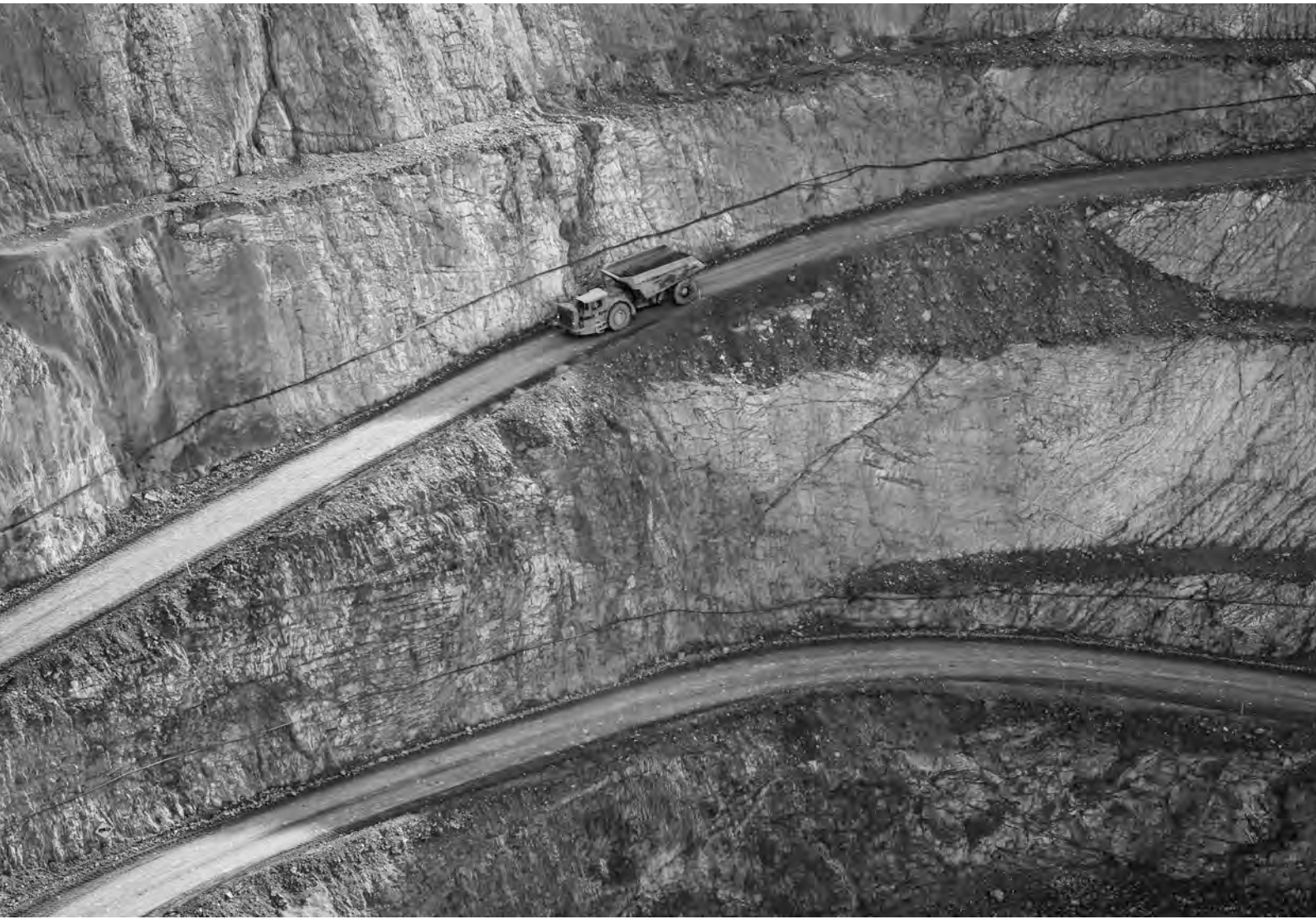
Appendix N

Rehabilitation and landscape management strategy



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aurelia
METALS Ltd.

New Cobar Complex Project State Significant Development (SSD-10419)

Rehabilitation and Landscape Management Strategy

Prepared for Peak Gold Mines Pty Ltd
December 2020

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New Cobar Complex Project State Significant Development (SSD-10419)

Rehabilitation and Landscape Management Strategy

Report Number

J190278 RP24

Client

Peak Gold Mines Pty Ltd

Date

18 December 2020

Version

v2 Final

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18 December 2020

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18 December 2020

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1 Introduction

1.1 Overview

Peak Gold Mines Pty Ltd (PGM), a wholly owned and operated subsidiary of Aurelia Metals Limited (Aurelia), owns and operates the Peak Gold Mines operation south-east of Cobar, far western New South Wales (NSW) see Figure 1.1.

The PGM operation comprises the New Cobar Complex located 3 kilometres (km) to the south-east of Cobar town centre and the Peak Complex located 10 km south-east of the town centre. Both complexes are located adjacent to Kidman Way, which connects Cobar to Hillston and Griffith to the south.

PGM has been operational since modern mining commenced at the Peak Complex in 1991 and all current mining operates under development approvals issued by Cobar Shire Council (CSC).

The New Cobar Complex Project State Significant Development (SSD) (the project) is an amalgamation of underground mining at New Cobar, Chesney and Jubilee deposits and development of new underground workings of the Great Cobar and Gladstone deposits to create the New Cobar Complex Project.

PGM is also seeking to consolidate all existing development approvals applicable to the New Cobar Complex into a single modern consent issued by the Department of Planning, Industry and Environment (DPIE). Approval will be sought for project elements accessed from, and undertaken within, the existing New Cobar Complex located within consolidated mining lease (CML) 6, mining purposes lease (MPL) 0854 and mining leases (ML) ML 1483 and ML 1805 (Figure 1.2).

1.1.1 Background

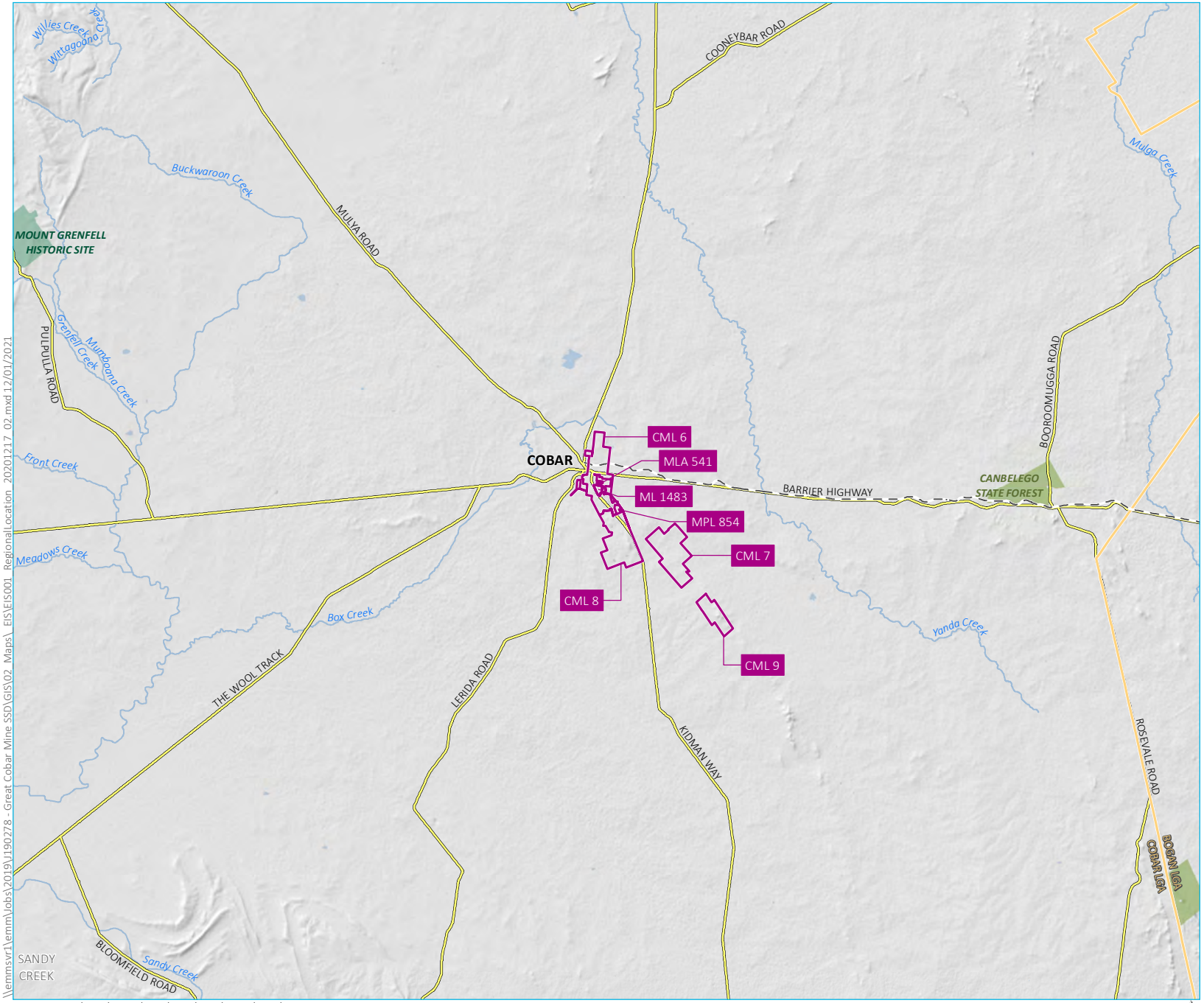
PGM has been operational since mining commenced at the Peak deposit in 1991 producing gold, copper, lead, zinc and silver. Mining at the New Cobar Complex commenced with the open cut in 2000, then transitioned to underground mining in 2004.

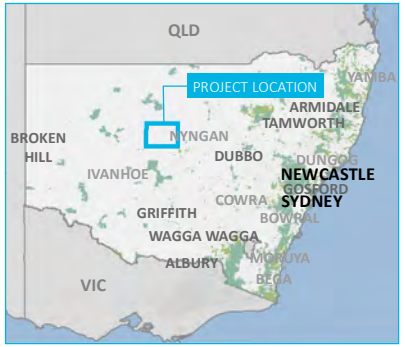
The current CSC development approvals at Peak Complex and New Cobar Complex allow for the operations to continue indefinitely and process up to 800,000 tonnes per annum (tpa) of ore. Ore processing, tailings storage and concentrate handling is undertaken at the Peak Complex with ore from the New Cobar Complex trucked by public road to processing facilities at the Peak Complex. Both the processing plant and the tailings storage facility (TSF) are located at the Peak Complex, and activities at those facilities are outside the scope of this project.

PGM has identified the Gladstone and Great Cobar deposits as targets for further mining to extend the life of operations at the New Cobar Complex. The Great Cobar deposit was historically exploited by surface and shallow underground mining between 1870 and 1919, but no mining of that deposit has been undertaken since that time.

PGM has obtained conditional approval for development of an exploration decline to facilitate exploration activities within the Great Cobar deposit. The objectives of the exploration activities are to:

- further define the mineral resource through underground drilling from an exploration decline; and
- taking of a bulk sample to provide further samples for metallurgical, geotechnical and associated test work.





KEY

- Mining lease boundary
- Rail line
- Major road
- Named watercourse
- Waterbody
- Local government area
- NPWS reserve
- State forest

Source: EMM (2020); DFSI (2017); GA (2011); DPE (2019)

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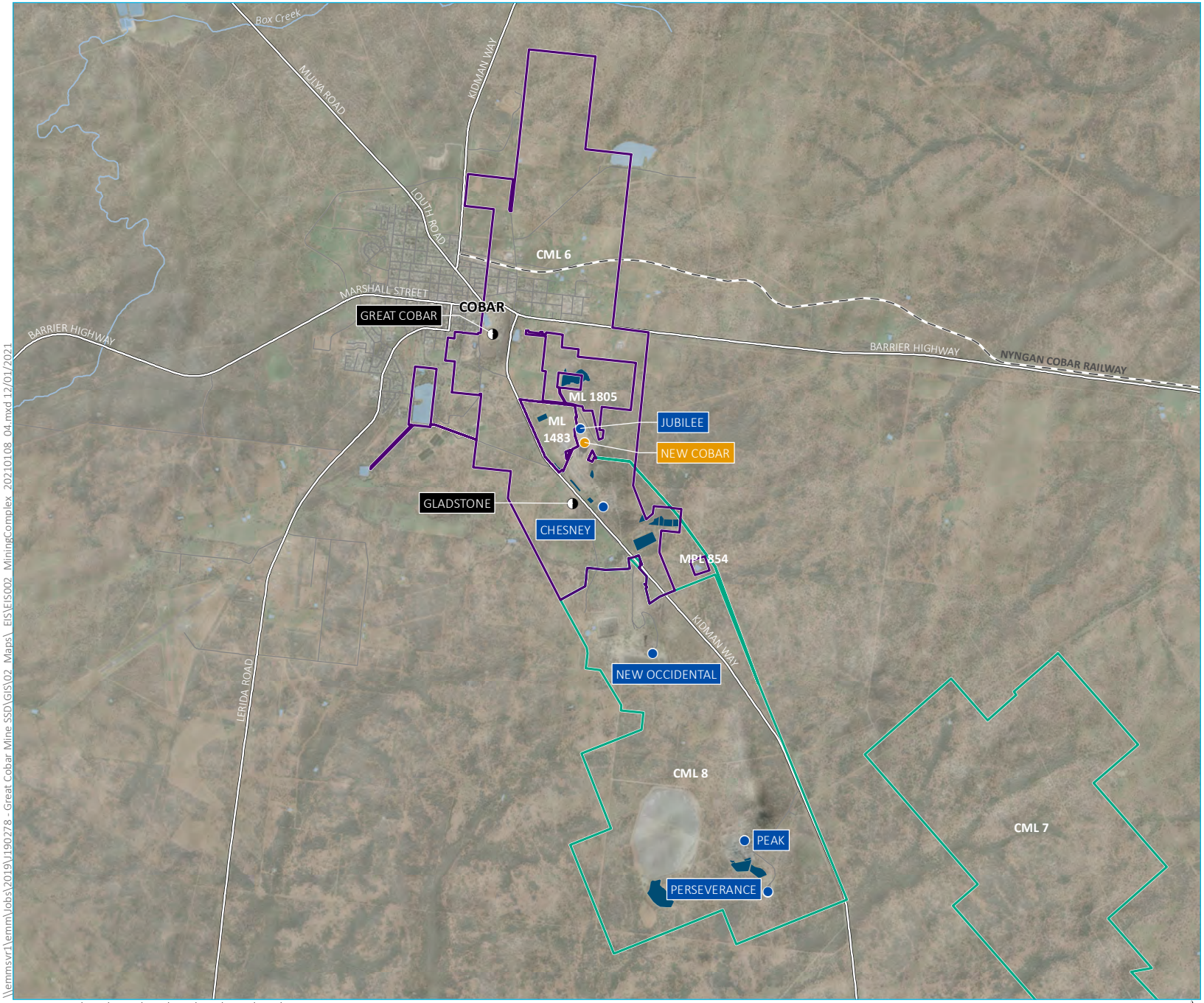
Regional location of the Peak Gold Mine

Peak Gold Mines
New Cobar Complex Project
Rehabilitation and closure strategy
Figure 1.1

EMM creating opportunities



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Source: EMM (2020); DFSI (2017); GA (2011); DPE (2019)

Mining leases and mining complexes

Peak Gold Mines
New Cobar Complex Project
Rehabilitation and closure strategy
Figure 1.2

EMM
creating opportunities

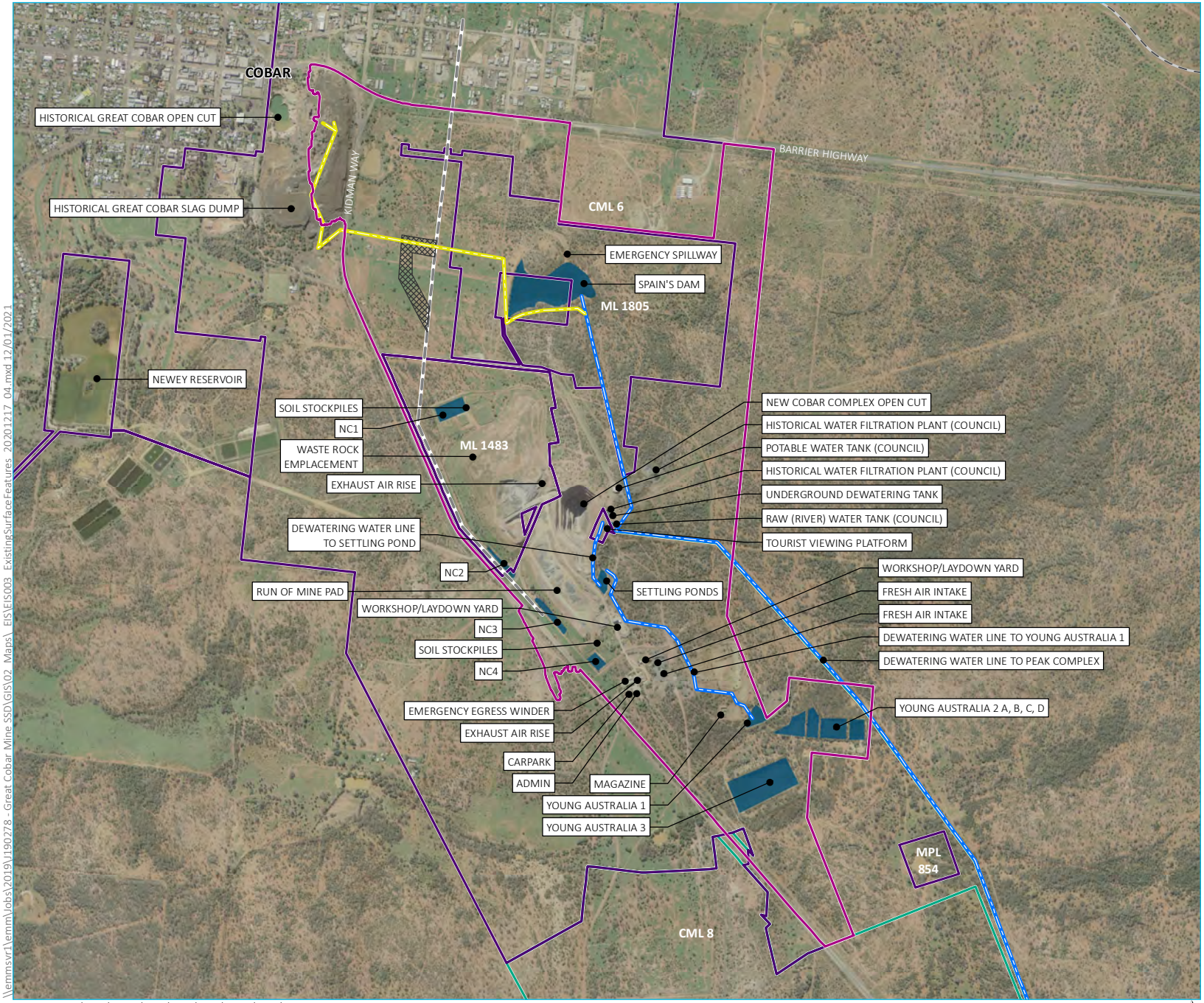
1.1.2 Project overview

All surface works associated with the project will be located underground or in the existing, operational mining New Cobar Complex except for a short (no more than 400 m) power line from an existing 22 kV line servicing PGM to a compact substation within the fresh air intake footprint.

PGM proposes to use the decline, infrastructure and intake and exhaust ventilation elements developed for the Great Cobar exploration drive (approved, but not yet constructed) to facilitate project development. Surface ventilation fans are not required during the development of exploration activities, however as they will be necessary during operation of mining, construction of a new powerline and compact substation, to be located adjacent to the fresh air intake is required. The power line will continue to the exhaust air rise where a ventilation fan will be installed at a depth of approximately 100 m or greater below ground level (bgl). An emergency egress winder headframe and winder house will be installed at the fresh air intake for the purpose of mine rescue in the event of an incident below ground preventing evacuation by conventional means. No additional new surface infrastructure is proposed.

