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COWAL GOLD OPERATIONS MINE LIFE MODIFICATION

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5 REHABILITATION AND LANDSCAPE MANAGEMENT STRATEGY

This section outlines the Rehabilitation and Landscape Management Strategy for the Modification. This strategy presents the overall rehabilitation philosophy, principles and objectives and describes the long-term land use strategy, final landform and revegetation concepts and conceptual rehabilitation domains. An overview of the status of rehabilitation at the approved CGO and a summary of the key findings from rehabilitation investigations and trials to date is provided in Section 5.2.1.

A Rehabilitation Proposal (Appendix F) has been prepared for this EA which provides a detailed description of how the Modification would be rehabilitated. Appendix F also describes in detail the results of rehabilitation investigations and trials undertaken at the CGO to date and how these findings have been incorporated into the CGO's rehabilitation programme.

The Rehabilitation and Landscape Management Strategy presented would continue to be provisional to allow for the consideration of results from future rehabilitation investigations and trials (Section 5.6) and rehabilitation monitoring (Section 5.7) (consistent with current practice).

A revised MOP would be prepared to reflect the Modification in consultation with and subject to approval by the DRE.

The MOP would continue to be periodically reviewed and updated over the life of the mine to incorporate proposed rehabilitation concepts for approval prior to implementation.

5.1 REHABILITATION PRINCIPLES AND OBJECTIVES

The approved CGO rehabilitation philosophy is to operate as a non-intrusive land user and to create stable rehabilitated landforms that increase the areas of endemic vegetation in the mine area and the status of land-lake habitats (Barrick, 2013a).

This philosophy would remain unchanged for the Modification and has led to the rehabilitation principles and objectives as described in Sections 5.1.1 and 5.1.2.

5.1.1 Rehabilitation Principles

The rehabilitation programme would include the following general principles:

- The rehabilitation of landforms is to be progressive and conducted in accordance with approved, verified plans.
- Final landforms are to be stable in the long-term and include native and/or endemic vegetation characteristic of remnant vegetation within the surrounding landscape.
- Endemic groundcover, understorey, tree seeds and seedlings are to be cultivated and used in the rehabilitation programme.
- Rehabilitation concepts are to be flexible to allow for adjustments, based on investigations, to improve the programme.
- The annual rehabilitation programme and budget is to be prepared by a site team incorporating senior management representatives.

5.1.2 Rehabilitation Objectives

The rehabilitation objectives for the Modification would include:

- The water quality of Lake Cowal is not detrimentally affected by CGO landforms.
- Revegetating CGO landforms with selected native and/or endemic vegetation that is suited to the physiographic and hydrological features of each landform, and which expand on the areas of remnant endemic vegetation in the surrounding landscape.
- Designing final landforms so that they are stable and include revegetation growth materials that are suited to the landform and support self-sustaining vegetation.
- The placement (wherever possible) of soils on final landforms to enable the progressive establishment of vegetation.
- The expansion of habitat opportunities for wetland and terrestrial fauna species. This includes the design and implementation of rehabilitation works at the New Lake Foreshore in a manner consistent with the *NSW Wetlands Policy* (DECCW, 2010).
- The selection of revegetation species in accordance with accepted principles of long-term sustainability (e.g. genotypic variation, vegetation succession, water/drought tolerances).

- Grazing of land within ML 1535 to be excluded during operations and during rehabilitation of the site. At lease relinquishment, rehabilitated final landforms are excluded from grazing, with some areas suitable for grazing surrounding the rehabilitated final landforms.

Specific rehabilitation objectives have been developed for the CGO final landforms resulting from the Modification which consider the results of rehabilitation investigations and trials undertaken at the CGO to date. These objectives are described in Section 5.3.2.

5.2 CGO REHABILITATION

Approximately 330 ha of land within ML 1535 is under rehabilitation (i.e. either shaped and covered [i.e. with rock armour, topsoil and revegetation] or rehabilitated and under maintenance). Areas currently under rehabilitation include:

- temporary isolation bund (shaped, topsoiled and revegetated with native and exotic tree and grass species including scattered aquatic species such as Lignum [*Muehlenbeckia florulenta*], Rush [*Eleocharis* sp.], River Cooba [*Acacia stenophylla*] and River Red Gum [*Eucalyptus camaldulensis*]);
- lake protection bund (shaped and lower batter rock armoured, topsoiled and revegetated with native and exotic tree and grass species including scattered aquatic species such as Lignum, Rush sp., River Cooba and River Red Gum);
- UCDS (rehabilitated and under maintenance);
- components of the ICDS (e.g. surface water diversion structures) (rehabilitated and under maintenance);
- northern and southern tailings storage facilities (embankments shaped and rock armoured with some areas topsoiled [with gypsum] and revegetated with native and exotic grass species);
- perimeter waste rock emplacement lower and majority of upper outer batter slopes of southern and eastern sections (shaped, rock armoured and topsoiled [with gypsum] with revegetation including native and exotic grass species establishing across majority of rehabilitation area);
- southern waste rock emplacement lower, mid and upper outer batter slopes of southern section and lower slopes of eastern section (shaped, rock armoured and topsoiled [with gypsum] with revegetation including native and exotic grass species establishing across rehabilitation area);
- northern waste rock emplacement north facing lower, mid and upper outer batter slopes (shaped, rock armoured and topsoiled [with gypsum] with revegetation including native and exotic grass species established across northern extent of the rehabilitation area and plantings of Eucalypt and Acacia species established across the rehabilitation trial area);
- embankments of contained water storage D9 (shaped, rock armoured, topsoiled and revegetated with native and exotic grass species); and
- Bland Creek Palaeochannel Borefield water supply pipeline (rehabilitated and under maintenance).

Photographs of rehabilitation progress at the CGO (including rehabilitation trial areas) are shown on Plates 5-1 to 5-6. Additional photographs are included in the Rehabilitation Proposal (Appendix F).

5.2.1 Results of Rehabilitation Investigations and Trials

Numerous rehabilitation investigations and trials have been undertaken since construction of the CGO commenced in 2005 to determine the most appropriate rehabilitation methods, rehabilitation materials and revegetation species likely to achieve the rehabilitation objectives for the CGO's final landforms.

Rehabilitation investigations and trials that have been undertaken to date have focussed on the following key aspects relevant to the CGO:

- **Rehabilitation Media**
  - Investigations and trials assessing the effectiveness of different surface cover treatments (e.g. rock mulch, native pasture hay, woodchips) and different substrate types (e.g. oxide waste, subsoil and topsoil) in stabilising landform slopes and providing effective vegetation growth medium.
  - Investigation into the geochemical suitability of rock armour material for the outer batters of mine landforms.

HAL-16-41 ML Mod_004C

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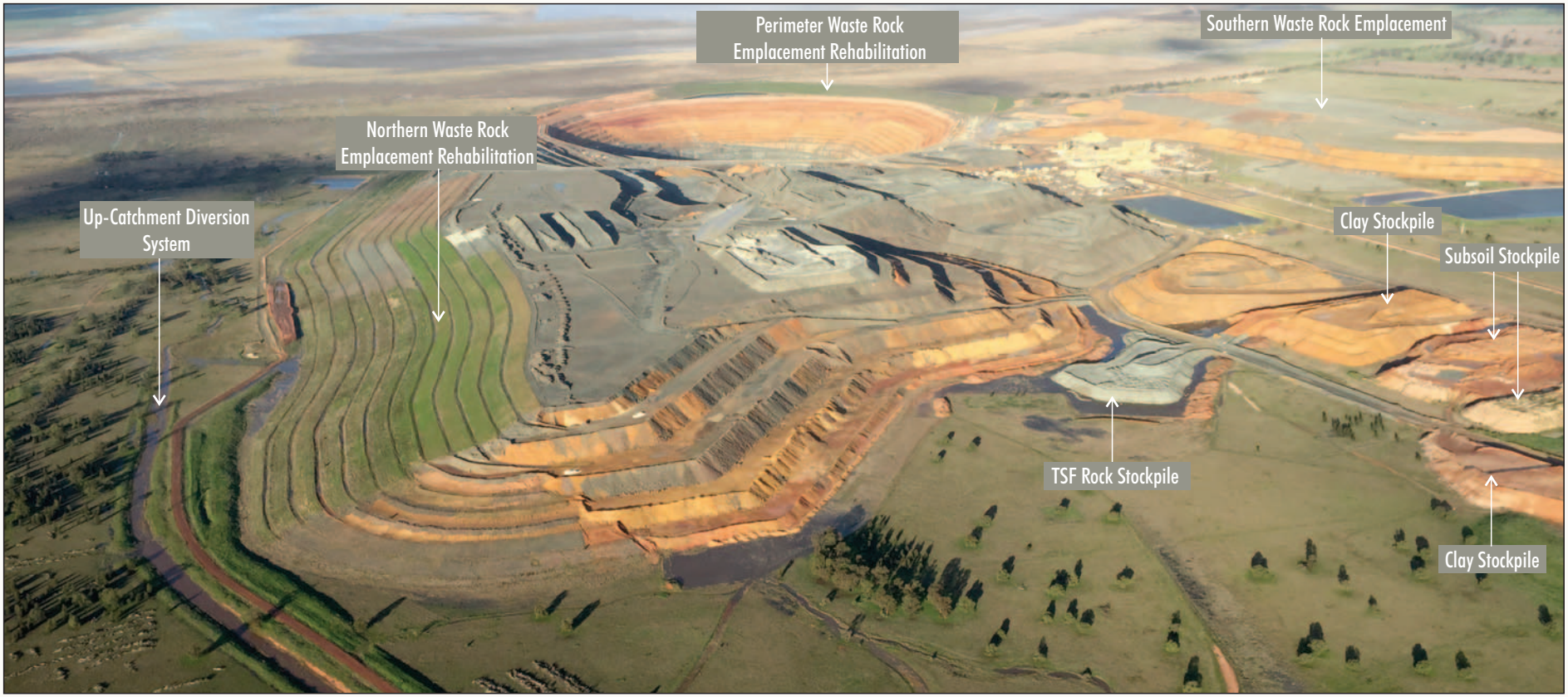
Perimeter Waste Rock Emplacement, Lake Protection Bund and Temporary Isolation Bund Rehabilitation (July 2016)

Plate 5-1



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Northern Waste Rock Emplacement Rehabilitation (June 2016)

Plate 5-2

HAL-16-41 ML Mod_009B

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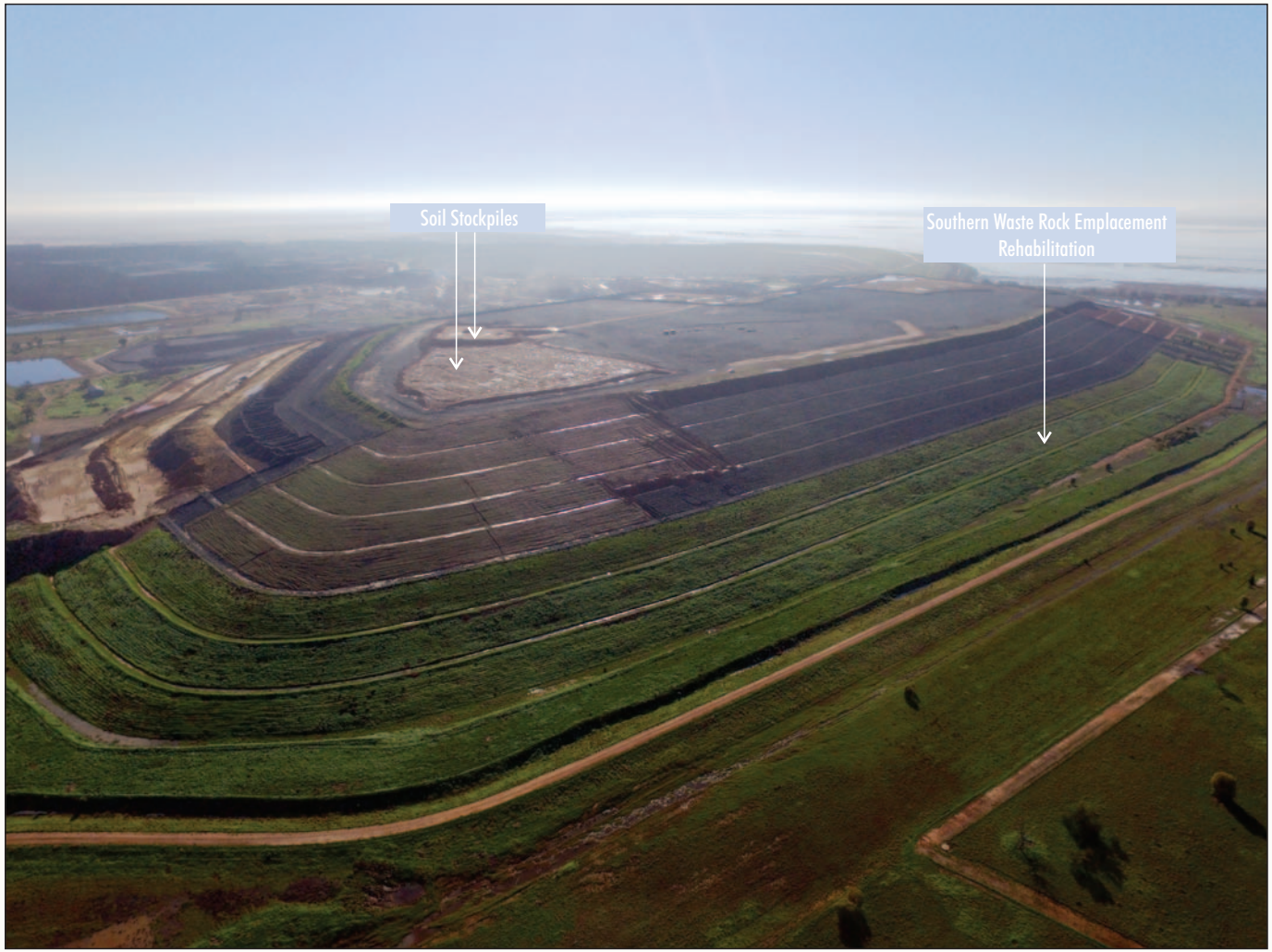
Rehabilitation on Perimeter and Southern Waste Rock Emplacements (June 2016)

