and the SAR Open Cut. **Appendix 4** presents an overview of those assessments and **Appendices 10** and **11** present the reports themselves, referred to hereafter as RGS (2021a) and RGS (2021b) respectively. Section 3.6.5 presents the waste rock management measures that would be implemented to address matters identified by the material characterisation assessments.

3.6.2.2 Caloma Eastern Cutback

Selected waste rock from the Caloma Eastern Cutback would be used for construction of Project-related infrastructure, including on-site roads and potentially for selected use during construction of the realigned Newell Highway and Kyalite Road and associated intersections. RGS (2021a) tested 50 waste rock samples from six distinct lithologies from below the base of oxidation within the Caloma Eastern Cutback and concluded the following.

- The dolerite and feldspar-phyric porphyry waste rock (referred to hereafter as "andesite") materials are classified as Non-Acid Forming (NAF), with a low risk of acid generation and a high factor of safety with respect to acid mine drainage.
- The only lithologies sampled that contain material classified as Potentially Acid Forming (PAF) are mudstone and mudstone/volcaniclastic siltstone.
- Total metal concentrations in waste rock are generally not significantly enriched compared to median crustal abundance, with the exception minor sporadic enrichment of arsenic and copper in diorite and andesite waste rock.

- Initial water contact with the waste rock materials is likely to be slightly to moderately alkaline, fresh (non-saline) with metals/metalloids in material represented by the NAF waste rock samples likely to be sparingly soluble with concentrations expected to remain within applied freshwater aquatic ecosystem and livestock drinking water quality guideline criteria. Some metal/metalloids may be marginally more soluble in initial contact water from waste rock compared to applied freshwater aquatic ecosystem guideline values. However, all trace metal/metalloid concentrations are well within the livestock drinking water guideline values. In the short-term, soluble metal/metalloid concentrations are unlikely to impact upon the quality of surface and groundwater resources.
- In the longer-term, metal/metalloid solubility from any PAF materials has the potential to increase, if these materials are not covered and are left exposed to oxidising conditions.

3.6.2.3 SAR Open Cut

Waste rock from within the SAR Open Cut would be used for initial site establishment, ongoing site maintenance activities, construction or capping of the Residue Storage Facilities or placement into the Caloma or SAR Waste Rock Emplacements.

RGS (2021b) tested 85 waste rock samples from nine distinct lithologies within the SAR Open Cut, including alluvium and oxidised and fresh rock and concluded the following.

- The overwhelming majority of tested materials may be classified as NAF, with a low risk of acid generation and a high factor of safety with respect to acid mine drainage.
- Some of the igneous lithologies have elevated sulphur content (as sulphide) and have the potential to oxidise over time and be a potential source of neutral mine drainage and saline drainage.
- Total metal concentrations in waste rock are generally not significantly enriched compared to applied guideline values and median crustal abundance in un-mineralised soils. The only exception is arsenic in some of the fresh igneous and quartz-rich lithologies.
- The majority of metals/metalloids in samples tested are likely to be sparingly soluble, with aluminium, arsenic and chromium potentially marginally more soluble. However, all trace metal / metalloid concentrations are well within the livestock drinking water guideline values.
- In the short-term, soluble metal/metalloid concentrations are unlikely to impact upon the quality of surface and groundwater resources. However, in the longer-term, metal/metalloid solubility from any PAF materials has the potential to increase, if these materials are not covered and are left exposed to oxidising conditions.
- Some waste rock materials may potentially be susceptible to dispersion and erosion.

3.6.3 Waste Rock Quantities and Uses

The Applicant anticipates that approximately 64.2 million bank (or *in situ*) cubic metres (Mbcm) of waste rock would be produced from the SAR Open Cut. A further 1.2Mbcm of waste rock would be produced from the Caloma Eastern Cutback. Assuming a swell factor based on the Applicant's experience at the TGO Mine, approximately 81.8 million loose cubic metres (Mlcm) of waste rock would be produced by the Project.

Initially, open cut waste rock would be utilised for a range of site establishment-related purposes. **Table 3.6.1** presents the anticipated uses, volumes, classes and post-mining fate of the materials used.

Table 3.6.1
Indicative Waste Rock Destinations

Infrastructure	Indicative Volume (Mlcm)	Material Source	Post-mining Fate
SAR Amenity Bund	0.5	Alluvium	Removed and used for rehabilitation.
SAR Haul and Services Road	0.2	SAR Alluvium ECB[1] hard rock	Removed and used for rehabilitation.
Administration Area	0.1	SAR Alluvium ECB[1] hard rock	Removed and used for rehabilitation.
Residue Storage Facilities	5.0	ECB and SAR hard rock	Remain in place.
RIM Pad	0.1	SAR Alluvium ECB[1] hard rock	Removed and used for rehabilitation.
Various site roads and other uses	0.1	SAR Alluvium ECB[1] hard rock	Removed and used for rehabilitation.
Caloma Waste Rock Emplacement	17.6	All	Remain in place.
SAR Waste Rock Emplacement	58.2[2]	All	Remain in place.
Total	**81.8**		

Note 1: ECB = Caloma Eastern Cutback.
Note 2: See also Section 3.6.4.2.
Source: Tomingley Gold Operations Pty Ltd

Waste rock produced during underground mining operations would, to the extent practicable, be placed within completed stopes underground. Alternatively, waste rock from underground operations would be transported to surface via the TGO underground workings and placed within the Wyoming 1 Open Cut or stored temporally in surface stockpiles in the vicinity of the Wyoming 1 Open Cut prior to being used for construction or being transferred back underground.

3.6.4 Waste Rock Emplacement Design

3.6.4.1 Caloma Waste Rock Emplacement

Figure 3.6.1 presents the layout of the proposed Caloma Waste Rock Emplacement, and the following presents the indicative design criteria for the Emplacement. In summary, the Caloma 1 and 2 Open Cuts would be backfilled to surface, with the final landform to be a low rise with slopes of approximately 1% to facilitate water drainage from the final landform.

- Area .... approximately 45ha
- Slope .... approximately 1%
- Maximum elevation .... approximately 277m AHD
- Maximum height above pre-mining landform .... up to approximately 7m
- Contained volume[6] .... approximately 17.6Mm^3

3.6.4.2 SAR Waste Rock Emplacement

Figure 3.6.2 presents the layout of the proposed SAR Waste Rock Emplacement. The following presents the indicative design criteria for the emplacement.

- Area 145ha
- Maximum crest elevation .... approximately 335m AHD
- Slope - distance from crest
  - 0m to 100m .... approximately 2% or 1:50 (V:H)
  - 100m to 200m .... Increase from 2% to 16.7%
  - 200m to base .... approximately 16.7% or 1:6 (V:H)
- Maximum height above pre-mining landform .... Approximately 70m
- Contained volume .... approximately 71.8Mm^3

As identified in **Table 3.6.1**, the Applicant anticipates that approximately 58.2Mm^3 of waste rock will be required to be stored within the SAR Waste Rock Emplacement. The proposed SAR Waste Rock Emplacement would therefore have an excess capacity of approximately 13.6Mm^3. This excess capacity has conservatively allowed for the production of a greater volume of waste rock than is currently anticipated. In the event that the final waste volume produced is less than the design storage capacity, the SAR Waste Rock Emplacement would be lower than proposed.

[6] At 1 July 2021, including the approved Caloma Eastern Cutback.

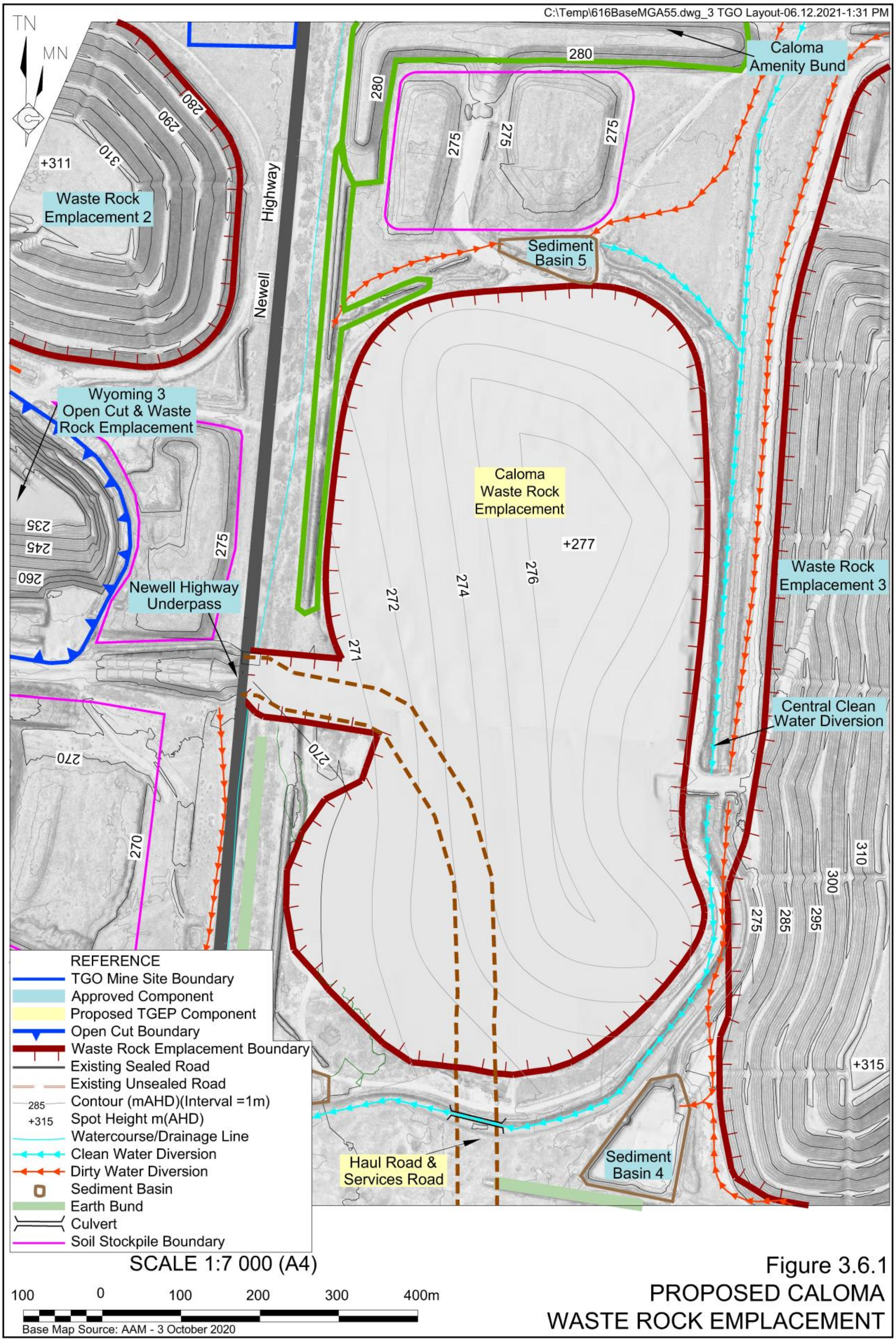


Figure 3.6.1
PROPOSED CALOMA WASTE ROCK EMPLACEMENT

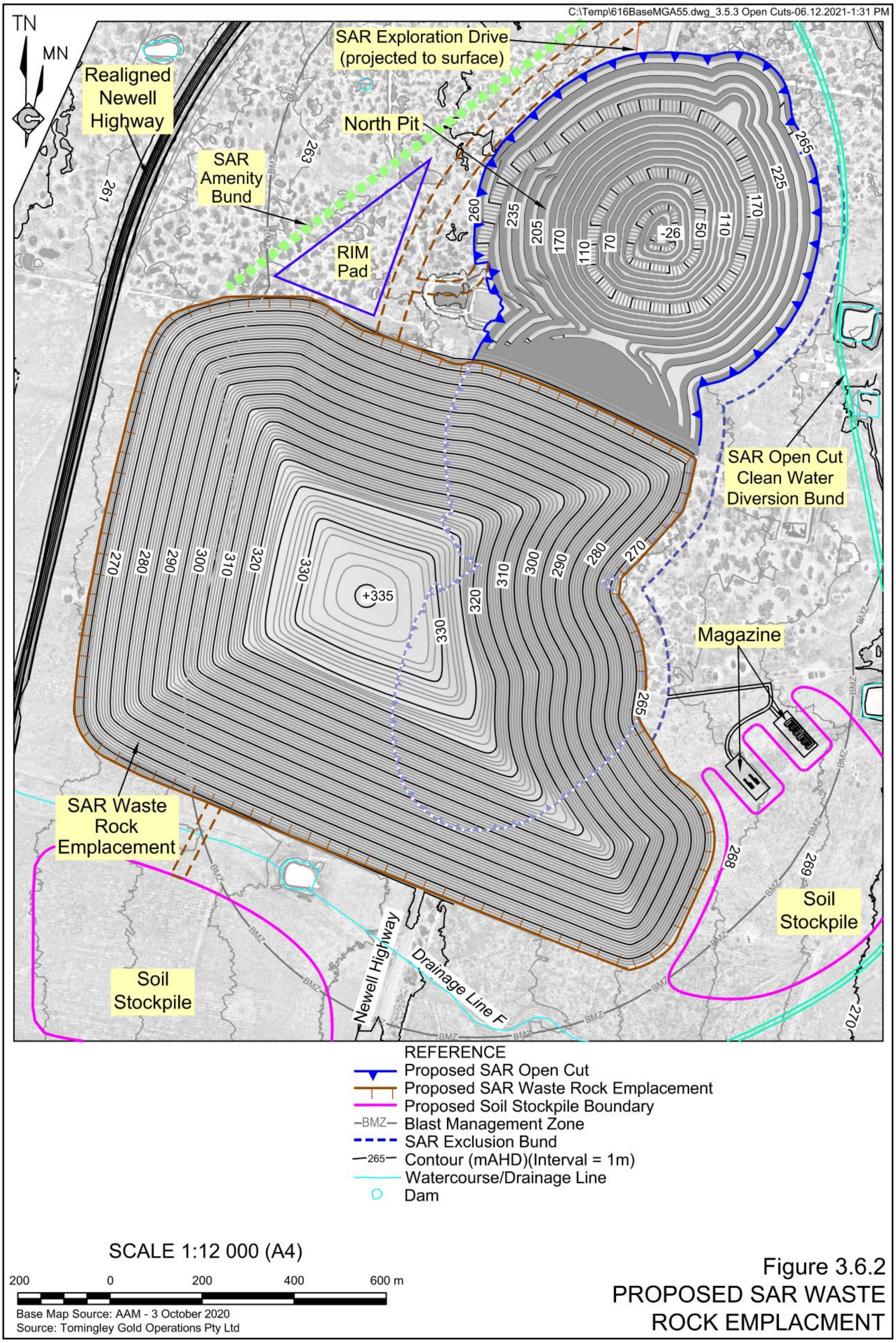


Figure 3.6.2
PROPOSED SAR WASTE ROCK EMPLACMENT

Landloch (2021b) assessed the erodibility and stability of the proposed SAR Waste Rock Emplacement design using the SIBERIA modelling software (see **Appendices 4** and **12**) and determined the following.

- Long-term average soil loss would be less than the target 5t/ha/y under a 60% vegetation cover scenario. The Applicant notes that the current vegetation cover at both TGO and the Peak Hill Gold Mine is approximately 90% and therefore the target soil loss should easily be achieved.
- Gullies are expected to begin to erode through the proposed 300mm of soil cover after 500 years. These gullies primarily form at the convex section of the proposed emplacement where the slope transitions from 5% to 16.7%. In order to mitigate the formation of gullies in this area, Landloch (2021b) has recommended placement of a soil/rock matrix in that location (see Section 3.14.8).

3.6.5 Waste Rock Placement and Management

Waste rock would be classified as follows prior to extraction.

- Construction and rehabilitation raw materials – materials suitable for use during site establishment, in particular for sheeting site roads and in construction of the public road network would be largely comprised of dolerite and andesite from the Caloma Eastern Cutback. Alternatively, friable, clay-rich material may be suitable for use in constructing and rehabilitating the Residue Storage Facilities, in particular for establishing the required permeability barriers. These materials would be separately stockpiled prior to use.
- Potentially acid forming material – comprising primarily mudstone and volcaniclastic siltstone from the Caloma Eastern Cutback. This material would be placed as deep as possible within the in-pit sections of the waste rock emplacements. This material would then be covered with non-acid forming waste rock and growth medium to limit the potential for oxidation and generation of an acidic leachate.
- Material with elevated arsenic concentrations – RGS (2021b) (See Section A4.3.3.5 of **Appendix 4**) identified that Fresh Andesite and Quartz may be relatively enriched and arsenic. These materials would be preferentially placed in-pit or above the in-pit section of the waste rock emplacements and would not be placed in close proximity to the final surface of the waste rock emplacement landforms.
- Friable or weathered material - comprising primarily alluvium and saprolite. This material has the potential to be dispersible. As a result, it would, where practicable, be placed within the in-pit or in central sections of the waste rock emplacements.
- Unweathered material – comprising unoxidized rock that would be non-dispersive and would, to the extent practicable, be placed on the outer batters of the proposed waste rock emplacements, prior to being covered with soil/growth medium. To the extent practicable, large rocks would not be placed close to the final surface of the SAR Waste Rock Emplacement.

Material would be placed using a combination of in-pit and out-of-pit placement techniques. The following presents a brief overview of the proposed in-pit and out-of-pit placement techniques, both of which are currently, or have previously been used at the TGO Mine Site (**Figure 3.6.3**). Material with the potential to be used for rehabilitation operations, would be stockpiled separately and an inventory would be maintained to ensure an adequate volume of that material is available during rehabilitation operations.

In-pit Placement

- Waste rock would initially be paddocked dumped on natural ground adjacent to the open cut to be backfilled.
- A bulldozer would push waste rock into the open cut, resulting in a rill surface within the open cut.
- Only when sufficient material has been pushed into the open cut to ensure the stability of the placed material would haul trucks be permitted to access the backfilled surface.
- Bulldozers would continue to push placed material into the open cut void until it is completely backfilled. At no time would haul trucks direct tip into the open cut void.
- Immediately prior to establishment of the terminal northern face of the in-pit waste rock emplacement between the SAR Open Cut Central and Northern Pits, the advice of a suitably qualified geotechnical engineer would be sought to determine the appropriate terminal face design.

Out-of-pit Placement

- Waste rock would initially be placed around the perimeter of the waste rock emplacement to create a perimeter amenity bund with an outer terminal face with a slope of approximately 1:6 (V:H). The terminal face would be shaped and revegetated as soon as practicable, as described in Section 3.14.
- Once the perimeter amenity bund has been established, waste rock would be paddocked dumped behind the bund and levelled with a bulldozer.
- As the elevation of the inner section of the waste rock emplacement increases, the perimeter amenity bund would be extended upwards (nominally in 10m lifts), shaped, soil spread and revegetated as described above. The Applicant would ensure that a minimum 5m high amenity bund is retained on all sides of the upper surface of the waste rock emplacement to minimise the potential for noise and visual impacts.