The existing surface infrastructure and facilities at the New Cobar Complex currently support underground mining of the New Cobar, Chesney and Jubilee deposits, and will continue to be used for this project (Figure 1.3 and Figure 1.4). Access to all underground workings in the complex is from a portal and decline at the base of the New Cobar Complex open cut. SSD approval will be sought for the following project elements accessed from, and undertaken within, the existing New Cobar Complex:

- Underground mining of the New Cobar Complex including, but not limited to, New Cobar, Jubilee and Chesney (existing development approval issued by CSC).
- Underground mining of the New Cobar Complex including Great Cobar and Gladstone (not yet approved).
- Groundwater dewatering of the relevant historic and proposed underground workings via the historic Great Cobar Shaft (existing development approval issued by CSC).
- Increase of the number of ore haulage trucks between the New Cobar Complex and Peak Complex from 25 loaded trips per day (50 movements in and out) to 50 loaded trips (100 movements in and out) per day (daylight hours only) averaged over a calendar year. The increase of daily truck movements will provide flexibility to PGM if there are unforeseen production disruptions (eg bad weather).
- Crushing and screening of ore within the existing New Cobar Complex ROM pad (existing approval by CSC).
- Transportation of ore to the Peak Complex via Kidman Way for processing, using road registered heavy vehicles (existing approval by CSC).
- Harvesting of waste rock and:
    - immediately deploying the material underground for use in stope backfilling operations (waste rock will remain underground and will not be transported to the surface as a preference); and
    - transportation of non-acid forming material to the surface and storage within the existing waste rock emplacement (WRE) prior to use across the complexes for construction / rehabilitation tasks (eg tailings dam lifts).
- Deposition of potentially acid forming waste rock brought to the surface and stored within the WRE where at end of mine life it would be capped, or progressively returned underground for disposal.
- Continuation of all other approved activities within the New Cobar Complex.



KEY

- Project area
- Pipeline route
- Great Cobar dewatering pipeline
- Existing 22 kV powerline
- Rail line
- Proposed power line corridor
- Mine water management storage

Mining lease boundaries

- New Cobar Complex
- Peak Complex

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Source: EMM (2020); DFSI (2017); GA (2011); DPE (2019)

0 0.5 1 km

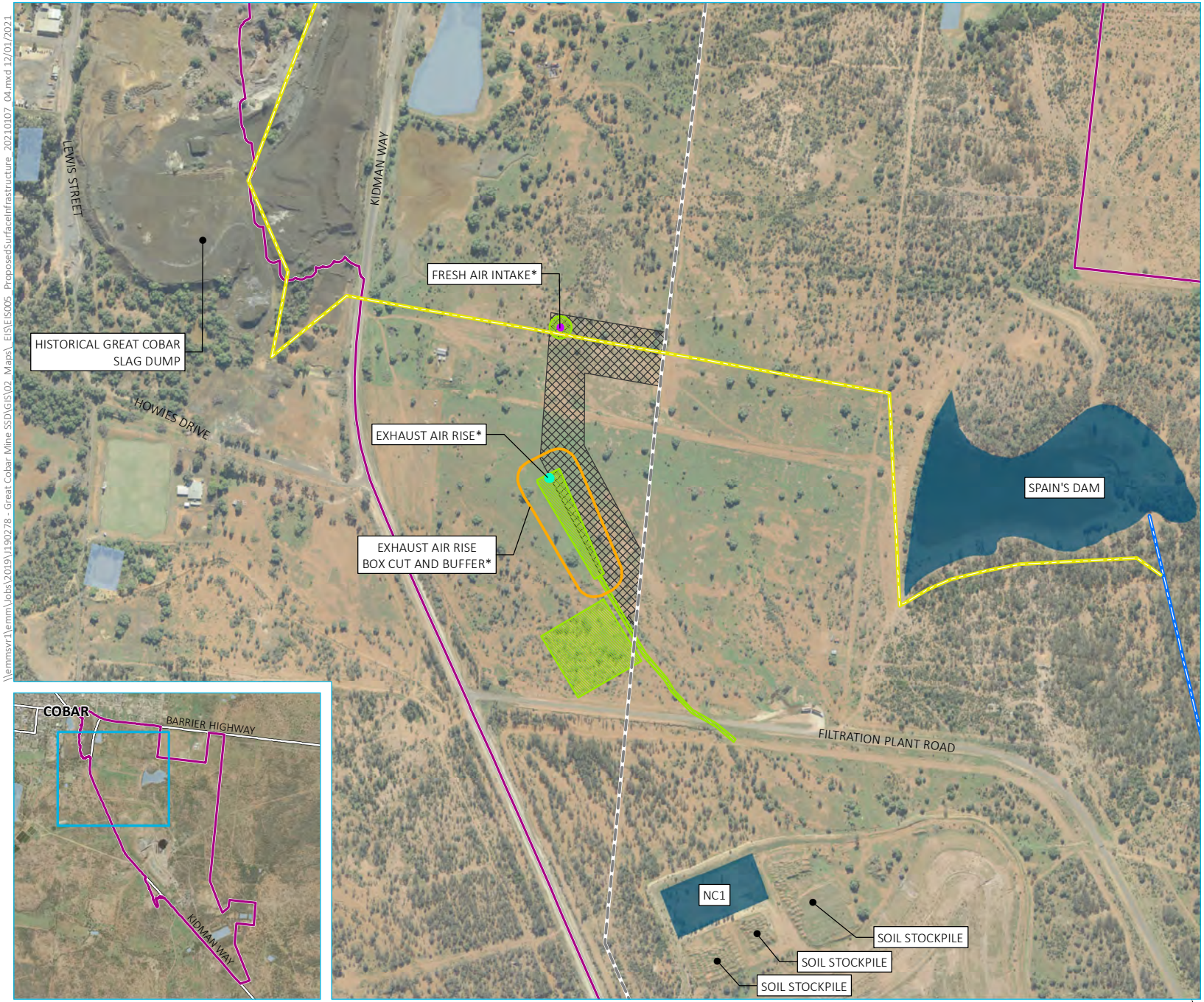
GDA 1994 MGA Zone 55

N

Existing surface features

Peak Gold Mines
New Cobar Complex Project
Rehabilitation and closure strategy
Figure 1.3

EMM creating opportunities



KEY

- Project area
- Major road
- Existing indicative pipeline route
- Existing Great Cobar dewatering pipeline
- Existing 22 kV powerline
- Exhaust air rise*
- Exhaust air rise buffer*
- Fresh air intake*
- Proposed power line corridor
- Waterbody
- Mine water management storage
- Area of approved vegetation clearance (indicative)*

*Approved under existing REF approvals, but not yet constructed.

Source: EMM (2020); DFSI (2017); DPE (2019); ELA (2018)

0 100 200 m

GDA 1994 MGA Zone 55

N

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Proposed surface infrastructure

Peak Gold Mines
New Cobar Complex Project
Rehabilitation and closure strategy
Figure 1.4

EMM creating opportunities

Processing will remain at the existing approved rate of up to 800,000 tpa, with production of ore from the Great Cobar and Gladstone deposits making up for the future decrease in production from other workings across PGM.

Additionally, there are remaining resources in the New Cobar, Jubilee and Chesney deposits that are mineral rich, but which are currently not economical to mine in isolation. Keeping the New Cobar Complex operational, and gaining access to Great Cobar and Gladstone deposits, will lead to increases in economies of scale and maximise opportunities to mine these resources, and keep PGM operational until 2035.

1.2 Purpose of this report

EMM Consulting (EMM) has been engaged by PGM to prepare and submit an environmental impact statement (EIS) to support an SSD application for development consent under section 4.12 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). It has been prepared to the form and content requirements set out in clauses 6 and 7 of Schedule 2 of the *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) as well as clause 8(1) and clause 5 of Schedule 1 of *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). The Peak Complex, which is not part of this SSD application will continue to operate under local government (CSC) approvals, as there is no proposed change to this arrangement.

PGM requested Secretary's Environmental Assessment Requirements (SEARs) from DPIE for the SSD EIS in December 2019; these were received in February 2020, and were re-issued in October 2020 following the receipt of a Biodiversity Development Assessment Report (BDAR) waiver. The SEARs included a requirement to assess potential land resources and rehabilitation risks associated with the construction and operation of the project. This rehabilitation and landscape management strategy has been prepared to address the relevant SEARs, provide information to be used in the EIS and support the SSD application for the project. The land resources and rehabilitation related matters and EMM responses are tabulated below (Table 1.1).

Table 1.1 Land resources and rehabilitation related SEARs and EMM responses

Requirements	EMM responses
Land Resources – include and assessment of:	
• the likely impacts of the development on the soils and land capability of the project area and surrounds;	Refer to Section 3.2.2
• the likely agricultural impacts of the development including biosecurity risks;	Refer to Section 3.2.2
• the likely impact of the development on landforms (topography), including the long-term geotechnical stability of any new landforms on the project area; and	The geotechnical risk of the proposed underground mine is addressed in Section 3.2.1. No new landforms will result from the project.
• an assessment of the compatibility of the development with other land uses in the vicinity of the development in accordance with the requirements of Clause 12 of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries)* 2007, paying particular attention to the agricultural land use in the region.	Section 3.9 of the EIS
Rehabilitation and Final Landform – including:	
• a detailed overview of the final land-use for the development, including the project area and ancillary infrastructure;	Refer to Section 5.2
• a description of final landform design objectives, having regard to achieving a natural landform that is safe, stable and non-polluting, fit for the nominated post-mining lands use and sympathetic with surrounding landforms; and	Refer to Section 5.1, however no new landforms will result from the project.

Table 1.1 Land resources and rehabilitation related SEARs and EMM responses

Requirements	EMM responses
• the proposed rehabilitation and mine closure strategies for the project area having regard to the key principles in the *Strategic Framework for Mine Closure*, including rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria.	This document

In addition to above SEARs, Resources Regulator in its letter dated 15 January 2020 has raised additional requirements. Resources Regulator requirements and EMM responses are provided below (Table 1.2).

Table 1.2 Agency project-specific assessment recommendations

Requirement	Section addressed
Post-mining land use	
a) Identification and assessment of post-mining land use options;	Refer to Section 5
b) Identification and justification of the preferred post-mining land use outcome(s), including a discussion of how the final land use(s) are aligned with relevant local and regional strategic land use objectives; and	Refer to Section 5
c) identification of how the rehabilitation of the project will relate to the rehabilitation strategies of neighbouring mines within the region, with a particular emphasis on the coordination of rehabilitation activities along common boundary areas.	The mines neighbouring the project are owned by PGM. There are no common boundary rehabilitation issues.
Rehabilitation objectives and domains	
d) Inclusion of a set of project rehabilitation objectives and completion criteria that clearly define the outcomes required to achieve the post-mining land use for each domain. Completion criteria should be specific, measurable, achievable, realistic and time bound. If necessary, objective criteria may be presented as ranges.	Refer to Section 7
Rehabilitation methodology	
e) Details regarding the rehabilitation methods for disturbed areas and expected time frames for each stage of the rehabilitation process;	Refer to Section 6
f) Project area layout and scheduling, including maximising opportunities for progressive final rehabilitation. The final rehabilitation schedule should be mapped against key production milestone (ie ROM tonnes (t)) of the mine layout sequence before being translated to indicative timeframes through the project life. The project plan should maximise opportunities for progressive rehabilitation.	The project will not result in the formation of new landforms. The proposed box cut will be backfilled at the completion of underground mining. There is no opportunity for progressive rehabilitation.
Conceptual final landform design	
g) Inclusion of a drawing at an appropriate scale identifying key attributes of the final landform, including final landform contours and the location of the proposed final land use(s).	The project will not result in the formation of new landforms. The existing landforms are the result of previous approvals and the landform attributes are provided in the approved mining operation plan (MOP).

Table 1.2 Agency project-specific assessment recommendations

Requirement	Section addressed
Monitoring and research	
h) Outlining the monitoring programs that will be implemented to assess how rehabilitation is trending towards the nominated land use objectives and completion criteria;	Refer to Section 7.2
i) Details of the process for triggering intervention and adaptive management measures to address potential adverse results as well as continuously improve rehabilitation practices;	Refer to Section 3.2.7
j) Outlining any proposed rehabilitation research programs and trials, including their objectives. This should include details of how the outcomes of research are considered as part of the ongoing review and improvement of rehabilitation practices.	Refer to Section 7.2.57.2.5
Post-closure maintenance	
k) Description of how post-rehabilitation areas will be actively managed and maintained in accordance with the intended land use(s) in order to demonstrate progress toward meeting the rehabilitation objectives and completion criteria in a timely manner.	Refer to Section 6.5
Barriers or limitations to effective rehabilitation	
l) Identification and description of those aspects of the project area or operations that may present barriers or limitations to effective rehabilitation, including:	
i) evaluation of the likely effectiveness of the proposed rehabilitation techniques against the rehabilitation objectives and completion criteria;	Refer Section 7.2
ii) an assessment and life of project management strategy of the potential for geochemical constraints to rehabilitation (eg acid rock drainage, spontaneous combustion etc), particularly associated with the management of overburden/inter-burden and reject material;	Refer to Section 3.2.1
iii) the process that will be implemented throughout the project life to identify and appropriately manage geochemical risks that may affect the ability to achieve sustainable rehabilitation outcomes;	Refer to Section 3.2.1
iv) a life of mines tailings management strategy, which details measures to be implemented to avoid the exposure of tailings materials that may cause environmental risk, as well as promote geotechnical stability of the rehabilitated landform; and	There are only historical tailings deposits with the project area. Management and rehabilitation strategies for historical tailings are discussed in Section 3.2.1.
v) existing and surrounding landforms (showing contours and slopes) and how similar characteristics can be incorporated into the post-mining final landform design. This should include an evaluation of how key geomorphological characteristics evident in stable landforms with the natural landscape can be adapted to the materials and other constraints associated with the project area.	N/A as the proposal does not create any new landforms and the existing landforms such as the WRE area was approved via a previous approval and are described in the approved MOP.
m) Where a void is proposed to remain as part of the final landform, include:	
i) a constraints and opportunities analysis of final void options, including backfilling, to justify that the proposed design is the most feasible and environmentally sustainable option to minimise the sterilisation of land post-mining;	The proposed Box Cut will be backfilled. Management of the existing approved New Cobar open

Table 1.2 Agency project-specific assessment recommendations

Requirement			Section addressed
			cut is unchanged and is discussed in Section 4.2.1 and Section 5.2.
	ii)	a preliminary geotechnical assessment to identify the likely long term stability risks associated with the proposed remaining high wall(s) and low wall(s) along with associated measures that will be required to minimise potential risks to public safety; and	The project will not result in the construction of any permanent open cuts. The proposed Box Cut will be backfilled at the completion of mining. The geotechnical stability of the proposed underground mine and existing New Cobar open cut is discussed in Section 3.2.1.
	iii)	outcomes of the surface and groundwater assessments in relation to the likely final water level in the void. This should include an assessment of the potential for fill and spill along with measures required to be implemented to minimise associated impacts to the environment and downstream water users.	Refer Section 3.2.1
n)	Where the project includes underground workings:		
	i)	determine (with reference to the groundwater assessment) the likelihood and associated impacts of groundwater accumulating and subsequently discharging (eg acid or neutral mine drainage) from underground workings post cessation of mining; and	Refer to Section 3.2.1v.
	ii)	consideration of the likely controls required to either prevent or mitigate against these risks as part of the closure plan for the project area.	Refer to Section 3.2.1v.
o)	Consideration of the controls likely to be required to either prevent or mitigate against rehabilitation risks as part of the closure plan for the project area;		A detailed risk assessment has been prepared for the approved MOP which is directly relevant to the proposed project. A summary of the key risks and associated management and mitigation measures are provided in Sections 3, 4 and 5.2.
p)	Where an ecological land use is proposed, demonstrate how the revegetation strategy (eg seed mix, habitat features, corridor width etc) has been developed in consideration of the target vegetation community(s);		Refer to: • Section 5.1; • Section 5.2; and • Section 6.2.
q)	Where the intended use is agriculture, demonstrate that the landscape, vegetation and soil will be returned to a condition capable of supporting this; and		Refer to Section 3.2.2
r)	Consider any relevant government policies.		Refer to Section 1.3

1.3 Other legislation, guidelines and leading practice

1.3.1 Legislation and environmental planning instruments

i Mining Act 1992

The project will operate within the existing mining leases issued under the *Mining Act 1992* ('Mining Act'). This includes consolidated mining lease (CML) 6, mining purposes lease (MPL) 0854 and mining leases (ML) ML 1483 and ML 1805. The Mining Act defines rehabilitation as the 'treatment or management of disturbed land or water for the purpose of establishing a safe and stable environment'. Mining lease conditions pertaining to rehabilitation are provided in Table 1.3.

Table 1.3 Mining lease rehabilitation conditions

Schedule	Condition	Requirements	Where addressed
CML 6 and ML1483			
2	2	Any disturbance resulting from the activities carried out under this mining lease must be rehabilitated to the satisfaction of the Minister	Approved MOP
	3		
	(a)	The lease holder must comply with an approved MOP in carrying out any significant surface disturbing activities, including mining operations, mining purposes and prospecting. The lease holder must apply to the Minister for approval of a MOP. An approved MOP must be in place prior to commencing any significant surface disturbing activities, including mining operations, mining purposes and prospecting.	
	(b)	The MOP must identify the post mining land use and set out a detailed rehabilitation strategy which:	
	(i)	Identifies areas that will be disturbed;	
	(ii)	Details the staging of specific mining operations, mining purposes and prospecting;	
	(iii)	Identifies how the project will be managed and rehabilitated to achieve the post mining land use;	
	(iv)	Identifies how mining operations, mining purposes and prospecting will be carried out in order to prevent and or minimise harm to the environment; and	
	(v)	Reflects the conditions of approval under: • The *Environmental Planning and Assessment Act 1979;* • The *Protection of the Environment Operations Act 1997*; and • Any other approvals relevant to the development including the conditions of this mining lease.	
	(c)	The MOP must be prepared in accordance with the *ESG3: Mining Operations Plan (MOP) Guidelines September 2013* published on the Department's website at www.resources.nsw.gov.au/environment.	
	(d)	The lease holder must prepare a Rehabilitation Report to the satisfaction of the Minister. The report must:	Annual review reports
	(i)	Provide a detailed review of the progress of the rehabilitation against the performance measures and criteria established in the approved MOP;	
	(ii)	Be submitted annually on the grant anniversary date (or at such other times as agreed by the Minister); and	

Table 1.3 Mining lease rehabilitation conditions

Schedule	Condition	Requirements	Where addressed
	(iii)	Be prepared in accordance with any relevant annual reporting guidelines published on the Department's website at www.resources.nsw.gov.au/environment.	

The project operates under an approved Mining Operations Plan (MOP). The MOP includes objectives and criteria for rehabilitation, rehabilitation plans, risks to rehabilitation that need to be addressed, rehabilitation controls and methodologies, and monitoring programs. The approved landform designs, rehabilitation strategies, techniques, standards, maintenance activities and monitoring will be carried over into this rehabilitation and landscape management strategy. Accordingly, rehabilitation of the project area will be carried out generally in accordance with this strategy.

ii Protection of the Environment Operations Act 1997

The Protection of the Environment Operations Act 1997 ('POEO Act') establishes the State's environmental regulatory framework and includes licensing requirements for certain activities. The objectives of the POEO Act that relate to decommissioning and rehabilitation include *...to protect, restore and enhance the environment, to reduce risks to human health and prevent degradation of the environment*.

The POEO Act objectives have been used in the preparation of this strategy and are principally reflected in one of the overarching goals of the strategy; to minimise the risk of pollution occurring from the project area during and following closure, decommissioning and rehabilitation.

iii Cobar Local Environmental Plan 2012

The project area is zoned IN1 General Industrial, SP2 Infrastructure and RU1 Primary Production under the Cobar Local Environment Plan 2012 (Cobar LEP) (Figure 1.5). Extractive industries are permissible with consent within the IN3 and RU1 zones. Extractive industries are prohibited within the RE2 zone. However, Section 4.38(3) of the Environmental Planning and Assessment Act 1979 (EP&A Act) states, in relation to SSD, that:

> Development consent may be granted despite the development being partly prohibited by an environmental planning instrument.