Plate 5-3



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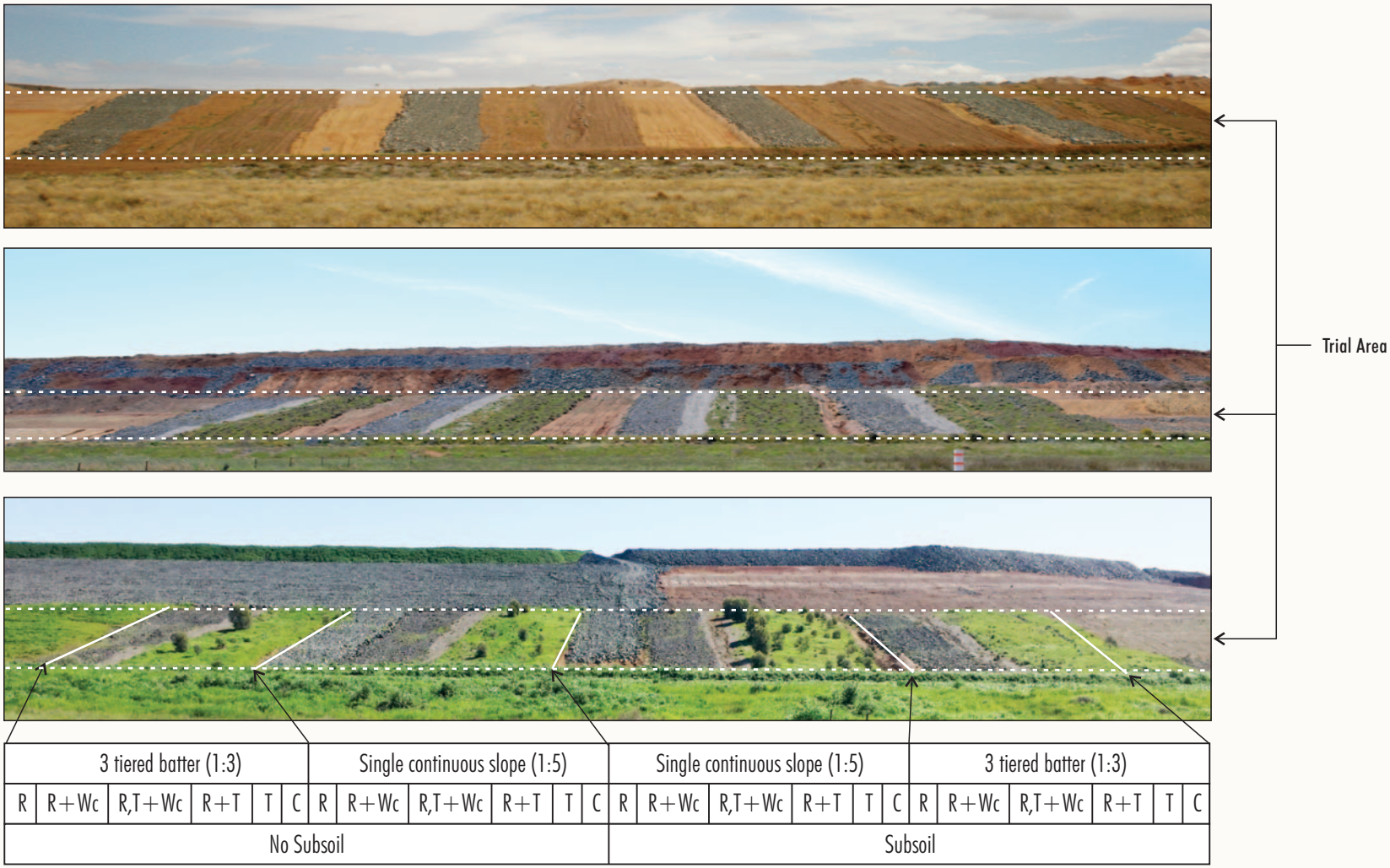
Southern Waste Rock Emplacement Rehabilitation (July 2016)

Plate 5-4



Southern Waste Rock Emplacement Trial Design

	Legend
(R)	Rock mulch
(R+Wc)	Rock mulch + woodchips
(R+T+ Wc)	Rock + topsoil + woodchips
(R+T)	Rock + topsoil
(T)	Topsoil
(C)	Control or No treatment

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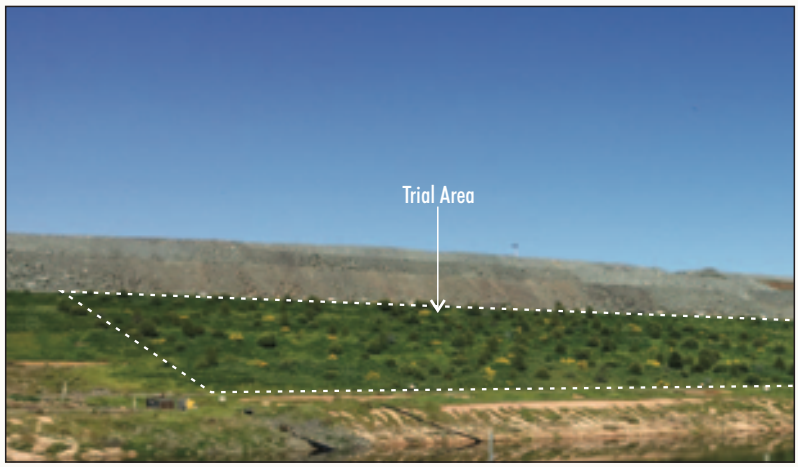
Southern Waste Rock Emplacement Trial Area in 2010, 2012 and 2016 including Trial Design

Plate 5-5



Northern Waste Rock Emplacement trial area (looking south-west)
(September 2016)

Northern Waste Rock Emplacement trial tubestock growth
(approximately two years old) and dense *Lolium Rigidum* (Wimmera
Ryegrass) ground cover.

Tubestock growth in 150mm topsoil.

HAL-16-41 ML Mod_007A

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Northern Waste Rock Emplacement
Trial Area Performance

Plate 5-6

- **Water Management and Erosion Control on Landform Slopes**
  - Investigation into water management and erosion control concepts including hydrological and hydraulic modelling of different CGO landform slope designs (i.e. single slope compared with tiered slope) and different surface treatments (i.e. rock mulch or without rock mulch surface treatments) under various rainfall events.
- **Material Characterisation and Amelioration**
  - Investigation into the chemical and physical properties of soil resources and the optimum rates of gypsum application to improve suitability for plant growth and use on rehabilitation areas.
- **Revegetation**
  - Ongoing trials and research to determine the most appropriate revegetation species suited to substrate materials of the CGO's final landforms.

The Rehabilitation Proposal (Appendix F) provides a detailed description of the results of these investigations and trials.

Key Findings of Rehabilitation Investigations and Trials

Key findings of the rehabilitation investigations and trials conducted at the CGO to date include the following (Appendix F):

- The surface cover treatment/method most likely to stabilise final landform slopes and support long-term vegetation growth includes (DnA Environmental, 2013a, 2013b; 2015):
  - rock mulch and gypsum-treated topsoil cross-ripped along the contour of the slope; and
  - a light to medium application of native pasture hay or clean wheaten straw hay as an immediate protective soil cover.
- The annual exotic grass Wimmera Ryegrass (*Lolium rigidum*) present in the topsoil seed bank establishes rapidly in high abundance across rehabilitation areas, providing extensive vegetation cover and soil/surface protection, and a mulch/litter cover once it desists. As a result, hay mulch is only considered necessary in areas where Wimmera Ryegrass has not established.
- Research is proposed to determine the most effective methods for direct seeding rehabilitation areas following the establishment of the initial Wimmera Ryegrass cover crop.
- At this stage, no obvious effects have been observed on the growth rates of the tubestock in the northern waste rock emplacement trial as a result of the different topsoil depths or mulch treatments or underlying waste rock substrate types.
- Primary waste rock is suitable for use as rock armour (or rock mulch) on landform slopes due to the material being typically non-saline and NAF (GEM, 2008; 2013; 2016). However, primary waste rock materials with higher reactive sulphide contents (greater than 0.5% sulphur) are likely to present a risk of developing saline conditions when oxidised and these materials should either be excluded from use as rock armour or blended with the lower sulphur material in order to dilute the reactive sulphides (GEM, 2008; 2013; 2016).
- Due to the expected salinity and sodicity of the oxidised waste rock, this material is not suitable for armouring the batter slopes of the waste rock emplacements and TSFs.
- Due to the sodic and dispersive nature of the oxide waste rock material, gypsum should be spread on the surface of oxide waste rock material (i.e. in particular on the southern waste rock emplacement) prior to the application of the rehabilitation cover materials (e.g. rock mulch and gypsum-treated topsoil) to assist with stabilising the underlying substrate material.
- The inclusion of rock mulch in the surface cover placed on CGO landform slopes would provide resistance to erosion and would reduce surface water flow velocities on landform slopes during high rainfall events (Gilbert & Associates, 2009).
- The majority of stockpiled soil resources at the CGO are typically sodic and dispersive and therefore require treatment with gypsum to improve the soil structure and suitability for plant growth (some soil stocks however require treatment with lime or a gypsum-lime blend to reduce the acidity of the soil) (McKenzie Soil Management Pty Ltd, 2013).

- Various methods for treating or ameliorating soil at the CGO have been recommended by McKenzie Soil Management Pty Ltd (2013), including treating soil stockpiles with gypsum (or other relevant treatment material); treating strongly sodic and dispersive soil stocks with gypsum in a dedicated soil amelioration farm; treating soil when re-applied to rehabilitation areas; and spreading gypsum on the surface of original soil profiles prior to soil stripping.
- Ameliorated soils are anticipated to improve revegetation outcomes for the CGO final landforms (due to improved soil properties for plant growth) and may increase the number and diversity of revegetation species able to be used in the CGO rehabilitation programme (i.e. additional species could be used that are typically less tolerant to deficient soils) (McKenzie Soil Management Pty Ltd, 2013). Soil conditioning (with gypsum) and the application of surface cover treatments improves the effectiveness of revegetation techniques including direct seeding and tubestock planting (DnA Environmental, 2013a).
- The results from vegetation growth trials undertaken to date indicate that seedlings of select salt tolerant tree species continued to grow when planted in a substrate including CGO oxide and sulphide tailings (Barrick, 2013b). As a result, it is considered salt tolerant tree species would likely establish and develop when planted on the top surfaces of the TSFs.
- The root systems of two year old tree species planted in substrates including topsoil and oxide waste rock and topsoil, subsoil and oxide waste rock continued to grow through the substrate profile (except for one plant where the root system desisted once entering oxide waste rock) (DnA Environmental, 2013a). Despite the small sampling size, there was no conclusive evidence to suggest these substrates would be a significant constraint to plant growth (DnA Environmental, 2013a).

Appendix F provides a detailed review of the results of the rehabilitation investigations and trials which have led to these key findings.