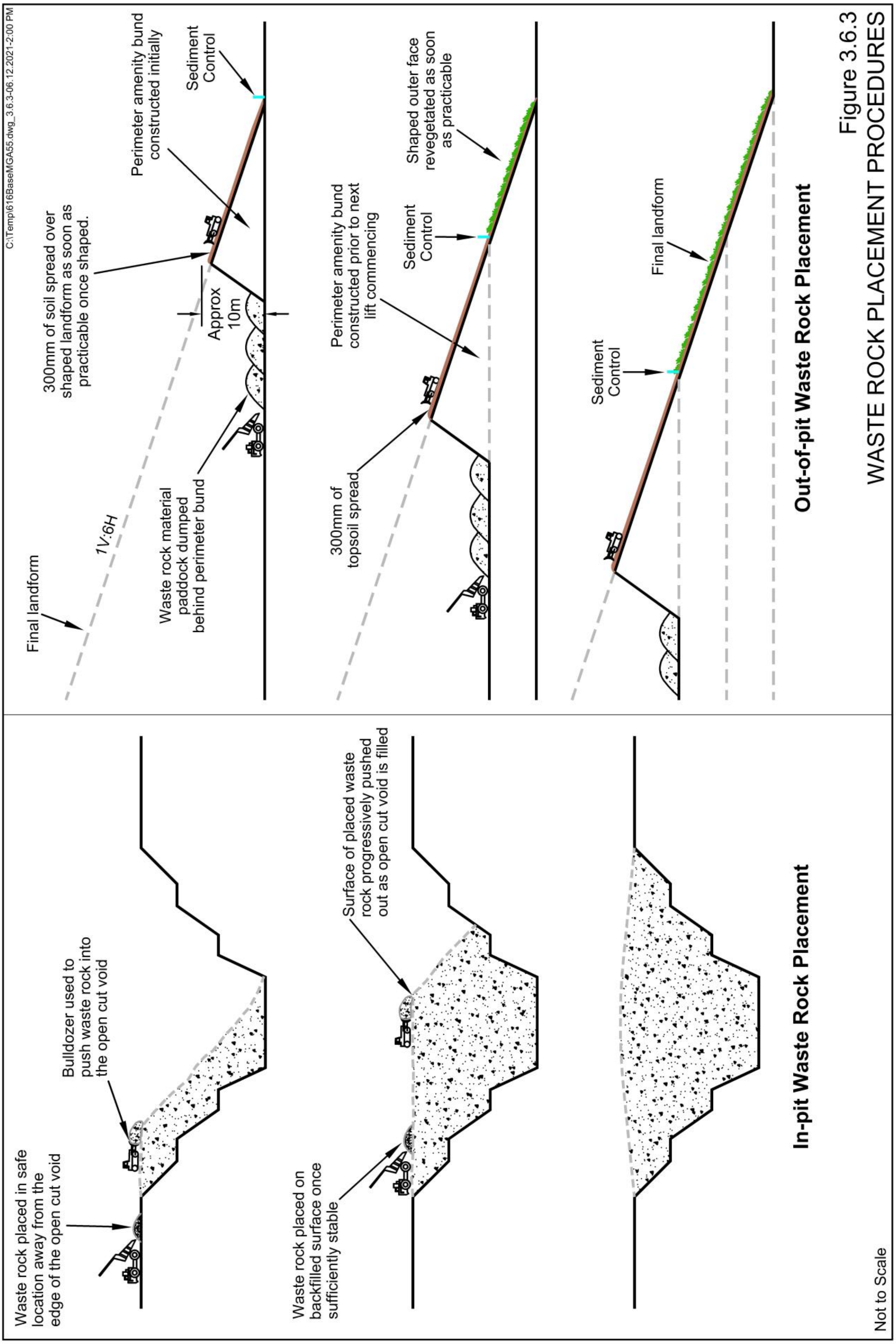


Figure 3.6.3
WASTE ROCK PLACEMENT PROCEDURES

3.6.6 Flexible Elements

Table 3.6.2 presents the waste rock-related flexible elements that cannot be described with certainty at this stage of the Project, together with clear limits on the flexibility sought and a justification of each element. Elements that may be smaller or with lesser impacts than that proposed are not described.

Table 3.6.2
Flexible Elements – Waste Rock and Low-grade Management

Flexible Element	Limit on Flexibility	Justification
Final design of the SAR Waste Rock Emplacement	Side Slopes - <1:6 (V:H) Maximum elevation – 335m AHD	The proposed SAR Waste Rock Emplacement has been conservatively designed to allow for a greater volume of waste rock to be mined than currently anticipated. It is likely, therefore, that the final Waste Rock Emplacements would be lower and / or have less steep side slopes than proposed.
Material movement schedule or destination	Maximum annual waste production - >32.1Mtpa	It is possible that material movement schedule may vary throughout the life of the Project. However, total maximum material movements would be less than 35.25Mt during any financial year throughout the life of the Project.
Use of the RIM Pad	RIM Pad no larger than proposed. Stockpiled material no higher than 7m.	The RIM Pad has been identified as a temporary stockpile area. The material stockpiled within the area may include ROM ore, low-grade material or waste rock. Notwithstanding this, the area of the RIM Pad would be no larger than that proposed and the stockpiles materials no higher than the adjacent SAR Amenity Bund.

3.7 Processing Operations

3.7.1 Introduction

Processing operations would be undertaken using the existing, approved Processing Plant, largely as described in RWC (2011) and approved under MP 09_0155. In order to facilitate the proposed increase in the approved maximum rate of processing from 1.5Mtpa to 1.75Mtpa, an additional ball mill and associated changes to the crushing and grinding circuit are proposed. This subsection briefly describes the existing, approved processing operations, as well as the proposed additional processing-related infrastructure. Management of residue or tailings material from the Processing Plant is described in Section 3.8.

3.7.2 Approved Processing Operations

Plates 3.7.1 and **3.7.2** present oblique aerial views of the existing, approved Processing Plant.

The principal components of the Processing Plant include the following.

ROM Pad and Crushing and Grinding Circuit

Ore material is transported to and stockpiled on the ROM pad. A front-end loader is used to transfer ore to the ROM bin from where it is transferred to a primary jaw crusher and then a secondary cone crusher. A range of screens and conveyors sort and recirculate crushed material to achieve a nominal size of 16mm or less. The crushed material is transferred via conveyor either directly to the grinding circuit or to a crushed ore stockpile. Material from the crushed ore stockpile is transferred to the grinding circuit using a front-end loader.

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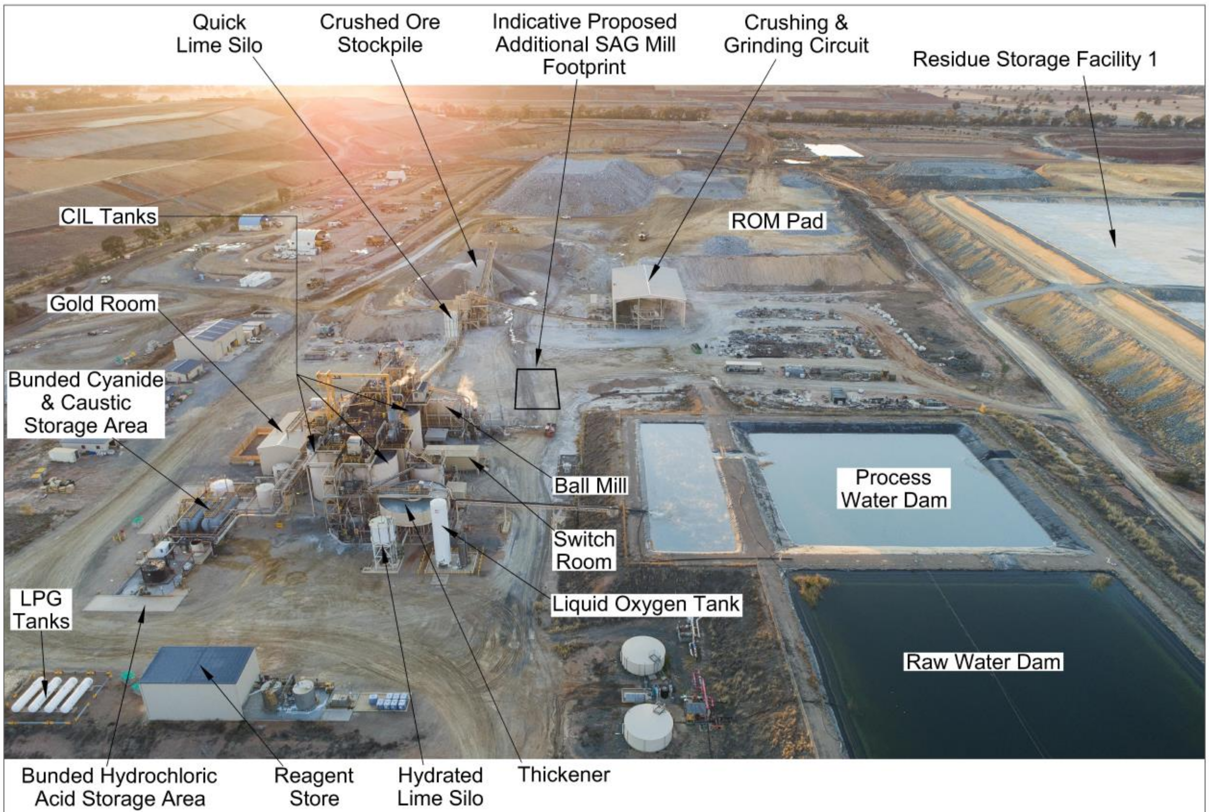

Ref: E616Q20200401/010

Plate 3.7.1: Processing Plant looking northeast

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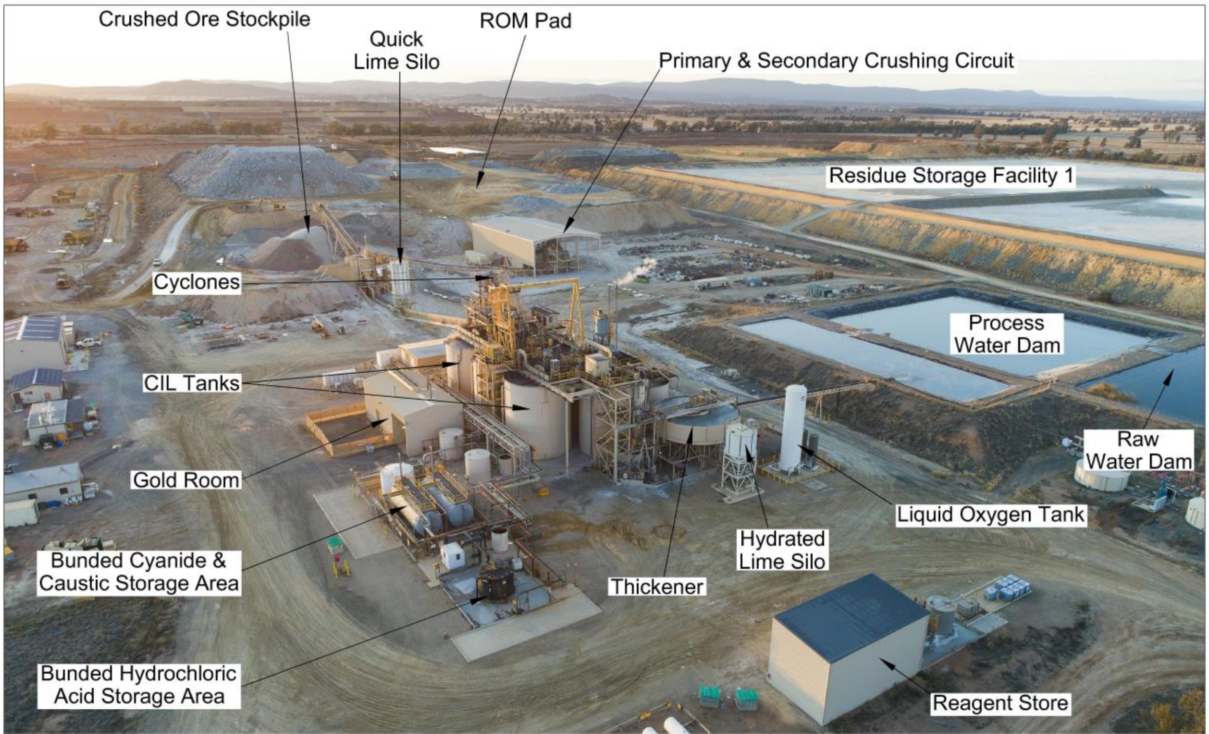

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Plate 3.7.2: Processing Plant looking southeast

The grinding circuit comprises a single stage ball mill with a diameter of 5m and a grinding length of 8.2m. The ore is combined with water and steel balls to further reduce the size of the crushed ore. The overflow from the ball mill flows to a trommel, to remove scat material, with the trommel underflow pumped to a bank of cyclones which classify the material, returning oversize material of greater than 106µm to the ball mill. The dense material in the cyclone underflow is passed to the gravity circuit. Cyclone overflow material less than 106µm is sent to the Carbon-in-Leach circuit.

The grinding circuit has a nominal feed rate of 125t/h for unweathered material, with higher throughputs achievable when processing softer, oxidised material.

Gravity and Leach Circuits

The gravity circuit comprises a centrifugal concentrator which further separates dense and less dense material, with the dense, gravity concentrate pumped to an intensive leach circuit and the less dense material pumped back to the grinding circuit.

The CIL circuit comprises six 979m^3 agitated tanks. The ground ore flows to Tank 1 where a weak solution of sodium cyanide and other additives are added. The cyanide dissolves the gold into solution as the ore and cyanide solution is passed from Tank 1 to Tank 6. Lime is added to increase the pH of the solution and prevent volatilisation of the cyanide and compressed air or oxygen is added to increase the dissolved oxygen concentration. In each tank, the additives are managed to maximise the recovery of gold.

The dissolved gold is recovered from the solution through adsorption onto activated carbon granules which flow counter current, namely from Tank 6 to Tank 2 where it is removed from the circuit. The gold-loaded carbon is then collected and transferred to the elution circuit.

In addition, the gravity concentrate, which typically contains much higher concentrations of gold than the feed for the CIL circuit, is passed to an intensive leach circuit where the concentrate is subjected to an intensive cyanidation process, operated at higher temperatures and pressures than a standard CIL circuit. The gold-bearing solution from the intensive leach circuit is transferred to the elution circuit and the tail from the intensive leach circuit is passed to the grinding circuit.

Gold Room Operations

Loaded carbon from the CIL circuit is transferred to an elution circuit which contains a strong solution of hot caustic and cyanide. This step re-dissolves the adsorbed gold into a concentrated solution. The gold-bearing solution from the intensive leach is then combined with the elution solution and together they are recovered onto steel wool using electrowinning. Activated carbon stripped of gold is returned to the CIL circuit for re-use.

The gold-covered steel wool is then fired with a range of fluxes in a furnace to produce gold doré, or unrefined gold bars, which are then transferred securely from the TGO Mine Site for further refining off site.

Residue Thickening and Cyanide Destruction

The remaining slurry from the CIL circuit is removed and flows to a thickener where water is removed to recover as much of the cyanide as possible for reuse in the CIL circuit. The remaining material is then treated using a cyanide destruction circuit and the residue is pumped to the residue storage facilities (see Section 3.8).

Reagent Management

Table 3.7.1 presents the reagents and consumables regularly used within the Processing Plant. All reagents are received, stored, used and managed in accordance with the Applicant's *Hazardous Materials Management Plan* available on the Applicant's website.

Table 3.7.1
Processing Reagents and Consumables

Reagent	Purpose	Form	Maximum Storage Capacity	Dangerous Goods Code
Cyanide and cyanide compounds	Leaching of gold	Liquid	2 x 100 000L tanks	6.1 (toxic)
Sodium hydroxide (caustic)	pH management during elution and intensive leach	Liquid	20 000L tank	8 (corrosive)
Hydrochloric acid (33%)	Regeneration of activated carbon	Liquid	30 000L tank	8 (corrosive)
Lime (quick lime and hydrated lime)	pH management during leaching and cyanide detoxification	Solid	2 x silos	nil
Sodium Metabisulphite	cyanide detoxification	Solid	35 x 1.2m^3 bulka bags stored in a bunded reagent store	Nil
Copper sulphate	Catalyst in the cyanide detoxification process	Liquid	25 x 1m^3 Intermediate Bulk Containers in a bunded reagent store	9 (misc)
Liquefied Petroleum Gas (LPG)	Heating	Liquified gas	4 x 7.5m^3 tanks	2.1 (flammable gas)
Liquid oxygen	Management of dissolved oxygen in CIL Circuit	Liquified gas	60m^3 tank	2.2 (non-flammable, non-toxic gas)
Source: Tomingley Gold Operations Pty Ltd – *Hazardous Materials Management Plan* – after Section 5				

Cyanide and cyanide compounds

Cyanide is transported to the TGO Mine Site as solid briquettes using 22t isotainers. On arrival on site, the isotainers are connected to the cyanide storage tanks within a bunded, concrete sealed area (**Plates 3.7.1** and **3.7.2**) and water is pumped from the storage tanks into the isotainers to dissolve the briquettes. The resulting solution is stored within the two tanks in a concrete bunded area adjacent to the Processing Plant.

Cyanide solution is added to the leach circuit in the quantities required. The pH of the cyanide leach solution is managed through the addition of lime and caustic to minimise the potential for volatilization of hydrogen cyanide, a gas with the potential for adverse impacts on humans and animals. Monitoring of cyanide concentrations in the leach solution and air is undertaken continuously and personnel evacuated in the event that excessive cyanide gas is detected. Measures are implemented immediately to reduce the concentration of hydrogen cyanide within the Processing Plant.

EPL 20169 nominates the following discharge limits for weak acid dissociable cyanide discharged into the residue storage facilities as follows. These limits are achieved through the use of a cyanide destruction circuit prior to discharge of residue.

- 90th percentile limit.. 20mg/L
- 100th limit 30mg/L

Finally, the Applicant inspects the residue storage facilities twice daily for stranded or cyanide affected wildlife. Section 1.4.7.2 presents the results of that monitoring, in summary, however 4 bird deaths and one wallaby death have been recorded, with none attributable to cyanide toxicity.

Other Reagents

All other reagents are managed in accordance with their Safety Data Sheets, manufacturer's instructions and the procedures identified in the *Hazardous Materials Management Plan.*

3.7.3 Proposed Processing Operations

MP 09_0155 permits processing operations up to a maximum of 1.5Mtpa. Notwithstanding this, the current design of the Processing Plant has permitted processing of a maximum of only 1.14Mtpa during the Financial Year 2015 when the approved TGO Open Cuts were mining saprolite and oxide ore (see **Table 1.3**). The principal constraint to achieving a higher processing rate has been the crushing and grinding circuit. As a result, the Applicant proposes to install a Semi-autogenous grinding (SAG) Mill to increase capacity and throughput. The SAG mill would be located adjacent to the existing Processing Plant in an area previously disturbed by mining-related activities (**Figure 3.3.1** and **Plate 3.7.1**).

The proposed SAG mill would indicatively have a diameter of 5.5m and a grinding length of 3.65m. The SAG mill would operate in a similar manner to the existing ball mill, with crushed ore and water added and rotation of the mill would result in the reduction in the size of the crushed ore through attrition with steel balls within the mill. The SAG mill would permit larger sized ore to be discharged from the crushing circuit, thereby increasing the throughput of that circuit. The coarsely crushed material would then be ground using the SAG mill which would be discharge to the ball mill for further grinding of the ore. The Applicant would retain the ability to bypass the SAG Mill, if required.

The Applicant anticipates that the proposed SAG Mill would increase the nominal feed rate for the Processing Plant when processing unweathered ore from 125t/h to approximately 188t/h. Allowing for a 91% availability, this would equate to a production rate that would be unchanged from the approved rate of 1.5Mtpa. Notwithstanding this, a substantial proportion of the ore within the upper sections of the SAR deposits is saprolite or oxidised material. This material is significantly softer and more easily crushed and ground than unweathered material. As a result, the Applicant anticipates that when processing such ore, nominally in Financial Year 2025, a production rate of up to 1.75Mtpa may be achieved. In all other years, the production rate would be less than the currently approved 1.5Mtpa (see Section 3.5.4.2 and **Table 3.5.2**).

No other substantive changes to the operation of the Processing Plant or processing operations are proposed.

3.7.4 Flexible Elements

Table 3.7.2 presents the processing-related flexible elements that cannot be described with certainty at this stage of the Project, together with clear limits on the flexibility sought and a justification of each element. Elements that may be smaller or with lesser impacts than that proposed are not described.

Table 3.7.2
Flexible Elements – Processing Operations

Flexible Element	Limit on Flexibility	Justification
Processing procedures, plant, equipment and reagents	No additional substantial plant or equipment other than that described. No significant additional emissions of noise, dust, gases or odour. No substantial change to the reagents used. Maximum rate of processing no greater than 1.75Mtpa.	Processing methodology, equipment and techniques are continually evolving and being optimised to maximise recovery of contained gold or the efficiency of processing operations. Minor adjustments to the processing equipment, process flow sheet or reagents used may be identified and implemented throughout the life of the Project.

3.8 Residue Management

3.8.1 Introduction

Following completion of processing operations, the residue or tailings in the form of a slurry from which the majority of the gold and cyanide has been removed would be pumped to Residue Storage Facility 1 or Residue Storage Facility 2. Residue Storage Facility 1 is approved to Stage 9, Cell 1, while Residue Storage Facility 2 is approved to Stage 2. This application seeks development consent for the construction of Stages 3 to 9 of Residue Storage Facility 2.

This subsection provides an overview of the material characteristics of the residue produced, the design and operation of the approved and proposed residue storage facilities as well as the proposed monitoring and closure of the facilities. Section 3.5.3.2 describes the proposed pastefill plant which would utilise residue from Processing Plant or the Residue Storage Facilities.

3.8.2 Residue Characterisation

DE Cooper & Associates Pty Ltd (Cooper, 2011) prepared an initial assessment of material characterisation of residue to be produced at TGO. That assessment was reviewed and confirmed by GHD (2016). As the mineralogy of ore within the SAR deposits is nearly identical to that at TGO, the Applicant contends that the residue to be produced from SAR ore would be consistent with that produced to date at TGO.

Cooper (2011) and GHD (2016) determined the following.

- All residue samples tested were non-acid forming.
- Decant water collected from the settled tailings had concentrations of dissolved arsenic and copper that exceeded the ANZECC (2000) stock watering guidelines.

The Applicant notes that since commissioning of Residue Storage Facility 1 in 2013, that there have been no significant issues related to material characterisation of the residue produced at TGO, including no evidence of generation of a low pH leachate or generation of a leachate with metal concentrations that requires anything other than industry standard management measures.