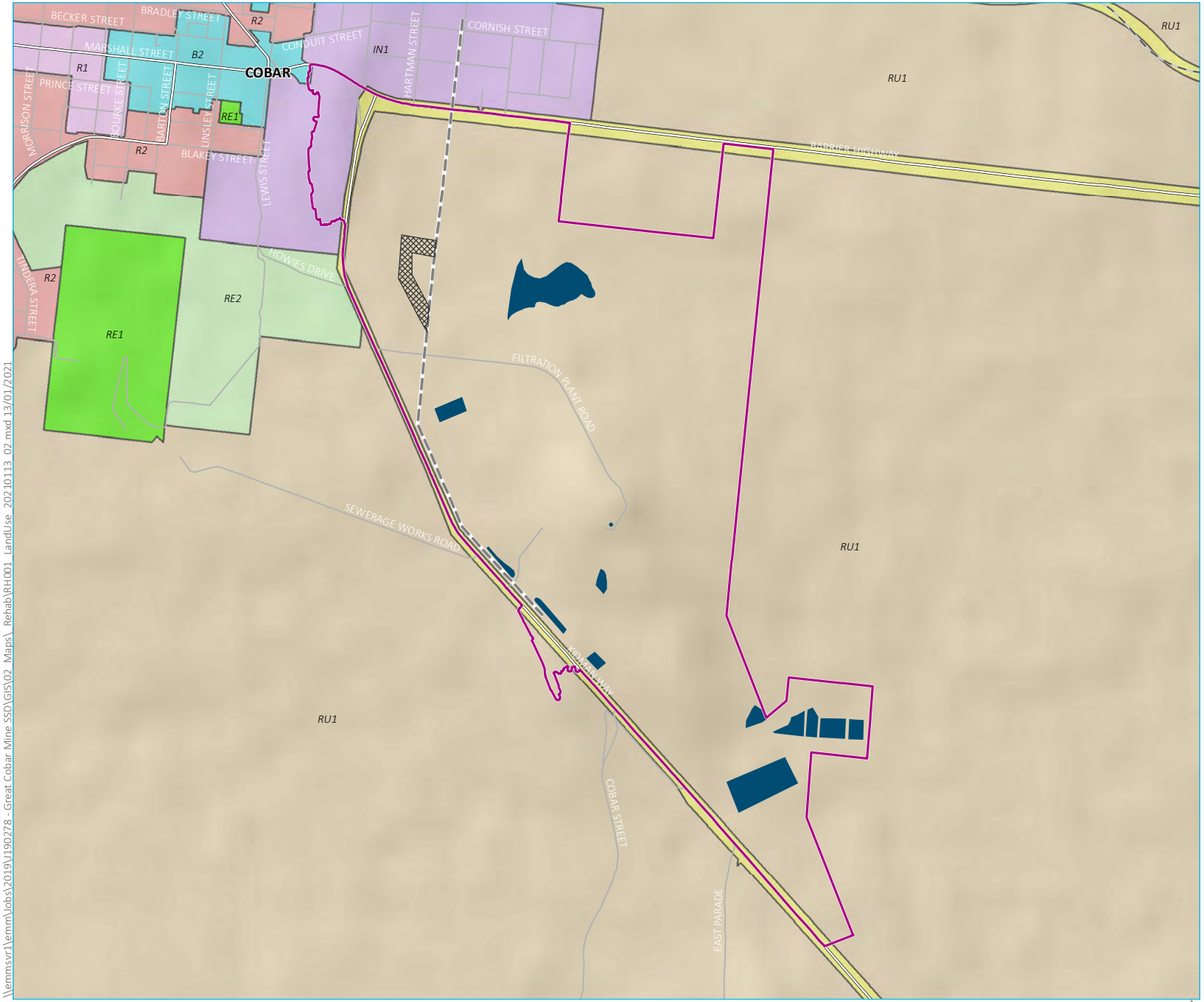
The objectives of the zoning from the Cobar LEP and applicability to this strategy are detailed in Table 1.4 below:

Table 1.4 Cobar LEP 2012 zoning objectives

Zone	Objectives	Applicability to project
IN1 Heavy industrial (Greater Cobar Mine)	To provide a wide range of industrial and warehouse land uses To encourage employment opportunities To minimise any adverse effect of industry on other land uses. To support and protect industrial land for industrial uses	This land use zone as it relates to the project is located on the derelict slag heaps above the proposed Greater Cobar underground workings. There will be no project related infrastructure in this zone. The derelict slag heap precludes future industrial development at this location.
SP2 Infrastructure (Greater Cobar Mine, Gladstone Mine)	To provide for infrastructure and related uses.	

Table 1.4 Cobar LEP 2012 zoning objectives

Zone	Objectives	Applicability to project
	To prevent development that is not compatible with or that may detract from the provision of the infrastructure.	The proposed Great Cobar and part of the Gladstone underground workings are below Kidman Way which is zone SP2. This infrastructure is existing, and the proposed operations will not preclude future works on Kidman Way.
RU1 Primary production (all project components)	To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.	The key approved land disturbing activities that have potential to impact on agricultural land use associated with the project such as the North Cobar Pit, WRE, workshop and laydown areas have already been constructed. The proposed surface infrastructure such as the ventilation fan and associated power line will be temporary with a small footprint
	To encourage diversity in primary industry enterprises and systems appropriate for the area.	As above
	To minimise the fragmentation and alienation of resource lands	Due to the minimal surface footprint the proposed project will not fragment or alienate agricultural lands. The majority of the existing land disturbance including derelict mining areas other than the New Cobar Pit will be rehabilitated back to an agricultural post-project land use.
	To minimise conflict between land uses within this zone and land uses within adjoining zones.	There will be a short-term conflict between land uses but the land will be rehabilitated to its pre-mining land and soil capability (LSC) classes.



KEY

- Project area
- Existing 22 kV powerline
- Rail line
- Major road
- Minor road
- Proposed power line corridor
- Mine water management storage

Land use zone

- B2 | Local centre
- IN1 | General industrial
- R1 | General residential
- R2 | Low density residential
- RE1 | Public recreation
- RE2 | Private recreation
- RU1 | Primary production
- SP2 | Infrastructure

DRAFT

Source: EMM (2020); DFSI (2017); GA (2011); DPE (2019)

0 0.5 1 km

GDA 1994 MGA Zone 55

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Land use zoning

Peak Gold Mines
New Cobar Complex Project
Rehabilitation and closure strategy
Figure 1.5

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1.3.2 Guidelines

This strategy has been prepared generally in accordance with the appropriate guidelines, policies and industry requirements, where appropriate. Guidelines and policies referenced are as follows:

- Guideline for mineral exploration drilling; drilling and integrity of petroleum exploration and production wells (NSW Department of Industry, Skills and Regional Development - Division of Resources and Energy, March 2016);
- ESG3 – MOP Guidelines, September 2013 (NSW Department of Trade and Investment – Division of Resources and Energy, 2013);
- The Strategic Framework for Mine Closure (ANZMEC and MCA 2000);
- Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia 2006a); and
- Mine Closure and Completion - Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia 2006b).

The relevance of each of the guidelines is discussed briefly in the following sections.

i Borehole Sealing Requirements on Land

The Guideline for mineral exploration drilling; drilling and integrity of petroleum exploration and production wells (DRE 2016) (the drilling guideline) provides an overview of the process for rehabilitation of boreholes not licensed under the *Water Management Act 2000*.

In the event that any boreholes remain open at completion of the operational phase, PGM will rehabilitate any remaining boreholes, having regard to the borehole sealing requirements in the drilling guideline.

ii MOP Guidelines

The *ESG3 – Mining Operations Plan (MOP) Guidelines, September 2013* (the MOP guidelines) (DTI 2013) provide a process for managing and monitoring progression towards successful rehabilitation of a mine site. The guidelines provide content and formatting requirements for MOPs and Annual Reviews. The purpose of these documents is to "ensure that all mining operations are safe, the resources are efficiently extracted, the environment is protected, and rehabilitation achieves a stable and satisfactory outcome". Specifically, the MOP must meet the content and format as set out in the MOP guidelines as well as:

- be consistent with any development consent requirements;
- be consistent with safety management plans;
- be based on objectives and outcomes developed with stakeholder involvement;
- provide sufficient detail, supported by scientific and engineering assessment and/or peer review where appropriate, to clearly demonstrate that the objectives and outcomes defined in the MOP will be met; and
- where necessary, contain an environmental assessment of any impacts associated with the implementation of the MOP, where the activities have not been previously assessed under the EP&A Act.

This strategy has been prepared to address the various requirements of the closure and rehabilitation aspects of the MOP guidelines. In particular, rehabilitation domains have been identified as per the guidelines and the approved MOP, as well as objectives and completion criteria for these domains.

This strategy incorporates key rehabilitation and closure components of the approved MOP. The MOP will be amended following project approval to include new components of the project as required.

iii Strategic Framework for Mine Closure

The *Strategic Framework for Mine Closure* (ANZECC and MCA 2000) (SFMC) was developed to promote nationally consistent project closure management. The SFMC provides guidelines for the development of a project closure plan to make sure that all stages of project closure are conducted appropriately, including stakeholder engagement, development of project closure methodology, financial planning, and implementation of project closure. The SFMC also describes the expected standards for project closure and relinquishment of the project to a responsible authority. Whilst the objectives generally relate to mine closure, there are key elements that are relevant to rehabilitation of the project, in particular the allocation of appropriate resources and the establishment of rehabilitation criteria, which have been included in this strategy.

The main objectives of the SFMC are:

To enable all stakeholders to have their interests considered during the mine closure process;

To ensure the process of closure occurs in an orderly, cost-effective and timely manner;

To ensure the cost of closure is adequately represented in company accounts and that the community is not left with a liability;

To ensure there is clear accountability, and adequate resources, for the implementation of the closure plan;

To establish a set of indicators which will demonstrate the successful completion of the closure process; and

To reach a point where the company has met agreed rehabilitation criteria to the satisfaction of the Responsible Authority.

iv Mine Rehabilitation - Leading Practice Sustainable Development Program for the Mining Industry

The aim of *Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry* (NSW Department of Industry, Tourism and Resources 2006) (MR Handbook) is to provide guidelines to promote 'leading practice' sustainable mine plan and rehabilitation design, considering environmental, economic, and social aspects to support on-going sustainability of a mining development. The MR Handbook recommends procedures and mitigation measures that should be considered during project plan and rehabilitation design, including stakeholder consultation, material and handling, water balance, final landform design, soil (topsoil and subsoil) management, vegetation and fauna habitat re-establishment and rehabilitation, and agriculture / commercial forestry suitability. The MR Handbook also provides relevant mine development case studies supporting the recommended procedures and mitigation measures. Where relevant to the project, the above principals have been addressed in this strategy.

v Mine Closure and Completion - Leading Practice Sustainable Development Program for the Mining Industry

The aim of *Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry* (NSW Department of Industry, Tourism and Resources 2006) (MCC Handbook) is to provide guidelines to promote 'leading practice' sustainable mine closure and completion, minimising any long-term environmental, economic, and social impacts and resulting in a suitable final landform for an agreed land use. Specifically, the MCC

Handbook provides that a progressive rehabilitation plan, which is a key principle of this strategy, should be developed for mine closure.

1.4 Adoption of leading practices

PGM is committed to adopting leading practices in the planning, construction, operation, closure and rehabilitation of the project. This includes leading practice measures to avoid, minimise and/or mitigate potential environmental and social impacts. In relation to rehabilitation the leading practices adopted are, and will continue to be:

- removal of a substantial portion the existing WRE from project area and rehabilitation of the WRE to a biodiversity post project land use;
- backfilling and where required, capping of historical mine shafts;
- rehabilitation, and where feasible, reprocessing of historical mine tailings;
- progressive backfilling of mined stopes to minimise the potential for subsidence; and
- undertaking material characterisation, erosion and landform evolution modelling of the WRE to guide future slope and rehabilitation design.

1.5 Purpose and scope of this strategy

The purpose of this strategy is to address applicable regulatory requirements, standards and guidelines for the rehabilitation and landscape management of the project.

This strategy has been prepared recognising that once conditions of consent are available for the project to proceed, the MOP will be amended and submitted to the Resources Regulator for approval. The amended MOP will be generally consistent with the commitments relating to rehabilitation and closure outlined in this strategy.

The objectives of this strategy are to:

- describe the proposed post-mining land use;
- identify potential risks and impacts which will impact on rehabilitation and land resources;
- describe the methods for establishing stable post-mining landforms; and
- set rehabilitation criteria and outline the monitoring requirements that assess whether these criteria are being accomplished.

2 Project summary

Specific details of the project are presented in Table 2.1 in the context of existing PGM approvals. For a full, detailed project description, please see Chapter 2 of the New Cobar Complex EIS.

Table 2.1 Detailed overview of the project

Development component	Approved New Cobar Complex operations	New Cobar Complex Project SSD
Tenement	Development approved to occur within the Development Application areas, including CML 6, CML 8, ML 1483, ML 1805 and MPL 854. Mining of the following deposits using underground mining methods, with each deposit accessed via the New Cobar Complex open cut: • New Cobar deposit; • Chesney deposit; and • Jubilee deposit. Minerals processing occurs at the Peak Complex within CML 8 and also includes CML 7 and CML 9.	No change to mine lease area. Mining of the following deposits using underground mining methods, with each deposit accessed via the New Cobar open cut: • New Cobar deposit; • Chesney deposit; • Jubilee deposit; • Gladstone deposit; and • Great Cobar deposit. Processing of materials from the New Cobar Complex will continue at the Peak Complex within CML8 under existing approvals and is therefore outside the scope for this project.
Approvals	***Cobar Shire Council Development Consent*** • New Cobar South Open Cut - LDA 98/99:08 • New Cobar Open Cut - LDA 99/00:22 • New Cobar Underground – 2004/LDA 00003 PGM has received approval from CSC and the Resources Regulator (reference number MAAG0006783, approved in May 2020) to construct an exploration decline, ventilation shafts and associated infrastructure to facilitate exploration activities within the Great Cobar deposit. This is detailed in the Mine Operations Plan (MoP) for 2019-2022. ***Other Authorisations and Licences*** • EPL -3596 (EPA) • Licence to Manufacture Explosives (New Cobar) - XMNKF200002 (SafeWork NSW) • Dangerous Goods Notification - New Cobar: 35/035154 (SafeWork NSW). • Water Supply Works Approval reference 85WA753861 (Natural Resources Access Regulator)	PGM is seeking to consolidate all existing development consents applicable to the New Cobar Complex including existing mining, proposed underground mining of the Great Cobar and Gladstone deposits and existing surface infrastructure within a single consent issued by DPIE. Once approved, relevant CSC development consents for the New Cobar Complex will be surrendered. The project will used infrastructure that has been approved but not yet constructed as a result of the exploration decline and associated infrastructure. Other approvals related to the Peak Complex, will be unaffected.
Mining method	Underground stope mining operations commence above a centrally positioned crown pillar and stopes will be extracted from the bottom-up. Bench stopes are backfilled progressively using waste from development and rock from the WRE. Upon completion of each stoping level, voids are backfilled. In some instances, mining against rock fill is required. In these instances, a	Expansion of underground stope mining operations will access new deposits at Great Cobar and Gladstone, as well as continued mining of New Cobar, Chesney and Jubilee deposits. The mining method will not change. There is no recorded history of significant subsidence or geotechnical failure associated with the current, modern mining operations at the Peak and New Cobar complexes.

Table 2.1 Detailed overview of the project

Development component	Approved New Cobar Complex operations	New Cobar Complex Project SSD
	rock and cement slurry is placed in the stope to provide additional stability. PGM undertake detailed geotechnical assessments of all stopes during the detailed stope design stage prior to mining.	
Blasting	Blasting will be used for the development of the underground workings and is proposed to occur under independent firing conditions (in the preliminary phases). Delays will be used to adjust sequencing and prevent any interaction or vibration enhancement from adjacent blastholes. The approximate number of blasts will be three per 24-hour period, 20 per 7-day period. Explosives are stored in the existing magazine at New Cobar Complex.	No change to blasting method.
Life of mine	Presently, the council approvals have no end date. Current mine plans envisage mining at New Cobar Complex to continue until 2023 under current market assumptions.	The project will extend the life of mine by 12 years to 2035 under current market assumptions.
Production	Approved for the mining and processing of 800,000 tpa of ore to produce lead, zinc, copper, gold and silver from both the Peak and New Cobar complexes. Processing occurs at the Peak Complex.	The project will produce ore within the mining and processing limit of 800,000 tpa for the Peak and New Cobar complexes. Ore will be transported to the existing processing plant at the Peak Complex. The ore will be processed at the Peak Complex processing plant, and tailings will be disposed of at the TSF at the Peak Complex under existing approvals. Processing of ore will only take place at the Peak Complex, therefore is outside the scope of this project.
Mining extent	The New Cobar Complex comprises a surface disturbance area of approximately 425 hectares. The New Cobar open cut pit extends to a depth of approximately 100 mbgl. Development of underground working at Chesney, Jubilee and New Cobar deposits extends from a portal at the base of the New Cobar open cut pit.	Development of New Cobar Complex Project will be in stages. The Great Cobar and Gladstone deposits will be accessed via a decline extending from the existing New Cobar Complex underground workings. The proposed underground working depths are approximately 150–800 mbgl for Great Cobar and 350-500 mbgl for Gladstone. The Great Cobar deposit will be accessed by the approved exploration decline off the existing Jubilee workings at approximately 500 mbgl, and the Gladstone deposit will be accessed by a decline off the existing New Cobar underground workings at approximately 350 mbgl.
Tailings storage	All ore is processed at the Peak Complex, with tailings placed within the TSF.	No change.

Table 2.1 Detailed overview of the project

Development component	Approved New Cobar Complex operations	New Cobar Complex Project SSD
Site access	Access to the New Cobar and Peak complexes is via Kidman Way.	No change
Ore transportation	Ore is transported from the New Cobar Complex along 5 km of public road (Kidman Way) in road registered trucks at the rate of 25 trucks (50 truck movements) per day, seven days a week.	Ore will continue to be transported from the New Cobar Complex but at a maximum rate of 100 truck movements per day (in and out of site) (daylight hours only), seven days a week averaged over a calendar year. This is an increase in truck movements from a current maximum rate of 50 truck movements per day. The increase of daily truck movements will provide flexibility to PGM if there are unforeseen production disruptions such as poor weather or machinery breakdowns.
Waste rock management	Waste rock generated from underground workings is used preferentially as backfill in previously mined underground stopes. Some waste rock material may be brought to the surface and stored within the existing WRE at the New Cobar Complex until it's required for use in construction or rehabilitation across the Peak and New Cobar complexes.	No change
Soil management	Application of soil resources management strategies/objectives in accordance with the existing Mining Operation Plan 2019-2022 (MOP 2019-2022) (PGM 2019) and Water Management Plan (PGM 2020)).	No change.
Mine ventilation	There are two existing exhaust air rises at the New Cobar Complex – one at the Jubilee workings and one at the Chesney workings. Fresh air is drawn down the portal at the base of the New Cobar Complex open cut and also via two fresh air intakes located near the Chesney ventilation fan. The infrastructure developed as part of the Great Cobar exploration decline will include an exhaust air rise and a fresh air intake.	No new ventilation shafts will be required; the ventilation shafts installed as part of the exploration decline will be required for ongoing mining operations and will remain in place. A new ventilation fan will be required to maintain a safe volume of air flow in the underground workings.
Surface infrastructure	All existing New Cobar Complex surface infrastructure operates under existing CSC approvals.	The project will require the construction of a short (no more than 400 m long) power line spur between an existing 22 kV line and ventilation shaft (approved, but not yet constructed as part of the Great Cobar exploration decline approvals). This power line will connect to a pad-mounted compact substation to supply power for an emergency egress winder at the fresh air intake shaft and a ventilation fan to be installed at the exhaust air rise. No additional surface infrastructure will be required.

Table 2.1 Detailed overview of the project

Development component	Approved New Cobar Complex operations	New Cobar Complex Project SSD
Water supply sources and infrastructure	The water requirements for the Peak Complex and the New Cobar Complex (combined) are approximately 580 ML/year. The source of this water is typically, comprised of approximately 212 ML/year from dewatering underground workings at the New Cobar Complex and approximately 368 ML/year of town water from Burrendong Dam. PGM is licenced to take up to 1,186ML/year from Burrendong Dam, however approximately 50% of this water is lost through seepage, evaporation and other methods before arriving at the New Cobar Complex. Following approval for the dewatering of the Great Cobar shaft in 2019, up to 400 ML/year can be extracted to replace the town water currently being used. This is as part of a move for PGM's operations to be more self-reliant and sustainable in times of drought. The water from the Great Cobar shaft will be used to make up any shortfall in site demand that cannot be made up by dewatering of underground workings. It will also reduce PGM's reliance on the town water supply during times of drought.	No change
Site water management infrastructure	A water management system is in place at the New Cobar Complex and is operated and managed in accordance with PGM's current water management plan (WMP). Dewatering water that is used in the New Cobar Complex underground workings is pumped to the New Cobar Complex settling pond for re-use. The water from these settling ponds is preferentially pumped back underground for reuse, or to the Peak Complex for use in the processing circuit. While it is PGM's preference to use water from dewatered mine workings for processing, this may not always be possible due to poor water quality and additional treatment requirements. Dewatering water excess to site requirements is pumped to Spain's Dam or Young Australia Dams for evaporation or storage for future reuse.	No change
Power supply	Electricity to the site is via a 22 kilovolt (kV) electricity transmission line (ETL) to the Peak Complex substation.	No change to power supply, but an additional power line spur will be required for the ventilation fan to be installed in the exhaust air rise and the emergency egress winder.
Hours of operation	Underground and above ground activities, 24-hour operations, seven days a week.	No change
Employment	The 2019/2020 workforce at PGM (including both the Peak and New Cobar complexes) totalled 404 full time equivalents (FTE).	Annual labour estimates for New Cobar Complex, being mining and underground maintenance staff range from 57 FTE in 2020/21 to a peak of 272 FTE in 2026/27. These however are not new employees; during the same period, as mining at the Peak Complex ramps down, staff will relocate to New Cobar Complex as their primary location of employment activity. PGM will continue to maintain operational control across the complexes.