Based on the above key findings, the current rehabilitation programme for the CGO includes:

- The following surface cover treatment to stabilise final landform slopes and support long-term vegetation growth:
  - rock mulch and gypsum-treated topsoil cross-ripped along the contour of the slope; and
  - in areas where Wimmera Ryegrass has not established, a light to medium application of native pasture hay or clean wheaten hay to provide an immediate protective soil cover.
- The application of gypsum and then a layer of primary waste rock placed on areas of oxide waste rock on the top surface (and batters) of the southern waste rock emplacement (which has largely been constructed of oxide waste rock material) to assist with stabilising the sodic and dispersive characteristics of the oxide waste rock material.
- Implementation of various soil amelioration methods to improve the structure and function of soil stocks and enhance suitability for plant growth including:
  - treating soil with gypsum when re-applied to rehabilitation areas;
  - treating soil stockpiles with gypsum (or other relevant treatment material); and
  - spreading gypsum on the surface of original soil profiles prior to soil stripping.
- Continued rehabilitation investigations and trials to determine:
  - the most effective combinations of the rock mulch and topsoil cover system materials; and
  - the most effective methods for managing Wimmera Ryegrass to maintain its benefits yet provide for the establishment of native tree and shrub species from seed (Section 5.6).

The above methods would be continued for the Modification.

5.3 REHABILITATION CONCEPTS FOR THE MODIFICATION

This section presents the rehabilitation concepts for the Modification. Section 5.3.1 describes the long-term land use strategy and presents the conceptual post-mining landform and Section 5.3.2 details the final landform design concepts and conceptual rehabilitation domains.

Figures 3-2 to 3-4 in Section 3 show proposed progressive rehabilitation for the Modification.

5.3.1 Long-term Land Use Strategy

In accordance with Development Consent (DA 14/98) Condition 3.8, a long-term land use strategy has been developed for the CGO. The strategy is relevant to land within ML 1535, the CGO's water supply pipeline (associated with the Bland Creek Palaeochannel and Eastern Saline Borefields) (Figure 1-2) and Evolution-owned land outside ML 1535.

The long-term land use strategy would remain unchanged for the Modification and would be applied to the modified landforms which would result from the Modification (i.e. the modified TSFs and final void). A conceptual view of the proposed long-term land use areas and the conceptual post-mining landform is shown on Figure 5-1.

At lease relinquishment, it is proposed that land use within the ML 1535 area would include fenced rehabilitation areas with grazing excluded and areas suitable for agricultural production including commercial and recreational fishing of lake areas or managed grazing by livestock (Figure 5-1).

Evolution-owned land outside the ML 1535 area (with the exception of the Compensatory Wetland and Northern and Southern Offset Areas) (Figure 5-1) would continue to be used for farming/agricultural production by Evolution and/or licensees that sign agreements to conduct agricultural activities on Evolution-owned land. It is anticipated that areas of lakebed country would be available for commercial and recreational fishing when inundated, and may be used for cropping and/or managed livestock grazing when dry, consistent with existing and historical uses of Lake Cowal. Consistent with the CGO's Land Management Plan, the RVEP Areas (Figure 5-1) would continue to be maintained for the term of Evolution's tenure of the land.

Some infrastructure may be retained and transferred to local landholders for use following lease relinquishment including electricity infrastructure, water storages, pipelines, bores and associated pump stations. Should the CGO's Bland Creek Palaeochannel Borefield, Eastern Saline Borefield and the saline groundwater bores within the ML 1535 area be retained for local use, the pipelines would remain in place.

Alternatively, if the infrastructure is not required for local use, the bores would be plugged, capped and decommissioned in accordance with relevant regulatory guidelines, the pump stations would be removed and the pipelines raised and dismantled for recycling. Infrastructure decommissioning activities are described further in Section 5.3.2.

Long-term land uses would ultimately be subject to consultation with relevant regulatory authorities and key stakeholders including surrounding landholders.

Consistent with Development Consent Condition 3.4(b) and the CGO's approved Biodiversity Offset Management Plan, long-term protection of the CGO Offset Areas would be provided by a Voluntary Planning Agreement registered on the title of the offset lands. Consistent with the CGO's approved LMP, management of the RVEP areas would be maintained for the term of Evolution's tenure of the relevant lands.

5.3.2 Final Landform Concepts and Rehabilitation Domains

The currently approved final landform design concepts would remain unchanged for the Modification. The CGO final landforms would be:

- designed wherever possible to be compatible with regional landscape features;
- progressively constructed as a ROM operation wherever possible and left with untrimmed surface roughness to lower runoff coefficients and promote water absorption and storage; and
- revegetated with endemic vegetation communities, selected specifically for their suitability to the created elevation, aspect, substrate conditions and the overriding objective of re-establishing a greater extent of endemic vegetation within ML 1535.

The Modification would not change the CGO's key final landforms which would include:

- a final void;
- rehabilitated waste rock emplacements surrounding the final void to the north, east and south;
- two rehabilitated TSFs located near the western extent of ML 1535;
- a woodland corridor between the rehabilitated northern waste rock emplacement and rehabilitated northern tailings storage facility;
- areas surrounding the rehabilitated waste rock emplacements and TSFs associated with rehabilitated site infrastructure areas (e.g. former process plant area and former soil stockpile areas);

LEGEND

CGO Offset Area

Remnant Vegetation Enchancement Programme (RVEP) Area (management of these areas would be maintained for the term of Evolution's tenure of the land)

Source: Evoultion (2016)

Evolution

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Conceptual Final Landform and Proposed Final Land Use Areas

Figure 5-1

- permanent water management features including the UCDS and low mounds associated with the ICDS; and
- permanent lake isolation embankments to hydrologically separate the open pit development area and Lake Cowal during mining and post-mining.

The Modification would involve processing of mineralised material and would therefore remove the mineralised material stockpile as a component of the northern waste rock emplacement landform. Figure 3-4 shows the conceptual general arrangement post-mining. Figure 5-1 shows the conceptual final landforms and long-term land use areas.

Consistent with the DRE's (2013) *ESG3: Mining Operations Plan (MOP) Guidelines September 2013* (MOP Guidelines), the following conceptual rehabilitation domains have been developed based on the CGO final landforms which are shown on Figure 5-2:

- Domain 1A – Final Void;
- Domain 2B – Permanent Water Management Infrastructure;
- Domain 3C – Infrastructure Area – Grassland/Scattered Eucalypt Woodland;
- Domain 4D – Tailings Storage Facilities – Eucalypt Woodland;
- Domain 5D – Waste Rock Emplacements – Eucalypt Woodland;
- Domain 6D – Woodland Corridor – Eucalypt Woodland; and
- Domain 7E – New Lake Foreshore – Riverine Woodland/Freshwater Communities.

The rehabilitation objectives and final landform and revegetation concepts for each domain/key final landform are described below and are consistent with the rehabilitation principles (Section 5.1.1) and rehabilitation objectives (Section 5.1.2) for the Modification. A detailed description of the final landform and revegetation concepts (including relevant figures and cross-sections) is provided in the Rehabilitation Proposal (Appendix F).

These concepts (and the long-term land use strategy) may be revised and refined if necessary throughout the life of the mine based on the outcomes of ongoing consultation with relevant regulatory authorities, stakeholders and the results of ongoing rehabilitation investigations and trials.

Domain 1A- Final Void

The rehabilitation objectives for the final void would remain unchanged for the Modification and are to (Barrick, 2013a):

- create habitat opportunities for waterbirds at the approximate level at which void water will reach equilibrium, where feasible; and
- leave the void surrounds safe (for humans and stray stock).

At the completion of mining, the final void would be surrounded on three sides by the revegetated mine waste rock emplacements.

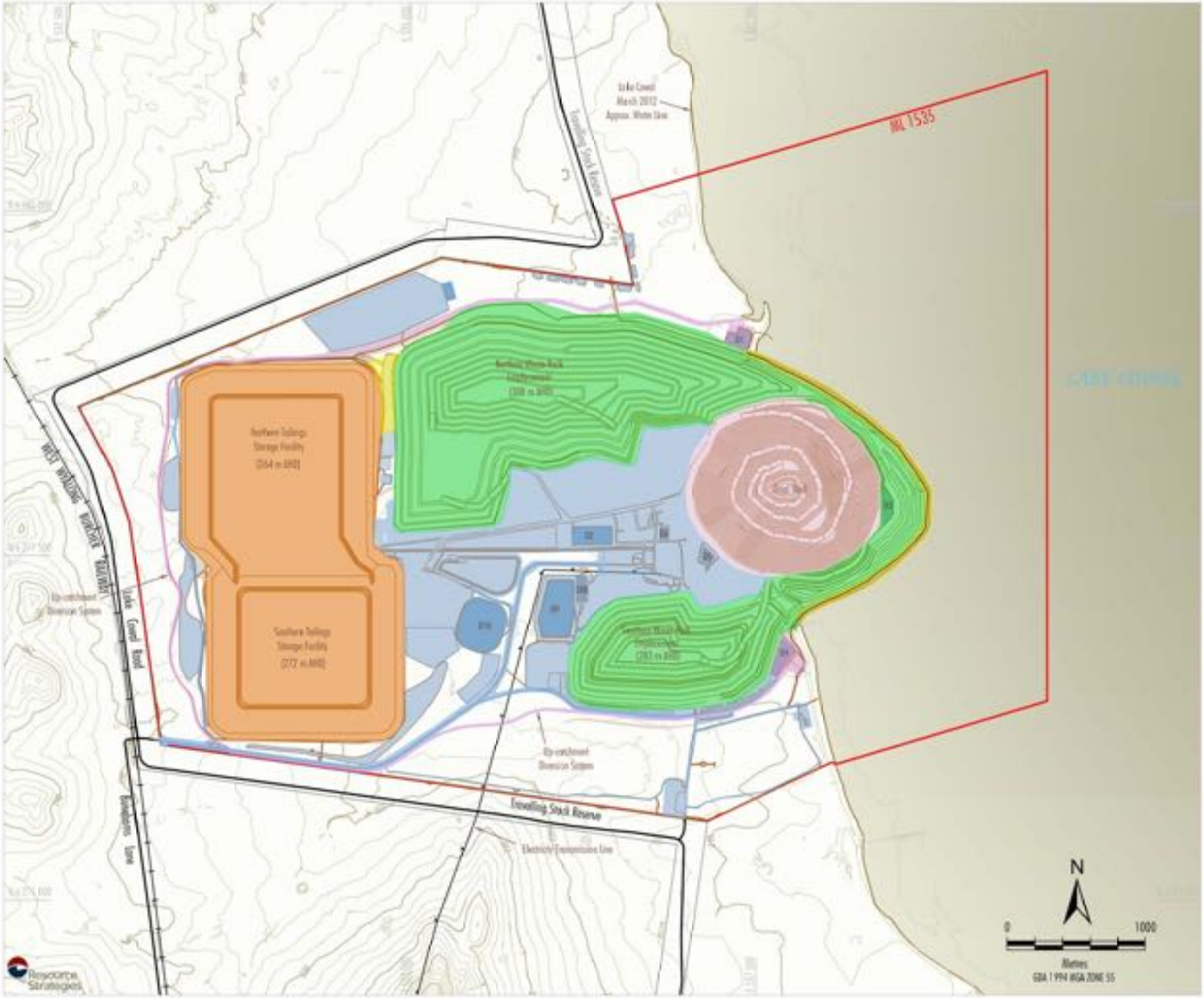
The Modification would increase the maximum final depth of the final void to approximately -331 m AHD (i.e. approximately 540 m below the natural surface level). The berm widths and slope angles would continue to be reviewed and monitored through ongoing geotechnical studies and data collection during mine development.

A description of the long-term hydrological characteristics for the modified final void is presented in Appendix B. Modelling indicates that the final void water level would be even lower than the final void level predicted in the previous *Cowal Gold Mine Extension Modification Hydrological Assessment* (Gilbert & Associates, 2013) (i.e. the water level is predicted to reach an equilibrium water level lower than approximately RL 130 m [approximately 80 m below spill level]) (Appendix B). Predictions of average void salinity confirm that salt concentrations in void waters would slowly increase towards hyper-salinity (Appendix B).

A bund would be constructed around the perimeter of the final void which would be planted with an initial cover crop (to assist in stabilising the bund following construction) and would then be seeded with native and/or endemic Eucalypt woodland species. The final void would be screened from public views on Lake Cowal Road by the TSFs and waste rock emplacements and would be fenced upon completion of mining. Signposted warnings to the public would also be placed along the fence.

Domain 2B – Permanent Water Management Infrastructure

The rehabilitation objective for the permanent water management structures is to create stable systems (i.e. acceptably low risk of environmental harm to Lake Cowal).