3.8.3 Design of the Residue Storage Facilities

3.8.3.1 Approved Residue Storage Facilities

Figure 3.8.1 and **Table 3.8.1** present the layout and design criteria for the approved residue storage facilities. In summary, development consent for the approved residue storage facilities were granted as follows.

- Residue Storage Facility 1 (Stages 1 to 6) ....Original Project Approval (2012)
- Residue Storage Facility 1 (Stages 7 to 9) MOD4 (2020)
- Residue Storage Facility 2 (Stages 1 and 2)......................................MOD5 (2021)

Table 3.8.1
Approved Residue Storage Facilities Design Criteria

Design Component	Residue Storage Facility 1		Residue Storage Facility 2
Maximum approved stage	Stage 9, Cell 1	Stage 8, Cell 2	Stage 2
Maximum crest elevation	286.5m AHD	284.5m AHD	272.0m AHD
Maximum residue elevation	286.0m AHD	284.0m AHD	271.3m AHD
Slope of outer face	1:3 (V:H)		1:3 (V:H)
Design capacity (approximate)	8.93Mt		7.40Mt
Residue discharge	Perimeter discharge		Perimeter discharge
Decant system	Central decant		Central decant
Minimum decant pond capacity	1:10 000-year AEP flood event		1:10 000-year AEP flood event
External decant storage	Caloma Central Dam		Caloma Central Dam
Basal liner • Material • Permeability	 Clay Maximum 1 x 10^{-9} over 1m		 Clay Maximum 1 x 10^{-9} over 1m
Spillway	Not required, designed for no spill		designed for no spill Emergency spillway for 1:1 000 AEP rainfall event
ANCOLD Category • Dam Failure Consequence • Environmental Spill Consequence	 Significant Significant		 Significant Low

A modification application for in-pit residue placement within the Wyoming 3 Open Cut was prepared prior to the MOD4 application but was withdrawn in 2016 following extensive consultation with the Environment Protection Authority. The principal issue of concern for the Environment Protection Authority was the fact that a permeability barrier that complied with the Authority's *Tailings Dam Liner Policy* could not be established.

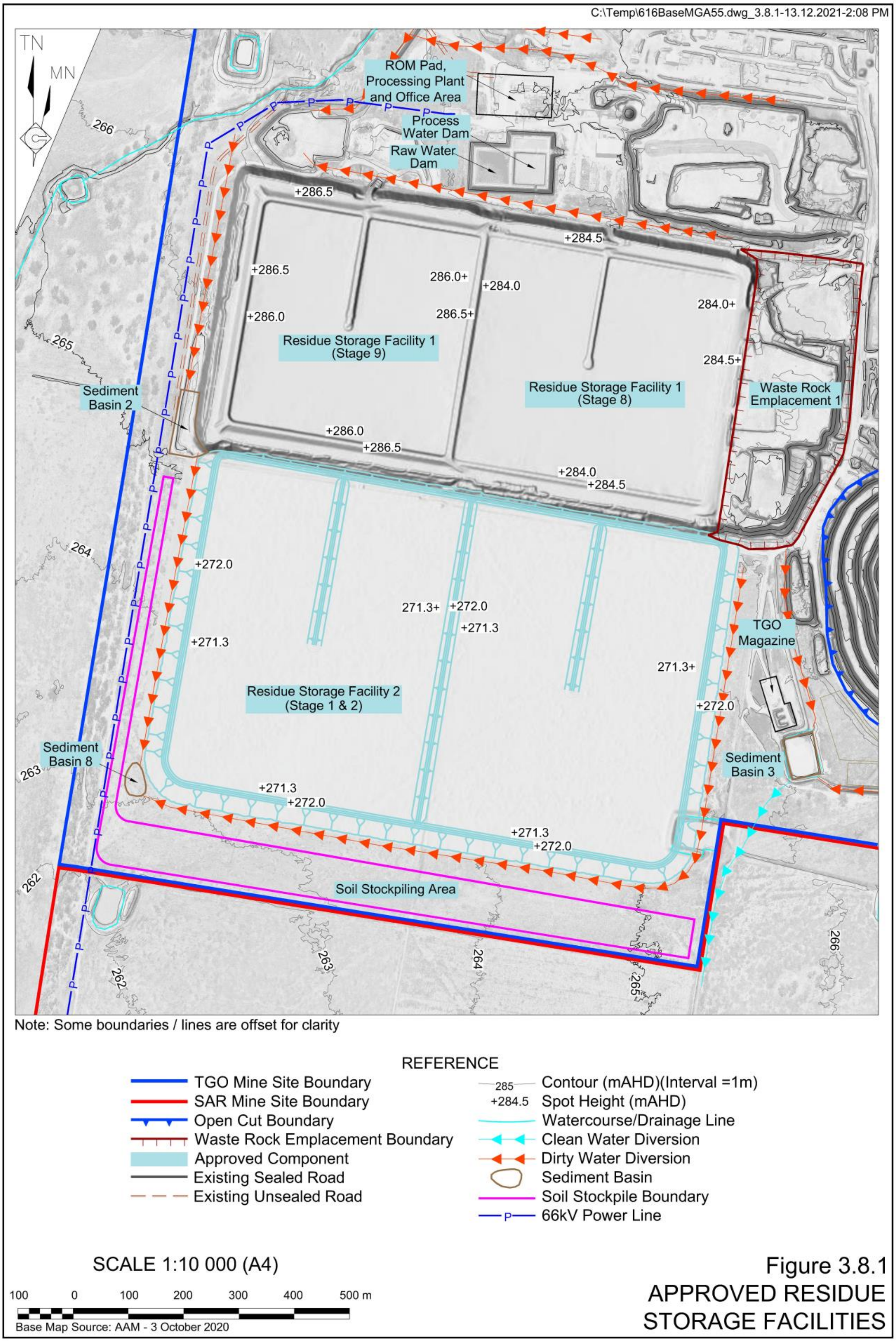


Figure 3.8.1
APPROVED RESIDUE STORAGE FACILITIES

3.8.3.2 Proposed Residue Storage Facility 2 – Stages 3 to 9

GHD prepared a design report for Residue Storage Facility 2, incorporating a detailed design for the approved Stage 1 and conceptual design for Stages 2 to 9. The resulting report is referred to hereafter as GHD (2021a) and is presented as **Appendix 13**. The detailed design for Stage 1 is largely consistent with the design presented in the *Modification Report* for MOD5 for MP 09_0155. The following presents an overview of the conceptual design criteria for Stages 3 to 9 of Residue Storage Facility 2. It is noted that the design of Stages 3 to 9 may be adjusted from that proposed in this document to reflect performance of Stages 1 and 2 or other relevant matters. Any revised design would be no higher or larger than that proposed in this document.

GHD (2021a) have prepared the conceptual RSF2 Stage 3 to 9 design based on the following.

- ANCOLD Guidelines on Tailings Dams.
- Relevant International Commission on Large Dams Guidelines.
- *Dam Safety NSW Regulation 2019*.
- NSW Environment Protection Authority, *Tailings Dam Liner Policy* Letter (2016).

Figures 3.8.2 to **3.8.4** and **Table 3.8.2** present the layout and design criteria for the proposed Residue Storage Facility 2 Stages 3 to 9. For comparison purposes, the approved design criteria for Residue Storage Facility 2 Stages 1 and 2 are also presented in **Table 3.8.2**.

Table 3.8.2
Proposed Residue Storage Facility 2 (Stages 3 to 9) Design Criteria

Design Component	Approved Design Criteria (Stages 1 and 2)	Proposed Design Criteria (Stages 3 to 9)
Maximum crest elevation	272.0m AHD	286.0m AHD
Maximum residue elevation	271.3m AHD	285.3m AHD
Construction Methodology	Centre line lift	Indicatively centre line lift
Slope of outer face (except northern embankment)	1:3 (V:H)	1:3 (V:H)
Cumulative maximum volume	3.2Mm^3	10.7Mm^3
Assumed residue density	1.4t/m^3	1.4t/m^3
Design capacity (approximate)	4.5Mt	15.0Mt
Proposed footprint	64.3ha	77.4ha
Residue discharge	Perimeter discharge	Perimeter discharge
Decant system	Central decant	Central decant
Minimum decant pond capacity	1:10 000-year AEP flood event	1:10 000-year AEP flood event
External decant storage	Caloma Central Dam	Caloma Central Dam
Basal liner • Material • Permeability	 Clay Maximum 1 x 10^{-9} over 1m	 Clay Maximum 1 x 10^{-9} over 1m
Spillway	designed for no spill Emergency spillway for 1:1 000 AEP 72-hour rainfall event	designed for no spill Emergency spillway for 1:1 000 AEP 72-hour rainfall event
ANCOLD Category • Dam Failure Consequence • Environmental Spill Consequence	 Significant Low	 Significant Low
Source: GHD (2021a)		

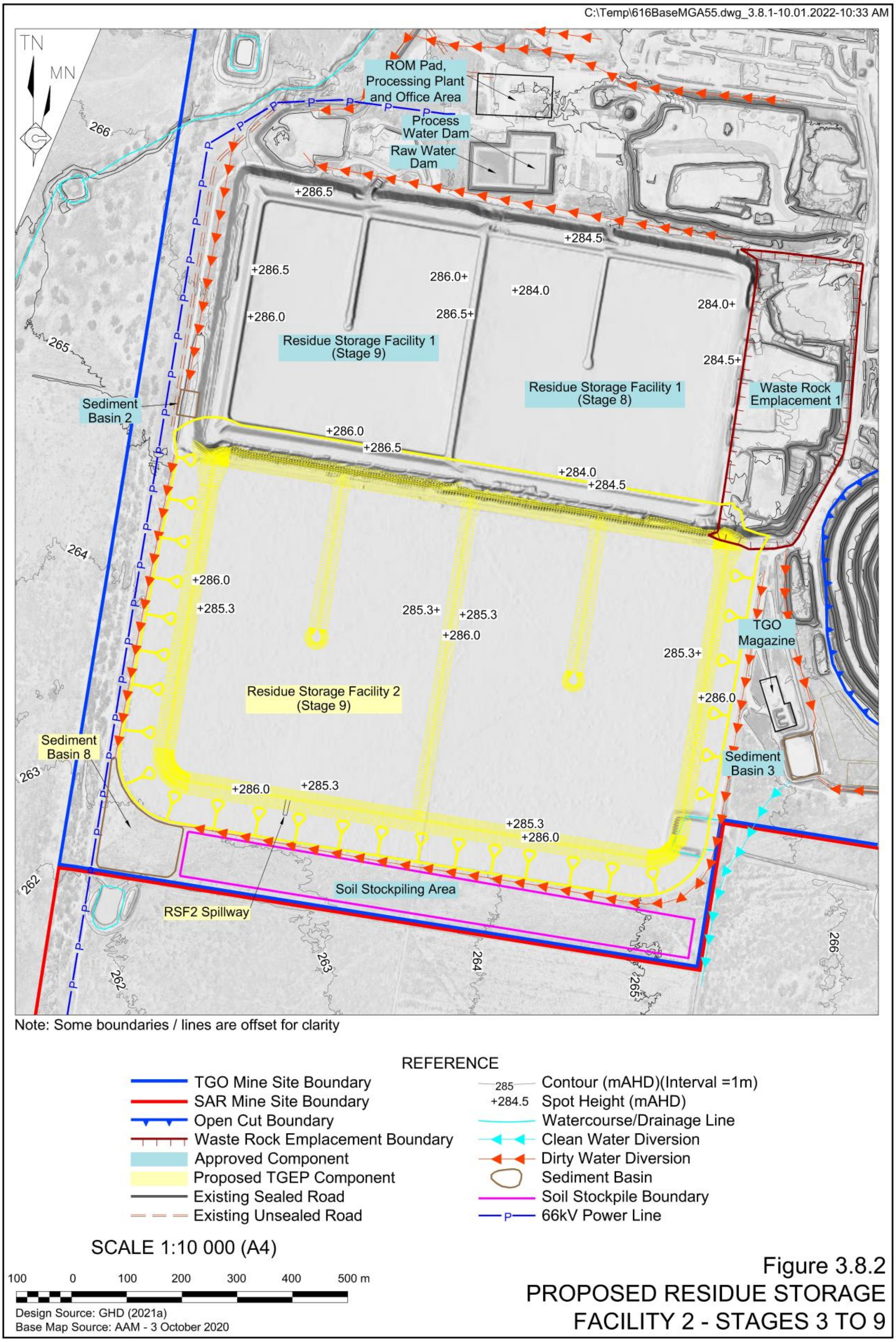
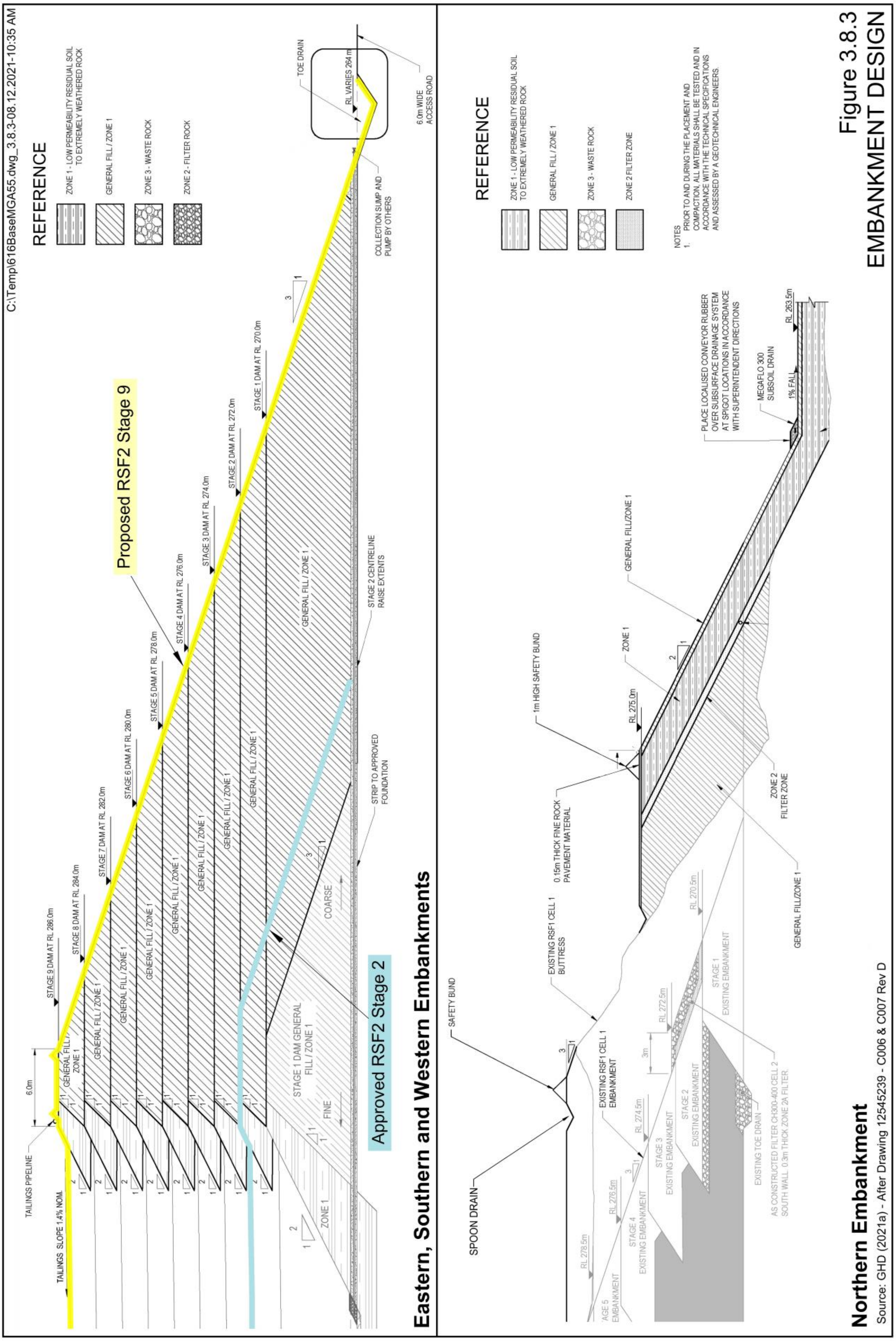


Figure 3.8.2
PROPOSED RESIDUE STORAGE FACILITY 2 - STAGES 3 TO 9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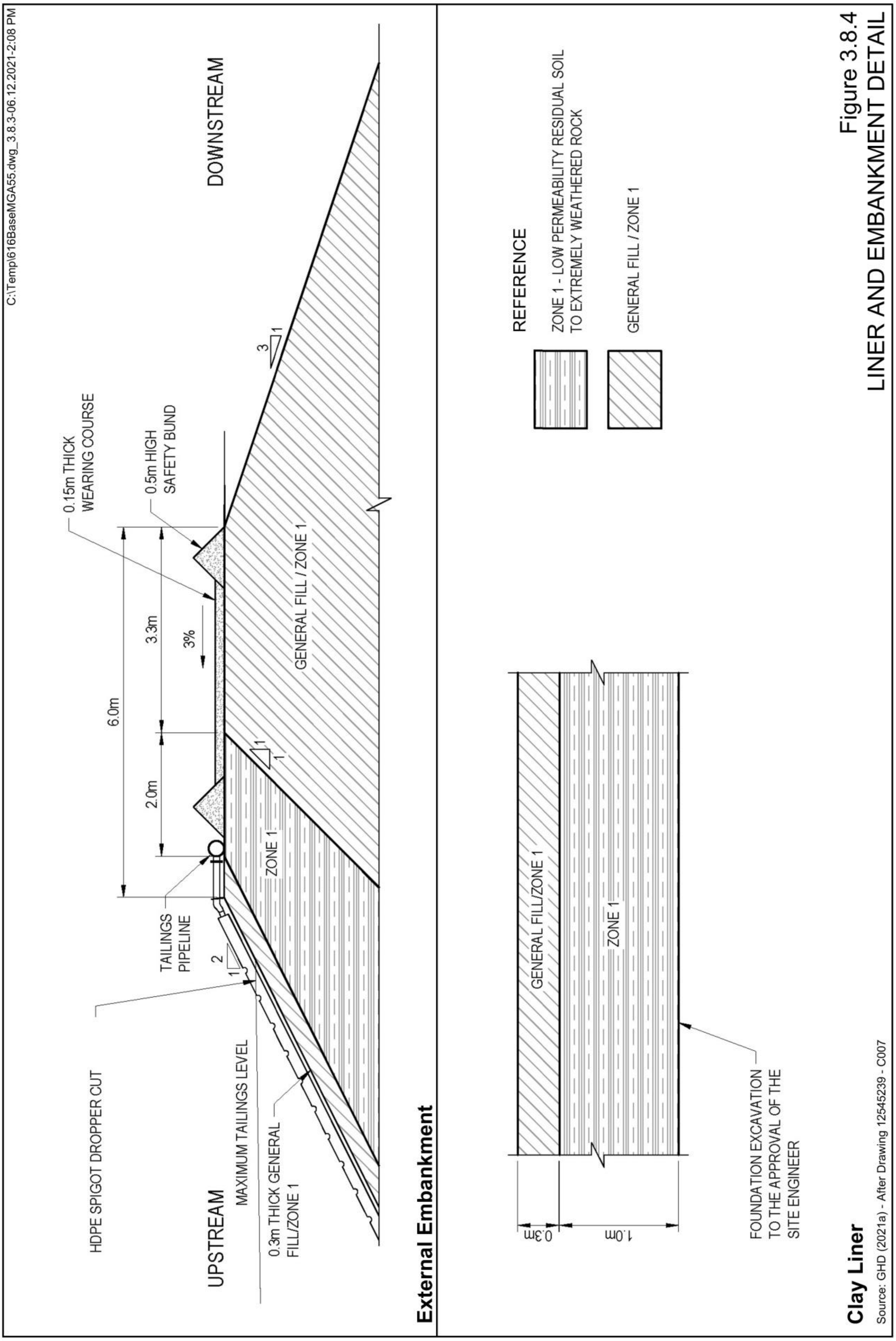
REFERENCE
ZONE 1 - LOW PERMEABILITY RESIDUAL SOIL TO EXTREMELY WEATHERED ROCK
GENERAL FILL / ZONE 1
ZONE 3 - WASTE ROCK
ZONE 2 - FILTER ROCK
Proposed RSF2 Stage 9
Approved RSF2 Stage 2
STAGE 9 DAM AT RL 286.0m
STAGE 8 DAM AT RL 284.0m
STAGE 7 DAM AT RL 282.0m
STAGE 6 DAM AT RL 280.0m
STAGE 5 DAM AT RL 278.0m
STAGE 4 DAM AT RL 276.0m
STAGE 3 DAM AT RL 274.0m
STAGE 2 DAM AT RL 272.0m
STAGE 1 DAM AT RL 270.0m
TAILINGS PIPELINE
TAILINGS SLOPE 1.4% NOM.
6.0m
STAGE 1 DAM GENERAL FILL / ZONE 1
FINE
COARSE
ZONE 1
STAGE 2 CENTRELINE RAISE EXTENTS
STRIP TO APPROVED FOUNDATION
COLLECTION SUMP AND PUMP BY OTHERS
TOE DRAIN
RL VARIES 264m
6.0m WIDE ACCESS ROAD
Eastern, Southern and Western Embankments
REFERENCE
ZONE 1 - LOW PERMEABILITY RESIDUAL SOIL TO EXTREMELY WEATHERED ROCK
GENERAL FILL / ZONE 1
ZONE 3 - WASTE ROCK
ZONE 2 FILTER ZONE
NOTES
1. PRIOR TO AND DURING THE PLACEMENT AND COMPACTION, ALL MATERIALS SHALL BE TESTED AND IN ACCORDANCE WITH THE TECHNICAL SPECIFICATIONS AND ASSESSED BY A GEOTECHNICAL ENGINEERS.
SPOON DRAIN
SAFETY BUND
EXISTING RSF1 CELL 1 EMBANKMENT
EXISTING RSF1 CELL 1 BUTTRESS
0.15m THICK FINE ROCK PAVEMENT MATERIAL
1m HIGH SAFETY BUND
ZONE 1
GENERAL FILL/ZONE 1
RL 275.0m
ZONE 2 FILTER ZONE
PLACE LOCALISED CONVEYOR RUBBER OVER SUBSURFACE DRAINAGE SYSTEM AT SPIGOT LOCATIONS IN ACCORDANCE WITH SUPERINTENDENT DIRECTIONS
MEGAFLO 300 SUBSOIL DRAIN
1% FALL
RL 263.5m
RL 278.5m
RL 276.5m
RL 274.5m
RL 272.5m
RL 270.5m
STAGE 4 EXISTING EMBANKMENT
STAGE 3 EXISTING EMBANKMENT
STAGE 2 EXISTING EMBANKMENT
STAGE 1 EXISTING EMBANKMENT
EXISTING TOE DRAIN
AS CONSTRUCTED FILTER CH300-400 CELL 2 SOUTH WALL. 0.3m THICK ZONE 2A FILTER.
Northern Embankment
Source: GHD (2021a) - After Drawing 12545239 - C006 & C007 Rev D
Figure 3.8.3
EMBANKMENT DESIGN



Source: GHD (2021a) - After Drawing 12545239 - C007

Figure 3.8.4
LINER AND EMBANKMENT DETAIL

Following establishment of the eastern, southern and western starter embankments, subsequent lifts would be designed as centreline lifts, whereby the crest of the subsequent embankment would be established vertically above the crest of the previous embankment.