Table 2.1 Detailed overview of the project

Development component	Approved New Cobar Complex operations	New Cobar Complex Project SSD
Mining fleet	The existing/approved indicative mobile equipment fleet used for underground ore extraction, transport and waste rock handling includes: • articulated dump trucks; • cabletec; • compactors; • dozers; • drill rigs. • excavators; • graders; • haul trucks (50t); • jumbos; • LHD Loading dump trucks; • loaders; • rollers; • scrapers; • service truck; • underground development drill; • underground diamond drill rigs; • waste rock dump trucks; and • water trucks.	No change
Rehabilitation and mine closure	Current rehabilitation requirements as per MOP	Mine closure concepts and management measures will continue to be developed via the MOP 2019-2022, which outlines specific soil handling, rehabilitation and post mining landform objectives, in consultation with relevant regulatory authorities. The MOP will be updated and extended as required.

3 Environmental and socio-economic risk management

3.1 Overview

Identifying environmental, social and economic risks associated with rehabilitation and closure is essential for effective closure planning.

Key identified risks during the rehabilitation and closure phases include:

- potential for long term acid rock drainage due to the geochemistry of the ore and waste rock;
- not achieving the agreed post mining land uses on rehabilitated lands;
- failure of erosion and sediment controls;
- noise and dust nuisance;
- establishment and spread of weeds;
- hydrocarbons, chemicals and waste contamination;
- bushfire; and
- socio-economic considerations.

3.2 Environmental risk

3.2.1 Geochemistry and geotechnical stability

Geochemical characterisation of waste streams has been undertaken at the New Cobar Complex to understand the potential impact of the waste on the environment, rehabilitation and mine closure activities and the surrounding land users.

Historical and contemporary waste rock characterisation has previously been undertaken for the New Cobar WRE:

- Environmental Geochemistry International Pty Ltd (EGI), *Geochemical Evaluation of Mine Rock from the New Cobar Deposit*, March 2000 (Appendix J of NSR EIS, 2000) (EGI 2000); and
- SGM Environmental, *Geochemistry Review*, May 2019 (SGM 2019).

Based on the similarity in lithology and geochemical properties for the Great Cobar and Gladstone deposits (EMM 2020a) the geochemistry data can be used to provide an understanding of the likely geochemical behaviour of the waste rock at the New Cobar Complex.

Waste rock can generally be categorised as PAF or non-acid forming (NAF). Acid mine drainage (AMD) occurs because of oxidation of reactive sulfides contained in PAF waste rock. Sulfide oxidation has the potential to produce sulfate, acidity and dissolved metals which can be transported by runoff. Neutral mine drainage (NMD) occurs when the acid generated is neutralised by dissolution of surrounding minerals such as dolomite. As the solubility of many metals in pH dependent, the neutralisation process can lead to the precipitation of many metals. However, at near

neutral pH, concentrations of particular metals can remain elevated. The drainage will also have high sulfate salinity. Saline drainage (SD) occurs when acidic drainage is completely neutralised by surrounding minerals and contains no significant concentrations of residual metals, leaving elevated calcium, magnesium, sulfate and salinity (SGM 2019).

All the New Cobar Complex deposits are in highly mineralised shear zones the ore and waste rock produced are assumed to be PAF. Weathered and oxidised waste including waste from shallow borrows are generally assumed to be NAF.

A Waste Rock Management Plan (WRMP) was prepared by SLR for the Peak Complex, New Cobar Complex and historical Queen Bee mine site in March 2020. The WRMP was submitted to the Resources Regulator in March 2020 and no response has been received to date. The WRMP details waste rock characterisation work undertaken to date and includes procedures and processes for characterisation of waste rock by project geological and engineering personnel. It also describes management and mitigation measures for the NAF and PAF waste rock material.

i Waste Rock Emplacement

The WRE was constructed as part of the New Cobar Open Cut project approved by Cobar Council (LDA 99/00:022 29 June 2000). It was constructed in three stages from the south extending to the north with the southern and western sections constructed from oxide (NAF) waste rock from the upper benches of the void (NSR 2000).

The WRE was sampled (53 samples) using a grid system in 2017 to identify PAF and NAF waste rock domains using test pits at depths from 1m to 5 m below ground level. Further sampling (75 samples) was undertaken in the eastern half of the WRE at depths of 1, 3 and 5 m below ground level to refine the extent and location of the PAF waste rock.

The AMD potential screening criteria is provided in Table 3.1 from *Preventing Acid and Metalliferous Drainage Leading Practice Sustainable Development Program for the Mining Industry* (DFAT 2016).

Table 3.1 AMD potential screening criteria (DFAT 2016)

Classification	Net acid producing potential (NAPP) (kg H_2SO_4/t)	Net acid generation (NAG) pH
PAF	>10	<4.5
PAF-low capacity (PAF-LC)	0–10	<4.5
NAF	negative	≥4.5
Acid consuming (AC)	Less than -100	≥4.5
Uncertain (UC)	positive	≥4.5
	negative	≤4.5

50 of the 128 samples had a positive NAPP, indicating a NAPP of which 39 were PAF-LC and 11 PAF. The remaining 78 samples had a negative NAPP or a NAPP of 0 kg H_2SO_4/t, indicating that the samples are not acid generating however the acid neutralising capacity (ANC) values were relatively low across the WRE, indicating minimal capacity to neutralise any acidity generated in AMD (SGM 2019).

55 samples were classified as NAF, 29 as UC (NAF) and 6 UC (PAF-LC).

The sampling indicated that the majority of the waste rock in the eastern half of the WRE had undergone some level of oxidation with potential ongoing acid generation which limits its future suitability for tailings dam capping at the Peak Complex (SGM 2019).

The data shows that waste rock in the western half of the WRE is the most suitable for capping of the TSF although SGM 2019 recommended further assessment to characterise the waste rock and assess vegetation tolerance of the waste rock chemistry to conclude on rehabilitation suitability with certainty.

As the maximum depth of sampling was 5 m below ground level, the waste rock properties below this may differ although it is anticipated that more oxidised material is likely to be found further down the WRE profile.

The WRE emplacement has a total volume of 2.5M m^3. PAF waste rock will be preferentially used for backfilling of stopes in the underground mines. Some PAF may be used on the inside of the TSF at the Peak Complex for embankment lifts and NAF material used for the remainder of the TSF embankments and capping of the TSF. The total volume of waste rock required for the embankment lifts and capping of the Peak TSF is expected to be approximately 1M m^3 which means approximately 1.5M m^3 of waste rock will remain.

The approved, as constructed WRE landform is a traditional bench and batter design and much of the WRE has been rehabilitated. There is rill and gully erosion on the northern and eastern where vegetation cover is low, and the channel banks have breached.

PGM anticipate that reworking of the northern and eastern batters will be required to achieve nominated stability and rehabilitation criteria. PGM will undertake additional waste rock and soil characterisation, as well as erosion and landform evolution modelling to inform the WRE batter stabilisation and rehabilitation approach.

Any runoff and seepage from the WRE is contained by a series of ponds (NC1, NC2 and NC3) which are monitored and maintained in accordance with the approved Water Management Plan incorporating an Erosion and Sediment Control Plan (ESCP).

ii Run of Mine pad

Mined ore from the underground mines is trucked to the surface and stockpiled on the Run of Mine (RoM) pad until it is loaded into trucks and transported to the Peak Complex for processing. The RoM was constructed as part of the New Cobar Open Cut project from oxide waste from the open cut.

Run off from the RoM reports to NC 3 and NC 4.

At the end of project life, it is anticipated that any ore or PAF material on the RoM pad will have either been processed or used to backfill underground stopes.

iii Open Cuts

a New Cobar Open Cut

The New Cobar open cut and associated final landform was approved by Cobar Council via LDA99/00:022 29 June 2000. It is approximately 100 m deep when measured from the top of Fort Bourke Hill with an overall wall slope of 30.9°. Groundwater modelling undertaken for the void (NSR 2000) demonstrated that the void would function as a groundwater sink. It showed that water level in the void will reach an equilibrium level approximately 20 to 30 m above the pit floor (RL10200 to RL10210) and will therefore never overtop. Groundwater modelling undertaken by EMM for the project identified that modelled groundwater levels the underground operations will be below the floor of the open cut and it will not pond water (EMM 2020a).

Subsidence modelling undertaken by Beck (2020) forecasts displacements of up to 50–60 mm in isolated sections of the open cut crests however it is considered that these sections have likely broken off during blasting and no longer exist. No significant displacement indicating multi-bench or wall scale instability is forecast.

Geotechnical monitoring of the open cut is undertaken by PGM in accordance with the approved Ground Control Management Plan (PGM 2017).

b Chesney Open Cut

The Chesney open cut is a historical shallow open cut that previously contained two mine shafts that were backfilled (S Lloyd, pers. comm, 2 August 2020). Two ventilation shafts have been installed during the backfilling process to provide ventilation to the underground mine workings. As the open cut was excavated in oxidised rock material there are no known sources of exposed PAF rock or AMD.

c Box Cut

A new box cut and 500 m service decline will be excavated to a depth of 20 m with wall slopes of 55 degrees at the northern end of the project area. An approximately 5 m diameter ventilation shaft will be installed at the base of the service decline to act as an exhaust air rise. A second ventilation shaft, approximately 5 m in diameter, will be installed north of the boxcut which will be the fresh air intake. At the end of project life the shafts will be capped, and the box cut will be backfilled and the original land surfaced contours and LSC class 6 re-established.

iv Chesney Tailings

The historical Chesney tailings are located to the east of the administration building and car park. There are no known AMD issues with the tailings and any seepage and run-off from the tailings are contained by the Young Australia 1, 2a, 2b, 2c, 2d and 3 dams.

It is expected that the tailings will be either excavated and pre-processed at the Peak Complex or simply transported to the Peak Complex TSF for disposal.

v Underground mines

Proposed underground mining operations will commence above a centrally positioned crown pillar and stopes will be extracted from the bottom-up. Bench stopes are backfilled progressively using waste from development and rock from the WRE. Upon completion of each stoping level, voids are backfilled. In some instances, mining against rock fill is required. In these instances, a mixture of rock and cement slurry are placed in the stope to provide additional stability (PGM 2020).

Surface subsidence forecasts by Beck (2020) are very low (<15 mm) and are considered negligible due to:

- small footprint of future underground mining;
- relatively strong rockmass conditions;
- small (narrow) stopes with a small footprint;
- low extraction ratio due to the narrow stopes and small amount of rock planned to be mined (compared to other larger stoping mines); and
- use of backfill.

Planned underground mining is not in proximity to the existing New Cobar void and there is no significant stress interaction and minimal subsidence in the vicinity of the void. Proposed underground mining does not result in instability in the void in the model forecasts.

Minor to moderate levels of rockmass damage is forecast in proximity to some stopes. This increases with depth. Forecast levels of damage would generally be associated with minor dilution and stope overbreak. This is normal in most stoping mines. Moderate levels of rockmass damage with potential for increased levels of stope overbreak is forecast along the Great Chesney and Great Cobar faults which bounds the hanging wall of some future stopes.

There are stopes in the New Cobar and Gladstone mines that are close to or intersect the weathered/oxidised layers near surface. The rockmass in the oxidised layers is weaker and more susceptible to instability and chimneying. Beck (2020) notes these stopes are conceptual only and were designed based on the inferred mineral resource and may not be economic or become part of the ore reserve and executable mine design. If the risks of chimneying cannot be reduced to as low as reasonably practicable, the stopes will not be mined.

Diminishing pillars are formed at Great Cobar and Gladstone mines due to the mining sequence. These diminishing pillars form as stopes are retreated to a central access. These stopes will likely have elevated levels of stope overbreak and dilution compared to nearby stopes due to the stress concentration that occurs as the pillar diminishes. However, due to the rockmass conditions, depth and small number of stopes with this sequence, this is not considered to be a significant problem for the mine.

Waste rock from the underground operations will be characterised and managed in accordance with the approved Waste Rock Management Plan. Rock will be characterised by PGM engineering and geological personnel to be either PAF or NAF both visually and / or using hand-held x-ray fluorescence (XRF) analysis (PGM 2020).

Static testing will be undertaken of identified NAF waste rock for construction or rehabilitation purposes to confirm that it has potential for generation of AMD.

Waste rock from the underground mines will be selectively handled to facilitate:

- the preferential return of PAF waste rock underground for stope backfilling;
- transportation of PAF and NAF waste rock to the surface on a campaign basis for construction projects (PAF to be used on internal TSF wall raises only);
- transportation of NAF waste rock to the surface for storage in designated stockpiles with the WRE footprint for future construction and rehabilitation purposes; and
- transportation of PAF waste rock to the surface and stored in temporary designated stockpiles within the WRE footprint if there is insufficient storage areas available underground.

Per the project groundwater assessment (EMM 2020a) there is limited potential for acid or neutral mine drainage to occur post-mining within underground workings as a result of groundwater accumulation and discharge. The groundwater assessment determined that:

- a large proportion of the lithologies affected by drawdown are anticipated to be NAF and is not expected to adversely affect groundwater quality; and
- exposed PAF rock may present an increased risk of adverse effects on groundwater, however the recovery (rise) of groundwater heads will result in inward draining of groundwater into the New Cobar Complex voids and prevent outward seepage of acidic and metalliferous water.

Based on these groundwater assessment findings no preventative or mitigating controls to manage the acid mine drainage in underground workings are required.

3.2.2 Land and soil capability

i Land and Soil Capability

A desktop assessment of LSC was undertaken for the project area. All proposed new land disturbances and the bulk of the existing land disturbances for the project will be on the Cobar Land System (OEH 2016). The Cobar Land System is strongly associated with red earths and lithosols on the lower slopes and drainage lines, with the upper

slopes and residual hills characterised by acid red earths and earthy or sandy lithosols with variable outcropping rock, surface quartz and gravel. The existing New Cobar void, WRE and mine infrastructure areas are located within the Mineshaft Land System which is characterised by sandy and earthy lithosols grading to neutral red earths or alluvial soils within drainage lines.

Imagery of the project area potentially indicates the presence of areas of historical mine tailings within and adjacent to the project area that overlie the natural soils further limiting the LSC.

The *Land and Soil Capability Assessment Scheme – second* approximation (OEH 2012) classifies land into one of eight soil and land capability classes. These classes give an indication of what the land can be used for without causing land and soil degradation (Table 3.2).

Table 3.2 LSC classes (OEH 2012)

LSC Class	Description
Land capable of wide variety of uses (cropping, grazing, horticulture, forestry, nature conservation)	
1	Extremely high capability land: Land has no limitations. No special land management practices required. Land capable of all rural uses and land management practices.
2	Very high capability land: Land has slight limitations. These can be managed by readily available, easily implemented management practices. Land is capable of most land uses and land management practices, including intensive cropping with cultivation.
3	High capability land: Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental limitations
Land capable of a variety of land uses (cropping with restricted cultivation, pasture cropping, grazing, some horticulture, forestry, nature conservation)	
4	Moderate land capability land: Land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.
5	Moderate-low capability land: Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations will need to be carefully managed to prevent long-term degradation.
Land capable of a limited set of land uses (grazing, forestry, nature conservation and some horticulture)	
6	Low capability land: Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation.
Land generally Incapable of agriculture land use (selective forestry, nature conservation)	
7	Very low capability land: Land has severe limitations that restrict most land uses and generally cannot be overcome. On-site and off-site impacts of land management practices can be extremely severe if limitations not managed. There should be minimal disturbance of native vegetation.
8	Extremely low capability land: Limitations are so severe that land is incapable of sustaining any land use apart from nature conservation. There should be no disturbance of native vegetation.

The project area is considered to comprise land of LSC class 6 (low capability land) and LSC class 7 (very low capability land) (RW Corkery & Co. 2019) primarily due to shallow soils (NSR 2000) and stoniness (Figure 3.1). LSC class 6 land is generally restricted to low-impact land uses such as grazing, forestry and nature conservation, and requires careful management to prevent severe land and environmental degradation. LSC class 7 land has severe limitations that restrict most land uses and generally cannot be overcome (OEH 2012).

Land-use within the project area, other than existing mining, is predominantly low intensity grazing, historical mining, a mine owned residence with one tenant (tenancy will not be renewed when the existing tenant leaves), a plant nursery, infrastructure (roads, municipal water supply, telecommunications) and tourism (Fort Bourke Hill lookout overlooking the New Cobar open cut).

Historically, the Cobar Peneplain was promoted as productive sheep and cattle grazing country following initial explorations in the early 19th Century by explorers such as Sturt, Mitchell and Oxley. Squatting and establishment of these pastoral activities was well underway by the 1830s (EMM 2020b). By 1886, much of the project area was encompassed within these pastoral leases (EMM 2020b). Following discovery of copper at Kubbur waterhole in Cobar – purportedly because of information obtained from Aboriginal people – in the late 1860s, mining of the region became established. These included the Great Cobar copper mine between 1870–1921, the Chesney Mine from 1887 to the 1970s) the New Occidental mine between 1930–1951, base metal mining at Cornish Scottish Australia (CSA) and Elura (now Endeavor) mines, and a resurgence of various mineral mining between 1985 and present day (EMM 2020b). These activities have resulted in significant landscape modification across the region, including the project area.

Field inspection of the project area reveals that the remains of current and historical mining activities are extensive, including the remains of former towns, stockpiles, dams, settling ponds, mining cuts, and a range of surrounding ancillary activities. Of specific relevance to the proposed surface activities was the establishment of Cornish Town (or Cornishtown), which was located immediately to the west of Spain's Dam (Plate 3.1). This was one of the original mining towns established in the 1870s and encompassed a portion of the 2,500 people working in the Cobar area. Cornish Town was removed by Cobar Shire Council in the 1960s and only traces of the original town remain (EMM 2020b).

Overall, there appear to be few areas of the project area that are unaffected by agriculture, settlement, historical and more recent mining activities, and this is likely to have had a significant effect on the soils within the project area.

Proposed additional disturbance include the Box Cut, power line, access roads and ventilation fans (Table 3.3).

Table 3.3 Existing and proposed mine disturbance areas

Aspect	Disturbance (ha)
New Cobar Complex project disturbance area	155 ha
Existing mine related disturbance	426 ha
Proposed mine related disturbance.	0.8 ha (associated with power line corridor)
Boxcut service decline (exhaust air rise), approved but not constructed	1.92 ha
Fresh air rise, approved but not constructed	0.97 ha

The proposed disturbance is minimal and temporary and will only have a short-term impact on the historically impacted LSC.

Biosecurity risks associated with rehabilitation activities are low on account of the historical land disturbance from dryland agriculture (grazing) and mining, and the inherently low LSC of the area. The likelihood of pathogen incursion and impacts is negligible and can be managed through standard vehicle and equipment hygiene practices in accordance with the existing PGM Biodiversity and Land Management Plan (PGM 2016a).

At the end of mining the ventilation fans, Emergency egress winder and wider house to be constructed at the fresh air intake post SSD approval and associated infrastructure will be removed, and the associated shafts capped and backfilled. The box cut will also be backfilled and the pre-mining LSC re-established.

PGM also has a program of capping and backfilling derelict mine shafts, reprocessing derelict tailings (colloquially called 'pinkie' (due to its colour) and Chesney) and generally clearing up non-heritage protected derelict mining disturbances essentially re-establishing some LSC on otherwise permanently impacted lands.

Plate 3.1 **Aerial photograph of the project area from 1963 showing Cornish Town to the west of Spain's Dam**

KEY

- Project area
- Existing 22 kV powerline
- Rail line
- Major road
- Minor road
- Proposed power line corridor
- Mine water management storage

Land and soil capability class

- 6
- 7

DRAFT

Source: EMM (2020); DFSI (2017); GA (2011); DPE (2019)

0 0.5 1 km

GDA 1994 MGA Zone 55

N

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Project modelled land and soil capability

Peak Gold Mines
New Cobar Complex Project
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Figure 3.1

EMM creating opportunities

a Soil chemical limitations

Soils across and adjacent to the project area are Vertosols and Tenosols. Four soil samples were collected by PGM in the footprint of the Box Cut and power line and analysis determined the soils to have the following characteristics:

- texture – loamy sands with one clay loam;
- medium to slight acidity;
- low salinity;
- low plant available nitrogen;
- low to adequate plant available phosphorous; and
- elevated iron, lead, manganese and zinc levels.