LEGEND
- Mining Lease Boundary (ML 1535)
- Road
- Contour m AHD (2 m Interval)

Domain
- Final Void
- Permanent Water Management Infrastructure
- Infrastructure Area - Grassland/Scattered Eucalypt Woodland
- Tailings Storage Facility - Eucalypt Woodland
- Waste Rock Emplacement - Eucalypt Woodland
- Woodland Corridor - Eucalypt Woodland
- New Lake Foreshore - Riverine Woodland and Freshwater Communities

Note: Landform elevations are approximate

Source: Evolution (2016)

Evolution

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Conceptual Rehabilitation Domains

Figure 5-2

The Modification would not change the existing permanent water management structures which comprise:

- the UCDS; and
- the ICDS (including the existing low mounds associated with the permanent catchment divide).

The UCDS has been constructed to simulate endemic drainage features in the region and includes a low flow drainage path within a wider floodplain (approximately 65 m wide). The channel includes constructed features such as low flow and overbank zones, meanders and pool/riffle sequences. The northern extent of the UCDS includes constructed rock outfalls at confluences with existing natural drainage lines to minimise erosion. At the completion of construction, the UCDS was revegetated with riparian vegetation including rapid germinating pasture species to assist in stabilising the channel.

The UCDS would remain to facilitate permanent drainage of adjacent areas upslope of the site to Lake Cowal and the low mounds associated with the ICDS would remain to contain runoff generated within the site catchment.

Although some components of the Lake Isolation System are permanent water management features (i.e. the lake protection bund and first outer batter of the perimeter waste rock emplacement) (which will become the New Lake Foreshore at mine closure), the rehabilitation objectives and concepts for the New Lake Foreshore are different from the UCDS and ICDS. Therefore, a separate Rehabilitation Domain (7E) has been developed for the New Lake Foreshore. The rehabilitation concepts for the remainder of the perimeter waste rock emplacement (i.e. excluding the first outer batter) will be the same as for the northern and southern waste rock emplacements.

Domain 3C – Infrastructure Areas

Post-operations, the rehabilitation objectives for the infrastructure areas are to:

- remove all infrastructure to ensure the site is safe and free of hazardous materials (unless an alternative arrangement is agreed by Evolution, the ultimate landholder and relevant regulatory authorities); and
- establish vegetative communities (including scattered Eucalypt Woodland species and native pasture species) that are endemic to the region and suitable for managed grazing.

Infrastructure areas associated with the Modification would largely remain the same as the existing infrastructure areas at the approved CGO, except the small area in between the TSFs would become part of the TSF domain.

Existing infrastructure which would continue to be used for the Modification would include the workshop, storage areas, process plant (with some upgrades to the leach circuit), administration, access roads, transmission line and substation, borefields, water management structures and exploration areas.

The general rehabilitation concepts for the infrastructure areas would remain unchanged for the Modification. A summary of these rehabilitation concepts is provided below.

The long-term objectives for site infrastructure features will be discussed during the life of the CGO and will be specifically reviewed in consultation with the CEMCC and relevant regulatory authorities prior to the final year of mine operations.

Workshop

At the completion of mining, the mine fleet would be demobilised and the workshop dismantled. The footprint area would be tested for contamination from fuels and lubricants and any contaminated soils removed for proper disposal in accordance with EPA requirements. The area would then be contour ripped, topsoiled and revegetated with endemic Eucalypt Woodland and native pasture species.

Reagent and Fuel Storage Areas

Unused reagents and fuels at the completion of processing would be returned to the supplier in accordance with all relevant safety and handling procedures. Storage areas would be tested for contamination from fuels and lubricants and any contaminated soils removed for proper disposal in accordance with EPA requirements. The area would then be contour ripped, topsoiled and revegetated with endemic Eucalypt Woodland and native pasture species.

Process Plant and Administration Area

The process plant and administration area buildings would be dismantled and removed following the cessation of processing.

The foundations and floors would be retained if a suitable alternative use is agreed with the ultimate landholder. Alternatively, they would be excavated for disposal at the base of the final void or as buried landfill in an approved manner. If the foundations and floors are removed, the area would then be contour ripped, topsoiled and revegetated with endemic Eucalypt Woodland and native pasture species.

Internal powerlines, pipelines and the explosives magazine would be dismantled and removed.

Internal Access Road and Other Roads

All internal roads would be contour ripped, topsoiled and revegetated with endemic Eucalypt Woodland and native pasture species, unless otherwise agreed with the ultimate landholder.

Transmission Line and Substation

At the end of the mine life, the electricity transmission line (from Temora to the CGO) would be the property of the electricity utility and would likely remain in place.

Water Supply Infrastructure

The Bland Creek Palaeochannel bores and associated pump stations (including the eastern pump station and diesel tank) may be transferred to local landholders or, alternatively, dismantled and the bores plugged, capped and decommissioned in accordance with the regulatory guidelines.

The pipeline would either be raised and dismantled for recycling or kept in place if required for local use. If dismantled, the section of pipeline in the bed of Lake Cowal would be raised when the lake is dry and disturbed areas revegetated with endemic species. If this is not possible due to successive high rainfall seasons, any decision to remove the pipeline would be discussed with the relevant regulatory authorities. However, given the likely maintenance period for CGO rehabilitation, it is likely that Lake Cowal would be sufficiently dry at some stage during this period.

Given the water supply from the saline groundwater supply bores within ML 1535 and the Eastern Saline Borefield is highly saline, it is unlikely that these bores would be suitable and/or requested for ongoing future use by local landholders post-closure of the CGO. Notwithstanding, consultation would include discussions between Evolution and local landholders regarding potential transfer of the saline groundwater supply borefield infrastructure for private use.

It is likely, however, that the saline groundwater supply bores would be plugged, capped and decommissioned in accordance with the regulatory guidelines and the associated pipelines and pump systems dismantled. The pipeline within the ML 1535 within Lake Cowal would be dismantled and removed during dry lake conditions and disturbed areas revegetated with endemic species.

Contained Water Storages

Rehabilitation objectives for the contained water storages (i.e. D1 to D10) are to either decommission the infrastructure or retain the infrastructure for local landholder use. Decommissioning of the contained water storages would be undertaken to the satisfaction of relevant regulatory authorities including the DRE, EPA and DPI-Water. Alternatively, the contained water storages may be retained for local landholder use upon agreement by Evolution and the regulatory authorities.

Exploration Areas

All exploration drillholes would be plugged, capped and decommissioned in accordance with the regulatory guidelines at the completion of exploration activities. Access tracks and areas disturbed by exploration activities would be revegetated in accordance with the procedures adopted for the internal site roads.

Domain 4D – Tailings Storage Facilities

The Modification would involve modifying the design of the TSFs to:

- increase the final heights of the northern and southern tailings storage facilities to approximately 264 m AHD and 272 m AHD, respectively;
- convert the area between the existing TSFs into a new storage area; and
- place a rock fill buttress over the outer slopes of the TSF embankments to provide long-term stability.

Notwithstanding, the Modification would not change the approved rehabilitation objectives for the TSFs which would be:

- to establish permanently stable landforms;
- during operations, stabilise batters so that they provide minimal habitat value for bird life (i.e. rock mulch or pasture cover);

- post-operations, to establish vegetative communities (including Eucalypt and Riverine woodland species and understorey species such as Rush sp. and pasture species) which are suited to the hydrological features and substrate materials of the landform; and
- to exclude grazing and agricultural production.

The currently approved rehabilitation strategy for the TSFs at the completion of processing would also remain unchanged and would include the following:

- The decant areas would be allowed to dry and the decant towers would be permanently capped with fill and/or a concrete plug.
- The underdrains (which previously conveyed decanted water to the reclaim dam) would be grouted.
- The tailings discharge pipes and monitoring systems would be dismantled for re-use or disposal with the bulk of CGO infrastructure.
- The TSFs would be fenced during rehabilitation and post-mining to exclude grazing and agriculture production.

Embankment Construction

The TSFs would continue to be stage constructed with the height of the embankments raised in advance of the storage requirements. As the storages fill, the embankments would be raised in a series of upstream lifts, at a rate of not more than approximately 5 m per year. Each lift would comprise an earth/rock fill embankment, with a clay basal zone, supported by the dry tailings beach.

Construction of each lift would also involve placement of an interim rock buttress cover on the outer slope of the embankment to enhance stability of the embankments during construction of the TSFs. Rehabilitation materials (e.g. rock mulch and topsoil) on the existing TSF embankments would be stripped prior to placement of the interim rock buttress. The stripped rehabilitation materials would be either transferred to a new rehabilitation area or stockpiled proximal to the TSFs for use during final rehabilitation activities.

Once the final embankment of both TSFs has been constructed, a final rock buttress would be placed over the outer slopes of the TSF embankments to provide long-term stability. To accommodate the final rock buttress, a minor extension of the TSF footprints would occur within currently approved surface disturbance areas.

The overall slope of the TSF embankments would be 1V:4.8H for the northern tailings storage facility, 1V:4.5H for the southern tailings storage facility and 1V:3.6H for the central connector embankments.

Figures 10 and 11 in the Rehabilitation Proposal (Appendix F) show conceptual cross-sections of the modified northern tailings storage facility and central connector embankments, respectively. The conceptual cross-section of the modified northern tailings storage facility shown on Figure 10 in Appendix F is also representative of the concept for the southern tailings storage facility.

Rehabilitation Cover System

The Modification would involve no change to the rehabilitation concepts for the top surfaces of the TSFs. The top surfaces of the TSFs would form a low, internally draining landform, with drainage affected by controlled placement of cover materials and a number of shallow swales. The TSF surfaces would form contained catchments to minimise surface water runoff from the top surface down the batters. The rehabilitation cover system materials for the top surfaces would include a capillary break layer of rock, and layers of subsoil and topsoil.

The rehabilitation cover system for the TSF embankments would include spreading gypsum-treated topsoil over the surface of the final rock buttress and revegetating with select species suited to the slope and substrate materials of the embankment. The depth of soil cover applied would be informed by rehabilitation trial results.

During operations, the TSF embankments would be constructed so that they provide minimal habitat value for bird life (i.e. rock mulch or pasture cover only).

Revegetation Concepts

Similar to the revegetation concepts for the waste rock emplacements, revegetation concepts for the TSFs would include selecting species suited to the hydrological features and substrate materials of the landform and would be based on the results of rehabilitation investigations and trials in consultation with regulatory authorities.

The vegetation growth trials undertaken to date (Appendix F) indicate that salt tolerant tree species including Belah (*Casuarina cristata*), Grey Box (*E. microcarpa*), Bimble Box (*E. populnea*), Mugga Ironbark (*E. sideroxylon*) and Buloke (*Allocasuarina leuhmannii*) and shrub species including Green Wattle (*Acacia deanei*), Western Golden Wattle (*A. decora*), Weeping Myall (*A. pendula*), Wedge-leaf Hop-bush (*Dodonaea viscose ssp. cuneata*) and Nitre Goosefoot (*Chenopodium nitrariaceum*) may be suitable for revegetation of the TSF top surfaces.

Based on the above, post-operations, revegetation concepts for the TSFs include:

- In the central, occasionally wet area, planting species such as River Red Gum and understorey species such as Rush sp.
- On the remainder of the covered storage surface, planting salt tolerant Eucalypt and Riverine woodland species (which may include Belah, Grey Box, Bimble Box, Mugga Ironbark and Buloke and shrub species including Green Wattle, Western Golden Wattle, Weeping Myall, Wedge-leaf Hop-bush and Nitre Goosefoot).
- On the TSF embankments, planting species suited to the slope and substrate materials of the embankment.

Revegetation concepts would consider the results of hydrological modelling predictions for the TSFs (i.e. plant species would be selected that are suited to the hydrological conditions of the storages such as inundated areas, dry areas and swales).

Rehabilitation trials would continue to be undertaken to determine the most suitable revegetation species for the top surfaces of the TSFs. A description of the rehabilitation trials that would be undertaken for the Modification is provided in Section 5.6.

Revegetation methods for the final rock buttress cover of the TSFs may include:

- on longer slopes, spreading seed laden topsoil down slope using a dozer; and
- on steeper slopes, either pushing seed laden topsoil over the crest of the slope and/or hydromulching the slope, or mixing seed laden topsoil with rock during placement of the outermost rock buttress material.

Mixing seed through topsoil stocks would be undertaken in parallel with soil stockpile management measures (Section 5.5.2) and would involve:

- deep-ripping and applying gypsum to soil stockpiles;
- spraying a pre-emergent or post-emergent herbicide treatment to control Wimmera Ryegrass;
- applying select seed mix to the treated soil surface;
- stripping the surface layer of the soil stockpile (up to approximately 1 m deep); and
- applying the seed laden topsoil to the rehabilitation area.

Evolution proposes to conduct research and implement a trial to investigate the most effective methods for revegetating the final TSF embankments and determine the species most suited to the final slopes and rehabilitation media (Section 5.6).