The northern embankment would be integrated into to southern embankment of Residue Storage Facility 1 and the facilities would essentially buttress each other. A suitable zone of engineered fill would be established between the facilities to enable a stable and uniformly shaped foundation for the establishment of the Residue Storage Facility 2 northern embankment. Suitable drainage would be established between the facilities to ensure that the central embankment is adequately drained.

Residue Storage Facility 2 would be constructed using a range of engineered materials as follows.

- Zone 1: Low permeability clay material, including alluvial and saprolite material. This material would form the liner and inner low permeability section of the embankments. The liner material in particular would be water conditioned and roller compacted in layers to achieve the required permeability and thickness.
- Zone 2: Filter rock, including crushed, screened and graded waste rock. This material would be used between Residue Storage Facility 1 and 2 to ensure that the embankment is appropriately drained.
- Zone 3: General fill, comprising waste rock or material extracted from the basin of the Residue Storage Facility and would provide the structural support for the facility.

The combined capacity of Residue Storage Facility 1 and 2 would be 8.93Mt and 15Mt respectively, for a combined total of 23.93Mt. The Applicant estimates that ore milled and therefore residue produced to 30 June 2021 is 7.5Mt (see **Table 1.3**). At that date, ore reserves of approximately 11.82Mt and mineral resources of approximately 27.01Mt remained. The proposed mining schedule (see **Table 3.5.2**) identified that approximately 16.35Mt of ore and low-grade material would be processed between July 2021 and December 2032 for a total life of mine production of 23.85Mt. As a result, the proposed Residue Storage Facility 2 would include sufficient capacity for all residue likely to be produced throughout the life of the Project.

Residue Storage Facility 2 would be equipped with a range of instrumentation to ensure the ongoing safe operation of the Facility, including the following.

- GPS monuments and other monitoring tools capable of detecting small movements in the Facility embankments.
- Vibrating wire piezometers to monitor the pore water through the tailings and the efficiency of the underdrainage system.
- Piezometers to monitor for seepage of leachate from the Facility, with the number and location to be approved as a component of the *Water Management Plan* prior to commissioning of the Facility.

3.8.4 Construction of Residue Storage Facility 2

The approved Residue Storage Facility 2 Stage 1 would be constructed as described by GHD (2021a). Construction is expected to commence in early 2022 and would comprise the following activities.

- Excavation of the floor of the facility to expose the foundation material and establish the required slopes to permit appropriate placement and consolidation of residue.
- Construction of the starter embankments and decant infrastructure using material extracted from the basin of Residue Storage Facility 2.
- Establishment of the clay liner across the floor and inner faces of the embankments (**Figure 3.8.4**). The liner would be designed and constructed to achieve a maximum permeability of 1 x 10^{-9}m/s over 1m. The geotechnical investigation presented as Appendix C of GHD (2021a) identified the foundation material to be clay rich with measured permeability between 2 x 10^{-10}m/s and 4 x 10^{-11}m/s. Water conditioning and compaction of this material would ensure that the proposed permeability of 1 x 10 ^{9}m/s over 1m is achieved.
- Establishment of a cover layer over the liner material to facilitate dewatering of the residue and to protect the liner during filling.
- Establishment of required infrastructure to operate the facility, including an emergency spillway, residue discharge pipes, monitoring infrastructure, access tracks around the crest and perimeter of the facility and a perimeter drain and seepage collection infrastructure.

Following establishment of the starter embankment, Residue Storage Facility 2 would be progressively raised in 2m lifts using the centreline lift methodology. Each lift would be constructed as the previous lift approached its maximum storage capacity. The Applicant would ensure that the maximum filling level of each stage is not exceeded.

Construction operations would be supervised by a suitably qualified and experienced person who would certify that the Facility had been constructed to the appropriate standard and that all identified construction criteria, including achieving the design liner permeability, had been achieved.

3.8.5 Operation of the Residue Storage Facilities

Operation of the residue storage facilities would be undertaken largely as it has been since the commencement of TGO. A detailed Operating Manual would be prepared by the design engineer and the Applicant would strictly implement the manual throughout the life of the Project.

Residue would continue to be deposited from spigots around the perimeter of each cell to form a “beach”, with supernatant water permitted to flow to central decant towers from where it would continue to be pumped to either the Process Water Pond (see **Figure 3.8.1**) or the Wyoming Central Dam (see **Figure 3.1.2**). Excess surface water would not, under normal operating conditions, be stored within the Facility.

The Applicant would continue to manage dust emissions through the management of the residue discharge cycles to maintain a damp surface. In the event that tailings discharge is halted for a period, chemical polymer dust suppressants may be applied to the surface of the residue to prevent dust lift off.

The Applicant would continue to ensure that the concentration of weak acid dissociable cyanide in residue discharged to the Facility is less than 20mg/L 90% of the time, with a maximum concentration of 30mg/L at all times.

Seepage from the facilities would continue to be collected using perimeter collection drains and would be directed to one or more seepage collection ponds from where it would be pumped to the surface of the facility. A network of piezometers would be installed and monitored to detect seepage from the Facility.

3.8.6 Flexible Elements

Table 3.8.3 presents the residue-related flexible elements that cannot be described with certainty at this stage of the Project, together with clear limits on the flexibility sought and a justification of each element. Elements that may be smaller or with lesser impacts than that proposed are not described.

Table 3.8.3
Flexible Elements – Residue Management

Flexible Element	Limit on Flexibility	Justification
Design of the residue storage facilities	Area – maximum 77.4ha Height – maximum 286m AHD Compliance with ANCOLD and related standards	Design and construction standards for residue storage facilities are periodically updated. As GHD (2021a) presents a detailed design for Stage 1 of Residue Storage Facility 2 only, with Stages 2 to 9 presented as conceptual designs, it is possible that subsequent amendments to the relevant design guidelines may result in the detailed design for Stages 2 to 9 being different to that presented in this document. Notwithstanding this, Residue Storage Facility 2 would be no higher and have a footprint no larger than that described in **Table 3.8.2**.
Operation of the residue storage facilities	Perimeter discharge Environmental impacts no greater than that described in this EIS	Operational requirements, including changing best practice standards for residue management, may result in operational procedures that may differ slightly from those described in Section 3.8.5. Notwithstanding this, Residue Storage Facility 2 would continue to operate as a perimeter discharge facility with Environmental impacts no greater than that described in this EIS.

3.9 Water Management Strategy

3.9.1 Introduction

Management of water within the Project Site would a critical component of Project-related activities. This Section provides a brief description of the existing and proposed water management system within the TGO and SAR Mine Sites respectively, as well as an overview of the proposed additional water supply bore and pipeline and water balance for the Project. Sections 6.6 and 6.7 present a detailed description and assessment of Project-related surface water and groundwater management and impacts.

3.9.2 Water Management System

3.9.2.1 Water Management Plan

The approved TGO *Water Management Plan*[7] describes the water management system for the TGO Mine Site. The *Water Management Plan* would be updated to reflect the proposed activities within the SAR Mine Site, including construction activities, prior to those activities commencing. In particular, one or more detailed *Construction Environmental Management Plans* would be prepared for road construction operations, including a *Soil and Water Management Subplan*, incorporating an *Erosion and Sediment Control Plan* prepared in accordance with the requirements of *Managing Urban Stormwater*. A similar plan would be prepared for mining-related site establishment operations

The water management principles currently applied at the TGO Mine Site would be extended to the SAR Mine Site following the commencement of construction and mining operations.

3.9.2.2 Classes of Water

All water within the Project Site would continue to be classified as follows.

- Clean water – comprising surface water from areas upslope of the Project Site. Clean water is currently, and would continue to be, diverted around disturbed sections within the Project Site and permitted to flow to natural drainage. Existing and proposed clean water diversions provide flood protection for flood events up to a 1% Annual Exceedance Probability[8] (AEP) flood event.
- Raw water – comprising externally sourced water that is and would continue to be imported to site for mining-related purposes. Raw water is currently supplied via the approved water pipeline from the approved "Woodlands" borefield. Additional raw water may be supplied from the proposed "Dappo" bore via the same pipeline (see Section 3.9.3).

[7] All TGO Management Plans are available at https://www.alkane.com.au/projects/tomingley-gold-project/tomingley-gold-operations/tgo-reports/management-plans/

[8] The Annual Exceedance Probability is the probability that a rainfall event will occur in any 12-month period. A 1% AEP rainfall event has a 1 in 100 chance of occurring in any one year. Such a rainfall event is commonly referred to as a 1 in 100-year rainfall event.

- Dirty water – comprising surface runoff generated within disturbed sections of the Project Site that are not within the process water catchment. Dirty water runoff is and would continue to be intercepted and managed by a series of dirty water drains and sediment basins.

  Existing and proposed sediment basins are and would be designed to manage sediment-laden runoff generated by the 10 day, 90th percentile rainfall event. Dirty water intercepted by the TGO sediment basins is currently used for mining-related purposes. Dirty water intercepted by the SAR sediment basins would be similarly used for mining-related purposes. A pipeline would permit two-way transfer of water between the Wyoming 3 Open Cut and the SAR Water Storage Dam.

  Accumulated surface water within the existing TGO sediment basins may be discharged off site following testing to confirm that the water meets the relevant criteria nominated under EPL 20169. Notwithstanding this, the TGO Mine Site currently operates as a nil discharge site. The Applicant would seek a similar arrangement for the proposed SAR Mine Site sediment basins.
- Mine water – comprising water accumulating with the existing and proposed open cuts and underground workings. Mine water is and would to be retained on site within the existing Wyoming 3 Open Cut and the proposed SAR Water Storage Dam for reuse for mining-related purposes. Mine water would not be discharged to natural drainage.
- Process water – comprising water that has been used for ore processing and or exposed to residue. Process water is stored within the lined Process Water Dam or Wyoming Central Dam – South and would continue to be used for processing purposes only.
- Wastewater - comprising effluent generated on site. Wastewater is and would be managed as described in Section 3.11.5.

3.9.2.3 Water Management Infrastructure

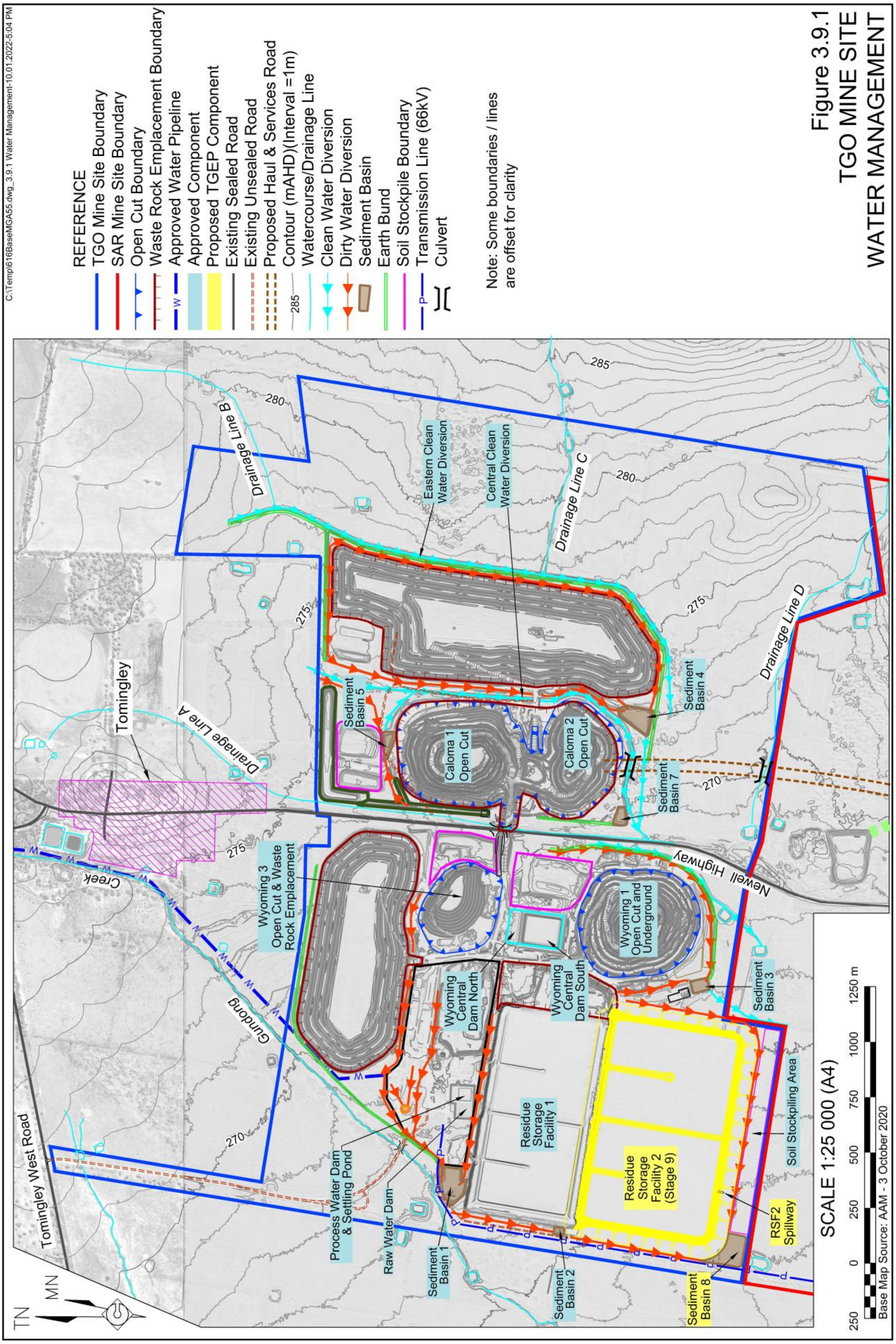
TGO Mine Site Water Management Infrastructure

Figure 3.9.1 and **Table 3.9.1** present the existing water management infrastructure within the TGO Mine Site.

SAR Mine Site Water Management Infrastructure

Figure 3.9.2 presents the proposed water management infrastructure within the SAR Mine Site. In summary, SAR water management infrastructure would include the following. **Table 3.9.2** presents details of the SAR Mine Site water management infrastructure. Detailed designs, including storage capacities for all infrastructure would be presented in the updated *Water Management Plan* to be prepared following receipt of development consent.

- SAR Water Storage Dam – described in Section 3.3.2.7. This dam would be constructed as an off-stream “turkey’s nest” dam with no surface catchment and an indicative capacity of 180ML (**Figure 3.3.4**). The dam would receive pumped water only from the following sources.
  - Sediment basins within the SAR Mine Site.


C:\Temp\616BaseMGA55.dwg_3.9.1 Water Management-10.01.2022-5:04 PM
REFERENCE
TGO Mine Site Boundary
SAR Mine Site Boundary
Open Cut Boundary
Waste Rock Emplacement Boundary
Approved Water Pipeline
Approved Component
Proposed TGEP Component
Existing Sealed Road
Existing Unsealed Road
Proposed Haul & Services Road
Contour (mAHD)(Interval =1m)
Watercourse/Drainage Line
Clean Water Diversion
Dirty Water Diversion
Sediment Basin
Earth Bund
Soil Stockpile Boundary
Transmission Line (66kV)
Culvert
Note: Some boundaries / lines are offset for clarity
Figure 3.9.1
TGO MINE SITE
WATER MANAGEMENT
Tomingley
Drainage Line A
Drainage Line B
Drainage Line C
Drainage Line D
Eastern Clean Water Diversion
Central Clean Water Diversion
Sediment Basin 4
Sediment Basin 5
Sediment Basin 7
Caloma 1 Open Cut
Caloma 2 Open Cut
Newell Highway
Gundong Creek
Wyoming 3 Open Cut & Waste Rock Emplacement
Wyoming 1 Open Cut and Underground
Wyoming Central Dam North
Wyoming Central Dam South
Sediment Basin 3
Residue Storage Facility 1
Residue Storage Facility 2 (Stage 9)
Soil Stockpiling Area
RSF2 Spillway
Process Water Dam & Settling Pond
Raw Water Dam
Sediment Basin 1
Sediment Basin 2
Sediment Basin 8
Tomingley West Road
TN
MN
SCALE 1:25 000 (A4)
250 0 250 500 750 1000 1250 m
Base Map Source: AAM - 3 October 2020
285
280
275
270

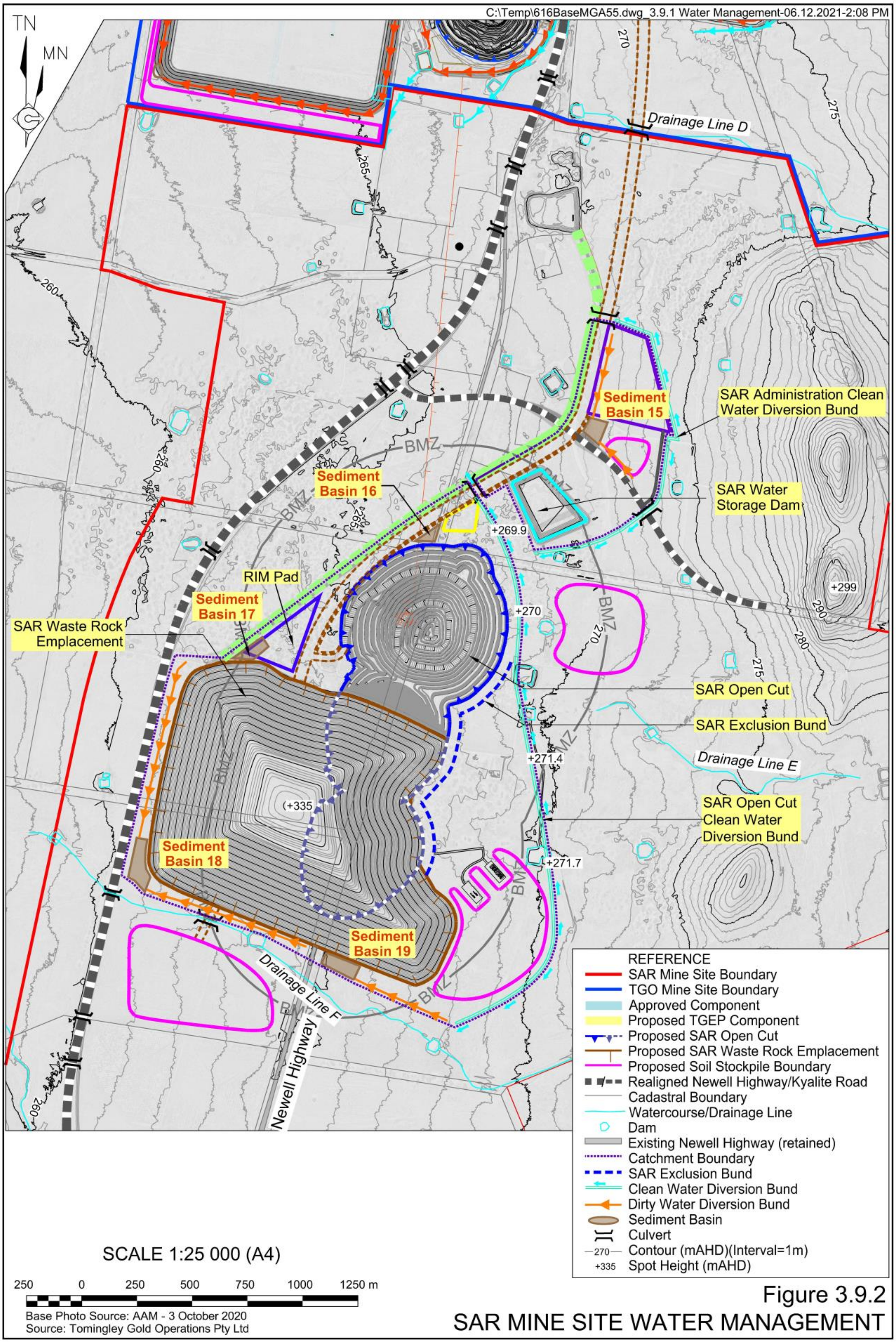


Figure 3.9.2
SAR MINE SITE WATER MANAGEMENT

– Water accumulated within the proposed open cut and underground mining operations.