In areas where historical mine tailings are present (known as pinkie), the potential for AMD and associated elevated metals and salinity can be problematic for revegetation.

b Erosion and sediment control

Erosion potential of a soil is determined by its physical and chemical properties. The erodibility of a soil due its physical properties is expressed as its K-Factor in t ha h $ha^{-1}MJ^{-1}mm^{-1}$. Table 3.4 provides a soil erodibility ranking for K-Factor from Rosewell (1993).

Table 3.4 Rosewell (1993) soil erosion ranking

K-Factor (t ha h $ha^{-1}MJ^{-1}mm^{-1}$)	Erosion potential
<0.02	Low
>0.02 to <0.04	Moderate
>0.04	High

Modelled K-Factors for the project area were determined from the eSpade 2.1 database (OEH 2016) (Figure 3.3). Modelled K-Factors range from 0.04– 0.06 t ha h $ha^{-1}MJ^{-1}mm^{-1}$ which indicate that the project soils have a high erosion potential.

Erosion hazard for the project area has been determined using the procedure described in Section 4.4.1 of Landcom (2004). The first step in the hazard assessment is a simple process using Figure 4.6 from. Landcom 2004 (reproduced as Figure 3.2) that considers slope of the land and the rainfall erosivity (R-Factor) in $MJmmha^{-1}h^{-1}$.

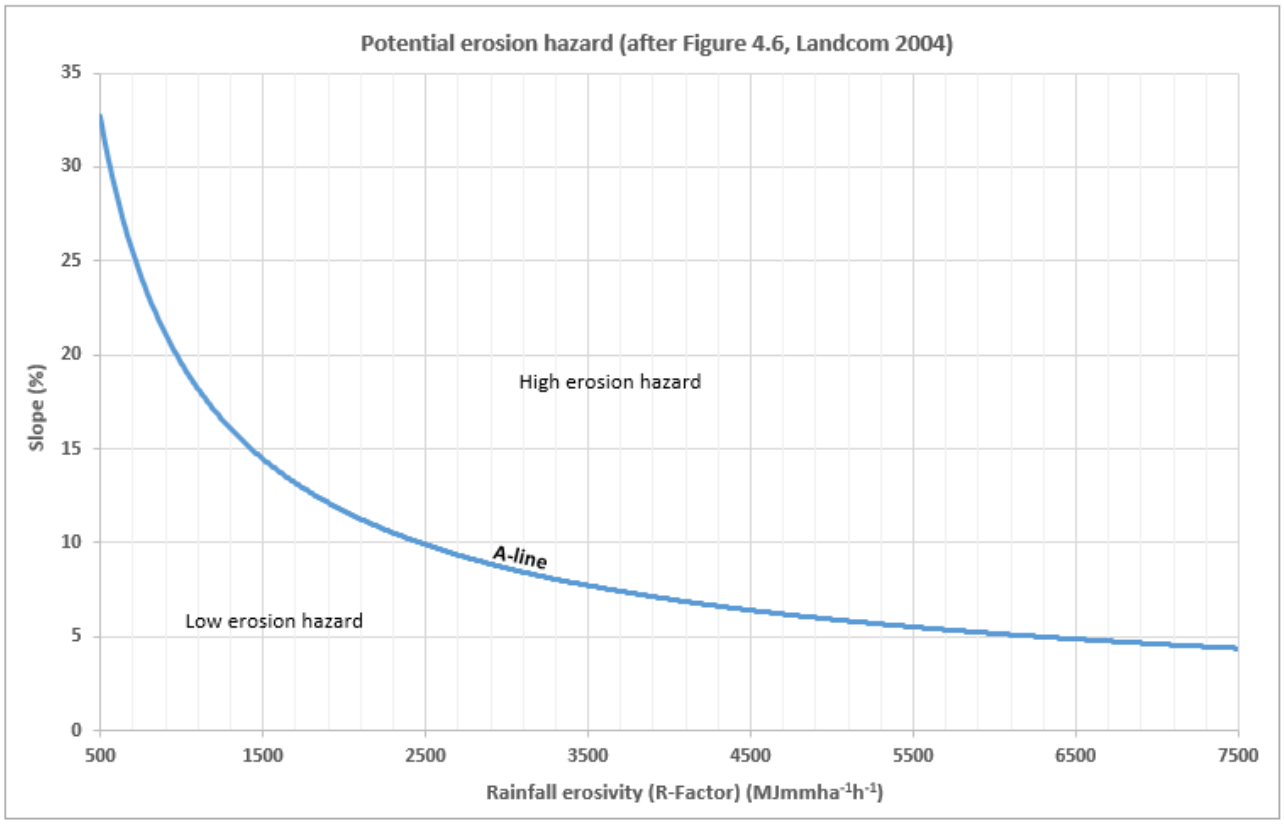
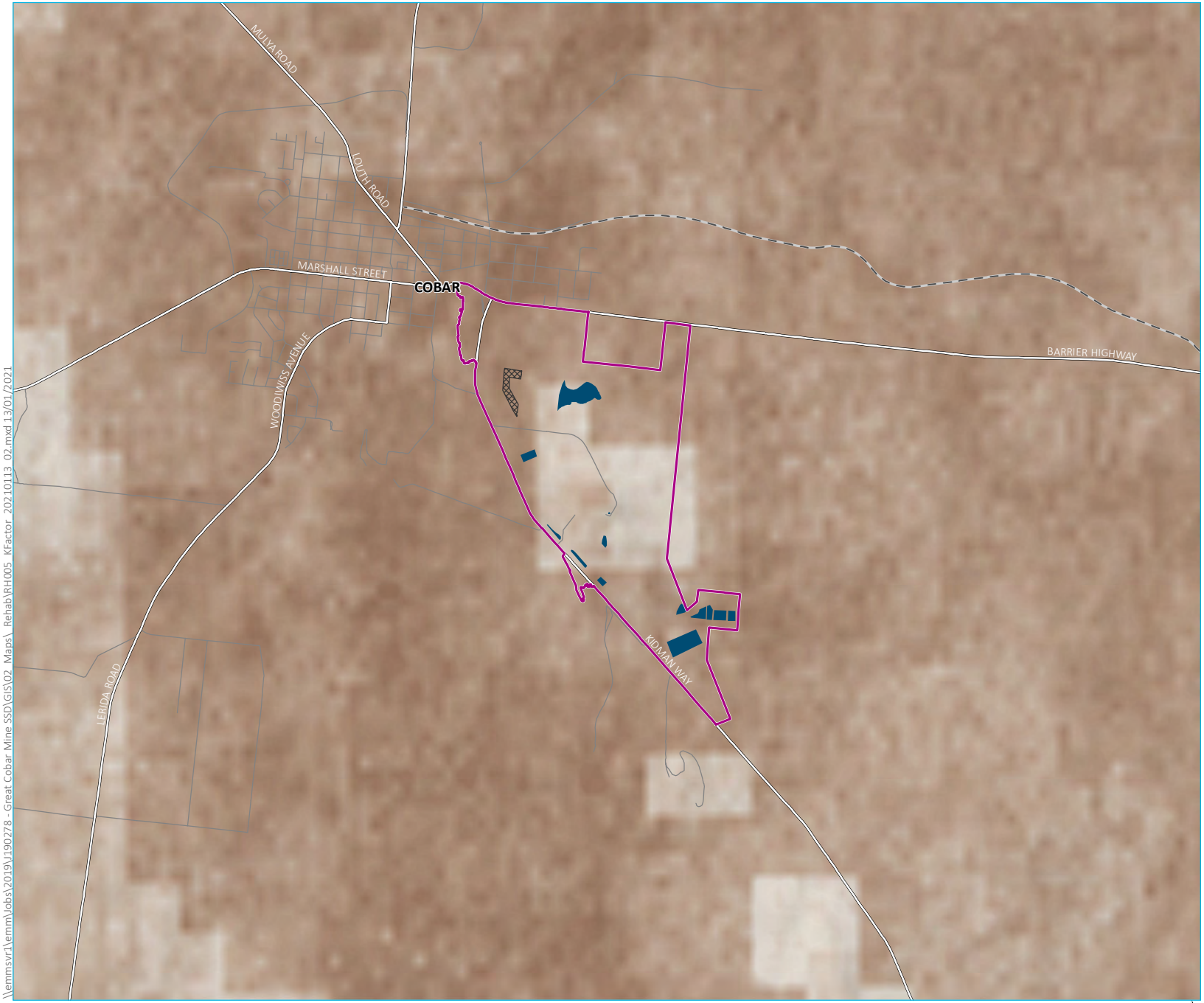


Figure 3.2 Assessment of potential erosion hazard (Landcom 2004)

For the planned project disturbances in the north of the project area, slopes range from approximately 0–2% (Figure 3.4) with the exception of the box cut which is approximately 143% slope, however the box cut excavation will be in competent rock which refers to geotechnical stability and not erosional stability. The R-Factor is interpolated from Appendix B of Landcom (2004) to be 1,000 MJmmha^{-1} h^{-1}. Comparing values to Figure 3.2 indicates a low erosion hazard. Per Landcom (2004), no further assessment of erosion hazard is therefore required.

The highest area of existing erosion hazard for the project area is the WRE (approximately 14.9% slope on outer batters) however this was assessed as part of the New Cobar Open Cut approval (LDA99/00:022). As discussed in Section 3.2.1i, there is rill and gully erosion on the northern and eastern slopes of the WRE where vegetation cover is low and some of the channel banks have breached. Runoff from this erosion is captured onsite in NC1, NC2 and NC3 limiting any potential impacts to the environment.

PGM anticipate that reworking of the northern and eastern batters will be required to achieve nominated stability and rehabilitation criteria. PGM will undertake additional waste rock and soil characterisation, as well as erosion and landform evolution modelling during mining operations to inform the revised WRE batter stabilisation and rehabilitation approach.



KEY

- Project area
- Rail line
- Major road
- Minor road
- Proposed power line corridor
- Mine water management storage

Soil erodibility factor

0.0515

-

0.0339

DRAFT

Modelled K-factor

Peak Gold Mines
New Cobar Complex Project
Rehabilitation and closure strategy
Figure 3.3

Source: EMM (2020); DFSI (2017); GA (2011); DPE (2019); PGM (2020)

0 1 2 km

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EMM creating opportunities

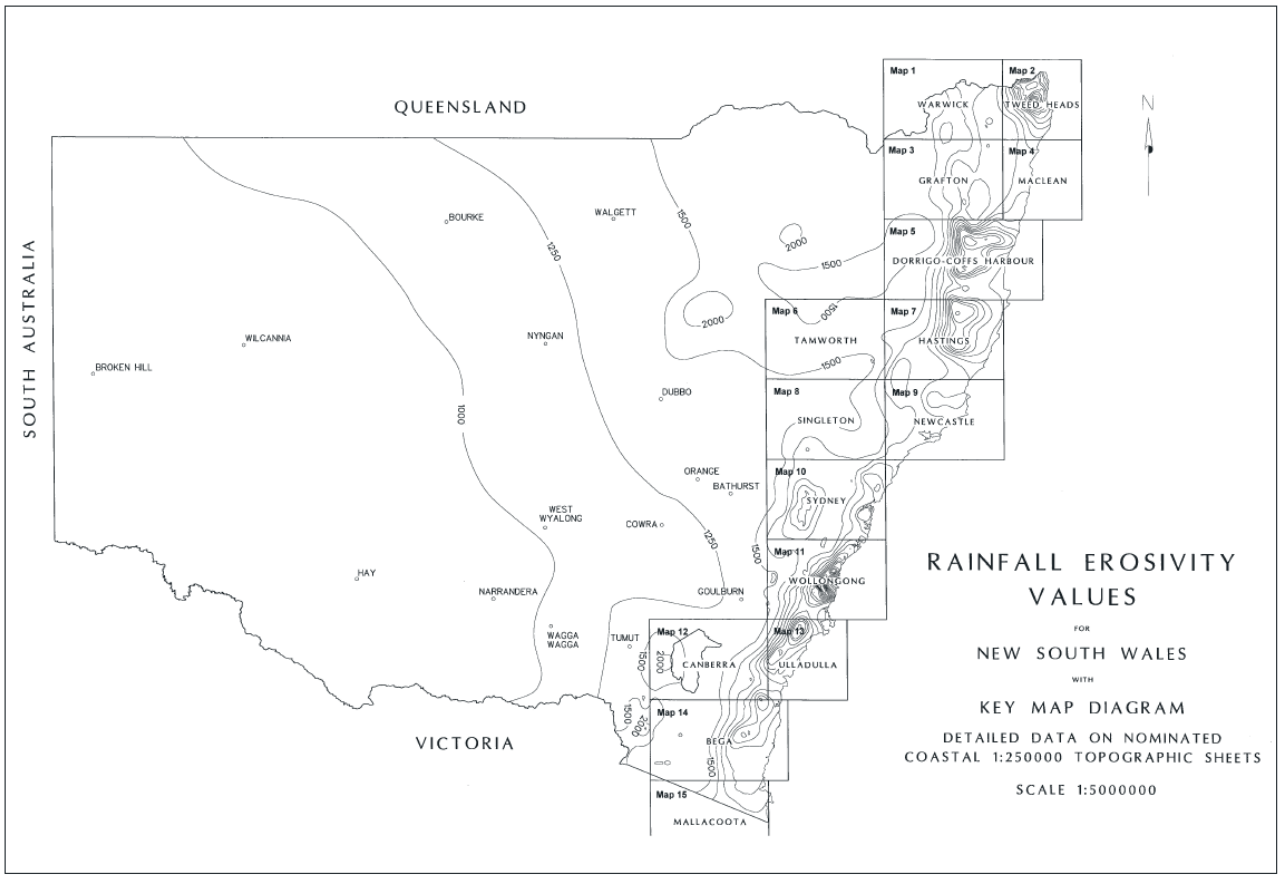

Figure 3.4 R-Factor maps for NSW (Landcom 2004)

3.2.3 Dust and Noise

Air quality and noise management will be undertaken in accordance with the existing air quality management plans and if need be, will be updated to include the rehabilitation phase of the project prior to rehabilitation activities commencing. These management plans will ensure compliance with project approval and licence limits during decommissioning and rehabilitation activities.

The main anticipated source of dust during rehabilitation operations include:

- light and heavy vehicles travelling on unsealed roads and tracks;
- backfilling of shafts;
- backfilling of the Box Cut;
- soil dumping during capping and topsoil activities; and
- land shaping.

Dust management to be used during rehabilitation and closure may include:

- sheeting roads with gravel;

- application of trafficable soil stabilising polymers to roads and tracks;
- watering areas of dust generation;
- reducing the speed of light and heavy vehicles;
- not undertaking works on exposed locations during windy conditions; and
- progressive stabilisation and rehabilitation of disturbed areas.

The main sources of noise during the rehabilitation and closure phases include:

- demolition works;
- hauling and placement of capping materials and soil;
- reshaping works; and
- construction of the void safety bund.

Noise control during rehabilitation and closure may include:

- undertaking demolition and rehabilitation works in daylight hours only;
- reducing heavy vehicle speeds;
- maintenance of guarding and silencers on vehicles and machinery; and
- modifying work operations when climatic conditions may increase noise impacts (wind direction, temperature inversion).

3.2.4 Weeds

The presence of weed species has the potential to have an impact on revegetation outcomes. Additionally, weed species within the surrounding land has the potential to impact on the success of rehabilitated areas. The PGM Biodiversity and Land Management Plan identifies the following common weed species within the project area:

- African Boxthorn (*Lycium ferocissimum*);
- Athel Pine (*Tamarix aphylla*)';
- Bathurst/Noogoora Burr (*Xanthium spinosum*);
- Blue Heliotrope (*Heliotropium amplexicaule*);
- Prickly Pear (*Opuntia stricta*); and
- Mother of Millions (*Bryophyllum spp.*).

Weed management will therefore be a critical component of rehabilitation activities.

Weeds will be managed in accordance with the PGM Biodiversity and Land Management Plan which will be updated for the rehabilitation and closure phases if necessary. Weed management measures will include but will not be limited to:

- if machinery to be used for rehabilitation is brought to the site from another site, and if there is a risk of weed seeds having been transported on the machinery, it will be hosed down in an approved wash down area before entry to the project area;
- herbicide spraying or scalping weeds from soil stockpiles prior to re-spreading;
- rehabilitation inspections to identify potential weed infestations; and
- identifying and spraying existing weed populations together with ongoing weed spraying over the life of the project.

3.2.5 Hydrocarbons, chemicals and wastes

Despite designs that prevent or contain spills, there is a low residual risk that land within the surface infrastructure area could be contaminated during de-commissioning (eg from hydrocarbon spills, storage of fuel and chemicals, refuelling activities, sewage, etc).

To manage any potential contamination sources, waste management practices in accordance with the site environmental management system will continue to be implemented during rehabilitation. For example:

- hydrocarbons will be stored in self bunded tanks or bunded areas designed in accordance with Australian Standard (AS) 1940;
- waste products that are removed from the project will be appropriately disposed of at licensed facilities; and
- sewage generated post-decommissioning will be minimal (once the existing New Cobar Complex sewage treatment plant is removed). Any such waste (eg portable toilets) will be transported off site for appropriate disposal at a licensed facility by a licensed waste contractor.

There is a low risk that hydrocarbon spills may occur during recontouring, backfilling and soil spreading associated with rehabilitation (eg a burst hydraulic hose), but the impact would be isolated and spill-clean-up procedures would mitigate any potential impacts.

3.2.6 Bushfire

The project area is not mapped as bushfire prone land therefore the project is not considered development on bushfire prone land requiring compliance with *Planning for Bushfire Protection 2019* (NSW Rural Fire Service) (PBP 2019) (EMM 2020c). However, the project could be affected by bushfire or pose a bushfire risk, and therefore, to assess potential bushfire risk and where relevant to the project, a bushfire assessment has been undertaken in consideration of the aims and objectives of PBP 2019 (EMM 2020c).

To prevent or manage bushfire risks, the *Peak Gold Mine Emergency Management Plan* (PGM 2020) will continue to be developed and implemented to address the identified bushfire risk for the rehabilitation and closures phases of the project. A hot work permit system is used during rehabilitation works which will consider the risk factors for bushfires. Machinery and vehicles working on site will have spark arrestors fitted to their exhaust systems.

3.2.7 Contingency measures

A detailed rehabilitation risk assessment has been undertaken as part of the approved MOP development. A Trigger Action Response Plan (TARP) has been developed based on the key outcomes from the risk assessment. The TARP identifies key risks or threats to rehabilitation success at the New Cobar Complex and details the risk treatment measures or contingency measures that will be undertaken to mitigate the identified risks.

The MOP and rehabilitation risk assessment will be updated following project approval to address any additional identified rehabilitation and project closure risks.

The triggers identified in the TARP will be reviewed and updated (if necessary) following implementation of the rehabilitation monitoring programme and/or evaluation of the rehabilitation monitoring programme results in the Annual Review.

Anticipated contingency measures that will be implemented where rehabilitation monitoring results identify a requirement for maintenance or remedial works include:

- repair of erosion (ie regrading of eroded areas);
- repair of drainage structures and de-silting of sediment control structures;
- supplementary seeding or planting;
- application of gypsum or lime to control pH and improve soil structure;
- bushfire management activities; and
- implementation of weed and pest control measures.

The effectiveness of the remedial works will be monitored, and the results reported in rehabilitation reports and Annual Reviews and used to inform and refine the rehabilitation programme.

3.3 Socio-economic impacts

Community consultation has been, and will continue to be, key to project planning and understanding the project's potential impacts on the local community. Relevant stakeholders will be engaged in the rehabilitation and closure planning and implementation process, including in the development of a detailed closure plan as the project progresses towards completion. The closure plan will address socio-economic impacts at closure, post-mining land use and rehabilitation objectives.

4 Rehabilitation domains

4.1 Overview

The project area is divided into a series of primary closure domains as described in the approved MOP, with each domain having similar bio-physical characteristics. These domains have been assigned in accordance with the requirements of the ESG3: MOP Guidelines (DTI 2013) (the MOP guidelines).

4.2 Primary domains

Primary domains (as defined in the MOP guidelines) are based on land management units within the project area, usually with a unique operational and functional purpose during operation and therefore have similar characteristics for managing environmental issues. The primary domains form the basis of the rehabilitation and project closure planning for this strategy. The primary domains for the project are from the existing approved MOP. As the MOP covers both the Peak and New Cobar Complexes, not all domains are represented at the New Cobar Complex as shown in Table 4.1.