Revegetation methods for the final rock buttress cover would be described in detail in future MOPs which would be prepared in consultation with and subject to approval by the DRE.

Domain 5D – Waste Rock Emplacements

The Modification would not change the approved rehabilitation objectives for the waste rock emplacements, which are to:

- stabilise batter slopes with rock armour (primary waste rock mulch) to control surface water runoff downslope and reduce erosion potential in the long-term;
- provide a stable plant growth medium able to support long-term vegetation growth including native and/or endemic Eucalypt woodland, shrubland and grassland species suited to slope and elevated positions similar to those remnants in the surrounding landscape; and
- exclude grazing and agricultural production.

The approved final heights of the northern, southern and perimeter waste rock emplacements (308 m AHD, 283 m AHD and 233 m AHD, respectively) would remain unchanged, as would the footprints of the emplacements. The Modification would however involve processing of mineralised material and would therefore remove the mineralised material stockpile as a component of the northern waste rock emplacement landform.

A conceptual cross-section of the approved northern waste rock emplacement is shown in Appendix F. The conceptual cross-section shown in Appendix F is also representative of the concept for the southern waste rock emplacement.

Development of the emplacements would continue to be consistent with currently approved designs, and would to meet the long-term goal of directing potential seepage generated from waste rock emplacement areas toward the open pit during operation and post-closure. The waste rock emplacement batter slopes would be constructed to 1V:5H and rock armoured with primary waste rock mulch to provide long-term slope stability, control surface water runoff downslope and reduce erosion potential.

The Modification would not change the approved rehabilitation concepts for the top surfaces of the waste rock emplacements which includes managing drainage via a series of small shallow basins (depressions) and via a rehabilitation cover system that absorbs rainfall and comprises woodland vegetation (Barrick, 2013a). The use of depressions would be aimed at maximising internal drainage without creating permanent ponding during normal and heavy rainfall events (Barrick, 2013a). As described in Section 5.2.1, a layer of gypsum and then primary waste rock will be placed over oxide waste rock areas on the top surface (and batters) of the southern waste rock emplacement (which has largely been constructed of oxide waste rock material) to assist with stabilising the sodic and dispersive characteristics of the oxide waste rock material.

A bund around the perimeter of the top surfaces of the waste rock emplacement would also be constructed to provide a contained catchment and minimise surface water runoff from the top surface down the batters.

Rehabilitation Cover System – Batters

The rehabilitation cover system for the waste rock emplacement batters would not change and would include:

- benign (primary) rock mulch; and
- low salinity and gypsum-treated topsoil.

The rock mulch and topsoil layers would be cross-ripped with approximately 10 tonnes per hectare (t/ha) gypsum, followed by seeding and/or planting with tubestock including native and/or endemic tree and shrub species during suitable seasonal conditions.

To stabilise areas where an adequate vegetation cover has yet not established, a layer of locally harvested seed bearing native pasture hay (or clean wheaten hay) would be spread to provide soil protection and soil stability for vegetation establishment. Cross-ripping along the contour of the slope is proposed to create 'troughs and banks' to minimise the potential for erosion downslope and enhance vegetation establishment within the troughs.

The benign (primary) rock mulch used in the cover system would be sourced from development of the open pit and would include suitable non-saline material. A description of the chemical and physical characteristics of primary waste rock is provided in Appendix F.

Results of rehabilitation trials would continue to inform and refine CGO rehabilitation concepts including rehabilitation materials and revegetation species. It is expected that the northern waste rock emplacement rehabilitation trial would inform the most suitable applications (i.e. material depths) of rock mulch and topsoil and the plant species suited to the substrate materials.

Revegetation Concepts

The Modification would not change the currently approved revegetation concepts for the waste rock emplacements. Revegetation aims to re-establish endemic woodland, shrub and grassland communities similar to those remnants which persist on similar landforms in the regional landscape (e.g. Wamboyne Mountain, Fellmans Hill and Billy's Lookout). Suitability of revegetation species would include consideration of the physiographic and hydrological features of the landform and performance relative to both stability and surface rehabilitation materials (subject to availability).

Results of rehabilitation trials, in particular the trial on the northern waste rock emplacement (Section 5.6), would continue to be used to determine the revegetation species suited to the cover system materials for the waste rock emplacement batters.

Revegetation species considered suitable for revegetation of the CGO waste rock emplacements have been developed by DnA Environmental (2016a) with assistance from Diversity Native Seeds (a local seed supplier) (Appendix F). These species are associated with woodlands on low ridges and hills in the local landscape. A selection of these species has been used in the northern waste rock emplacement rehabilitation trial and would also be used in the large scale vegetation growth trials (Section 5.6).

Consistent with the approved Rehabilitation and Landscape Management Strategy, revegetation species lists developed for the waste rock emplacements may be refined based on the results of rehabilitation investigations and trials.

Domain 6D – Woodland Corridor

Consistent with the EIS (North Limited, 1998), a woodland corridor would be established between the rehabilitated northern waste rock emplacement and the rehabilitated northern tailings storage facility (Figure 5-2).

The rehabilitation objectives for the woodland corridor (post-operations) are to:

- establish native and/or endemic woodland species characteristic of remnant woodland communities in the surrounding landscape to provide connectivity between the rehabilitated landforms and facilitate fauna movement between the rehabilitated landforms; and
- exclude grazing and agricultural production.

Domain 7E – New Lake Foreshore

The Modification would not change the approved New Lake Foreshore components associated with the approved CGO (i.e. the height of the perimeter waste rock emplacement would remain unchanged and there would be no change to the temporary isolation bund or the lake protection bund). As a result, the rehabilitation concepts for the New Lake Foreshore would remain unchanged for the Modification.

A summary of the approved New Lake Foreshore rehabilitation concepts is provided below.

Similar to the design of the northern and southern waste rock emplacements, the outer batter slope of the perimeter waste rock emplacement and the temporary isolation bund would be maintained at 1V:5H. A conceptual cross-section through the lake isolation system is shown Appendix F.

Construction of the lake isolation embankments has been completed and the temporary isolation bund and the lake protection bund have been topsoiled and revegetated with native and exotic grass species including scattered aquatic species such as Lignum, Rush sp., River Cooba and River Red Gums. The outer batter slopes of the lake protection bund have been rock armoured to further protect against wave action from lake level rises.

As described in the approved rehabilitation strategy, the temporary isolation bund is a short-term feature and at the completion of operations is proposed to be reworked (breached) by light machinery (i.e. small excavator and bob cat) when the level of the lake is lower than the bund, to create a series of low mounds (Barrick, 2013a). The mounds would comprise a mixture of the inert bund rock and lakebed sediments (Barrick, 2013a).
The revegetation concepts for the New Lake Foreshore would also remain unchanged for the Modification.

Rehabilitation of the New Lake Foreshore would be an iterative process and revegetation species would continue to be selected in consideration of Lake Cowal's hydrological regime (wetting and drying cycles), species occurring in relevant reference sites (including lake and slope woodland communities), species performance during revegetation trials and species suitability to substrate conditions.

Subject to these parameters, species may be selected from the following vegetative suites:

- fringing lake vegetation on the foreshore batters (i.e. Eucalypt dominated woodland including River Red Gum, River Cooba, Wilga [*Geijera parviflora*], Kurrajong [*Brachychiton populneus*], Green Wattle and Grey Box); and
- freshwater habitats (i.e. Foxtail [*Austrostipa densiflora*], Rush, Cane Grass [*Eragrostis australasica*] and Lignum).

Revegetation trials that have been undertaken on the New Lake Foreshore have included native grass establishment, hand broadcasting of Red River Gum seed and planting of wetland species such as Lignum and Rushes from tubestock and cuttings (Appendix F).

DnA Environmental (2016b) has observed that since 2005 there has been a significant increase in ecological function in the lake foreshore rehabilitation sites largely due to the increase in ground cover from plants which have established as a result of seed dispersal from flood events, natural regeneration from the topsoil stored seed bank as well as seed applied by hand broadcasting. DnA Environmental (2016b) notes that monitoring results indicate that the two rehabilitated lake foreshore sites were ecologically functional and largely comparable to their relevant reference sites in 2015.

5.4 REHABILITATION MANAGEMENT PLAN

In accordance with Development Consent Condition 2.4(c), a RMP has been developed for the CGO which details the rehabilitation management measures and rehabilitation monitoring programme currently implemented at the CGO.

The RMP would be revised (where necessary) to reflect the rehabilitation concepts for the Modification as described in Section 5.3.

The rehabilitation management measures detailed in the RMP would continue to apply for the Modification and would include (but not be limited to) those detailed in Section 5.5 below.

5.5 GENERAL REHABILITATION PRACTICES AND MEASURES

5.5.1 Progressive and Interim Rehabilitation

Consistent with Development Consent Condition 2.4(b), rehabilitation of final landforms or disturbed areas would be undertaken progressively as soon as reasonably practicable following disturbance and would include interim rehabilitation measures. Progressive rehabilitation would aim to minimise erosion and sedimentation potential and to minimise visual impacts of CGO landforms.

Interim rehabilitation measures may include:

- Rock mulch application as soon as practicable following completion of landform shaping to minimise the potential for windblown dust from waste rock surfaces and to reduce the potential for soil erosion from rainfall.
- Topsoiling and establishment of a cover crop on landform areas available for rehabilitation and on long-term soil stockpiles to minimise the area exposed for dust generation.
- Application of native pasture hay or clean wheaten hay on areas where the initial cover crop has not yet established to assist with stabilising the soil surface and minimising the loss of topsoil resources.

In addition to these measures, the safeguards and dust management controls described in the CGO's Air Quality Management Plan would be implemented to minimise dust generated from exposed areas and from general mining activities.

5.5.2 Soil Management

The currently approved strategies/objectives for management of soil resources, as detailed in the CGO Soil Stripping Management Plan, would continue to be implemented for the Modification and would include:

- characterisation of the suitability of material for rehabilitation works prior to stripping;
- stripping and storing soil resources selectively according to their suitability for rehabilitation purposes;
- providing sufficient subsoil and stable topsoil resources for rehabilitation purposes;
- progressively rehabilitating final landforms as soon as practical once constructed to final design; and
- stripping and storing soil resources in such a manner that their long-term viability is maintained.

Soil management for the Modification would focus on ongoing soil stockpile management and soil amelioration measures, as the Modification would not involve any soil stripping.

As described in Section 5.3.2, rehabilitation materials (e.g. rock mulch and topsoil) on the existing TSF embankments would be stripped prior to buttressing of the embankments. The stripped rehabilitation materials would then be either directly transferred to a new rehabilitation area or stockpiled proximal to the TSFs for use during final rehabilitation activities.

The currently approved general protocol for management of stockpiled soils includes soil handling measures that optimise the retention of soil characteristics (in terms of nutrients and micro-organisms) favourable to plant growth. The protocol would continue to be applied for the Modification and would include:

- leaving the surface of the completed soil stockpiles in a "rough" condition to help promote water infiltration and minimise erosion prior to vegetation establishment;
- deep ripping soil stockpiles and seeding (if necessary) to maintain soil organic matter levels, soil structure and microbial activity;
- treating soil stockpiles with gypsum to reduce dispersiveness during stockpiling;

- installing signposts for all soil stockpiles with the date of construction and type of soil; and
- recording details of all soil stockpiles on a site database which includes the location and volume of each stockpile and the stockpile maintenance records (e.g. ameliorative treatment, weed control, seeding).

Long-term topsoil stockpiles have been constructed up to approximately 3 m in height. Subsoil stockpiles vary in height as determined by storage volumes and available space within the footprint of approved disturbance areas.

Soil amelioration methods would continue to be implemented for the Modification and would be guided by the results of McKenzie Soil Management's (2013) *Soil Stockpile Characterisation Assessment*.

These methods may include:

- deep-ripping and applying gypsum (or other relevant treatments) to existing and proposed soil stockpiles;
- applying gypsum to soil during re-application on rehabilitation areas;
- spreading gypsum on the surface of original soil profiles prior to soil stripping; or
- treating strongly sodic and dispersive soil stocks with gypsum in a dedicated soil amelioration farm.

A detailed description of the CGO's soil amelioration methods is provided in Appendix F.

A soil inventory would continue to be maintained to track soil resource stocks available for rehabilitation. Details of estimated soil resource accounting (availability and requirements for rehabilitation) would continue to be detailed in the CGO MOP.

The CGO's approved Soil Stripping Management Plan would continue to be used to guide soil management for the Modification.

5.5.3 Plant Species Selection for Revegetation

As described in Section 5.3.2, the CGO's final landforms would be revegetated with endemic vegetation communities, selected specifically for their suitability to the created elevation, substrate conditions and the overriding objective of re-establishing a greater extent of endemic vegetation within ML 1535. The revegetation concepts for the Modification landforms are described in Section 5.3.2.