– Water pumped from the TGO Mine Site via the proposed water transfer pipeline between the TGO and SAR Mine Sites.

Water outflows would be limited to water for construction or mining-related purposes and water pumped to the Wyoming 3 Open Cut. Water from the SAR Water Storage Dam would not be discharged to natural drainage.

Table 3.9.1
TGO Mine Site Water Management Infrastructure

Water Storage	Volume (ML)	Source[2]	Destination/Use[2]
Raw water			
Raw Water Dam	10.7	External supply pipeline	Process Water Dam Wyoming Central Dam North Processing Plant
Dirty water[1]			
Sediment Basin 1	35	Overland flows from disturbed sections of the TGO Mine Site	Wyoming 3 Open Cut Discharged via Licenced Discharge Points (emergency only)
Sediment Basin 2	8		
Sediment Basin 3	11.7		
Sediment Basin 4	32.8		
Sediment Basin 5	12.8		
Sediment Basin 7	2.7		
Sediment Basin 8	42		
Mine water			
Wyoming 3 Open Cut	1 300 (nominal)	Sediment Basins Open Cut and underground workings SAR Water Storage Dam	Wyoming Central Dam North SAR Water Storage Dam
Wyoming Central Dam North	17.4	Wyoming 3 Open Cut Raw Water Dam	Dust suppression Process Water Dam TGO Underground
Process water			
Process Water Dam (including Settling Pond)	13.4	Wyoming Central Dam South Wyoming Central Dam North Raw Water Dam Thickener Residue Storage Facilities	Processing plant
Wyoming Central Dam South	162.5	Residue Storage Facilities	Process Water Dam
Residue Storage Facilities	Variable (200ML assumed for site water balance)	Processing Plant	Process Water Dam Processing Plant Wyoming Central Dam South

Note 1: Sediment Basin 6 has not been constructed.
Note 2: See **Figures 3.9.1** and **3.9.2**.
Source: GHD (2021b) – after Section 2.3 and 3.5.

Table 3.9.2
SAR Mine Site Water Management Infrastructure

Water Storage	Volume (ML)	Inflows	Outflows
Mine Water			
SAR Water Storage Dam	180	Sediment Basins Wyoming 3 Open Cut SAR Open Cut and Underground	Dust Suppression SAR Underground Pastefill Plant Wyoming 3 Open Cut
Dirty water[1]			
Sediment Basin 15	4.7	Overland flows from disturbed sections of the TGO Mine Site	Wyoming 3 Open Cut Discharged via Licenced Discharge Points (emergency only)
Sediment Basin 16	1.8		
Sediment Basin 17	9.1		
Sediment Basin 18	21.0		
Sediment Basin 19	14.1		
Note 1: Proposed sediment basin volumes are minimum volumes. As the SAR Mine Site is proposed to be operated as a nil-discharge site, the volumes of the proposed sediment basins may be increased once pump and pipe designs are complete.			

- SAR Clean Water Diversion Bund – would divert all surface water flows from east of the disturbed areas to the north and south of the SAR Open Cut. The bund would be designed with a minimum 0.5m freeboard above the modelled 0.1% AEP flood level (see Section 6.6.6.2) and would vary from 0.6m to 2.0m above natural ground level. Water diverted to the north by the bund would pass under the Haul Road and Services Road and the Newell Highway via box culverts. Water diverted to the south by the bund would enter Drainage Line F before passing under the Newell Highway via box culverts.
- SAR Administration Clean Water Diversion Bund – would divert surface water flows to the north of the SAR Administration Area and the south of the SAR Water Storage Dam. Water diverted to the north would pass under the Haul Road and Services Road and the Newell Highway via box culverts. Water diverted to the south would pass under the realigned Kyalite Road via a box culvert before passing south of the SAR Water Storage Dam and under the Haul Road and Services Road and the Newell Highway via box culverts.
- SAR Exclusion Bund – incident rainfall between the SAR Open Cut Clean Water Bund and the SAR Exclusion Bund would accumulate adjacent to the Exclusion Bund and would be pumped to the SAR Water Storage Dam.
- Sediment Basins 15 to 19 and associated dirty water collection bunds – would be constructed in key locations within the disturbed sections of the SAR Mine Site in accordance with the requirements of *Managing Urban Stormwater*. The sediment basins would, consistent with those at TGO, be designed as Type D sediment basins with adequate capacity to contain a 10 day, 90th percentile rainfall event with a nominal rainfall depth of 50.5mm. The storage capacity of each sediment basin would be re-established within 5 days of a rainfall event, either by pumping to the SAR Water Storage Dam or via controlled discharge following testing and confirmation that the water quality meets the required discharge criteria. As the water within the sediment basins would be used for Project-related purposes, they have been accounted for under the Applicant's Harvestable Right (see Section 6.6.7).

- Culverts – A series of box culverts have been included in the design for the realigned Newell Highway and Kyalite Road as well as the Haul Road and Services Road. In addition, the SAR Amenity Bund would include gaps to permit surface water to pass from the Haul Road culverts to the Newell Highway culverts.

Given the dispersive nature of the subsoil, the clean and dirty water diversions would, where practicable, be constructed using bunds constructed using topsoil rather than excavating into the natural surface. Emphasis would be placed on maintaining a grassed channel for all diversions to minimise the potential for erosion.

Where required, temporary sediment control fencing would be established where disturbed surfaces are expected to be revegetated and stabilised within a short period following construction. This would include at the toe of soil stockpiles and the SAR Amenity Bund.

Finally, roadside drainage would be installed adjacent to the Haul Road and Services Road in accordance with the requirements of *Managing Urban Stormwater – Volume 2E – Unsealed Roads.*

3.9.3 Proposed Water Supply Bore and Pipeline

The Applicant currently operates a water supply bore on the "Woodlands" property[9] located approximately 7km to the east of Narromine (**Figure 3.9.3**). Water Access Licence (WAL) 20270, issued under the Lower Macquarie Zone 6 Groundwater Source, permits extraction of up to 1 000MLpa from that bore. Extracted water is pumped via an approved water supply pipeline to the TGO Mine Site. That pipeline and water supply is also used to supplement the water supply for Tomingley village.

The Site Water Balance (see Section 3.9.4) identifies that under certain circumstances, more than 1 000MLpa of water may be required. As a result, the Applicant proposes to replace an existing dilapidated bore[10] on the "Dappo" property (Lot 235, DP 755131). The replacement bore would:

- extract water from the same groundwater source and the same depth as the existing bore;
- be within 20m of the existing bore; and
- have an internal diameter the same as the existing bore.

In accordance with Clause 44 of the *Water Sharing Plan for the Macquarie-Castlereagh Groundwater Sources Order 2020,* the proposed bore would be classified as a "replacement bore" and no additional hydrogeological impact assessment is required.

The existing "Dappo" bore has an existing water allocation of 716MLpa under WAL11692. The Applicant proposes to subdivide WAL11692 and acquire a part of that licence to permit extraction of up to 400MLpa from the replacement bore. As the existing bore and associated WAL are already licenced and approved, the Applicant contends that a change of purpose from "irrigation" to "mining" is the only approval required and that no further groundwater assessment is required.

[9] Water Supply Works Authority 80WA705442.
[10] Water Supply Works Authority 80CA703364.

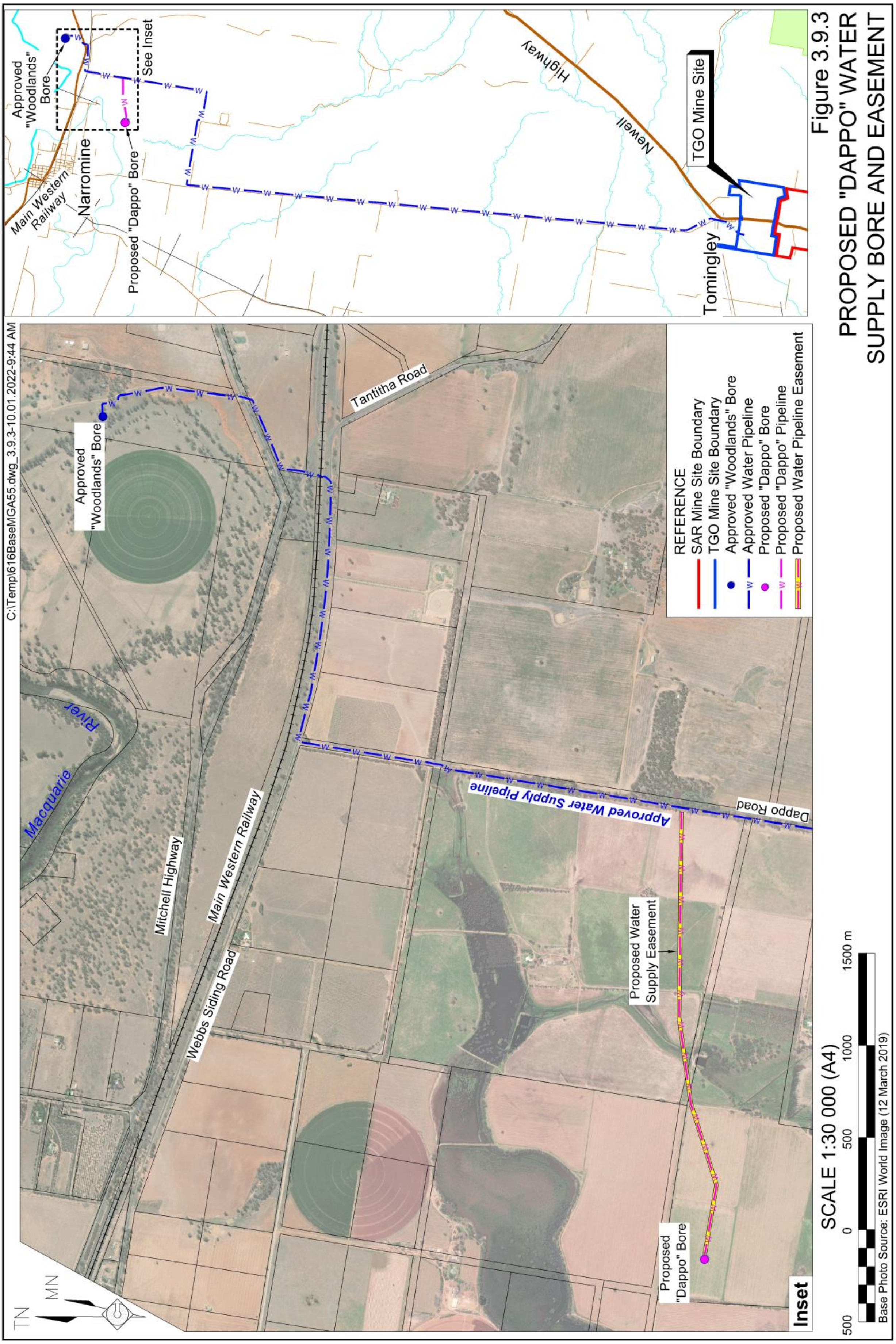


Figure 3.9.3
PROPOSED "DAPPO" WATER SUPPLY BORE AND EASEMENT

In addition, the Applicant proposes to construct and operate an approximately 2.4km buried pipeline from the replacement bore to the existing water supply pipeline (see **Figure 3.9.3**). The proposed pipeline would join the approved pipeline which has adequate capacity to transfer the combined 1 400MLpa of water from the "Woodlands" and "Dappo" bores to the TGO Mine Site. The route of the pipeline has been selected to minimise potential ecological and heritage related impacts. Development consent for the construction and operation of the proposed pipeline is sought as part of this application.

3.9.4 Site Water Balance

GHD prepared a Site Water Balance for the Project, including TGO and SAR mining operations. The resulting report, referred hereafter as GHD (2021b), is presented as **Appendix 14**. The following subsection presents a brief overview of the site water balance. Readers requiring greater technical detail are referred to **Appendix 14**.

In preparing the Site Water Balance, GHD (2021b) relied upon the existing TGO Site Water Balance, adjusted to incorporate the proposed activities. Section 3.9.2.3 and **Figures 3.9.1** and **3.9.2** present the water management infrastructure within the TGO and SAR Mine Sites and provide a brief overview of water movement within the Project Site.

In addition, the following data was relied upon in preparing the site water balance.

- Rainfall data from the Bureau of Meteorology Peak Hill Post Office for a period of 132 years to the end of 2020, with missing data 'patched in' by interpolating data from nearby stations.
- Evaporation data estimated based on equilibrium temperature concepts using the methodology described in *Water Management Review* (PSM 2014) and monthly pan evaporation factors for Scone (the closest available reference location) included in McMahon *et al*. (2013).
- Groundwater inflows determined by Jacobs (2021) and described in Section 6.7.

The site water balance was modelled using the *Australian Water Balance Model* of Boughton & Chiew (2003) and the GoldSim modelling software (ver 12.1). The full proposed mine schedule from 1 January 2021 to 31 December 2032 to was run using 1 day time steps, with 132 simulations, each beginning in a different year of the historical rainfall record and proceeding consecutively through the record (and looped where required). The model was validated based on existing TGO operations, with GHD (2021b) indicating that the model adequately represented the existing observations.

Model results are presented based on the 132 simulations run, with the water balance determined for average as well as the 10th percentile and 90th percentile values for each component.

Table 3.9.3 presents the annual average site water balance results for the existing TGO operations in 2021 and the proposed combined TGO and SAR operations in 2026. The year 2026 was selected because that corresponded with the maximum modelled groundwater inflows modelled by Jacobs (2021) (see Section 6.7). The results may be summarised as follows.

Table 3.9.3
Annual Average Site Water Balance Results

Mine Stage	Existing conditions (2021) (ML/year)	Proposed conditions (2026) (ML/year)
Inputs		
Direct rainfall and catchment runoff	414	850
Supplied external borefield	500	356
Moisture in ore	56	72
Secondary release from residue	22	21
Groundwater inflows	238	766
Total Inputs	**1 230**	**2 065**
Outputs		
Evaporation from water storages	78	145
Discharge from sediment dams	1	1
Potable use	1	2
Water in residue	553	669
Evaporation from active residue	120	178
Losses from rewetting of inactive residue	220	529
Dust Suppression	250	388
Losses from underground workings	8	16
Total Outputs	**1 231**	**1 928**
Change in Storage	**-1**	**137**
Balance	**0**	**0**
Source: GHD (2021b) – Table 6.1		

Annual external water supply and water security

The annual average water supply from the "Dappo" and "Woodlands" bores is expected to decrease slightly from 500MLpa for TGO alone to 356MLpa for the combined operation as a result of increased groundwater inflows to the SAR Open Cut and underground. This is less than the current 1 000MLpa and proposed 1 400MLpa licenced allocation associated with those bores.

In order to ensure adequate water supply for the Project, GHD (2021b) assumed nil groundwater inflows to the mine workings. That analysis determined that the mean water demand from the "Dappo" and "Woodlands" bores, in the absence of groundwater inflow to the workings, would be 930MLpa. The 95th percentile water demand, namely in the unlikely scenario of concurrent nil groundwater inflows and extreme low rainfall, would be 1 360MLpa. This is less than the proposed 1 400MLpa licenced allocation for the "Dappo" and "Woodlands" bores.

Discharge from sediment basins

GHD (2021b) determined that the Project would not result in increased risk of discharge of surface water from the Project Site. This, however, is contingent upon adequate dewatering capacity at each of the proposed SAR Sediment Basins and sufficient capacity to store pumped water within the SAR Water Storage Dam.

Water inventory

GHD (2021b) determined that site water storage within the Project Site is likely to vary seasonally throughout the life of the Project. In summary, GHD (2021b) conservatively assumed a storage capacity of approximately 1 700ML. The site water balance indicates that the volume of water stored within the Project Site under mean conditions would be between 400ML and 500ML. Under 95^{th} percentile conditions, that would increase to 1 500ML. This is less than the total storage capacity of approximately 1 612ML.

3.9.5 Flexible Elements

Table 3.9.4 presents the water-management related flexible elements that cannot be described with certainty at this stage of the Project, together with clear limits on the flexibility sought and a justification of each element. Elements that may be smaller or with lesser impacts than that proposed are not described.

Table 3.9.4
Flexible Elements – Mining Operations

Flexible Element	Limit on Flexibility	Justification
Location, size and number of water management structures, including sediment basins, diversion bunds and water storages.	All surface disturbance within the approved limit of disturbance.	Detailed design of the proposed water management system would be completed post receipt of development consent. As a result, the arrangement of the proposed water management infrastructure may vary slightly from that described. However, as all infrastructure would be constructed within the approved limit of disturbance, there would be no additional environmental impacts.

3.10 External Transportation Operations

3.10.1 Introduction

Section 3.4 describes the design, construction and operation of the proposed realigned public road network. Similarly, Sections 3.3.2.4 and 3.3.2.5 describe the design and operation of the internal road network. This subsection describes the TGO and SAR Site Access Roads and the traffic types and volumes of traffic that would access the Project Site during the construction and operational phases of the Project.

3.10.2 Access to the Project Site

Access to the Project Site during construction operations would be as described in Section 3.4.3, including the following.

- A temporary Channelised Right / Basic Auxiliary Left intersection on the Newell Highway at the entrance to "Kenilworth" to permit light and heavy vehicles to enter and light vehicles only to exit.
- Temporary intersections in the vicinity of the proposed Newell Highway alignment onto Back Tomingley West Road and McNivens Lane to permit vehicles to exit. Such vehicles would then use the existing intersections of these roads with the Newell Highway.

- A temporary intersection from the SAR Mine Site onto Kyalite Road to permit light and heavy vehicles to enter and exit.

Access to the TGO Mine Site throughout the life of the Project would continue to occur via the existing TGO Site Access Road from the Tomingley West Road (**Figure 3.1.2**). The road has a sign posted speed limit of 40km/h and is maintained by the Applicant as an all-weather access. The road includes a crossing over Gundong Creek.

Access to the SAR Mine Site would be via the proposed SAR Site Access Road from the realigned Kyalite Road (**Figures 3.1.3** and **3.4.3**). That road would, with the exception of a 30m section closest to the intersection with Kyalite Road, be an unsealed, two-lane private road with a sign posted speed limit of 40km/h. The section of the SAR Site Access Road closest to the realigned Kyalite Road would be sealed.

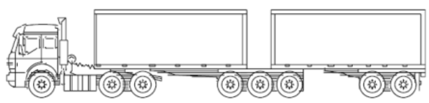
The intersection between the SAR Site Access Road and the realigned Kyalite Road would be a Basic Auxiliary Left intersection to cater for the predominantly left-in, right out traffic movements. A "Give Way" sign and associated linework would be installed on the SAR Site Access Road, together with a sightboard on Kyalite Road opposite the intersection.

3.10.3 Traffic Types and Volumes

3.10.3.1 Construction Traffic

During public road and SAR Mine Site construction operations, a range of vehicles would access the SAR Mine Site. **Table 3.10.1** presents an overview of the anticipated classes of vehicles and their purposes. In addition, during construction and at the commencement and completion of mining or processing, a limited number of low loaders transporting mobile plant and materials would access the Mine Site. Any over size or overweight vehicles would be required to obtain appropriate permits or approvals prior to being transported on the public road network.