The primary and secondary domains are illustrated in Figure 4.1, and the extent of disturbance per primary domain is presented in Table 4.1.

Table 4.1 Surface Infrastructure disturbance by primary domain

Primary domain	Project element	Area (ha)
1. Voids and portals	New Cobar open cut Chesney void Southern void Box Cut New Cobar portal Chesney portal	8.22
2. Historical shafts	Gladstone and Tharsis backfilled shafts and remaining open shafts	1.19 (not including all identified shafts)
3. Infrastructure	Potable water tank Workshop/Laydown Yard Administration Carpark Explosives magazine ROM Pad Haul roads Access roads Ventilation Fans Water Lines Bathhouse	19.27

Table 4.1 Surface Infrastructure disturbance by primary domain

Primary domain	Project element	Area (ha)
4. Water management	Spain's Dam Young Australia 2a, 2b, 2c and 2d dams Young Australia 1 Dam Young Australia 3 Dam Settling pond NC	14.63
5. Mineral waste emplacement	WRE	23.88
6. Tailings	N/A – at Peak Complex	N/A
7. Other (disturbed land)	Pinkie, historical Chesney tailings	7.65
8. Processing Plant	N/A – at Peak Complex	N/A
9. Soil Stockpiles	Soil stockpiles T15, T16, T17 and T18	1.96

An overview of the rehabilitation activities to be carried out in each primary domain is presented in the following section. The decommissioning of each project element is described in Section 5.2.

4.2.1 Domain 1 – Voids and portals

A small 20 m deep x 90 m long x 40 m box cut void will be excavated in the northern section of the project area to allow the construction of an exhaust air rise and ventilation fan. At the completion of mining the ventilation fan will be removed, the shaft capped in accordance with the Resources Regulator requirements and the box cut will be backfilled with the soil profile re-established to its pre-mining profile to as reasonably practical extent to re-establish LSC class 6 lands.

There are two unused historical voids within the project area – the Chesney Void and Southern Void. Due to the shallow depth of excavation, PAF rock is not exposed in the void walls or floors. There were previously two mine shafts in the Chesney Void that were backfilled, and two vent stacks installed to provide underground ventilation.

At the end of project life, the stacks will be removed, shafts capped, and the walls of both the Chesney and Southern Voids will be blasted and/or regraded to form a stable grade of 1:3 (v:h) (18°).

KEY

- Project area
- Rail line
- Major road
- Minor road
- Historical shaft*

Primary domain

- Voids and portals
- Infrastructure
- Water management
- Mineral waste emplacement
- Stockpiled material
- Other (disturbed land)

Secondary domain

- Final void
- Grazing unimproved pasture
- Modified ecosystem
- Water management

*Secondary domain: modified ecosystem

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Source: EMM (2020); DFSI (2017); GA (2011); DPE (2019); PGM (2020)

0 0.5 1 km

GDA 1994 MGA Zone 55

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New Cobar Complex primary and secondary domains

Peak Gold Mines
New Cobar Complex Project
Rehabilitation and closure strategy
Figure 4.1

EMM creating opportunities

Access to all underground workings, including the Gladstone and Great Cobar deposits is through the existing decline at the base of the existing New Cobar open cut. At the completion of mining the portal will be sealed in accordance with the Resources Regulator requirements and all infrastructure within the void removed. The mine dewatering tank and associated pipework located near the existing tourist lookout will be removed. A safety bund will be constructed around the void to prevent vehicle and machinery access to the void and the existing safety fence will be extended to prevent the public, stock and larger native fauna entering the void.

The existing tourist look out will be maintained subject to agreement with Cobar Shire Council, as this is an important tourism drawcard for Cobar.

Infrastructure associated with the other existing portals will be removed and sealed in accordance with the Resources Regulator requirements.

4.2.2 Domain 2 – Historical shafts

Approximately 100 historical shafts exist within the project area. PGM have agreed with the Resources Regulator to backfill shafts up to 30 m deep and fence all shafts greater than 30 m deep prior to project closure in the project area. All shafts are and will continue to be fenced and sign-posted to minimise the risk to the public, stock and large fauna.

PGM have developed and implemented a historical shaft inspection and filling procedure. In accordance with the procedure, shafts that meet the 'high priority' criteria are rehabilitated first, and timeframes identified for backfilling and capping.

After backfilling, a period of approximately one year is allowed for settlement/consolidation. Inspections are then undertaken to determine if additional filling or other remedial action is required. If the consolidated fill level is below natural ground level, additional filling is undertaken. Any slumping, subsidence or corrective actions undertaken are recorded in a dedicated database for reference. In the project area, the historical Gladstone Mine shafts and Tharsis Mine shafts have been backfilled and have been rehabilitated (PGM 2006).

4.2.3 Domain 3 – Infrastructure

Mine related infrastructure that cannot be beneficially used by the landowner/land manager for the agreed post mining land use will be removed unless it has heritage value. There may be historical mine-related infrastructure such as the Chesney processing plant footings that may have heritage values and may need to be retained. PGM will consult with relevant stakeholders and regulators over the life of the project to determine which (if any) should remain.

Following infrastructure removal, land contamination assessments will be undertaken, and any mineralised material placed in the Peak Complex TSF. Any hydrocarbon-contaminated soil will be bioremediated on-site and any other identified contaminated waste such as asbestos shall be disposed of lawfully. Any remaining slopes will be reshaped to form stable grades and in-situ soils tested and chemically and biologically ameliorated as required, and then seeded.

Target grass species of LSC class 6 grazing lands are detailed in Appendix E of the approved MOP.

4.2.4 Domain 4 – Water management

Of the 13 water management structures within the project area, it is expected that 'the Salty', Spain's Dam and the Young Australia dams will remain post mining. 'The Salty' is an existing town dam that is not used for mining purposes.

The remaining sediment dams, settling dams and other water management dams will be dewatered, any mineralised sediment removed to the Peak Complex TSF and the dam excavations backfilled using the wall material.

Target grass species of LSC class six grazing lands are detailed in Appendix E of the approved MOP.

Sediment in the dams to remain will be analysed for contamination and any mineralised material excavated and placed in the Peak Complex TSF. All dams to remain will have appropriately sized and stabilised spillways.

4.2.5 Domain 5 – Mineral waste emplacement

Domain 5 covers the existing WRE which has been partially rehabilitated in accordance with the requirements of the existing New Cobar open cut approval and approved MOPs.

During the life of the project, NAF and PAF waste rock from underground may be brought to the surface for temporary stockpiling within the footprint of the WRE. NAF and PAF waste rock will also be excavated from within the WRE to be used as construction and capping material for the Peak Complex TSF.

It will be necessary to undertake additional rehabilitation works on the WRE for:

- the existing PAF and NAF waste rock excavation areas;
- existing PAF and NAF waste rock stockpiles; and
- areas where rehabilitation has not met agreed stability and ecosystem function requirements.

PGM will undertake additional material characterisation of the outer surfaces of the WRE for agronomic and erosion parameters during mining operations. Erosion and landform evolution modelling will be undertaken to determine if adequate stability can be achieved with current slope gradients without the contour bank drainage design and with additional erosion enhancements or if regrading or some other form of erosion protection is required.

Due to gradients of the outer slopes (average slope 14.9%, or 8.5°) and the risk to the NAF waste rock cap posed by grazing and animal pads, the nominated post project land use for the WRE is modified ecosystem. Historical land disturbance has resulted in significant impact to native plant communities with the project area (EMM 2020d). Accordingly, PGM propose to re-establish some biodiversity values to the project area by rehabilitating the WRE using selected species from the White Cypress Pine-Poplar Box woodland on footslopes and peneplains plant community type (PCT) (PCT 72), within the Cobar Peneplain Bioregion.

4.2.6 Domain 6 – Tailings

Domain 6 is not represented in the New Cobar Complex project area.

4.2.7 Domain 7 – Other disturbed land

Domain 7 covers the existing historical 'pinkie' tailings deposit on the west side of Kidman Way, and the historical Chesney tailings on the south-east side of the New Cobar Complex. The proposed mining operations are not expected to disturb additional pinkie deposits. The tailings with either be remediated in place (in rehabilitation objectives can be achieved), excavated and re-processed at the Peak Complex or disposed of in the Peak Complex TSF.

Any remaining slopes will be reshaped to form a stable grade of 1:3 (v:h) (18°) or flatter. Soils will be tested and chemically and biologically ameliorated as required, contour scarified and seeded with pasture species (pinkie areas) or modified ecosystem species (Chesney tailings).

4.2.8 Domain 8 – Processing plant

Domain 8 is not represented in the New Cobar Complex project area.

4.2.9 Domain 9 – Soil stockpiles

Domain 9 includes all the proposed and existing soil stockpiles for the project. The MOP identifies that there is a soil deficit for rehabilitation so it is expected that all soil stockpiles will be removed, and the soil used in rehabilitation.

The soil from within the footprint of the soil stockpiles will be tested and chemically and biologically ameliorated if required and seeded with the pasture seed mix.

5 Land use options following closure

Land uses surrounding the project area include:

- transport infrastructure – Kidman Way, Barrier Highway and the Nyngan-Cobar railway;
- other PGM owned projects – Peak Complex;
- derelict mines – shafts and tailings;
- industrial, including the industrial precinct located immediately to the north of the project area and the Council owned sewage treatment plant to the west;
- commercial, including the Cobar central business district;
- low density residential, primarily to the north and west of the project area;
- tourism, including the Great Cobar Heritage Centre and Cobar Miners Heritage Park at the northern end of the project area;
- recreation – Ailisa Fitzsimmons Oval (rugby club), Ward Oval, Cobar Gold Course and Drummond Park Youth and Squash Centre; and
- low intensity grazing.

As described in Section 3.2.2, the project area is currently predominantly LSC classes 6 and 7, which is consistent with the historical land-use of low intensity grazing and mining. Domains currently under agricultural land use (grazing) will be rehabilitated to this same land use.

All soil resources will be stripped from the footprint of the box cut, ventilation shafts, laydown area and access roads and preserved for future rehabilitation.

The existing New Cobar Complex open cut will remain a void as previously approved and will be a focal point for tourism. The existing New Cobar Complex WRE will have a modified ecosystem post mine land-use to protect the integrity of the capped PAF, the slopes are too steep for grazing and stock pads may concentrate flow and damage the existing drainage structures.

There are some infrastructure areas associated with the project that may be able to provide an alternate beneficial post mining land use, such as:

- the project infrastructure areas that may be used for industrial purposes; and
- a workshop that may be suitable for storage of agricultural or industrial machinery.

Such alternate options will be considered, along with any other identified options by PGM during operation of the mine as part of detailed closure planning, and in consultation with relevant stakeholders, including DPIE, the Resources Regulator and CSC.

Proposed post-project land uses are summarised in Table 5.2.

5.1 Rehabilitation objectives

This rehabilitation strategy has been developed in consideration of several factors including opportunities (such as proximity to remnant native vegetation areas) and constraints (such as slope and soil quality), ecological and rural land use values and existing strategic land use objectives. The rehabilitation objectives for the project are set out in Table 5.1.

Table 5.1 Rehabilitation objectives by primary domain

Primary domain	Project element	Objectives
1. Voids and portals	New Cobar Complex open cut Chesney void Southern void Box cut void New Cobar portal	Mine portals and voids are safe, stable and non-polluting. All infrastructure not required for the post-project land use is removed, unless otherwise agreed with the landowner/land manager. Mining heritage values are preserved to facilitate tourism.
2. Historical shafts	Historical shafts	Final landforms are stable and do not present a risk of environmental harm to the receiving environment or safety risks to the public, stock and native fauna. There is no residual soil contamination that is incompatible with the final land use or that poses an unacceptable risk of environmental harm. Mining heritage values are preserved.
3. Infrastructure	Workshop/Laydown Yard Administration Carpark Explosives magazine ROM Pad Haul roads Access roads Ventilation Fans Water Lines Bathhouse	All infrastructure not required for the post-project land use is removed, unless otherwise agreed with the landowner/land manager. Final landforms are stable and do not present a risk of environmental harm to the receiving environment or safety risks to the public, stock and native fauna. There is no residual soil contamination that is incompatible with the final land use or that poses an unacceptable risk of environmental harm. Proposed grazing post-project land use does not preclude other beneficial post-project land use options.
4. Water management	Spain's Dam Young Australia 2a, 2b, 2c, 2ddams Young Australia 1 dam Young Australia 3 dam NC1 NC2 NC3 NC4	All infrastructure not required for the post-project land use is removed. Dam walls to remain are stable and do not present an unacceptable risk of environmental harm to the receiving environment or safety risks to the public, stock and native fauna. There is no residual soil contamination that is incompatible with the final land use or that poses an unacceptable risk of environmental harm. Dam water quality is compatible with nominated post-project land use.

Table 5.1 Rehabilitation objectives by primary domain

Primary domain	Project element	Objectives
5. Mineral waste emplacement	WRE	Final landforms are stable and do not present an unacceptable risk of environmental harm to the receiving environment or safety risks to the public, stock and native fauna. There is no residual soil contamination that is incompatible with the final land use or that poses an unacceptable risk of environmental harm. The vegetation structure of the rehabilitation is recognisable as, or is trending towards, the target plant community (eg PCT) contained within the NSW Vegetation Information System). Levels of ecosystem function have been established that demonstrate the rehabilitation is self-sustainable.
6. Tailings storage	N/A – located at Peak Complex	N/A
7. Other (Disturbed land)	Pinkie and historic Chesney	Final landforms are stable and do not present an unacceptable risk of environmental harm to the receiving environment or safety risks to the public, stock and native fauna. There is no residual soil contamination on-site that is incompatible with the final land use or that poses an unacceptable risk of environmental harm. Runoff water quality is compatible with nominated post-project land use. The vegetation structure of the rehabilitation is recognisable as, or is trending towards, the target plant community (eg PCT) contained within the NSW Vegetation Information System. Levels of ecosystem function have been established that demonstrate the rehabilitation is self-sustainable
8. Processing Plant	N/A – located at Peak Complex	N/A
9. Soil stockpiles	Soil stockpiles T15, T16, T17 and T18	Final landforms are stable and do not present a risk of environmental harm to the receiving environment or safety risks to the public, stock and native fauna. There is no residual soil contamination on -site that is incompatible with the final land use or that poses an unacceptable risk of environmental harm. Runoff water quality is compatible with nominated post-project land use.

5.2 Rehabilitation by domain

5.2.1 Secondary domains and final land uses

Primary and secondary domains for rehabilitation planning have been developed for the project in accordance with the requirements of the MOP guidelines and are generally in accordance with the domains described in the approved MOP. As described in Section 4.2, the primary domains are defined based on land management units within the project area with unique operational and functional purposes.

The secondary domains are the post-mining land-use domains and are characterised by similar post-mining land-uses. These domains form the basis of performance criteria used for measuring rehabilitation and closure success. They are derived from the approved MOP.

The primary domains are identified numerically, and the secondary domains are identified alphabetically. The primary and secondary domains for the project area are shown on **Error! Reference source not found.** and summarised in Table 5.2.

Table 5.2 Primary and secondary domains

Primary domain	Project element	Secondary domain
1. Voids and portals	New Cobar Complex open cut Chesney void Southern void Box cut void New Cobar portal Chesney portal	A – LSC class 6 grazing C – Final void (New Cobar only)
2. Historical shafts	Gladstone and Tharsis shafts and other historical shafts	B – Modified ecosystem
3. Infrastructure	Workshop/Laydown Yard Administration Carpark Explosives magazine ROM Pad Haul roads Access roads Ventilation Fans Water Lines Bathhouse	A – LSC class 6 grazing
4. Water management	'The Salty' Spain's Dam Young Australia 2a, 2b, 2c, 2ddams Young Australia 1 dam Young Australia 3 dam NC1 NC2 NC3 NC4	D – Water management (Salty's, Spains and Young Australia dams) A – LSC class 6 grazing
5. Mineral waste emplacement	WRE	B – Modified ecosystem
6. Tailings storage	N/A – located at Peak Complex	N/A

Table 5.2 Primary and secondary domains

Primary domain	Project element	Secondary domain
7. Other (disturbed land)	Historical tailings (Pinkie/ Chesney)	A – LSC class 6 grazing B – Modified ecosystem (Chesney tailings)
8. Processing Plant	N/A – located at Peak Complex	N/A
9. Soil Stockpile	Soil stockpiles T15, T16, T17 and T18	A – LSC class 6 grazing

Rehabilitation of the WRE has been undertaken as part of the existing approved activities at the New Cobar Complex. As discussed in Section 3.2.1i, part of the WRE will be excavated for stope backfilling in the underground mines and to provide construction and capping material for the Peak Complex TSF. PGM acknowledge that these areas, as well as some areas of the WRE, are subject to erosion and will require further rehabilitation works to achieve agreed rehabilitation targets and criteria.

Progressive rehabilitation of derelict mine shafts and tailings areas will be undertaken as described in the approved MOP and Sections 5.2.2, 5.2.3 and 5.2.7.

5.2.2 Domain 1 – Voids and portals

A small box cut will be excavated to allow the construction of an exhaust air rise. At the completion of mining the ventilation fan will be removed, the shaft capped in accordance with the Resources Regulator requirements and the void will be backfilled with the soil profile re-established to its pre-mining profile to as reasonably practical extent to re-establish LSC class 6 lands.

There are two historical voids within the project area – the Chesney Void and Southern Void. Due to the shallow depth of excavation PAF rock is not exposed in the void walls or floors. There were previously two mine shafts in the Chesney Void that have been backfilled and two vent stacks installed to provide underground ventilation.

At the end of project life, the stacks will be removed, shafts capped and the walls of both the Chesney and Southern Voids will be blasted and/or regraded to form a stable grade of 1(v):3(h) (18°) using a rock/soil matrix.

Access to the Gladstone and Great Cobar deposits are through the existing decline at the base of the existing New Cobar Complex open cut. At the completion of mining the portal will be sealed in accordance with the Resources Regulator requirements and all infrastructure within the void removed. The mine dewatering tank and associated pipework located near the existing tourist lookout will be removed. A safety bund will be constructed around the void to prevent vehicle and machinery access to the void and the existing safety fence will be extended to prevent the public, stock and larger native fauna entering the void.

Groundwater modelling undertaken by EMM (2020a) predicts that the final ground water level will be below the floor of the void and therefore water is only likely to accumulate in the void temporarily following rainfall.

The void walls will be monitored for stability until the relevant rehabilitation stability criteria have been met.

The existing tourist look out will be maintained subject to agreement with CSC, as this is an important tourism drawcard for Cobar.

Infrastructure associated with the other existing portals will be removed and sealed in accordance with the Resources Regulator requirements.