Consistent with the approved CGO, revegetation concepts would continue to be informed by the results of the rehabilitation investigations, trials and monitoring and the rehabilitation programme refined in consultation with relevant regulatory agencies.

5.5.4 Seed Collection and Habitat Enhancement Measures

A Vegetation Clearance Protocol (VCP) has been developed for the approved CGO and would continue to be applied for the Modification. Although no additional surface disturbance is proposed for the Modification, the VCP would be implemented for areas proposed to be disturbed within currently approved disturbance areas.

During the preliminary habitat assessment phase of the VCP, trees may be examined for their provision of seed to be used in the rehabilitation programme. Where available, seed would be collected at the time of vegetation clearance activities and habitat features (i.e. hollows and logs) would be salvaged for use in rehabilitation or habitat enhancement programmes within ML 1535 and/or within the CGO Offset Areas and RVEP areas (Figure 5-1). Seed may also be collected from surrounding vegetation on Evolution-owned lands.

5.5.5 Erosion and Sediment Control

The erosion and sediment control systems detailed in the approved CGO's Erosion and Sediment Control Management Plan would continue to be implemented for the Modification.

The Erosion and Sediment Control Management Plan details sediment and erosion control systems developed to control the movement of sediment and salinity from areas disturbed by mining activities, and maintain downstream (Lake Cowal) water quality. These measures would remain unchanged for the Modification.

Rehabilitation monitoring at the approved CGO also includes monitoring of erosion incidence on rehabilitation areas (Section 5.7 and Appendix F). Erosion monitoring and measures to control erosion on rehabilitation areas would continue to be undertaken for the Modification.

5.5.6 Weed and Pest Control

Weed Control

Weeds would continue to be managed in accordance with measures described in the LMP and RMP (and BOMP). The CGO's weed management programme is aimed at minimising the possibility of new weed incursion and controlling the spread of any existing noxious weeds on-site (including rehabilitation areas) and on all Evolution-owned land.

The weed management programme includes the following measures:

- identification of weeds by annual site inspections and recording weed presence in an annual weed survey report;
- communication with other landholders/leaseholders and regulatory authorities to keep weed management practices in line with regional weed control activities;
- mechanical removal of identified noxious weeds and/or the application of approved herbicides in authorised areas (herbicide use in wetland areas would be strictly controlled);
- implementation of follow-up site inspections to determine the effectiveness of the weed control measures; and
- where practicable, prevention of the establishment of new weeds on Evolution-owned land by minimising seed transport of weed species (measures may include the use of a vehicle hygiene/wash down procedures).

Rehabilitation monitoring at the approved CGO also evaluates floristic diversity and documents the presence of exotic plant species in the rehabilitation areas. If present, weed incursion is recorded and control measures implemented where necessary.

These measures would remain unchanged for the Modification.

Pest Control

Evolution would continue to undertake pest control activities in accordance with procedures detailed in the FFMP, LMP, RMP and BOMP, including:

- regular property inspections to assess the status of pest populations;
- mandatory pest control for declared pests (i.e. rabbits, feral pigs, wild dogs and foxes) in accordance with Pest Control Orders under the NSW *Local Land Services Act, 2013*, and management of plague locust species including the Australian Plague Locust (*Chortoicetes terminifera*), Migratory Locust (*Locusta migratoria*) and the Spur-throated Locust (*Austracris guttulosa*);
- inspections to assess the effectiveness of control measures implemented and review of these if necessary; and
- documenting pest sightings and control measures in a Pest Register and marking the location of sightings on a map.

Evolution undertakes pest control activities in conjunction with adjacent landholders for more effective pest control. This process is facilitated via consultation with local landholders and landholder groups.

These measures would remain unchanged for the Modification.

5.5.7 Management of Grazing and Agriculture

In accordance with the LMP, grazing and cropping activities are excluded within ML 1535 during operation and rehabilitation of the CGO. The fence along the perimeter boundary of ML 1535 would continue to be maintained to prevent access by stock and minimise the potential for damage to rehabilitation areas.

As described in Section 5.3.2, rehabilitation objectives for the waste rock emplacements and TSFs involves exclusion of grazing and agricultural production from these areas post-mining. These areas would therefore be fenced post-mining.

Evolution-owned lands outside the CGO area (with the exception of RVEP Areas and Northern and Southern Offset Areas) are utilised for farming/agricultural production by Evolution and/or licensees that sign agreements to conduct agricultural activities on Evolution-owned land.

These measures would remain unchanged for the Modification.

5.5.8 Landscaping to Minimise Visual Impacts

Progressive rehabilitation of mine waste rock emplacements and TSFs is undertaken to reduce the contrast between the CGO landforms and the surrounding landscape. This includes progressive rehabilitation with selected grass, shrub and/or tree species.

Vegetation screens have been planted along sections of the western and northern boundaries of ML 1535 to break up continuous views from Lake Cowal Road. The vegetation screens include endemic plants that are compatible with the existing surrounding vegetation.

Maintenance of the vegetation screens (e.g. replacement of plant losses) is undertaken in these areas where necessary. An increase in screening effect over time as plants grow would continue as a result.

These measures would remain unchanged for the Modification.

5.5.9 Bushfire Management

Bushfire management at the approved CGO includes fuel management strategies, planning and implementation procedures for hazard reduction and strategies for reducing fire hazards and related risks on-site and on Evolution-owned land. These strategies and procedures would continue to be implemented for the Modification.

5.6 REHABILITATION INVESTIGATIONS AND TRIALS

Rehabilitation at the CGO would continue to be an iterative process, whereby the results of rehabilitation trials and monitoring would continue to be used to inform and refine the rehabilitation programme in consultation with relevant regulatory agencies.

Rehabilitation trials and research proposed for the Modification would be an extension of the trials that have been undertaken to date and would include:

- **Rehabilitation Media**
  - Northern waste rock emplacement trial – continued investigation into the effectiveness of various applications associated with the rock mulch, topsoil and hay cover materials in stabilising landform slopes (i.e. controlling erosion) and providing a suitable medium for revegetation.
- **Revegetation**
  - Implementation of new vegetation growth trials to investigate revegetation species suited to the top surface rehabilitation materials of CGO final landforms, including the TSFs and waste rock emplacements, to refine revegetation objectives.
  - Investigations and implementation of a trial to determine the most effective methods for direct seeding rehabilitation areas following the establishment of the initial Wimmera Ryegrass cover crop.
  - Implementation of research and a revegetation trial to investigate revegetation methods and species suited to the final slopes and rehabilitation media of the TSF embankments.

A detailed description of the proposed rehabilitation investigations and trials is provided in Appendix F.

5.7 REHABILITATION MONITORING

The current rehabilitation monitoring programme implemented at the approved CGO would be applied to the Modification. The current monitoring methodology includes landscape function analysis indicators, soil analyses indicators and ecological indicators. Rehabilitation performance indicators and completion criteria have been developed based on monitoring data from reference sites representative of the CGO final landforms to assess rehabilitation performance (Section 5.7.1).

As progressive rehabilitation of completed landform features (e.g. batter slopes) occurs, additional rehabilitation monitoring sites would be included in the monitoring programme.

A detailed description of the current rehabilitation monitoring methodology is provided in Appendix F.

5.7.1 Rehabilitation Performance Indicators and Completion Criteria

Rehabilitation performance indicators and completion criteria have been developed (based on monitoring data obtained from relevant reference sites) to assess rehabilitation performance at the approved CGO. These indicators and criteria are detailed in Appendix F.

The performance indicators and completion criteria reflect the 'rehabilitation phases' (at which ecological targets are relevant) defined in the DRE's (2013) *Mining Operations Plan (MOP) Guidelines September 2013*:

- landform establishment;
- growth medium development;
- ecosystem and land use establishment; and
- ecosystem and land use development.

Consistent with the approved rehabilitation programme (Barrick, 2013a), rehabilitation performance at the CGO will be considered to be satisfactory when the monitoring data indicates the completion criteria have been met, or when the relevant Minister(s) otherwise accepts the rehabilitation status.

5.7.2 Ongoing Rehabilitation Evaluation

The existing monitoring data analysis, assessment and review process would continue to be implemented for the Modification.

Rehabilitation monitoring data would be used to:

- track revegetation and/or regeneration progress against performance indicators and completion criteria;
- assess the performance of landform design and rehabilitation concepts and methods;
- evaluate the effectiveness of environmental management measures/controls; and
- identify the requirement for intervention strategies or ameliorative/contingency measures.

The results of rehabilitation trials and investigations would continue to be used to inform and refine future rehabilitation concepts, practices and measures for the Modification.

In addition to the above, in accordance with the CGO's Development Consent (DA 14/98), rehabilitation (and overall environmental) performance at the CGO is independently assessed via the Independent Environmental Audit process and the IMP inspection and review process. Results of these processes including the CGO's Annual Review are reported quarterly to the CGO's CEMCC.

5.8 MINE CLOSURE AND LEASE RELINQUISHMENT

Upon cessation of mining operations, tenure of ML 1535 would be maintained by Evolution until such a time when lease relinquishment criteria have been met and the relevant Minister(s) accepts the rehabilitation status of the site. It is anticipated that lease relinquishment criteria would include:

- Rehabilitated landforms are stable and consistent with the nominated post-mining land use which has been developed in consultation with relevant regulatory agencies and key stakeholders.
- The water quality of Lake Cowal has not been detrimentally affected by the final landforms.
- Rehabilitated final landforms are indicative of a landscape on a trajectory towards a self-sustaining ecosystem and comprise self-sustaining native and/or endemic species characteristic of remnant vegetation communities in the surrounding landscape.
- All ML 1535 conditions (including public safety considerations) and Development Consent conditions have been satisfied.
- Hard-stand areas and infrastructure have been removed (unless otherwise agreed with the ultimate landholder).

The *Strategic Framework for Mine Closure* published by the Australian and New Zealand Minerals and Energy Council and Mineral Resources Council of Australia (2000) would be used as a guide for mine closure.

6 PLANNING FRAMEWORK AND MODIFICATION JUSTIFICATION

This section outlines the statutory requirements relevant to the assessment of the Modification and its justification (i.e. the need for the Modification on economic, social and environmental grounds when considered against the objects of the EP&A Act).

6.1 LEGISLATIVE FRAMEWORK

Development Consent for the CGO and the Bland Creek Palaeochannel Borefield water supply pipeline was granted by the NSW Minister for Urban Affairs and Planning under Part 4 of the EP&A Act on 26 February 1999 (DA 14/98) (Section 2.1).

Development Consent (DA 2011/64) for the operation of the Eastern Saline Borefield was granted by the Forbes Shire Council on 20 December 2010 (Section 2.1).

6.1.1 Environmental Planning and Assessment Act, 1979

This EA has been prepared to support a request to modify Development Consent (DA 14/98) under section 75W of the EP&A Act.

Clause 12 of Schedule 6A of the EP&A Act provides that section 75W of Part 3A of the EP&A Act continues to apply to modifications of development consents referred to in clause 8J(8) of the *Environmental Planning and Assessment Regulation, 2000* (EP&A Regulation) following the repeal of Part 3A.

The CGO was approved under Part 4 of the EP&A Act in February 1999 by development consent under Division 4 of Part 4 of the Act (relating to State significant development). Therefore the Development Consent (DA 14/98) is a development consent that falls within clause 8J(8)(b) of the EP&A Regulation. That is, section 75W of the EP&A Act continues to apply to modifications to the CGO Development Consent (DA 14/98), notwithstanding its repeal[3].

Approval for the Modification will be sought as a modification to the Development Consent (DA 14/98) under section 75W of the EP&A Act. Section 75W of the EP&A Act states:

> **75W Modification of Minister's approval**
>
> *(1) In this section:*
>
> ***Minister's approval** means an approval to carry out a project under this Part, and includes an approval of a concept plan.*
>
> ***modification of approval** means changing the terms of a Minister's approval, including:*
>
> *(a) revoking or varying a condition of the approval or imposing an additional condition of the approval, and*
>
> *(b) changing the terms of any determination made by the Minister under Division 3 in connection with the approval.*
>
> *(2) The proponent may request the Minister to modify the Minister's approval for a project. The Minister's approval for a modification is not required if the project as modified will be consistent with the existing approval under this Part.*
>
> *(3) The request for the Minister's approval is to be lodged with the Director-General. The Director-General may notify the proponent of environmental assessment requirements with respect to the proposed modification that the proponent must comply with before the matter will be considered by the Minister.*
>
> *(4) The Minister may modify the approval (with or without conditions) or disapprove of the modification.*
>
> *…*

Table 1-1 in Section 1 provides a comparison of the Modification with the currently approved CGO.