Table 3.10.1
Vehicle Types and Purposes

Vehicle Class	Description	Example[1]	Purpose
10	B-double truck and Trailer		Delivery of bulk consumables such as road construction materials, processing reagents, mining consumables and diesel
6 to 9	Articulated or semi-trailer trucks		
3 to 5	Light Truck or large bus		Delivery of general goods to the Mine Site
1 and 2	Light vehicles, including small buses		Transportation of personnel to and from the Mine Site

Note 1: Image Source – AustRoads Vehicle Classification System: Asset and Network Information – January 2002

It is anticipated that approximately 80% of construction-related traffic would approach the Project Site from the north (from Dubbo and Narromine) and approximately 20% would originate from the south (from Peak Hill and Parkes). **Table 3.10.2** presents the anticipated construction-related traffic levels. It is noted that there is a substantial difference between "typical day" and "maximum day" heavy vehicle movements, with "maximum day" movements expected during periods when substantial volumes of road base and other material would be delivered from off-site sources. The Applicant has conservatively assumed that there would be limited use of buses to transport workers to and from the Project Site as most workers would reside within a 40-minute drive of the Project Site.

Table 3.10.2
Proposed Construction Traffic Levels

	Light Vehicles[2]	Heavy Vehicles[3]
Road Construction Site Compound		
Typical Daily Movements[1]	100	6
Estimated Maximum Daily Movements[1]	120	120
Estimated Peak Hour Movements[1]	48	48
SAR Mine Site Construction Site Compound		
Typical Daily Movements[1]	120	6
Estimated Maximum Daily Movements[1]	170	60
Estimated Peak Hour Movements[1]	68	24

Note 1: Two vehicle movements = one return trip
Note 2: Light Vehicles – Class 1 or 2 vehicles
Note 3: Heavy vehicles – Class 3 to 10 vehicles
Source: Tomingley Gold Operations Pty Ltd

3.10.3.2 Operational Traffic

TGO Mine Site

During the operational phase of the Project, traffic would continue to access the TGO Mine Site via the existing TGO Site Access Road. Vehicles and personnel accessing the TGO Mine Site would primarily be associated with the following activities.

- Open cut and underground mining operations.
- Processing operations.
- Administrative and technical management operations, with the majority of the ongoing administrative and management personnel based at the TGO Mine Site.

Classes of vehicles that would access the TGO Mine Site would be consistent with those presented in **Table 3.10.1**. It is expected that the vast majority of vehicles would continue to access the TGO Mine Site from the east via Tomingley West Road, with approximately 80% of traffic approaching Tomingley West Road from the north (from Dubbo and Narromine) via the Newell Highway or Tomingley Road and approximately 20% approaching Tomingley West Road from the south (from Peak Hill and Parkes). It is the Applicant's experience with the TGO mining operations that there is limited demand for bus services to and from the TGO Mine as most workers reside within a 40-minute drive of the Project Site.

Table 3.10.3 presents the anticipated TGO Mine Site traffic levels, which would remain largely unchanged from the existing, approved traffic levels. The peak period for light vehicle movements is typically at shift start and finish times, namely 5:00am to 7:00am and 5:00pm to 7:00pm. Heavy vehicle movements are distributed throughout the day.

Table 3.10.3
TGO Mine Site Operational Traffic Levels

	Light Vehicles	Heavy Vehicles
Daily Movements[1]	156	12
Note 1: Two vehicle movements = one return trip		
Source: Tomingley Gold Operations Pty Ltd		

SAR Mine Site

During the operational phase of the Project, traffic would access the SAR Mine Site via the SAR Site Access Road. Vehicles and personnel accessing the SAR Mine Site would primarily be associated with open cut mining operations including administrative and technical management operations.

Classes of vehicles that would access the TGO Mine Site would be consistent with those presented in **Table 3.10.1**. It is expected that the vast majority of vehicles would continue to access the TGO Mine Site from the west via the realigned Kyalite Road, with approximately 80% of traffic approaching Kyalite Road from the north (from Dubbo and Narromine) and approximately 20% approaching Kyalite Road from the south (from Peak Hill and Parkes).

Table 3.10.4 presents the anticipated SAR Mine Site traffic levels. The peak period for light vehicle movements would typically be at shift start and finish times, namely 5:00am to 7:00am and 5:00pm to 7:00pm. Heavy vehicle movements would be distributed throughout the day.

Table 3.10.4
SAR Mine Site Operational Traffic Levels

	Light Vehicles[2]	Heavy Vehicles[3]
Average Daily Movements[1, 2]	100	6
Maximum Daily Movements[1, 3] (indicative only)	240	8
Peak Hour Movements[1]	96	4
Note 1: Two vehicle movements = one return trip Note 2: An "Average Day" would be representative of operations during FY27 when anticipated direct employment levels would be approximately 155 people, plus contractors. Note 3: A "Maximum Day" would be representative of operations during FY25 when anticipated employment levels would be approximately 235 people, plus contractors.		
Source: Tomingley Gold Operations Pty Ltd		

3.10.4 Flexible Elements

Table 3.10.5 presents the transportation-related flexible elements that cannot be described with certainty at this stage of the Project, together with clear limits on the flexibility sought and a justification of each element. Elements that may be smaller or with lesser impacts than that proposed are not described.

Table 3.10.5
Flexible Elements – Mining Operations

Flexible Element	Limit on Flexibility	Justification
Vehicle type	All vehicles accessing the Project Site would be road registered and/or hold a suitable permit to access the public road network	At times there may be the need to deliver or remove oversize equipment or changes to the transport regulations/economics may make larger vehicles the preferred option for particular transportation tasks. Notwithstanding this, all vehicles accessing the Project Site would have the required approvals to access the public road network
Traffic level	+20% of the proposed traffic level	Potential exists for short periods when traffic levels higher that that proposed may be required, including during shutdowns when substantial maintenance works are undertaken.

3.11 Non-production Waste Management

3.11.1 Introduction

The principal non-production wastes that would be generated throughout the life of the Project would include the following.

- Materials remaining after the removal of sections of decommissioned public roads and demolition of the "Rosewood" homestead and associated farm buildings.
- General solid wastes and recyclables.
- Hazardous wastes.
- Wastewater, including sewage.

In general, these materials would be classified in accordance with the *Waste Classification Guidelines* (EPA, 2014) and managed in accordance with the *Protection of the Environment Operations Act 1997* and *Waste Avoidance and Resource Recovery Act 2001* and associated regulations. The Applicant would maintain records of all wastes generated and removed from the Project Site.

3.11.2 Demolition Materials

Sections of the existing road network would be removed following commissioning of the realigned public roads. Salvaged material would be reused within the Project Site, including for construction and maintenance of the internal road network. Material unable to be used within the Project Site that may be classified as General Solid Waste – non-putrescible would be placed within the Waste Rock Emplacements.

During demolition of the "Rosewood" homestead and associated farm buildings, the following procedures would be implemented.

- Hazardous or contaminated wastes such as asbestos or hydrocarbon-contaminated soils would be identified and removed to a licenced waste facility in accordance with the requirements for such waste.

- Any recyclable material such as steel, copper, etc would be recovered and recycled.
- The buildings would be demolished and, to the extent practicable, construction waste would be reused within the Project Site. Where that is not possible, waste that may be classified as building and demolition waste, namely glass, plasterboard, ceramic, bricks, concrete, metal and wood, would be placed within the central sections of the Waste Rock Emplacements. All other waste would be transported to a licenced waste facility.

3.11.3 General Solid Wastes and Recyclables

Wastes from offices, crib rooms, workshops (not including hazardous wastes), etc. would continue to be divided into two streams, namely recyclables and general waste.

Recyclables collected would include steel, aluminium, glass, paper, certain types of plastics and cardboard. Bins and/or collection skips would be located in or adjacent to buildings in which the wastes are generated. These bins and skips would be collected on an as needs basis for off-site recycling.

General solid waste collected would include food scraps, non-recyclable plastics and other non-recyclable materials. Bins and/or collection skips would be located in or adjacent to buildings in which the wastes are generated and would be collected on a weekly basis and transported to a licenced waste management facility.

3.11.4 Hazardous and Special Wastes

Routine maintenance of mobile mining and earthmoving equipment would continue to generate wastes that are classified as hazardous under the *Waste Classification Guidelines* (EPA, 2014), including principally waste oil and hydrocarbons and associated containers and contaminated materials such as oily rags. Similarly, processing operations would continue to generate wastes contaminated with reagents, including used containers.

Waste oil would be stored in self-bunded waste oil tanks or on bunded pallets under cover within the TGO and SAR Administration Areas or the TGO Processing Plant area from where it would be collected and removed from site for disposal/reuse by an appropriately licensed waste contractor. Other hydrocarbon contaminated wastes, such as used containers and oily rags would be stored in sealed containers and would similarly be collected by an appropriately licensed waste contractor. Oily water separation facilities would be installed in the vicinity of the SAR Wash Bay and in workshops, with the separated hydrocarbons sent to the waste oil tank and the treated water used for mining-related purposes.

Contaminated reagent containers would be stored in the same area that the reagents are stored until such time they can be removed, either by the supplier or for disposal at a licenced waste management facility.

Used batteries would continue to be stored in a covered area and collected as required by an appropriately licensed waste contractor for recycling.

As identified in Section 3.3.2.2, non-putrescible General Solid Waste from removal of infrastructure during site establishment operations, including demolition material, that cannot be reused or recycled would be placed within the central sections of the Waste Rock Emplacements. Waste that cannot be classified as General Solid Waste would be transported to a licenced waste management facility for disposal.

Used tyres >1.2m in diameter would, where practicable, be reused for retaining walls, traffic control, etc or recycled. Where that is not practicable, such tyres would be placed into the waste rock emplacements in a location where they would not adversely impact on settling and compaction of the waste rock.

3.11.5 Wastewater

All wastewater generated within the TGO Mine Site would continue to be treated using the existing, aerated wastewater treatment facility. A similar facility would be installed within the SAR Administration Area and all amenities, toilets, wash basins, sinks and showers would be connected to that facility. The SAR wastewater treatment facility would be designed, installed and operated in accordance with the requirements of Narromine Shire Council.

All water treated through the TGO and SAR wastewater treatment facilities would be irrigated. in compliance with the EPA's guidelines "*The Use of Effluent by Irrigation*" with the remaining water treated in compliance with Australian Standard AS/NZS 1547:2012 "*On-site Domestic Wastewater Management*".

Finally, all wastewater generated by reverse osmosis plants within the Project Site would be incorporated into the Mine Water circuit.

3.12 Hours of Operation and Project Life

3.12.1 Hours of Operation

Table 3.12.1 presents the proposed hours of operation. It is noted that particular noise and dust emitting activities identified in Section 6 may be limited during particular times of day, such as 10:00pm until 7:00am, or under particular weather conditions, including temperature inversions, or in response to real-time noise or air quality monitoring results and discussions with surrounding landholders.

3.12.2 Project Life

The Applicant anticipates that after an initial site preparation phase of approximately 9 to 12 months, open cut mining operations within the SAR Mine Site would commence with the decommissioning of the existing Newell Highway and Kyalite Road and commissioning of the realigned roads. Underground mining operations would commence once the SAR Exploration Drive has been completed and exploration operations have provided the required certainty to permit mine development and stoping operations to commence.

Table 3.12.1
Proposed Hours of Operation

Activity	Proposed Days of Operation	Proposed Hours of Operation
Construction and site preparation, including public road construction		
• Out of hours construction operations [2]	7 days per week	24 hours per day
• All other construction operations	Monday to Saturday, not including public holidays	7:00am to 10:00pm
Mining operations	7 days per week	24 hours per day
Waste rock management	7 days per week	24 hours per day
Processing operations	7 days per week	24 hours per day
Transportation operations	7 days per week	24 hours per day
Maintenance operations	7 days per week	24 hours per day
Rehabilitation operations[2]		
• During surface mining operations • Following the completion of surface mining operations	7 days per week	7:00am to 6:00pm

Note 1: Out of hours activities would be activities that satisfy the requirements for out of hours construction operations as identified by the *Interim Construction Noise Guideline*, background noise levels + 5dB ($LA_{eq(15\ min)}$). Examples may include but are not limited to installation of formwork, maintenance of plant and equipment, internal fit out of buildings, delivery of equipment and/or selected consumables.

Note 2: To be undertaken on a campaign basis.

Source: Tomingley Gold Operations Pty Ltd

Section 3.5.4.2 presents the anticipated mining schedule for the Project assuming that development consent is granted in mid-2022 and that all conditions precedent for the commencement of site establishment and public road realignment are complete by the end of 2022. That would permit road construction operations to commence in early 2023 and SAR open cut mining operations to commence in late Q3 2023. Based on those assumptions, mining and processing operations are anticipated to be completed by December 2032.

Following the completion of mining and processing operations. a period of rehabilitation would be required (see Section 3.14). Rehabilitation of sections of the Project Site would be undertaken progressively throughout the life the Project, however, substantial sections of the Project Site would be utilised until the end of the proposed mining and processing operations, including the Processing Plant, residue storage facilities, TGO and SAR Administration Areas and other areas. Rehabilitation operations are expected to require a further period to complete.

Ongoing maintenance and management of the rehabilitated landform would be required after this date until all rehabilitation criteria have been achieved and the mining leases may be relinquished. No time period has been set for relinquishment of the Mining Leases.

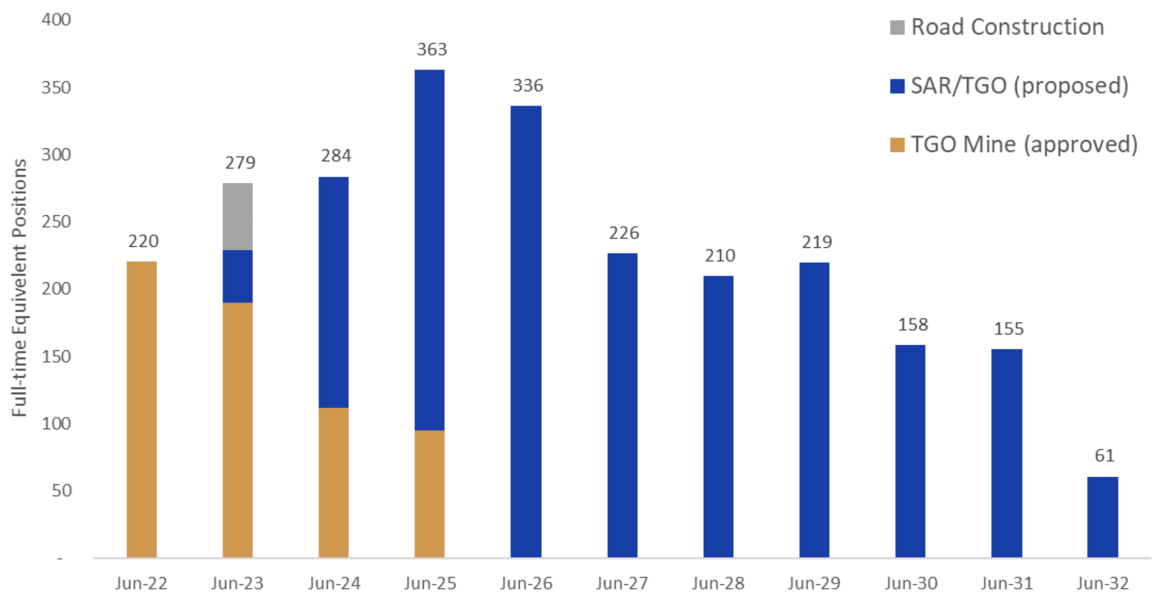
Notwithstanding the above, the Applicant anticipates identifying additional resources within or in the vicinity of the Project Site during the life of the Project. Should additional resources be identified, the Applicant would submit an application to extend the life of the Project or an application for a new development consent.

3.13 Employment, Economic Contributions and Capital Investment Value

3.13.1 Employment

Figure 3.13.1 presents the anticipated number of full-time equivalent employees that would be engaged by the Applicant for the Project. Additional contract personnel would also be required, as well as indirect employment associated with suppliers or service providers. Finally, additional personnel required during peak periods, including shutdowns and for other reasons.

The vast majority of positions would be residential in surrounding towns and cities, including Dubbo, Narromine, Peak Hill, Parkes, Tomingley and surrounding rural areas. Limited numbers of employees and contractors may be engaged on a drive-in / drive-out or fly-in / fly-out basis. It has been the Applicant's experience that such arrangements are primarily required for specialist technical or highly qualified roles where locally based expertise may not be available.



Source: Tomingley Gold Operations Pty Ltd

Figure 3.13.1
Anticipated Project-related Employment

3.13.2 Economic Contributions

Section 6.14 presents an overview of the Economic Assessment for the Project prepared by Diana Gibbs and Partners (2021). In summary, the Applicant anticipates that the Project would generate the following additional economic contributions within NSW over the life of the Project. It is noted that these figures have been subjected to a 7%pa discount rate to convert future contributions into a present value.

- Capital expenditure in NSW .... $100.58 million
- Operating expenditure in NSW .... $432.31 million
- NSW and Local government taxes, royalties and duties .... $90.94 million

In summary, the Project would contribute approximately **$633.17 million** in 2021 dollar terms to the economy of NSW, of which the vast majority would be retained within the local and regional areas. This would further support the economy of Narromine, Dubbo and Parkes Local Government Areas and ongoing employment of numerous, non-Mine personnel. Additional contributions would be made to the National economy for goods and services not available within NSW.

3.13.3 Capital Investment Value

The Applicant and its advisors have undertaken a detailed assessment of the anticipated Capital Investment Value (CIV) of the Project in accordance with Planning Circular PS 21-020 dated 2 December 2021. **Table 3.13.1** presents an overview of the results of that assessment. It is noted that the CIV for the Project is different to the capital cost if $115 million identified in the Economic Assessment presented Section 6.14 because the methodologies used to determine each is different. In particular, the CIV includes the cost of mobile open cut mining plant, whereas in reality the Applicant anticipates undertaking contract mining operations and that plant has been excluded from the capital cost use for determining the feasibility of the Project.

Table 3.13.1
Summary Capital Investment Value Estimate

Item	Value (A$ million)
Approvals costs and other fees and bonds	1.86
Site development and services relocation	3.69
Newell Highway Realignment	32.94
Council roads realignment – include overpass	8.64
Surface infrastructure	12.41
Underground mine development, including replacement mobile plant	12.68
Open cut mine development, including mobile plant	189.55
Ore processing and waste rock management	19.61
Total	**281.39**
Note: Apparent arithmetic inconsistencies are due to rounding	
Source: WTP Australia Pty Ltd	

3.14 Mine Closure and Rehabilitation Strategy

3.14.1 Introduction

Rehabilitation of all areas disturbed by mining-related activities is an integral aspect of the Project. Emphasis would be placed upon progressively creating final landforms and progressive rehabilitation wherever practicable. Sections of the Project Site would, however, remain active throughout the life of the Project and, as a consequence, rehabilitation of those sections of the Project Site would be undertaken following the completion of mining operations.

Rehabilitation activities within the Project Site would be planned and undertaken in accordance with a *Rehabilitation Management Plan* (RMP) prepared following the receipt of development consent and the SAR Mining Lease. Components of the RMP would be reviewed and approved by the Resources Regulator prior to commencement of SAR-related mining activities.

This subsection provides a brief overview of the approved and proposed mine closure and rehabilitation strategy for the Project, including those aspects already approved for the TGO Mine Site. **Appendix 4** presents additional detail in relation to mine closure and rehabilitation.

3.14.2 Rehabilitation Consultation and Reference Documentation

Successful rehabilitation of mining-related disturbance is best achieved with ongoing consultation with the surrounding community and relevant government agencies and structured rehabilitation planning. **Appendix 16** presents an overview of consultation undertaken and reference documentation relied upon in preparing this rehabilitation and mine closure strategy. In summary, consultation identified the following aspects of the strategy would be important for the community.

- A “natural” final landform.
- Limited final voids.
- Ongoing productive use of the land, including agriculture and industrial/commercial use, to generate local employment and economic activity.
- Post-mining surface water flows largely unchanged from pre-mining flows.
- Management of weeds and pests during and following mining.
- Manage and preserve existing biodiversity.
- Prefer agricultural land not lost to biodiversity offsets.
- Public roads, including the Newell Highway, in the same standard or better than at the start of mining operations.

3.14.3 Final Landform and Infrastructure to be Retained

Figures 3.14.1 to **3.14.3** present the approved and proposed final landform for the Project. In summary, the combined final landform would include the following. A detailed description of the design of each of each component of the final landform is presented in Sections 3.4 to 3.9 and associated sections of **Appendix 4**.

- Two bunded and fenced final voids, namely the Wyoming 1 Open Cut and the SAR North Pit.
- Three fully backfilled open cuts, namely the Wyoming 3, Caloma 1 and Caloma 2 Open Cuts and one partially backfilled open cut, namely the SAR South and Central Pits.