5.2.3 Domain 2 – Historical shafts

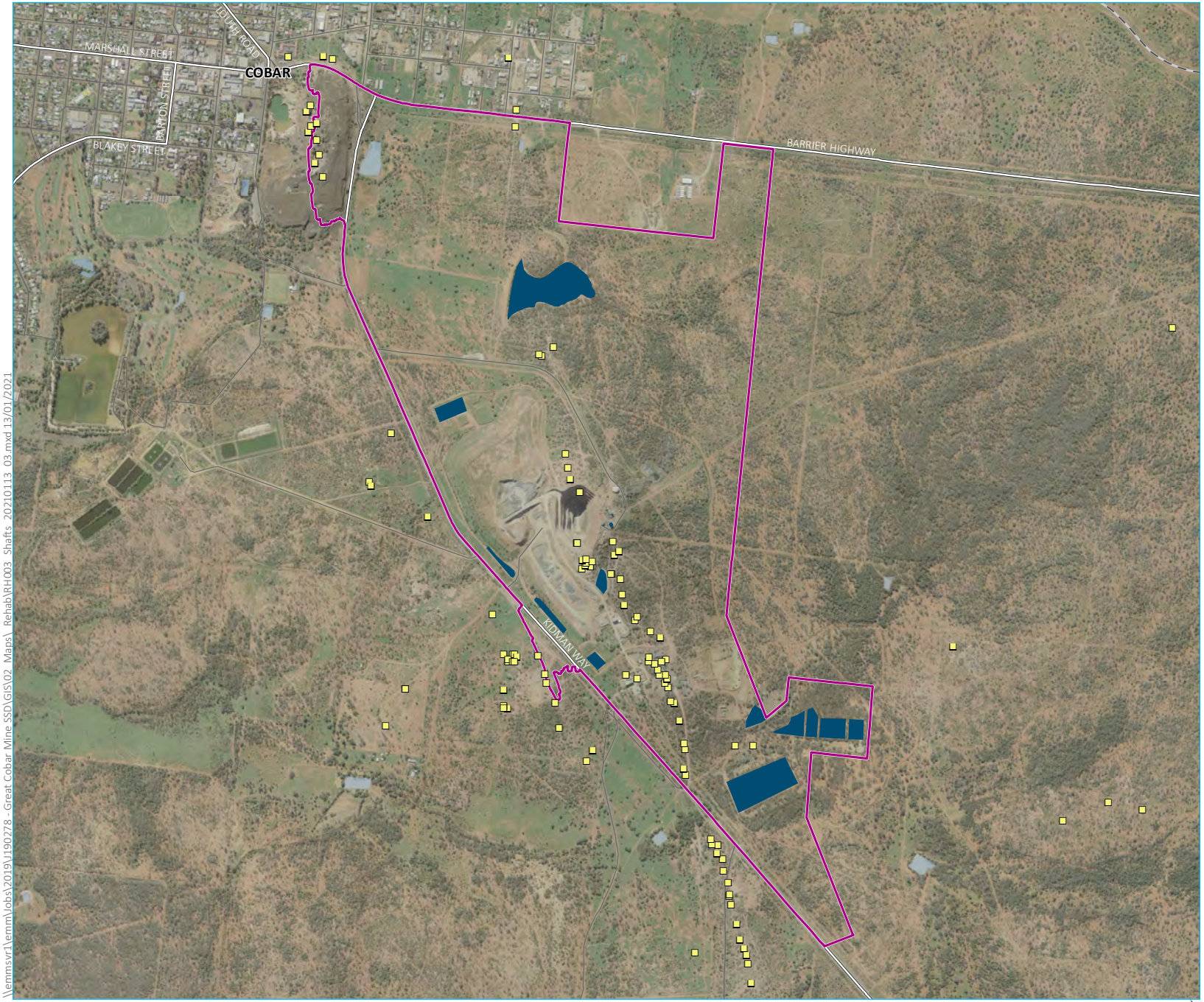
There are approximately 100 historical shafts with the New Cobar Complex (Figure 5.1). Shafts associated with the historical Gladstone and Tharsis mines have been backfilled and rehabilitated and it is possible that other historical shafts have been informally backfilled during previous mining operations within the complex. PGM have agreed with the Resources Regulator to backfill shafts up to 30 m deep and fence all shafts greater than 30 m deep prior to mine closure. All shafts are fenced and signposted to minimise the risk to the public, stock and large fauna.

PGM have developed and implemented a historical shaft inspection and filling procedure. Per the procedure, shafts that meet the 'high' criteria are rehabilitated first, and timeframes identified of backfilling and capping. Additionally, the procedure outlines the timeframes for inspection post backfilling. The criteria are detailed in Table 5.3.

Table 5.3 Historic shaft prioritising criteria (from Table 3-2, MOP)

Priority	Criteria	
High	Shafts located on town common, crown land or private land, which are: • >3 m deep; and • have inadequate or no fencing.	
Moderate	Shaft on town common or private land	• Shafts with adequate fencing but not filled. • Shafts with a history of subsidence. • Filled shafts that were originally <30 m deep and not fenced. • Been filled within the last 12 months.
	Shafts on Peak land	• Shafts >3 m deep, not fenced or filled. • Shafts >3 m deep, fenced but not filled and located within 100 m of Peak boundary. • Shafts not fenced and have a history of subsidence. • Have been filled in the last 12 months.
Regular	All shafts that do not fit the high or moderate priority rating are to be carried out at a regular priority as defined in Section 6 of the PGM Inspection and Filling Procedure.	

Any potentially contaminated soil/rock in the immediate vicinity of the shaft is used preferentially for backfilling then additional NAF from the WRE used as required. After backfilling a period of approximately one year is allowed for settlement/consolidation. Inspections are then undertaken within to determine if additional filling or other remedial action is required. If the consolidated fill level is below natural ground level, additional filling is undertaken, and the disturbed area revegetated. Any slumping, subsidence or corrective actions taken are recorded in a dedicated database for reference.



KEY

- Project area
- Historical shaft
- Rail line
- Major road
- Minor road
- Waterbody
- Mine water management storage

DRAFT

Backfilled and remaining historical shafts

Peak Gold Mines
New Cobar Complex Project
Rehabilitation and closure strategy
Figure 5.1

Source: EMM (2020); DFSI (2017); GA (2011); DPE (2019); PGM (2020)

0 0.5 1 km

GDA 1994 MGA Zone 55

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EMM creating opportunities

PGM propose to re-establish biodiversity in the backfilled shaft domain by rehabilitating using selected species from the Gum Coolabah - Mulga woodland on gravel ridges PCT (PCT 108).

Species used for rehabilitation of the backfilled shafts will be dependent on seed availability but are expected to include the structural dominant species for the PCT as listed in Table 5.4. This list will be refined based on the species present at analogue sites.

Table 5.4 Structural dominant rehabilitation species (PCT 108)

Community	*Gum Coolabah - Mulga woodland on gravel ridges of the Cobar Peneplain Bioregion PCT (PCT 108)*
Understory species	Wiregrass *Aristida spp.*
	Eragrostis eriopoda
	Mulga oats *Monachather paradoxus*
	Mulga Grass *Thyridolepis mitchelliana*
	Box grass *Paspalidium constrictum*
	Copperburrs *Sclerolaena spp.*
	Sida spp.
Mid-story species	Mulga *Acacia aneura*
	Ironwood *Acacia excelsa*
	Beefwood *Grevillea striata*
	Senna spp.
	Horse Mulga *Acacia brachystachya*
	Wilga *Geijera parviflora*
Overstory species	Gum coolabah *Eucalyptus intertexta*

Cover crops will be used with all seeding activities to provide erosion protection and minimise the potential for weed invasion. Seed predation by meat ants is common and it may be necessary to include pesticides with the seed application.

5.2.4 Domain 3 – Infrastructure

Project related infrastructure that cannot be beneficially used by the landowner/land manager for the agreed post project land use will be removed unless heritage protected. There may be historical mine related infrastructure such as the Chesney processing plant footings that have heritage values and may need to be retained. PGM will undertake investigations over the life of the mine to determine which (if any) should remain.

Following infrastructure removal, land contamination assessments will be undertaken, and any contaminated material placed in the Peak Complex TSF. Any remaining slopes will be reshaped to form a stable grade of 1(v):3(h) (18°) or flatter. In situ soils will be tested and chemically and biologically ameliorated as required and seeded.

Target grass species of LSC class 6 grazing lands are detailed in Appendix E of the approved MOP.

5.2.5 Domain 4 – Water management

Of the 13 water management structures within the project area, it is expected that 'the Salty', Spain's Dam and Young Australia dams will remain post mining. 'The Salty' is an existing town dam that is not used for mining purposes.

The remaining sediment dams, settling dams and other water management dams will be dewatered, any contaminated sediment removed to the New Cobar Complex open cut and the dam excavations backfilled using the wall material.

Soils will be tested, chemically and biologically ameliorated as required, contour scarified and seeded.

Target grass species of LSC class 6 grazing lands are detailed in Appendix E of the approved MOP.

Sediment in the dams to remain will be analysed for contamination and any mineralised material excavated and placed in the Peak Complex TSF. All dams to remain will have appropriately sized and stabilised spillways.

5.2.6 Domain 5 – Mineral waste emplacement

Domain 5 covers the existing WRE which has been partially rehabilitated in accordance with the requirements of the existing New Cobar open cut approval and approved MOPs.

During the life of the project NAF and PAF waste rock from underground may be brought to the surface for temporary stockpiling within the footprint of the WRE. NAF and PAF waste rock will also be excavated from within the WRE to be used as construction and capping material for the Peak Complex TSF.

It will be necessary to undertake additional rehabilitation works on the WRE for:

- the existing PAF and NAF waste rock excavation areas.
- existing PAF and NAF waste rock stockpiles; and
- areas where rehabilitation has not met agreed stability and ecosystem function requirements.

PGM will undertake additional material characterisation of the outer surfaces of the WRE for agronomic and erosion parameters. Erosion and landform evolution modelling will be undertaken to determine if adequate stability can be achieved with current slope gradients without the contour bank drainage design and with additional erosion enhancements or if regrading or some other form of erosion protection is required.

Due to gradients of the outer slopes (8.5°) and the risk to the NAF waste rock cap posed by grazing and animal pads, the nominated post project land use for the WRE is for biodiversity (modified ecosystem). Historical land disturbance has resulted in significantly impact to native plant communities with the project area (EMM 2020b). Accordingly, PGM propose to re-establish some biodiversity values to the project area by rehabilitating the WRE using selected species from the White Cypress Pine-Poplar Box woodland on footslopes and peneplains (PCT 72), within the Cobar Peneplain Bioregion.

Species used for rehabilitation of the WRE will be dependent on seed availability but are expected to include the structural dominant species for PCT 72 as listed in Table 5.5. This list will be refined based on the species present at analogue sites.

Table 5.5 Structural dominant rehabilitation species (PCT 72)

Community	White Cypress Pine-Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion (PCT 72)
Understory species	*Austrostipa scabra* subsp. *scabra*
	Austrodanthonia spp
	Ridge Sida (*Sida cunninghamii*)
	Desert goosefoot (*Chenopodium desertorum*)
	Blue Burr-daisy (*Calotis cuneifolia*)
	Chrysocephalum semipapposum/apiculatum
	Galvinised Burr (*Sclerolaena birchii*)
	Grey Copperburr (*Sclerolaena diancantha*)
	Ruby Saltbush (*Enchylaena tomentosa*)
Mid-story species	Deane's Wattle (*Acacia deanei*)
	Hopbush (*Dodonea viscosa*)
	Budda (*Eremophila mitchelli*)
	Cough Bush (*Cassinia laevis*)
Overstory species	White Cypress Pine (*Callitrus glaucophylla*)
	Poplar Box (*Eucalyptus populnea* subsp *bimbil*)

Cover crops will be used with all seeding activities to provide erosion protection and minimise the potential for weed invasion.

Seed predation by meat ants is common and it may be necessary to include pesticides with the seed application.

Seeding of the WRE will focus on establishing the structural dominant components of PCT 72 with additional seeding and/or tube stock planting undertaken if required.

5.2.7 Domain 6 – Tailings

Domain 6 is not represented at the New Cobar Complex as the only formal tailings storage facility is at the Peak Complex. The rehabilitation of historical tailings is detailed in Domain 7 below.

5.2.8 Domain 7 – Other (disturbed land)

Domain 7 covers the existing historical 'pinkie' tailings deposit on the west side of Kidman Way and the historical Chesney tailings on the south-east side of the New Cobar Complex. These tailings with either be remediated in place (if rehabilitation objectives can be achieved), excavated and re-processed at the Peak Complex or disposed of in the Peak Complex TSF. Any residual contaminated soil will be excavated to a reasonable and feasible extent and placed in the Peak Complex TSF.

Any remaining slopes will be reshaped to form a stable grade of 1(v):3(h) (18°) or flatter. Soils will be tested and chemically and biologically ameliorated as required, contour scarified and seeded.

5.2.9 Domain 8 – Processing plant

Domain 8 is not represented at the New Cobar Complex as mineral processing is undertaken at the Peak Complex.

5.2.10 Domain 9 – Soil stockpile

Domain 9 includes all the proposed and existing soil stockpiles for the project. The approved MOP identifies that there is a soil deficit for rehabilitation purposes, so it is expected that all soil stockpiles will be removed, and the soil spread over rehabilitation areas.

The soil from within the footprint of the soil stockpiles will be tested and chemically and biologically ameliorated if required and seeded with the pasture seed mix.

6 Rehabilitation methods for closure

6.1 Soil management

Minimal soil stripping will be required for the proposed project disturbances. PGM operate a Permit to Dig / Disturb system that will be implemented by operations personnel to ensure that clearing and soil stripping activities are managed appropriately.

Although the soils within the project area are generally shallow, there is an existing usable soil layer suitable for rehabilitation purposes. Therefore, the stripping of all available soil resources will be undertaken. Soil stripping and stockpiling will involve disturbance and mixing of soil, and hence a reduction in soil stability and fertility can be expected. Rehabilitated areas will be (initially) completely bare of vegetation, with increased rates of runoff and erosion risk (particularly on slopes). Therefore, the amelioration of soils to ensure stability is likely to be required.

6.1.1 Soil testing

Prior to stripping, soil will be sampled to:

- identify the soil resource prior to stripping;
- assist with the preparation of a soil balance or inventory to assist with rehabilitation planning; and
- determine if the soil requires amelioration.

Soil sampling will determine if the soil requires amelioration to ensure the soils physical and chemical characteristics are within ranges necessary to address any erosion or revegetation constraints posed by the soils.

Soil exchangeable sodium levels and potential for clay dispersion will be assessed, with data on exchangeable cations used to calculate gypsum requirements (if any) to reduce Exchangeable Sodium Percentage (ESP) to <4% (presence of dispersive clays will drastically increase erosion risk, and also reduce vegetation establishment and growth.)

Removal of vegetation will effectively reduce nutrient stores. Some elements such as Nitrogen will be eventually replaced by growth of leguminous species, but elements (generally phosphorus) that are in extremely low levels may well become limiting to both pastures and native woodland rehabilitation.

Soil sampling prior to stripping is essential to determine whether the soils require amelioration, and to provide guidance on maximum depths of stripping. Further, this sampling data will provide useful baseline information on the ranges of specific soil properties.

The soil parameters to be measured and preferred methods are listed in Table 6.1.

Table 6.1 Physical and chemical soil testing parameters

Parameter	Test method
Organic carbon	Walkley and Black
pH	1:5 suspension, water
Effective cation exchange capacity (CEC) and exchangeable cations	
Electrical conductivity (EC)	1:5 suspension, water

Table 6.1 Physical and chemical soil testing parameters

Parameter	Test method
Total Nitrogen (TN)	Kjeldahl
Total Phosphorous (TP)	Nitric/Perchloric
Available Phosphorous	Colwell
Available Potassium	Colwell
Labile Sulfur	Potassium Chloride (KCl) extraction

Additional assessment of soil for the presence of weeds will be undertaken as part of soil sampling.

Soil sampling will be undertaken at a sampling frequency of one sample per 0.8–4 ha (1:10,000 scale) and will include an assessment of soil depth and analysis of soil characteristics as detailed in Table 6.1. A soil stripping and placement plan will be incorporated into the PGM Land Disturbance Permit for each stripping event.

6.1.2 Clearing and grubbing

During the clearing and grubbing process stumps and roots ≥100 mm in diameter to a depth of 0.5 m will be removed and placed on the WRE to provide erosion protection and fauna habitat.

6.1.3 Soil amelioration

Soil testing as discussed previously will be undertaken to determine amelioration requirements and rates.

Some ameliorants may be mixed in with the soil as part of the stripping operation, irrespective if the soil is to be placed in storage or directly applied to a rehabilitation area.

Application of ameliorants as part of the soil stripping process can be more cost effective and allows additional time for certain ameliorants to react and modify the soil to assist in the maintenance of soil conditions suitable for plant development.

Mine soils are typically ameliorated with agricultural gypsum to treat dispersion, and improve the structure, water holding capacity and agricultural lime to increase pH to improve nitrogen and phosphorous availability.

Fertilisers are unlikely to be required but if they are, non-water-soluble fertilisers will be applied following respreading.

Soil stockpiles will require amelioration and/or good mixing of the anaerobic and aerobic layers when returned to rehabilitated areas.

6.1.4 Soil stripping

All staff and contractors will be required to obtain a *Permit to Dig / Disturb* prior to clearing activities. The responsible environmental personnel or their delegate will advise on permits required and authorise permits prior to commencement of works.

Stripping operations will be supervised to ensure they are conducted in accordance with the stripping plan and in situ soil conditions. This will ensure that all suitable soil resources are salvaged, and that the quality of the stripped soil is not reduced through contamination with unsuitable material.

The process of soil stripping will also involve the continual evaluation of soil throughout the depths of the profile as areas and layers are exposed. Management of soils and stripping depths during this process is dynamic and generally require soil observations to be made on-site on the day soil stripping is occurring. This enhances decision making and operational modifications can be adopted to best utilise the soil resources available.

The following process for stripping soil will be followed:

- the area to be stripped of soil will be clearly demarcated and surveyed;
- soil will not be stripped during excessively wet or dry conditions;
- as part of the planning process, sufficient area for stockpiling will have been identified and these areas will be accessible;
- as part of the planning process, temporary drainage, sediment control and structures to prevent erosion will be developed for the area if required; and
- grading or pushing soil into windrows with graders or dozers will be undertaken for later collection by trucks and front-end loaders.

6.1.5 Soil stockpiling

A soil management plan is incorporated in the MOP, which identifies where the stripped soil is placed.

The following process for soil stockpiling will be followed:

- where possible, soil stockpiles will be located away from concentrated flow paths;
- sediment controls will be installed downstream from stockpiles to prevent contamination of clean water; and
- stockpiles will be limited to a maximum height of 3 m.

i Soil re-spreading

The following will be considered during soil respreading:

- soil requirements for rehabilitation areas will be balanced against stored stockpile inventories, proposed post project land-use and proposed stripping volumes;
- during the removal of soils from the stockpiles, care will be taken to minimise structural degradation of the soils; and
- material will be spread in even layers at an appropriate thickness to meet the rehabilitation goals of the area being rehabilitated. Further detail on rehabilitation methods is included in the MOP.

ii Monitoring

The soil management process will be monitored through each step to ensure that the health of the soil is maintained, and the rehabilitation and biodiversity objectives can be achieved. The future MOP will detail the testing, witness and hold points requirements for each step of the soil management process.

6.2 Establishment of vegetation

Vegetation species for rehabilitation purposes is anticipated to consist of:

- introduced and native pasture species for soil stockpile protection and rehabilitation for grazing purposes; and
- selected species that comprise the vegetation communities previously thought to be present within the project area, and within the Cobar Peneplain Bioregion:
  - White Cypress Pine-Poplar Box woodland on foot slopes and peneplains (PCT 72); and
  - Gum-Coolabah-Mulga open woodland on gravel ridges (PCT 108).

Seed for cover crop and pasture species will be obtained from commercial suppliers. Collection of native seed will be undertaken. Given the limited availability of open woodland on-site for seed collection and the significant reductions in seed viability that can occur when seed is stored, purchase of additional seed from commercial suppliers is anticipated. Seed will be stored in a humidity controlled and vermin free environment to maximise its viability.

Several sowing methods will be employed at the project area. These may include:

- hand seeding;
- broadcast seeding; and
- hydro-seeding.

Hand seeding is likely to be used on small areas or where machinery access is difficult such as soil stockpiles and backfilled historical mine shafts. Broadcast seeding is likely to be used to sow natives on the top of the WRE where gradients are flatter. This will be followed by harrowing using pasture harrows to lightly cover the seed with soil to ensure intimate soil contact.

On the slopes of the WRE native seed is likely to be sowed using a hydro-seeder followed by the application of a straw-based hydro-mulch and hydro-colloid binder to protect the seed and soil from rain and wind erosion. Cover crops will be used with all seeding activities to provide erosion protection and minimise the potential for weed invasion.

6.3 Fauna and habitat enhancement measures

Bush rock and tree debris will be retained from land clearing and stripping activities for placement on the WRE to provide erosion protection and habitat enhancement for small invertebrates and reptiles. Cleared timber may also be placed on the slopes on the contour and track rolled to ensure intimate soil contact and to minimize the concentration of flow under the timber.

6.4 Erosion and sediment control

An assessment of soil erosion hazard was undertaken for the proposed disturbance areas in accordance with the requirements of Landcom (2004). This is described in Section 3.2.2 and is ranked as low due to low slope gradients and low rainfall erosivity.

The Water Management Plan incorporating the ESCP for the project area (PGM 2016b) will be revised to include the new proposed disturbance areas and submitted to DPIE for approval. Erosion and sediment control for the existing project disturbances will be managed in accordance with the approved ESCP.

6.5 Post-closure maintenance

6.5.1 Rehabilitation monitoring

Rehabilitation monitoring has been undertaken at the New Cobar Complex since 2011 using analogue sites and Landscape Function Analysis (LFA) to assess rehabilitation progress and success. Annual rehabilitation reports have been prepared, and a summary of these reports will be included in future Annual Review's following project approval. Data obtained from the analogue sites provides a range of values from replicated examples of similar vegetation communities. Rehabilitation areas are compared to reference sites that best represent the final land use, vegetation community and management conditions they will be subjected to.

This approach allows the recognition of the dynamic nature of ecosystems therefore rehabilitation sites will be monitored simultaneously to the reference sites over time to account for changes in:

- seasonal variations;
- climatic conditions;
- management practices; and
- unexpected disturbance events such bushfire.