In general, there would be no change to the existing functionality of the CGO due to the Modification, as the Modification would involve:

- continued mining in the existing open pit for the extraction of gold-bearing ore and waste rock;
- continued use of existing waste rock emplacements for the placement of waste rock extracted from the open pit;
- continued use of existing ore processing infrastructure, with some upgrades to the flotation circuit to improve gold recovery; and
- continued use of the existing TSFs with some alterations to increase the storage capacity of the facilities.

[3] Section 75W of the EP&A Act (as in force immediately before its repeal) continues to apply for the CGO. The description and quotations of relevant references to section 75W in this document are as if section 75W of the EP&A Act is still in force.

The Modification would involve **no change** to the following key components of the existing CGO:

- mining tenements (i.e. ML 1535);
- lake isolation system;
- existing surface development extent of the CGO;
- water management system and design objectives;
- mining methods;
- ore processing rate;
- waste rock emplacement disturbance areas;
- cyanide destruction method;
- approved cyanide concentration limits in the aqueous component of the tailings slurry;
- water supply sources;
- approved daily or annual extraction limits of the Bland Creek Palaeochannel Borefield;
- site access road;
- power supply;
- exploration activities;
- average or peak annual employment; or
- hours of operation.

Given that key environmental management measures and design principles (e.g. lake isolation system) for the currently approved CGO would be maintained for the Modification, limited additional environmental impacts are predicted in comparison to the currently approved CGO.

Where additional impacts are predicted (e.g. potential for increased operational noise), additional management measures are proposed (i.e. implementation of noise mitigation measures at receiver locations) to mitigate potential impacts of the Modification.

As such, it is considered that the Modification would result in limited environmental consequence in comparison with the currently approved CGO.

Given this, and given that the Modification would not generally change the functionality of the approved CGO, approval for the Modification is sought as a modification to Development Consent (DA 14/98) under section 75W of the EP&A Act.

6.1.2 Environmental Planning Instruments

State environmental planning policies and local environmental plans that may be relevant to the Modification are discussed below.

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

The S*tate Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) regularises the various environmental planning instruments that previously controlled mining activities.

Clause 5(3) of the Mining SEPP gives it primacy where there is an inconsistency between the provisions of the Mining SEPP and the provisions of any other environmental planning instrument (excluding the *State Environmental Planning Policy [Major Projects] 2005*, the *State Environmental Planning Policy No. 14 [Coastal Wetlands]* and the *State Environmental Planning Policy No. 26 [Littoral Rainforests]*).

Part 1 – Clause 2

Clause 2 of the Mining SEPP outlines the aims of the SEPP, including the following of relevance to the Modification:

> *(a) to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and*
>
> *(b) to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and*
>
> *(c) to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources.*

The Modification is considered to be generally consistent with the aims of the Mining SEPP because it is a Modification which:

- provides stimulus to local and regional economies through continued employment and on-going royalties and tax revenue for an additional 8 years, thus contributing to future generations through social welfare, job security, amenity and infrastructure;

- involves the orderly economic use and development of land containing mineral resources, as the Modification open cut deepening has been designed to optimise the recovery of the E42 ore deposit within ML 1535, and the upgrades to the ore processing infrastructure have been designed to improve gold recovery;
- has been developed in consideration of environmental planning instruments and the principles of consideration of ecologically sustainable development (ESD) principles (Section 6.2.2); and
- involves proper and sustainable management of the State's mineral resources (i.e. gold reserves) in a manner that minimises environmental impacts as the Modification has been designed such that there would be no change to key existing environmental management measures (e.g. lake isolation system) and where additional impacts are predicted, appropriate mitigation measures are proposed (Section 4).

Part 2 – Clause 7

Clause 7(1) states:

> *(1) Mining Development for any of the following purposes may be carried out only with development consent:*
>
> *…*
>
> *(b) mining carried out:*
>
> *...*
>
> *(ii) on land that is, immediately before the commencement of this clause, the subject of a mining lease under the Mining Act 1992 or a mining licence under the Offshore Minerals Act 1999,*
>
> *...*
>
> *(d) facilities for the processing or transportation of minerals or mineral bearing ores on land on which mining may be carried out (with or without development consent), but only if they were mined from that land or adjoining land,*
>
> *…*

The existing CGO and the Modification comprises mining activities within the existing ML 1535.

Part 3 – Clause 12

Clause 12 of the Mining SEPP requires that, before determining an application for consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must:

> *(a) consider:*
>
> *(i) the existing uses and approved uses of land in the vicinity of the development, and*
>
> *(ii) whether or not the development is likely to have a significant impact on the uses that, in the opinion of the consent authority having regard to land use trends, are likely to be the preferred uses of land in the vicinity of the development, and*
>
> *(iii) any ways in which the development may be incompatible with any of those existing, approved or likely preferred uses, and*
>
> *(b) evaluate and compare the respective public benefits of the development and the land uses referred to in paragraph (a) (i) and (ii), and*
>
> *(c) evaluate any measures proposed by the applicant to avoid or minimise any incompatibility, as referred to in paragraph (a) (iii).*

The existing land use within ML 1535 consists of mining activities associated with the existing CGO. Lands surrounding ML 1535, including Evolution-owned lands, are predominantly used for agriculture (e.g. livestock grazing and grain cropping) with some areas forming the biodiversity offsets and remnant vegetation enhancement areas for the existing CGO.

The Modification would involve the continuation of mining activities within ML 1535 and would involve no change to currently approved development areas within ML 1535, and therefore would not change existing land use within ML 1535.

Additionally, the Modification would not change the CGO water supply borefields and pipeline or existing land uses of Evolution-owned lands surrounding the CGO.

Specialist studies undertaken as part of this EA demonstrate that the Modification would not result in additional impacts on adjoining land uses near the approved CGO. The specialist studies also demonstrate that the Modification would not have a significant impact on regional water users or nature conservation, and that the Modification would not be incompatible with the existing land uses within the vicinity of the CGO (Appendices A to F).

The Modification would provide socio-economic benefits to the local, state and national economies for an additional 8 years.

There would be no change to the proposed final land use for the land within ML 1535 due to the Modification. Consistent with existing operations, decisions regarding final land use would be made in consultation with key stakeholders and in consideration of surrounding land use at the time of lease relinquishment.

Part 3 – Clause 14

Clause 14(1) of the Mining SEPP requires that, before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure the following:

(a) that impacts on significant water resources, including surface and groundwater resources, are avoided, or are minimised to the greatest extent practicable,

(b) that impacts on threatened species and biodiversity, are avoided, or are minimised to the greatest extent practicable,

(c) that greenhouse gas emissions are minimised to the greatest extent practicable.

In addition, Clause 14(2) requires that, without limiting Clause 14(1), in determining a development application for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider an assessment of the greenhouse gas emissions (including downstream emissions) of the development, and must do so having regard to any applicable State or national policies, programmes or guidelines concerning greenhouse gas emissions.

The potential impacts of the Modification on groundwater and surface water resources including measures to minimise potential impacts are discussed in Sections 4.1 and 4.2 and Appendices A and B, respectively.

Greenhouse gas emission estimates for the Modification are described in Section 4.4, and Appendix E.

The potential impacts of the Modification on threatened species and biodiversity are limited as no increase to approved disturbance areas is proposed.

Part 3 – Clause 15

Clause 15 of the Mining SEPP requires that:

(1) Before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider the efficiency or otherwise of the development in terms of resource recovery.

(2) Before granting consent for the development, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at optimising the efficiency of resource recovery and the reuse or recycling of material.

(3) The consent authority may refuse to grant consent to development if it is not satisfied that the development will be carried out in such a way as to optimise the efficiency of recovery of minerals, petroleum or extractive materials and to minimise the creation of waste in association with the extraction, recovery or processing of minerals, petroleum or extractive materials.

The Modification would allow for the efficient extraction of additional gold reserves within the E42 ore deposit utilising existing mining methods.

The proposed upgrades to the leach circuit within the process plant would treat flotation tailings (i.e. would allow for the extraction of gold from tailings) and would maximise gold recovery from the CGO process plant.

Evolution has presented information on the Modification to the DRE during the development of this EA (Section 1.4). It is in Evolution's financial interest to maximise the efficiency of gold recovery and minimise the production of waste that requires disposal.

Part 3 – Clause 16

Clause 16(1) of the Mining SEPP requires that, before granting consent for development for the purposes of mining or extractive industry that involves the transport of materials, the consent authority must consider whether or not the consent should be issued subject to conditions that do any one or more of the following:

(a) require that some or all of the transport of materials in connection with the development is not to be by public road,

(b) limit or preclude truck movements, in connection with the development, that occur on roads in residential areas or on roads near to schools,

(c) require the preparation and implementation, in relation to the development, of a code of conduct relating to the transport of materials on public roads.

Gold product would continue to be transported from the CGO by road.

The upgrade of the existing leach circuit within the process plant would require additional deliveries of some process consumables. It is expected that one to two additional deliveries per day would be required. No new process consumables would be required for the Modification.

As the Modification would not result in any additional demand for employees/contractors, there would be no change in vehicle movements associated with employee and contractor vehicle movements to the CGO.

The transport of hazardous materials at the CGO (i.e. materials transport and routes used) would continue in accordance with the existing THMS.

Given the above, it is considered that the Modification would not result in any material change to potential road transport impacts.

Part 3 – Clause 17

Clause 17 of the Mining SEPP requires that before granting consent for development for the purposes of mining, petroleum production or extractive industry, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring the rehabilitation of land that will be affected by the development. In particular, the consent authority must consider whether the conditions of the consent should:

(a) require the preparation of a plan that identifies the proposed end use and landform of the land once rehabilitated, or

(b) require waste generated by the development or the rehabilitation to be dealt with appropriately, or

(c) require any soil contaminated as a result of the development to be remediated in accordance with relevant guidelines (including guidelines under section 145C of the Act and the Contaminated Land Management Act 1997), or

(d) require steps to be taken to ensure that the state of the land, while being rehabilitated and at the completion of the rehabilitation, does not jeopardize public safety.

Rehabilitation at the CGO is conducted in accordance with the RMP and the CGO MOP. The RMP would be revised to reflect the rehabilitation concepts for Modification.

Consistent with the currently approved rehabilitation strategy, rehabilitation objectives for the Modification would include final landforms that are stable and are revegetated with native and/or endemic species that are suited to the landform (Section 5). The management of tailings and other wastes is described in Sections 2, 3 and 4.

A new MOP would be prepared to reflect changes in mining operations as a result of the Modification. The new MOP would be developed in accordance with the DRE's (2013) MOP Guidelines and would include a detailed description of proposed mining and rehabilitation activities.

State Environmental Planning Policy No 33 – Hazardous and Offensive Development

The *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development* (SEPP 33) is applicable to the whole of NSW. Clause 13 of SEPP 33 requires that in determining an application to carry out development for the purposes of a potentially hazardous industry, the consent authority (in this case the NSW Minister for Planning) must take into account:

(a) current circulars or guidelines published by the Department of Planning relating to hazardous or offensive development, and

(b) whether any public authority should be consulted concerning any environmental and land use safety requirements with which the development should comply, and

(c) in the case of development for the purpose of a potentially hazardous industry—a preliminary hazard analysis prepared by or on behalf of the applicant, and

(d) any feasible alternatives to the carrying out of the development and the reasons for choosing the development the subject of the application (including any feasible alternatives for the location of the development and the reasons for choosing the location the subject of the application), and

(e) any likely future use of the land surrounding the development.

A PHA, HAZOP Study and a FHA were completed for the approved CGO.

The PHA concluded that the highest risks to the environment, public safety and public property from the approved CGO were associated with the following scenarios (ANSTO Safety and Reliability, 1997):

- spillage of material during transport;
- a major spillage of material from on-site storage tanks coincident with catastrophic bund failure;
- spillage of diesel fuel onto the ground outside the mine site;
- wildlife entering the tailings storages following damage to the fence;
- birds using the tailings storages when an accidental release of cyanide occurs; and
- release of hazardous material in the event of a fire.

The PHA included a number of recommended risk reduction measures relevant to the environment and public safety that have been incorporated into the approved CGO design to reduce the likelihood or the consequences of incidents that could cause damage.

The recommended risk reduction measures relevant to the environment and public safety have been incorporated into relevant approved CGO management plans (Section 4.5.10). No hazardous events or incidents have occurred at the CGO since the commencement of operations that have changed the assumed consequence and likelihood ratings described in the PHA.