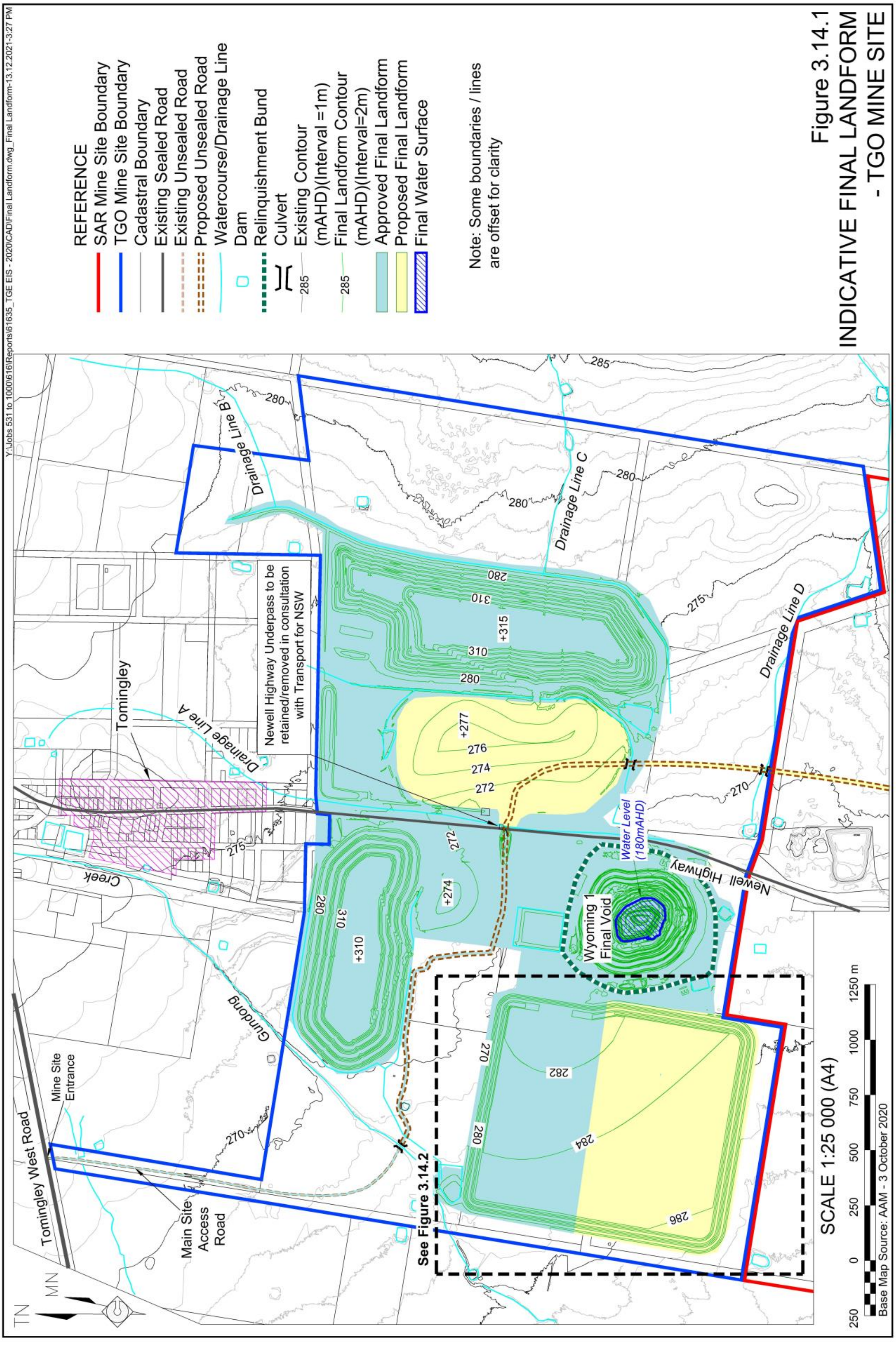
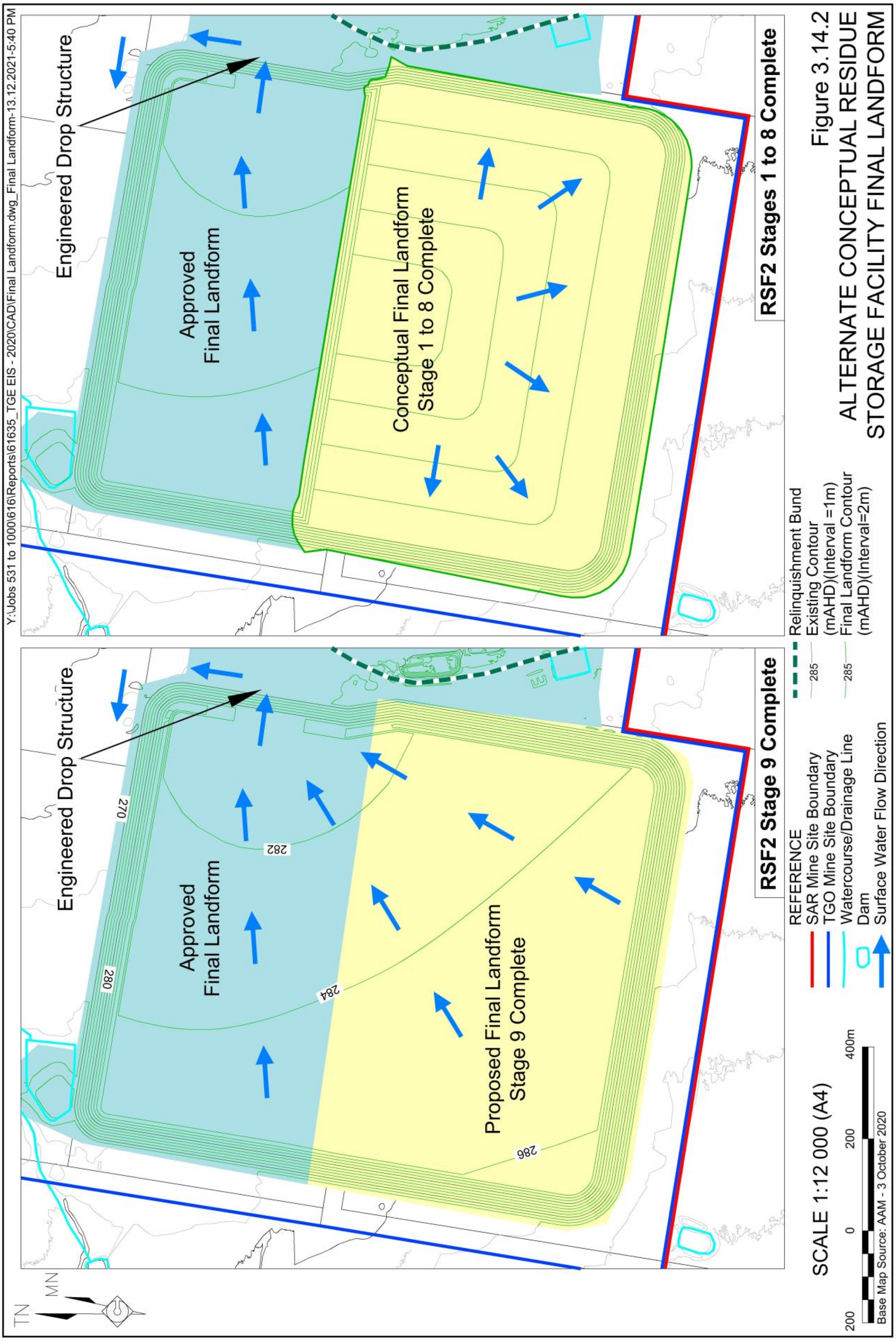


Figure 3.14.1
INDICATIVE FINAL LANDFORM - TGO MINE SITE


Y:\Jobs 531 to 1000\616\Reports\61635_TGE EIS - 2020\CAD\Final Landform.dwg_Final Landform-13.12.2021-5:40 PM
Engineered Drop Structure
Approved Final Landform
Conceptual Final Landform Stage 1 to 8 Complete
RSF2 Stages 1 to 8 Complete
Engineered Drop Structure
Approved Final Landform
Proposed Final Landform Stage 9 Complete
RSF2 Stage 9 Complete
270
280
282
284
286
TN
MN
SCALE 1:12 000 (A4)
200 0 200 400m
Base Map Source: AAM - 3 October 2020
REFERENCE
SAR Mine Site Boundary
TGO Mine Site Boundary
Watercourse/Drainage Line
Dam
Surface Water Flow Direction
Relinquishment Bund
285 Existing Contour (mAHD)(Interval =1m)
285 Final Landform Contour (mAHD)(Interval=2m)
Figure 3.14.2
ALTERNATE CONCEPTUAL RESIDUE STORAGE FACILITY FINAL LANDFORM

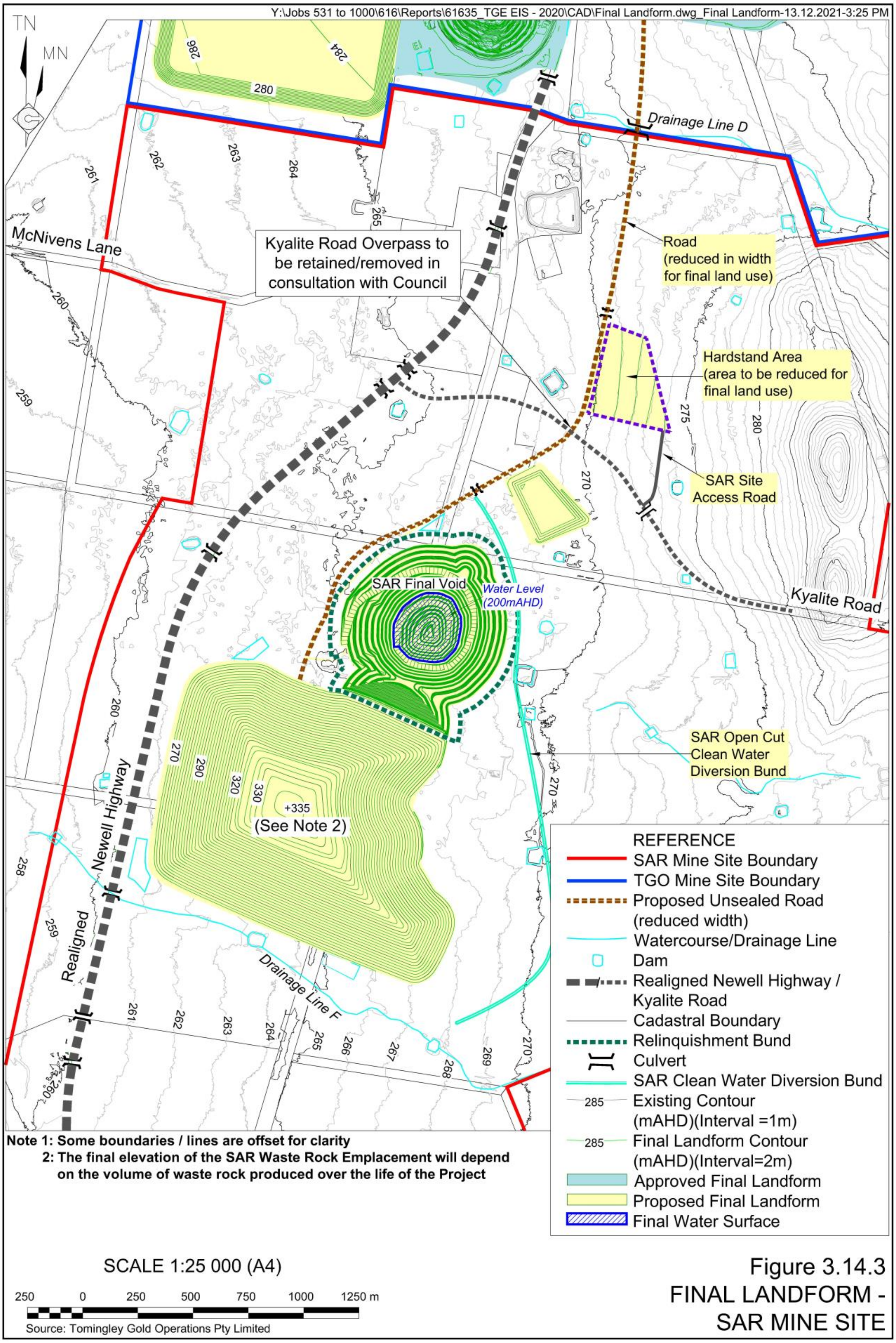


Figure 3.14.3
FINAL LANDFORM - SAR MINE SITE

- Three shaped and rehabilitated waste rock emplacements, namely Waste Rock Emplacements 2 and 3 and the SAR Waste Rock Emplacement. Material contained within Waste Rock Emplacement 1 would be largely consumed during rehabilitation of the residue storage facilities. Material contained within the Wyoming 3 Open Cut and Caloma Waste Rock Emplacement would be shaped to form a low rise with slopes of approximately 1%.
- A capped, free-draining integrated Residue Storage Facility. **Figure 3.14.2** presents two alternate final landforms for the Residue Storage Facility. In the event that Stage 9 of the Residue Storage Facility 2 is completed, the final landform would be constructed in a manner that would drain to a single drop structure in the northeast section of the Facility consistent with the approved final landform for Residue Storage Facility 1. In the event that the Residue Storage Facility 2 is not completely filled, the Facility would be shaped to drain to the west, south and east and Residue Storage Facility 1 would be shaped in a manner consistent with the approved final landform.

All infrastructure not required for the final land use would be removed or reduced in area or width and would be shaped and revegetated as required. Infrastructure to be retained would, indicatively include the following.

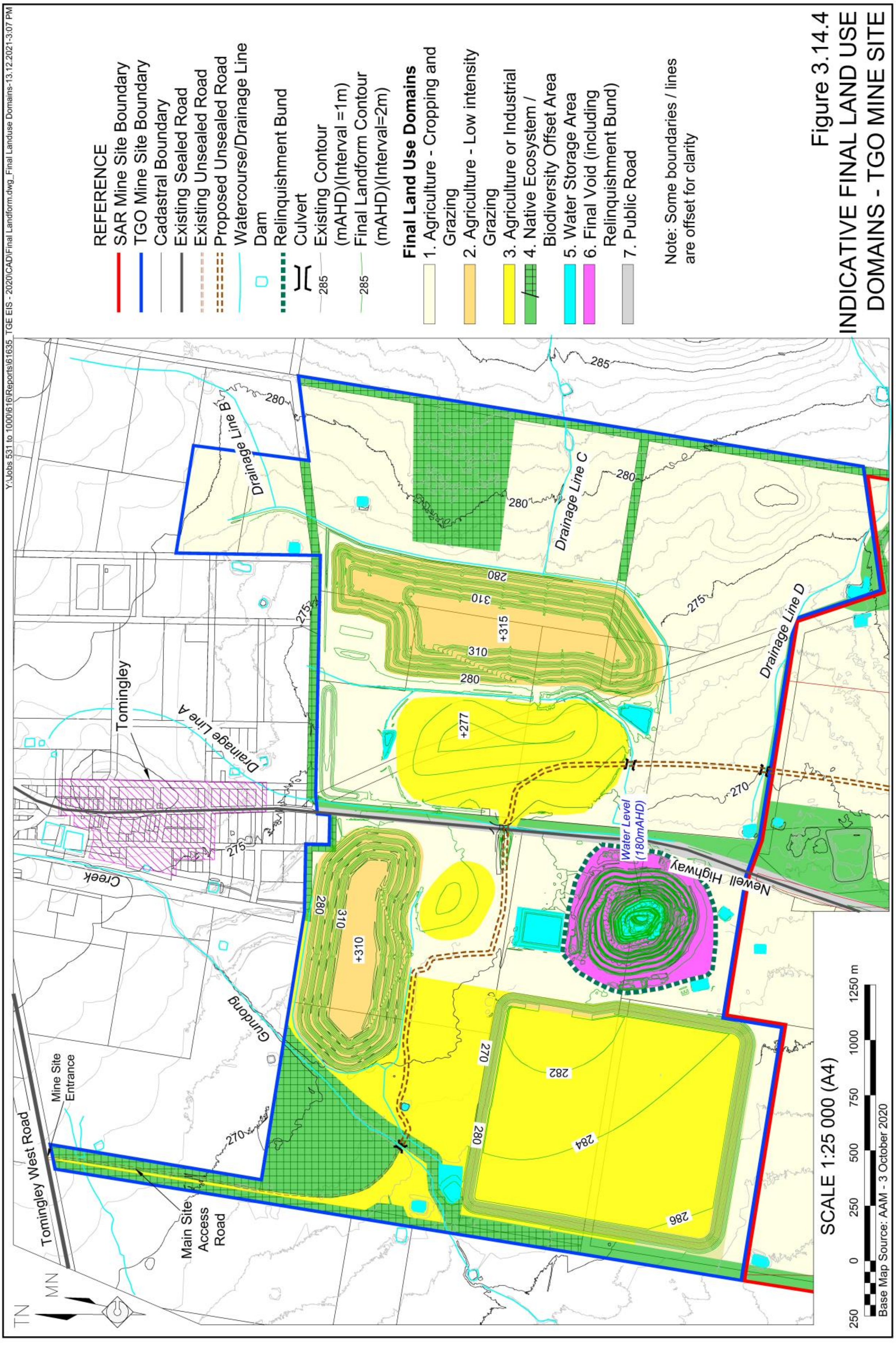
- Unsealed roads, reduced in width to that required for post-mining land management (indicatively 5m to 10m wide), with under road drainage retained.
- Hardstand areas, reduced in size to that required for post-mining land use.
- Limited sheds and buildings required for post-mining land use.
- Powerlines and substations where these may facilitate the proposed or future land use.
- Water supply pipeline from the “Woodlands” and “Dappo” bores to facilitate the ongoing supply of water to Tomingley village and for the post-mining land uses.
- Water management infrastructure, including clean water bunds and water storages, including the Wyoming Central Dam, SAR Water Storage Dam and selected sediment basins.

Realigned public roads would be retained, including the realigned Newell Highway and Kyalite Road and intersections with Back Tomingley West Road and McNivens Lane. The Newell Highway underpass and Kyalite Road overpass would be retained or removed in consultation with the relevant roads authority.

3.14.4 Final Land Use Domains

Figures 3.14.4 and **3.14.5** present the proposed final land use domains. **Appendix 4** presents an overview of the final land use options assessed and a more detailed discussion of the proposed final land use domains.

- Domain 1 - Agriculture – Cropping and Grazing.
- Domain 2 - Agriculture – Low Intensity Grazing.