To demonstrate rehabilitation success or succession toward rehabilitation success, specific indicators are expected to equal or exceed values obtained from the reference site under the same set of conditions or demonstrate a positive trend towards target values. With the exceptions of Domain 5, 7 and 10, all the other domains will have a grazing post mining land use. Grazing productivity parameters in the rehabilitation monitoring program.

Rehabilitation monitoring will inform areas requiring maintenance and identify and address deviations from the expected outcomes. Rehabilitated areas will be assessed against performance indicators (refer to Section 7) and regularly (at least on an annual basis) inspected for the following aspects:

- evidence of any erosion or sedimentation;
- success of initial establishment cover;
- natural regeneration of improved pasture;
- weed infestation (primarily noxious weeds, but also where rehabilitation areas are dominated by other weeds);
- integrity of graded banks, diversion drains, waterways and sediment control structures; and
- general stability of the rehabilitation areas.

Where rehabilitation criteria have not been met, maintenance works will be undertaken. This may include the following:

- re-seeding and, where necessary, re-soiling and/or the application of specialised treatments;

- use of materials such as composted mulch to areas with poor vegetation establishment;
- replacement of drainage controls if they are found to be inadequate for their intended purpose, or compromised by vegetation or wildlife; and
- de-silting or repair of sediment control structures.

6.5.2 Weed management

The presence of weed species has the potential to have a major impact on revegetation outcomes. Additionally, any significant weed species within the surrounding land has the potential to impact on the success of the rehabilitated areas. Weed management will be an important component of rehabilitation activities.

The spread of declared noxious weeds (and other invasive weeds that could impact revegetation success and/or plants that are undesirable to grazing stock) will be managed across the project area through a series of control measures, including:

- herbicide spraying or scalping weeds;
- post-mining use of rehabilitated areas as a working farm, with associated management practices; and
- rehabilitation inspections to identify potential weed infestations.

6.5.3 Access

Access tracks may be required to facilitate the revegetation and ongoing maintenance of the project. These tracks will be kept to a practical minimum and will be designated prior to the completion of the project.

6.5.4 Public safety

Controls will be implemented to minimise the potential for impacts on public safety and may include maintenance of fencing and warning signs around areas that have the potential to cause harm and are that are accessible to the public including bunding and fencing of the void as described in Section 5.2.2.

6.5.5 Rehabilitation resources

Environmental personnel will implement specific management requirements arising from this strategy. Earth moving operations will be performed by machinery operators with experience and skill in the operation of the relevant machinery (scrapers, bulldozers, loaders, excavators etc). Project supervisors will be responsible for compliance with the requirements of this strategy and its future revisions.

The General Manager will be responsible for achieving the rehabilitation criteria. The MOP includes a structured and documented process for managing and improving rehabilitation activities in the project area. The plan will serve as a process map for interdepartmental administration of rehabilitation activities within the project planning and implementation process.

7 Performance indicators and completion criteria

7.1 Rehabilitation criteria and reporting

Rehabilitation completion criteria are used as the basis for assessing when rehabilitation of the project is complete. Indicators are measured against the criteria, and are set for the six phases of rehabilitation, consistent with the MOP guidelines and the approved MOP as follows:

- Phase 1 – Decommissioning (ie removal of equipment and infrastructure);
- Phase 2 – Landform Establishment (ie land shaping);
- Phase 3 – Growth Medium Development (ie soil physical and chemical properties);
- Phase 4 – Ecosystem and Land Use Establishment (ie vegetation establishment);
- Phase 5 – Ecosystem and Land Use Sustainability (ie established vegetation is supporting post-mining land use); and
- Phase 6 – Land Relinquishment.

Rehabilitation criteria for the project have been developed with the current knowledge of rehabilitation practices and success in similar project environments and are detailed in the approved MOP. They consist of a set of objectives, rehabilitation criteria and evidence that criteria have been met using LFA and agricultural productivity measures or the like.

Whether rehabilitation criteria have been met depends on the trending of measurements over time compared to pre-mining or analogue site conditions. The criteria will be refined and confirmed in the amended MOP and in the detailed closure plan as the project progresses towards closure.

The rehabilitation criteria for the project are presented in Table 7.1 – Table 7.3 that address the following outcomes:

- restoration of a safe and stable landform that is non-polluting; and
- reinstate soil profiles and function and create landforms that are compatible with surrounding topography; and reestablishment of landforms that permit grazing, improved pasture and biodiversity outcomes.

Table 7.1 provides rehabilitation criteria applicable to both grazing and biodiversity post mining land uses. Table 7.2 provides rehabilitation criteria applicable to grazing only and Table 7.3 provides rehabilitation criteria application to modified ecosystems only. Reporting on rehabilitation activities, monitoring and progress towards achieving agreed rehabilitation criteria will occur via an Annual Review.

Table 7.1 Common rehabilitation performance indicators and completion criteria

Stage of Development	Aspect or Component	Completion Criteria	Performance Indicators
Landform establishment and stability	Landform slope, gradient	Landform suitable for final land use and generally compatible with surrounding topography	• Slope angles consistent with design
	Landform function	Landform is functional and indicative of a landscape on a trajectory towards a self-sustaining ecosystem	• LFA Stability; • LFA Infiltration; • LFA Nutrient Cycling; and • LFA Landscape Organisation.
	Active erosion	Areas of active erosion are limited	• Number of rills/gullies; • cross-sectional area of rills/gullies; • presence/absence of sheet erosion; and • presence/absence of tunnel erosion.
Growth medium development	Soil chemical and physical properties and amelioration	Soil properties are suitable for the establishment and maintenance of selected vegetation species	• pH; • EC; • Organic Matter; • Phosphorus; • Nitrate; • CEC; • ESP; • Magnesium (Mg); and • Aluminium (Al).
		Soil contaminant levels are suitable for post-project land use	• total petroleum hydrocarbons (TPH); • heavy metals; and • mining related chemicals.

Table 7.2 Grazing rehabilitation performance indicators and completion criteria

Stage of Development	Aspect or Component	Completion Criteria	Performance Indicators
Pasture establishment	Pastures established equivalent to analogue pastures sites	Pastures contains a diversity of species comparable to analogue pastures	• native species richness.; and • introduced pasture species richness.
		Number of weeds species and surface area cover ≤ analogue site	• weed species diversity and percentage cover.
Pasture development	Protective ground cover	Ground layer contains protective ground cover and structure comparable to that of the local pasture analogue	• litter cover; • foliage cover; • annual plants; • cryptogam cover; • rock; • log; • bare ground;

Table 7.2 Grazing rehabilitation performance indicators and completion criteria

Stage of Development	Aspect or Component	Completion Criteria	Performance Indicators
			• perennial plant cover (0.5 m); and • total ground cover.
	Ground cover diversity	Pasture contains a diversity of species per square metre comparable to that of the local remnant vegetation	• native understorey abundance; and • exotic understorey abundance
		Number of weeds species and surface area cover ≤ analogue site	• weed species diversity and percentage cover.
Pasture stability	Pasture health	Pasture condition is comparable to that of analogue pastures	• Live plants, healthy plants, pest infestation
	Pasture productivity	Pasture productivity equivalent to analogue pastures	• carrying capacity (dry sheep equivalent/ha) (DSE/ha); • crude protein (%); • digestibility (%); and • green/dry matter content.

Table 7.3 Modified ecosystem rehabilitation performance indicators and completion criteria

Stage of Development	Aspect or Component	Completion Criteria	Performance Indicators
Ecosystem establishment	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	• diversity of shrubs and juvenile trees; • total species richness; • native species richness; and • exotic species richness.
	Vegetation density	Vegetation contains a density of species comparable to that of the local remnant vegetation	• density of shrubs and juvenile trees.
	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	• trees; • shrubs; • sub-shrubs; herbs; • grasses; • reeds; • ferns; and • aquatic

Table 7.3 Modified ecosystem rehabilitation performance indicators and completion criteria

Stage of Development	Aspect or Component	Completion Criteria	Performance Indicators
Ecosystem development and habitat complexity	Protective ground cover	Ground layer contains protective ground cover and structure comparable to that of the biodiversity analogue	• litter cover; • foliage cover; • annual plants; • cryptogam cover; • rock; • log; • bare ground; • perennial plant cover (0.5 m); and • total ground cover
	Ground cover diversity	Vegetation contains a diversity of species per square metre comparable to that of the local remnant vegetation	• native understorey abundance; and • exotic understorey abundance
		Native ground cover abundance is comparable to that of the local remnant vegetation	• percent ground cover provided by native vegetation.
	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	• shrubs and juvenile trees (0–0.5 m); • shrubs and juvenile trees (0.5–1 m); • shrubs and juvenile trees (1–1.5 m); • shrubs and juvenile trees (1.5–2 m); and • shrubs and juvenile trees (>2.0 m).
Ecosystem stability	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	• foliage cover (0.5–2 m); • foliage cover (2–4 m); • foliage cover (4–6 m); and • foliage cover (>6 m).
	Tree diversity	Vegetation contains a diversity of maturing tree and shrub species comparable to that of the local remnant vegetation	• Tree diversity.
	Tree density	Vegetation contains a density of maturing tree and shrub species comparable to that of the local remnant vegetation	• tree density; and • average tree diameter at breast height.
	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation	• alive trees; • healthy trees; • medium health; • advanced dieback; • dead trees; • mistletoe; and • flowers/fruit (trees).

7.2 Rehabilitation monitoring and research

7.2.1 Monitoring methodology

As proposed rehabilitation works require the establishment of pastures and woodland areas, the rehabilitation monitoring methodology adopted needs to be sufficiently flexible and capable of providing meaningful information of rehabilitation trajectories and when intervention is required.

A combination of LFA and agricultural productivity analysis is an appropriate and generally accepted rehabilitation monitoring methodology for demonstrating the success of rehabilitation works and providing meaningful guidance where intervention is required.

7.2.2 Frequency of monitoring

Rehabilitation monitoring will continue to be undertaken annually during operations and for five years following project closure. At this time, a review of the monitoring frequency will be undertaken based on the performance of the revegetation and an appropriate monitoring frequency determined. The frequency will be determined by a suitably qualified person(s) and in consultation with the relevant regulatory authorities. Informal monitoring of rehabilitation by mine environmental personnel will also be undertaken.

7.2.3 Analogue sites

As detailed in the approved MOP, representative analogue sites have been established for grazing areas and modified ecosystem communities.

7.2.4 Rehabilitation monitoring

Permanent transacts and quadrats have been established for rehabilitation monitoring in analogue and some of the rehabilitation areas over time. These include permanent photo monitoring points. Additional rehabilitation monitoring transects, and photo monitoring points will be established as required. The monitoring results are used to assess whether rehabilitation areas are on a trajectory towards a self-sustaining landscape.

Soil samples are taken using a core sampler within a monitoring quadrat at each rehabilitation monitoring site and soil samples will be sent to a National Association of Testing Authorities (NATA) accredited laboratory for analysis. Soil samples are analysed for the following parameters: pH, electrical conductivity, available calcium, magnesium, potassium, ammonia, sulfur, organic matter, exchangeable sodium, calcium, magnesium, potassium, hydrogen, aluminium, cation exchange capacity, available and extractable phosphorus, micronutrients (zinc, manganese, iron, copper, boron) and total carbon and nitrogen. Exchangeable sodium percentages are also calculated to determine sodicity and soil dispersion.

For the modified ecosystem rehabilitation, various biodiversity components are assessed to monitor the successional phases/changes of plant development and to identify the requirements for ameliorative measures and guide adaptive management.

Rapid ecological assessment techniques are used to provides quantitative data that measures changes in:

- floristic diversity including species area curves and growth forms (using full floristic sampling);
- ground cover diversity and abundance;
- vegetation structure and habitat characteristics (including ground cover, cryptogams, logs, rocks, litter, projected foliage cover at various height increments);

- understorey density and growth (including established shrubs, direct seeding and tubestock plantings and tree regeneration);
- overstorey characteristics including tree density, health and survival; and
- other habitat attributes such as the presence of hollows, mistletoe and the production of buds, flowers and fruit. Permanent transects and photo-points (as described below) have been established to record changes in these attributes over time.

As large portions of the site will be returned to a grazing post-project land use, rehabilitation monitoring will also include indicators of grazing productivity such as:

- stock carrying capacity (DSE/ha);
- pasture crude protein levels;
- digestibility; and
- dry matter content.

7.2.5 Research and continual improvement

Knowledge of appropriate rehabilitation practices required to achieve the rehabilitation objectives is continually growing. PGM have and will continue to engage with industry specialists in the development of rehabilitation landform designs and techniques through the EIS development process and will consult with various experts as required during the operational, rehabilitation and closure phases of the project to address any rehabilitation and closure knowledge gaps.

A key focus of research will be determining an appropriate slope treatment for the WRE area. This will require additional waste characterisation, erosion modelling and landform evolution modelling. The growing media trials detailed in the approved MOP will continue and the outcomes reported in future Annual Reports.

References

ANZMEC & MCA 2000, *The Strategic Framework for Mine Closure*, Australian and New Zealand Minerals and Energy Council and the Minerals Council of Australia, Canberra.

Beck Engineering 2020, *Geotechnical and subsidence assessment for New Cobar Complex Project (SSD-10419),* prepared for Peak Gold Mines Pty Ltd by Beck Engineering.

Commonwealth of Australia 2006a, *Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry,* prepared by the *Department of Industry, Tourism and Resources*, Canberra, ACT, October 2006, pp. 1-63.

- 2006b, Mine Rehabilitation – Leading Practice Sustainable Development, prepared by the Department of Industry, Tourism and Resources, Canberra, ACT, October 2006, pp. 1-67.

CSC 2000, *Designated Development Approval 99/00:022 – Open Cut Gold Mine, Cobar,* Cobar, NSW, July 2000.

DFAT 2016, *Preventing Acid and Metalliferous Drainage Leading Practice Sustainable Development Program for the Mining Industry,* prepared by Department of Foreign Affairs and Trade, Canberra, ACT, September 2016, pp. 1-211.

DnA Environmental 2019, *Peak Gold Mine Rehabilitation Monitoring Report,* prepared for Peak Gold Mines Pty Ltd by DnA Environmental.

DPIE 2016, *eSPADE NSW soil and land information database, version 2.0,* prepared by NSW Department of Planning, Industry and Environment, Sydney, NSW.

- 2020, *NSW soil and land information system (SALIS), version 5.1.3*, New South Wales and Department of Planning, Industry and Environment 2015-2020.

DRE 2016, *Guideline for mineral exploration drilling; drilling and integrity of petroleum exploration and production wells,* prepared by *NSW Department of Industry, Skills and Regional Development - Division of Resources and Energy*, Sydney, NSW, March 2016, pp. 1-43.

DTI 2013, *ESG3 Mining Operations Plan (MOP) Guidelines*, NSW Department of Trade and Investment – Division of Resources and Energy, September 2013.

EGI 2000, *Geochemical Evaluation of Mine Rock from the New Cobar Deposit*, prepared for Peak Gold Mines Pty Ltd. by Environmental Geochemistry International Pty Ltd.

EMM 2020a, *New Cobar Complex Project (SSD 10419) – Groundwater Assessment,* prepared for Peak Gold Mines Pty Ltd by EMM Consulting Pty Ltd.

- 2020b, New Cobar Complex Project, State Significant Development (SSD-10419) Aboriginal cultural heritage assessment, prepared for Peak Gold Mines Pty Ltd by EMM Consulting Pty Ltd.

- 2020c, New Cobar Complex Underground Project (SSD – 10419) bushfire hazard assessment, prepared for Peak Gold Mines Pty Ltd by EMM Consulting Pty Ltd. 2020d, New Cobar Complex Project (SSD 10419) – Previous geochemistry investigations summary, prepared for Peak Gold Mines Pty Ltd by EMM Consulting Pty Ltd.

ISO 2009, *ISO*: *3100: 2009 Risk Management - Principles and Guidelines,* prepared by *the International Organization for Standardization*, Geneva, Switzerland, November 2009, pp. 1-24.

Landcom 2004, *Soils and Construction*: *Managing Urban Stormwater Soils and Construction (Volume 1 and Volume 2E),* New South Wales Government, Sydney.

NSR 2000, *New Cobar Opencut Project Environmental Impact Statement,* prepared for Peak Gold Mines Pty Ltd. by NSR.

OEH 2012, *The land and soil capability assessment scheme: second approximation,* 2nd Edition, State of NSW and Office of Environment and Heritage, Sydney.

- 2017a, Australian soil classification (ASC) soil type map of NSW, prepared by NSW Office of Environment and Heritage, Sydney, NSW, September 2017.
- 2017b, *Great Soil Group (GSG) soil type map of NSW*, prepared by *NSW Office of Environment and Heritage*, Sydney, NSW, September 2017.
- 2017c, Land and Soil Capability Mapping for NSW, prepared by NSW Office of Environment and Heritage, Sydney, NSW, September 2017.

PGM 2006, *CMLs 6 to 9 Conceptual Closure Plan,* prepared for Peak Gold Mines Pty Ltd. by PGM.

- 2016a, *Biodiversity and Land Management Plan*, version 1.0, prepared for Peak Gold Mines Pty Ltd. by PGM.
- 2016b, *Peak Gold Mine Erosion and Sediment Control Plan,* prepared for Peak Gold Mines Pty Ltd. by Peak Gold Mines Pty Ltd.
- 2019, Peak Gold Mines Mining Operations Plan, prepared for Peak Gold Mines Pty Ltd. by Peak Gold Mines Pty Ltd.
- 2020, *Peak Gold Mine Emergency Management Plan,* prepared for Peak Gold Mines Pty Ltd. by Peak Gold Mines Pty Ltd.
- n.d., *Peak Gold Mine Historical Shaft Inspection and Filling Procedure,* prepared for Peak Gold Mines Pty Ltd. by Peak Gold Mines Pty Ltd.

Rosewell, CJ 1993, *SOILOSS – a program to assist in the selection of management practices to reduce erosion. Technical Handbook No. 11*, Soil Conservation Services, Sydney.

RW Corkery & Co. 2020, Great Cobar Project Review of Environmental Factors, prepared for Peak Gold Mines Pty Ltd. by RW Corkery & Co.

SGM 2019, *Geochemistry Review*, prepared for Peak Gold Mines Pty Ltd. by SGM Environmental.

SLR 2020, *Waste Rock Management Plan Peak Gold Mines,* prepared for Peak Gold Mines Pty Ltd. by SLR.

Abbreviations

Term	Description
Aurelia	Aurelia Metals Limited
AC	Acid Consuming
Al	Aluminium
AMD	Acid Mine Drainage
ANC	Acid Neutralising Capacity
AS	Australian Standard
BDAR	Biodiversity Development Assessment Report
CAF	Cemented Aggregate Fill
CEC	Cation Exchange Capacity
CML	Consolidated Mining Lease
CSA	Cornish Scottish Australian
CSC	Cobar Shire Council
DPIE	Department of Planning, Industry and Environment
DSE	Dry Sheep Equivalent
EC	Electrical Conductivity
EGI	Environmental Geochemistry International Pty Ltd
EIS	Environmental Impact Assessment
EMM	EMM Consulting Pty Ltd.
EP&A	Environmental Planning and Assessment
ESCP	Erosion and Sediment Control Plan
ESP	Exchangeable Sodium Percentage
ETL	Electricity Transmission Line
ha	Hectare
KCI	Potassium Chloride
km	kilometres
kV	Kilovolt
LEP	Local Environment Plan
LFA	Landscape Function Analysis
LSC	Land and Soil Capability
m	Meters
mBGL	Metres Below Ground Level

MCC	Mine Closure and Completion
Mg	Magnesium
ML	Mining Lease
MOP	Mining Operation Plan
MPL	Mining Purpose Lease
NAF	Non-Acid Forming
NAPP	Net Acid Producing Potential
NATA	National Association of Testing Authorities
NMD	Neutral Mine Drainage
NSW	New South Wales
PAF	Potentially Acid Forming
PAF-LC	PAF-low Capacity
PBP	Planning for Bushfire Protection
PCT	Plant Community Type
PGM	Peak Gold Mines Pty Ltd.
POEO	Protection of the Environment Operations
R-Factor	Rainfall Erosivity
RoM	Run of Mine
SD	Saline Drainage
SEARs	Secretary's Environmental Assessment Requirements
SFMC	Strategic Framework for Mine Closure
SGM	SGM Environmental
SoEE	Statement of Environmental Effects
SSD	State Significant Development
TARP	Trigger Action Response Plan
TN	Total Nitrogen
TP	Total Phosphorous
tpa	tonnes per annum
TPH	Total Petroleum Hydrocarbons
TSF	Tailings Storage Facility
UC	Uncertain
WRE	Waste Rock Emplacement
WRMP	Waste Rock Management Plan
XRF	X-ray Fluorescence