Y:\Jobs 531 to 1000\616\Reports\61635_TGE EIS - 2020\CAD\Final Landform.dwg_Final Landuse Domains-13.12.2021-3:07 PM
REFERENCE
SAR Mine Site Boundary
TGO Mine Site Boundary
Cadastral Boundary
Existing Sealed Road
Existing Unsealed Road
Proposed Unsealed Road
Watercourse/Drainage Line
Dam
Relinquishment Bund
Culvert
Existing Contour (mAHD)(Interval =1m)
Final Landform Contour (mAHD)(Interval=2m)
Final Land Use Domains
1. Agriculture - Cropping and Grazing
2. Agriculture - Low intensity Grazing
3. Agriculture or Industrial
4. Native Ecosystem / Biodiversity Offset Area
5. Water Storage Area
6. Final Void (including Relinquishment Bund)
7. Public Road
Note: Some boundaries / lines are offset for clarity
Figure 3.14.4
INDICATIVE FINAL LAND USE DOMAINS - TGO MINE SITE
Drainage Line B
Drainage Line C
Drainage Line D
Drainage Line A
Tomingley
Gundong Creek
Newell Highway
Water Level (180mAHD)
Tomingley West Road
Mine Site Entrance
Main Site Access Road
TN
MN
SCALE 1:25 000 (A4)
250 0 250 500 750 1000 1250 m
Base Map Source: AAM - 3 October 2020

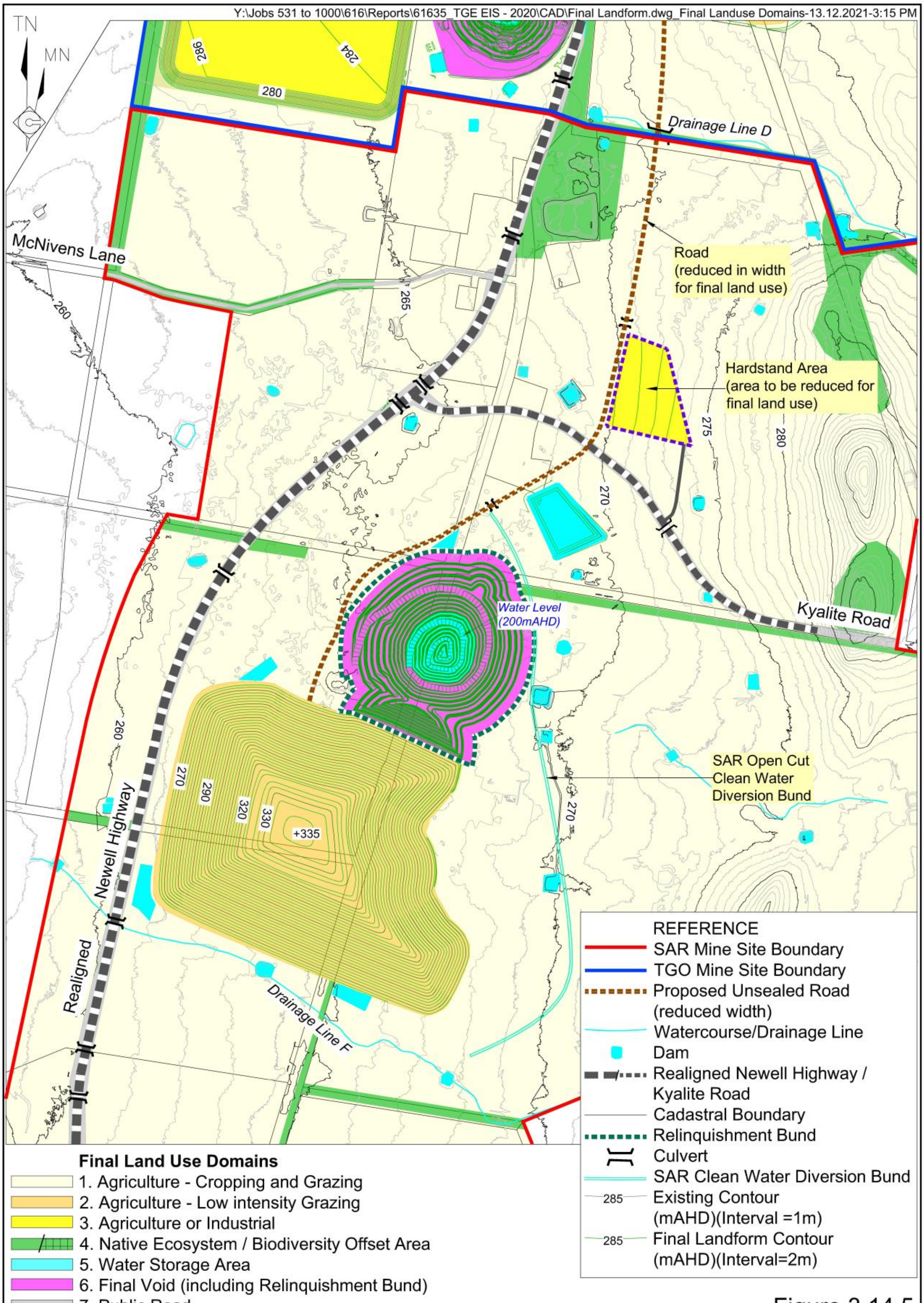


Figure 3.14.5
INDICATIVE FINAL LAND USE DOMAINS - SAR MINE SITE

- Domain 3 - Agriculture/Industrial Use.
- Domain 4 - Native Ecosystem / Biodiversity Offset.
- Domain 5 - Water Storage Areas.
- Domain 6 - Final Voids.
- Domain 7 - Public Road.

3.14.5 Rehabilitation Risk Assessment

The Applicant undertook a preliminary rehabilitation risk assessment for the Project generally in accordance with procedures identified by the document *Guideline: Rehabilitation Risk Assessment* published by the Resources Regulator in July 2021. **Appendix 3** presents the risk assessment. Rehabilitation risks with a ranking of Moderate or above included the following together with a summary of how each of the identified risks would be managed.

- Exposure or access to final voids (moderate risk) or underground workings (high risk) ....Moderate risk

  Potential exists for unauthorised access to the final voids or underground workings following the completion of mining operations. However, the backfilling of the Wyoming 3 and Caloma 1 and 2 Open Cuts and SAR Open Cut South and Central Pits would remove the risk associated with those voids. In addition, installation of the proposed relinquishment bund and security fence and blocking of the access ramps for the Wyoming 1 Open Cut and SAR Open Cut North Pit final voids would mitigate risks associated with unauthorised access to the remaining final voids.

  Finally, all portals and ventilation rises would be blocked or capped in accordance with the relevant guidelines to prevent unauthorised access.

- Erosion or mass movement of the SAR Waste Rock Emplacement...Moderate risk

  Section 3.6.4.2 presents an overview of the landform stability assessment of the SAR Waste Rock Emplacement undertaken by Landloch (2021b). That assessment determined that the landform as designed, together with the proposed rehabilitation materials, would not result in unacceptable erosion, provided adequate vegetation cover is established and maintained on the landform.

  In addition, the Applicant would engage a suitably qualified geotechnical engineer to determine the long-term stability of the final landform prior to mine closure.

- Erosion or mass movement of the final voids ....High risk

  Section 3.5.2.2 presents an overview of the long-term geotechnical assessment of the SAR Open Cut North Pit final void. A relinquishment bund and security fence would be established around that void and the consequence of any unplanned failure of that structure would be minor given the distance to public infrastructure.

Section 3.5.2.1 presents an overview of the long-term geotechnical assessment of the Wyoming 1 Open Cut final void. The Applicant would ensure that the final landform would achieve a Factor of Safety of 1.3 through either cutting back the upper sections of the open cut or covering and supporting selected sections of the wall of the open cut with waste rock.

- Failure of revegetation as a result of adverse climatic conditions...... Moderate risk

  Drought and periods of low rainfall, or periods of excessive rainfall, are common occurrences. The Applicant would mitigate against such eventualities by undertaking progressive rehabilitation of sections of the SAR and Caloma Waste Rock Emplacement throughout the life of the Project, indicatively annually during the cooler months of March to June. In the event that revegetation operations achieve a strike rate that does not comply with the identified completion criteria, remediation operations would be undertaken.

3.14.6 Rehabilitation Objectives

Rehabilitation objectives for the Project as a whole include the following. Detailed rehabilitation objectives for each final land use domain would be developed as part of the Rehabilitation Management Plan for the Project.

- Minimise adverse social and economic impacts associated with mine closure.
- Ensure that all surface infrastructure not required for the final land uses is removed or reduced in area.
- Undertake progressive rehabilitation as soon as practical in areas no longer required for mining-related operations.
- Ensure that the rehabilitated landform, including final voids, is safe, stable and non-polluting with maintenance requirements consistent with the agreed post mining land use(s).
- Ensure that surface water flows of suitable quality continue to flow to downstream catchments.
- Provide for a final land use comprising a mixture of agriculture and native ecosystem, with potential industrial land uses following receipt of required approvals or consents at that time.
- Ensure that the SAR Waste Rock Emplacement reflects, to the extent practicable, natural landforms surrounding the Project Site.
- Ensure that areas to be retained for agricultural use achieve the nominated agricultural land capability and that the agricultural productivity of this land managed by the Applicant is higher at the end of mining operations than at the start.
- Ensure that areas to be retained for Native Ecosystem maintain or improve species diversity and habitat value.

- Ensure that the approach to rehabilitation is continually reviewed throughout the life of the Project based on site specific knowledge, research and monitoring.
- Allow for the rehabilitation security to be returned progressively and the Mining Leases to be relinquished within a reasonable timeframe after the successful completion of rehabilitation activities.

3.14.7 Rehabilitation Implementation

3.14.7.1 Rehabilitation Completed and in Progress

The Applicant has undertaken the following rehabilitation operations on Waste Rock Emplacements 2 and 3 within the TGO Mine Site. These operations have been undertaken in a manner that is consistent with MP 09_0155 and the approved *Mining Operations Plan*. The Applicant would continue to liaise with the Resources Regulator to facilitate acceptance and signoff of the completed rehabilitation.

- Shaping and installation of surface water controls, including rock-lined drop structures.
- Spreading of previously stockpiled growth medium.
- Establishment of grassland vegetation on rehabilitated areas.

Plates 3.14.1 and **3.14.2** present views of rehabilitation completed to date within the TGO Mine Site. In addition, the Applicant rehabilitated the Peak Hill Gold Mine, located approximately 11km south of the SAR Open Cut. **Plates 3.14.3** and **3.14.4** present views of the completed rehabilitation of the Peak Hill Gold Mine Waste Rock Emplacement. The Applicant anticipates that rehabilitation operations within the Project Site would be equally as successful as rehabilitation completed at the Peak Hill Gold Mine.

3.14.7.2 Opportunities for Improved Rehabilitation Outcomes for Rehabilitated Areas

The Applicant notes that current NSW Government guidelines for Mine Site rehabilitation require a focus on continuous review and implementation of best practice rehabilitation procedures to achieve optimal outcomes. The rehabilitation risk assessment presented in Section 3.14.5 identifies barriers or limitations to rehabilitation operations with the Project Site.

The Applicant has and would implement the following to improve rehabilitation and environmental outcomes for existing disturbed and rehabilitated areas.

- Incorporate all existing disturbed areas with the *Rehabilitation Management Plan* to be prepared for the Project.
- Continue to monitor environmental performance of existing rehabilitated areas to ensure that those areas continue to progress towards the progressive and final completion criteria identified in the existing *Mining Operations Plan* and future *Rehabilitation Management Plan.*

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Plate 3.14.1: Oblique aerial view of rehabilitated Waste Rock Emplacement 2 looking south-southeast - prior to site decommissioning
(Source - Tomingley Gold Operations Pty Ltd)

Plate 3.14.2: View of rehabilitation in progress on the western face of Waste Rock Emplacement 3
(Date of photograph - 6 May 2021)

Plate 3.14.3: View of rehabilitated northern face of the Peak Hill Gold Mine Waste Rock Emplacement
(Date of Photograph - 6 May 2021)

Plate 3.14.4: View of rehabilitated upper surface of the Peak Hill Gold Mine Waste Rock Emplacement
(Date of Photograph - 6 May 2021)

- Undertake remedial action to address issues where progression towards the agreed progressive and final completion criteria is not progressing at the required rate.
- Continue to investigate methods or procedures to improve rehabilitation and environmental outcomes for areas of existing rehabilitation.
- Continue to investigate alternate final landform or land use options for existing and disturbed areas that may generate improved rehabilitation and environmental outcomes.
- Continue to undertake agricultural improvements as described in Section 6.9.3 to undisturbed and rehabilitated lands.

3.14.8 Proposed Progressive and Final Rehabilitation

3.14.8.1 Introduction

The following subsections present a brief overview of the progressive, temporary and final rehabilitation implementation to be undertaken throughout the life of the Project.

3.14.8.2 Progressive and Temporary Rehabilitation

Sections of the Project Site that would be available for progressive rehabilitation, and the timing for each, would include the following.

- SAR Amenity Bund – immediately following construction.
- Newell Highway and Kyalite Road road-side disturbance areas, including the Kyalite Road overpass embankment - immediately following construction.
- Clean water diversion bunds - immediately following construction.
- The outer face of each lift of the SAR Waste Rock Emplacement – progressively as each lift is completed.
- Northern section of the Caloma Waste Rock Emplacement – following completion of backfilling operations. It is noted that the northern section of the Caloma Waste Rock Emplacement only would be available for progressive rehabilitation as the southern section would continue to be used for stockpiling operations for the life of the Project.

In addition, the proposed soil stockpiles would be temporarily rehabilitated and stabilised as soon as practicable following establishment, with final rehabilitation of the stockpile footprints to be undertaken once the stockpiled soil has been used for rehabilitation elsewhere within the Project Site.

Progressive and temporary rehabilitation implementation operations would be largely as described for the proposed final rehabilitation operations.

3.14.8.3 Final Rehabilitation

Final rehabilitation operations would largely be consistent with those described in the approved MOP for the TGO Mine Site. Broadly, rehabilitation operations would include the following. The *Rehabilitation Management Plan* would provide additional guidance in relation to rehabilitation implementation.

Decommissioning

- Remove all consumables, equipment, stores and other materials not required for rehabilitation operations.
- Remove all buildings, plant (including concrete foundations), infrastructure, and water storages not required for the final land use.
- Undertake a contamination assessment and treat or remove any contaminated material.
- Block underground portals and cap ventilation rises in accordance with relevant guidelines applicable at the time.
- Undertake an assessment of all structures, infrastructure and landforms to be retained.

Landform Establishment

- Remove or reduce in size stockpile/hardstand areas and roads not required for the final land use, including the SAR Amenity Bund and TGO ROM Pad. Use extracted material for rehabilitation operations.
- Install temporary surface water controls, as required.
- Progressively shape the final landform in a manner that is generally consistent with that described in Section 3.14.3 and shown in **Figures 3.14.1** to **3.14.3**. The *Rehabilitation Management Plan* would provide additional detail in relation to the final landform design based on final material volumes close to the end of the life of the Project.
- Cap and shape the residue storage facilities to ensure encapsulation of contained materials and a free draining landform.
- Undertake a geotechnical assessment of the final voids and establish relinquishment bunds and security fencing with signage at a suitable distance from the voids.
- Undertake a geotechnical assessment of the Residue Storage Facilities and establish suitable capping of the upper surface of the facility, surface water drainage, including engineered drop structures if required, and buttressing, if required.

Growth Medium Development

- Test soils prior to placement and apply suitable ameliorants.
- Where available, place friable material on the upper surface of the final landform and deep rip prior to placement of soil.

- Place soils in a manner consistent with the recommendations of SSM (2021), including ensuring that a minimum of 300mm of Chromosol and Sodosol topsoil is used for rehabilitation of moderately sloped lands and 200mm of topsoil in other areas.
- Preserve the structure of placed soils to ensure that subsoil and topsoil are moist to just moist when spreading, not dry or excessively wet.
- Place a soil/rock matrix approximately 80m wide at the break of slope on the upper face of the SAR Waste Rock Emplacement as described in Section 10.4 of Landloch (2021b). In summary:
  - rip the waste rock to a depth of 500mm; and
  - mix approximately 2 parts angular, durable rock with a D_{50} >53mm with 1 part soil and place the matrix material to a minimum depth of 400mm.
- Apply temporary soil stabilisation products such as polymer-based sprays to stabilise the final landform if a vegetation cover of 70% coverage will not be established within 3 months of soil placement.
- Install temporary sediment and erosion control structures on the final landform.

Ecosystem and Land Use Establishment

- Revegetate the final landform using species consistent with those identified in the approved TGO *Mining Operations Plan* based on the proposed final land use. **Appendix 4** reproduces the approved species mix.
- Undertake revegetation operations using mechanical or direct seeding techniques, including mulches or stabilising agents as required.
- Undertake weed and pest management, as required, until relinquishment.

Ecosystem and Land Use Development

- Monitor the rehabilitated landform to determine initial germination success and success of other measures, including soil ameliorants, erosion controls, weed and grazing management.
- Monitor vegetation establishment on the rehabilitated landform against existing TGO and SAR analogue sites.
- Monitor the agricultural productivity of the rehabilitated landform against surrounding lands to benchmark progress towards achieving closure criteria.
- Undertake remediation, as required, including:
  - Re-seeding, including with alternate species, if required;
  - addition of ameliorants, as required;
  - weed and grazing control; and
  - maintenance of erosion controls.

3.14.9 Rehabilitation Quality Assurance and Monitoring

Section 3.14.6 presents conceptual rehabilitation completion objectives for the Project and **Appendix 4** presents the completion criteria for each land use domain. In order to achieve those criteria, the following quality assurance measures would be implemented.

- Identify key roles and responsibilities for rehabilitation and mine closure and include relevant performance indicators in position descriptions. Broadly, the following responsibilities would apply.
  - TGO General Manager - ensure that appropriate resources are available to site management and personnel to enable the implementation of the mine closure and rehabilitation measures identified in the *Rehabilitation Management Plan*.
  - TGO Environment and Community Manager - Ensure that the activities identified in the *Rehabilitation Management Plan* are fully implemented and a *Rehabilitation Quality Assurance Registe*r is maintained.
  - All Mine Personnel - follow direction provided by the Environment and Community Manager.
- Develop a *Rehabilitation Quality Assurance Register* of all commitments included in this document and the *Rehabilitation Management Plan*. The register would include checklists for site personnel undertaking rehabilitation activities and a compliance register.
- Report annually on the progress of rehabilitation within the Project Site.

Finally, the existing TGO rehabilitation monitoring that is routinely undertaken for rehabilitation operations within the TGO Mine Site would be continued and extended to the SAR Mine Site. That program is described in the approved *Mining Operations Plan* and includes monitoring of nine analogue sites and five rehabilitated sites. Additional analogue sites would be established within the SAR Mine Site and identified in the *Rehabilitation Management Plan.* In summary, however, rehabilitation monitoring throughout the life of the Project would include the following.

- Undertake continued monitoring to track progress towards the relinquishment criteria identified in the *Rehabilitation Management Plan*, including monitoring of:
  - erosion or subsidence of rehabilitated lands, including in particular sections of the final landform with moderate slopes (>6%);
  - the success (or otherwise) of the vegetation communities established on the final landform against selected analogue sites, including pasture communities; and
  - agricultural productivity of rehabilitated lands, including measuring key metrics against selected analogue sites.
- Undertake remediation, as required, to ensure continued tracking towards the relinquishment criteria identified in the *Rehabilitation Management Plan*.
- Annual reporting on the status of rehabilitation within the Mine Site, including, where appropriate, progress towards the identified relinquishment criteria.

3.14.10 Rehabilitation Research and Trials

While the Applicant has extensive experience rehabilitating both the Peak Hill Gold Mine and Waste Rock Emplacements 2 and 3 within the TGO Mine Site, additional rehabilitation trials would be undertaken throughout the life of the Project.

Trial sites would be established within areas undergoing progressive rehabilitation. A range of rehabilitation methodologies would be tested in consultation with a person suitably experienced in landform establishment and rehabilitation. A range of parameters would be tested to determine the optimum combination of rehabilitation techniques and procedures, including the following.

- Final landform preparation, including nature and preparation of the substrate and preferred microrelief.
- Soil depth and preferred ameliorants.
- Vegetation methodology and preferred seed mix, fertiliser and stabiliser.

The results of these trials would be reported annually and used to refine rehabilitation practices on site.

3.14.11 Flexible Elements

Table 3.14.1 presents the rehabilitation-related flexible elements that cannot be described with certainty at this stage of the Project, together with clear limits on the flexibility sought and a justification of each element. Elements that may be smaller or with lesser impacts than that proposed are not described.

Table 3.14.1
Flexible Elements – Mine Closure and Rehabilitation

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Flexible Element	Limit on Flexibility	Justification
Final SAR Waste Rock Emplacement landform	Final landform to be no larger or steeper that that proposed.	The Applicant has designed the SAR Waste Rock Emplacement to accommodate all waste rock that may be generated over the life of the Project. In determining the volumes of these materials likely to be generated, conservative assumptions have been made. Priority would be given to completely backfilling the Caloma 1 and 2 Open Cuts as well as the SAR Open Cut South and Central Pits. Remaining materials would be placed within the SAR Waste Rock Emplacement. As a result, it is likely that final SAR Waste Rock Emplacement may be lower and/or less steep than that proposed.
Final Wyoming 3 or Caloma Waste Rock Emplacement landform	Final landform may not completely backfill the final voids. Final void to be safe, stable, secure and non-polluting.	The final landform for each of these voids is proposed to be a low rise with slopes of approximately 1% to facilitate shedding of water. It is possible that additional waste rock may be required during the final stages of the life of the Project for rehabilitation operations or stabilisation of the Wyoming 1 final void. As a result, there is potential that the Wyoming 3 or Caloma Waste Rock Emplacements may not be completely backfilled. Should this occur, the Applicant would establish a final landform that is safe, stable, secure and non-polluting, with internal slopes as gentle as possible.

Table 3.14.1 (Cont'd)
Flexible Elements – Mine Closure and Rehabilitation

Page 2 of 2

Flexible Element	Limit on Flexibility	Justification
Final Residue Storage Facilities landform	Final landform to be no larger or steeper that that proposed. Final landform to be capped to achieve relevant permeability criteria. Final landform to be free draining.	The Applicant has designed Residue Storage Facility 2 to accommodate all residue that may be generated over the life of the Project. In determining the volumes of these materials likely to be generated, conservative assumptions have been made. As a result, Residue Storage Facility 2 may not be constructed to Stage 9 and a final landform that is lower than that proposed may remain at the end of the life of the Project. That may result in alternate surface water management to that proposed.
Final land use	Final land uses to have appropriate planning approval or exemption prior to adoption and acceptance under the *Rehabilitation Management Plan.*	A range of alternative final land uses may be relevant for the Project Site at the time when the Project is decommissioned. However, with limited exceptions, each would require further planning approval, or a relevant exemption. In the event that such an alternate land use is proposed, relevant planning approval (or an exemption) would be obtained, and the modified final land use, including modified completion criteria, would be incorporated into the *Rehabilitation Management Plan.*

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