The scope of the HAZOP study included storage and/or handling areas relevant to dangerous goods, hazardous materials and/or materials with the potential for off-site impact. The HAZOP study also included a review of the monitoring, control, alarm and shutdown systems associated with the cyanide process. Control measures to maintain cyanide concentrations within compliance levels were also proposed. No hazardous events were determined during the study that had not been previously known and which had the potential for significant off-site risk (Pinnacle Risk Management, 2004a).

The FHA concluded that the risks associated with the approved CGO complied with the HIPAP 4 *Risk Criteria for Land Use Safety Planning* (DUAP, 1992a) and HIPAP 6 *Guidelines for Hazard Analysis* (DUAP, 1992b) for tolerable fatality, injury, irritation and societal risk (Pinnacle Risk Management, 2004b).

The use of some process reagents would increase due to the Modification, however the operational activities and the existing management measures described in the PHA, HAZOP study and FHA would generally remain unchanged. Further, the transport of hazardous materials at the CGO would continue in accordance with the existing controls and procedures detailed in the *Cowal Gold Project Transport of Hazardous Materials Study*. A hazard identification review relevant to the Modification and a description of hazard prevention and mitigation measures that would be implemented is provided in Section 4.5.10.

In addition, and as described in Section 3.5.2, the Modification would not change:

- the existing cyanide destruction methods currently used at the CGO (i.e. either Caro's Acid or the INCO process); or
- the approved CN_{WAD} concentration limits of the aqueous component of the tailings slurry stream (Section 2.5.2).

The mitigation and management measures described in the CMP (including the cyanide monitoring process) would continue to be implemented for the Modification.

In consideration of the above, the Modification would not change the potential impact mechanisms to the environment, public and public property, and their associated consequences or likelihoods, to the extent that risk levels would change from those previously assessed in the PHA, HAZOP study or FHA. Subsequently, no change to the overall PHA, HAZOP study or FHA risk assessment findings would result from the Modification.

Notwithstanding, the CGO's approved environmental management plans and monitoring programmes would be reviewed, and if necessary, revised by Evolution, to include the Modification and manage any associated environmental risks.

With regard to the other considerations under Clause 13(b), (d) and (e) of SEPP 33:

- consultation with relevant authorities has been undertaken during preparation of this EA, as described in Section 1.4;
- alternatives to the Modification are described in Section 6.2.1; and
- no change to the proposed future use of the land surrounding the approved CGO would occur as a result of the Modification (Section 5.3.1).

State Environmental Planning Policy No. 44 – Koala Habitat Protection

State Environmental Planning Policy No. 44 (Koala Habitat Protection) requires councils in certain LGAs (including the Forbes LGA) to consider whether land subject to a development application comprises "potential Koala habitat" or "core Koala habitat".

Since the CGO is State Significant Development to which Division 4.1 of Part 4 of the EP&A Act applies, the Minister is the consent authority (Section 6.2.2) rather than the Council.

Notwithstanding, the Modification would be located wholly within approved development areas and would not involve additional disturbance beyond currently approved development areas. Therefore no potential or core Koala habitat would be affected by the Modification.

State Environmental Planning Policy No. 55 – Remediation of Land

State Environmental Planning Policy No. 55 (Remediation of Land) (SEPP 55) aims to provide a State-wide planning approach to the remediation of contaminated land. Under SEPP 55, planning authorities are required to consider the potential adverse affects on contamination on the suitability of the site for its proposed purpose.

"Contaminated land" in SEPP 55 has the same meaning as in Part 7A of the EP&A Act as follows:

> ***contaminated land*** *means land in, on or under which any substance is present at a concentration above the concentration at which the substance is normally present in, on or under (respectively) land in the same locality, being a presence that presents a risk of harm to human health or any other aspect of the environment.*

Clause 7(1) states that a consent authority must not consent to the carrying out of any development on land unless:

> *(a) it has considered whether the land is contaminated, and*
>
> *(b) if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out, and*
>
> *(c) if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.*

Clause 7(2) of SEPP 55 provides that before determining an application for consent to carry out development that would involve a change of use of land, the consent authority must consider a report specifying the findings of a preliminary investigation of the land concerned, carried out in accordance with the contaminated land planning guidelines.

Because the Modification would be located wholly within the existing ML 1535 and approved development areas, no change of land use of these areas is proposed and no preliminary land contamination investigation is required.

Bland Local Environmental Plan 2011

The CGO mining area is located wholly within the *Bland Local Environmental Plan 2011* (Bland LEP) area.

Clause 1.2(2) of the Bland LEP outlines the aims of the plan, including the following of relevance to the Modification:

> *(a) to protect, enhance and conserve agricultural land through the proper management, development and conservation of natural and man-made resources,*
>
> *(b) to encourage a range of housing, employment, recreation and facilities to meet the needs of existing and future residents of Bland,*
>
> *(c) to promote the efficient and equitable provision of public services, infrastructure and amenities,*
>
> *(d) to conserve, protect and enhance the environmental and cultural heritage of Bland,*
>
> *...*

The Modification is generally consistent with these objectives, as the development would facilitate the continued employment of the approved workforce at the CGO (including employees from the Bland LGA) for an additional 8 years; and would be operated in a manner that would minimise potential impacts on natural resources, soils, water resources, agricultural land and environmental heritage.

Permissibility

Clause 2.3(2) of the Bland LEP relevantly provides:

> *The consent authority must have regard to the objectives for development in a zone when determining a development application in respect of land within the zone.*

The currently approved development area for the CGO is zoned as RU1 "Primary Production". The Modification would not change the currently approved development area for the CGO.

"Open cut mining" is permissible with consent on lands zoned as RU1 "Primary Production".

Zone Objectives

Part 2 of the Bland LEP outlines the land use objectives for lands zoned as RU1 "Primary Production" as follows:

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*
- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To ensure that development on land within this zone does not unreasonably increase the demand for public services or public facilities.*

The Modification is considered to be generally consistent with the above zone objectives, as detailed management and mitigation measures would be implemented where practicable, to minimise the potential impacts of the Modification on other land uses and the environment, including Lake Cowal. As the Modification would not result in any additional demand for employees/contractors, it is expected that the Modification would not unreasonably increase the demand for public services or public facilities.

Forbes Local Environmental Plan 2013

The *Forbes Local Environmental Plan 2013* (Forbes LEP) is applicable to all land within the Shire of Forbes. The CGO water supply borefields (including the Bland Creek Palaeochannel borefield and Eastern Saline Borefield) and pipeline are located within the Forbes LEP area.

Clause 1.2(2) of the Forbes LEP outlines the aims of the plan, including the following of relevance to the Modification:

(a) to encourage and manage ecologically sustainable development within the Forbes local government area;

...

(c) to reinforce the rural character of Forbes whilst promoting sustainable development;

(d) to protect Forbes' agricultural land for continued agricultural production whilst allowing for planned expansion at the urban fringe;

...

(f) to protect, enhance and conserve the natural environment, including the Lachlan River, Lake Forbes, wetlands, native vegetation, environmentally sensitive land and other natural features that provide habitat for flora and fauna, provide scenic amenity and that may prevent or mitigate land degradation;

...

The Modification is generally consistent with these objectives, as the development would facilitate the continued employment of the approved workforce at the CGO for an additional 8 years; and would be operated in a manner that would minimise potential impacts on natural resources, soils, water resources and agricultural land. A consideration of the Modification against the principles of ESD has been provided in Section 6.2.2.

Permissibility

Clause 2.3(2) of the Forbes LEP relevantly provides:

> *The consent authority must have regard to the objectives for development in a zone when determining a development application in respect of land within the zone.*

The currently approved development area for the CGO water supply borefields and pipeline is zoned as RU1 "Primary Production". The Modification would not change the currently approved development area of the CGO water supply borefields and pipeline.

"Open cut mining" and "water supply systems" are permissible with consent on lands zoned as RU1 "Primary Production".

Zone Objectives

Part 2 of the Forbes LEP outlines the land use objectives for lands zoned as RU1 "Primary Production" as follows:

- *To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.*
- *To encourage diversity in primary industry enterprises and systems appropriate for the area.*
- *To minimise the fragmentation and alienation of resource lands.*

- *To minimise conflict between land uses within this zone and land uses within adjoining zones.*
- *To provide opportunities for intensive and extensive agriculture in appropriate locations consistent with the environmental capability of the land.*

The Modification is considered to be generally consistent with the above zone objectives, as detailed management and mitigation measures would be implemented where practicable, to minimise the potential impacts of the Modification on other land uses and the environment, including Lake Cowal.

6.1.3 Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act, 1999

The *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) defines proposals that are likely to have a significant impact on a matter of national environmental significance as a 'controlled action'. Proposals that are, or may be, a controlled action are required to be referred to the Commonwealth Minister for the Environment for a determination as to whether or not the action is a controlled action.

Matters of national environmental significance include:

- world heritage properties;
- wetlands listed under the Ramsar Convention;
- listed threatened species and ecological communities;
- listed migratory species protected under international agreements;
- nuclear actions;
- the Commonwealth marine environment;
- the Great Barrier Reef Marine Park;
- national heritage places; and
- water resources, in relation to coal seam gas development and large coal mining developments.

The CGO was referred for consideration under the EPBC Act on 29 August 2001. The Minister for the Environment and Heritage determined that it was not a controlled action on 29 September 2001.

Matters of national environmental significance relevant to the Modification include threatened species, ecological communities and migratory species listed under the EPBC Act.

The following matters of national environmental significance are not located within or near the approved CGO development areas:

- world heritage properties;
- national heritage places;
- wetlands listed under the Ramsar Convention;
- Commonwealth marine areas; and
- the Great Barrier Reef Marine Park.

The Modification does not constitute a nuclear action, a coal seam gas development or a large coal mining development.

The Modification would not be likely to have a significant impact on threatened species, ecological communities and migratory species listed under the EPBC Act as the Modification is not expected to significantly change currently approved impacts of the CGO given (Section 4.5.4):

- There would be no change to the existing approved surface development extent of the CGO (i.e. the Modification would not involve vegetation clearance of any new/unapproved areas).
- The approved cyanide concentration limits of the aqueous component of the tailings slurry stream would be maintained (i.e. cyanide levels of the aqueous component of the tailings slurry would not exceed 20 mg/L CN_{WAD} [90^{th} percentile over 6 months] and 30 mg/L CN_{WAD} [maximum permissible limit at any time] at the process plant).
- Therefore, potential risks to fauna interacting with the TSFs would not change as a result of the Modification.
- Existing fauna deterrence methods at the TSFs would continue to be implemented for the Modification.
- HEC (2016) considers that there would be no additional impact to the hydrology or water quality of Lake Cowal due to the Modification (Appendix B). On this basis, it is unlikely that there would be an adverse impact on listed threatened species or listed migratory species as a result of the Modification.

- The final void associated with the Modification is predicted to slowly fill with water and trend towards hypersaline conditions in the long-term, and consistent with the approved CGO, the final void water level would remain well below the predicted spill level (Appendix B). As such, the Modification is unlikely to increase the potential for adverse impacts on fauna from their interaction with the final void because the same trend as for the currently approved CGO would occur.

In addition, the extension of the operational life of the CGO for an additional 8 years would extend the time that some potential impacts from the CGO would occur (e.g. the potential impacts from fauna vehicular strikes, noise, dust and artificial lighting). However, the continued operation of the mine for an additional 8 years is not likely to pose a significant impact on any flora and fauna because:

- Annual vehicular traffic movements at the CGO would not significantly increase as a result of the Modification.
- No material change in noise impacts at bird breeding areas are anticipated (Appendix D).
- Blasting protocols (i.e. size and frequency) would not change as a result of the Modification (Section 3.3).
- Dust deposition levels would not significantly increase as a result of the Modification (Appendix E).
- Light emissions would be of a similar nature to light emissions from the currently approved CGO (Section 4.5.8).
- The risk of high frequency fire would not increase as a result of the Modification (Section 4.5.4).
- Continued management of the CGO in accordance with the existing management plans (e.g. FFMP).

National Greenhouse and Energy Reporting Act, 2007

The *National Greenhouse and Energy Reporting Act, 2007* (NGER Act) introduced a single national reporting framework for the reporting and dissemination of corporations' greenhouse gas emissions and energy use. The NGER Act makes registration and reporting mandatory for corporations whose energy production, energy use or greenhouse gas emissions meet specified thresholds.

Evolution currently reports annual greenhouse gas emissions and energy consumption from the CGO to the federal government in accordance with the NGER Act requirements. This reporting would be continued for the Modification.

6.1.4 Plans, Licences and Agreements that Require Revision

Management/Monitoring Plans

Some management plans (e.g. the NMP and THMS) may require revision to reflect updated environmental management measures or changes to Development Consent (DA 14/98) conditions resulting from the Modification.

Mining Operations Plan

As detailed in Section 6.1.2, a new MOP would be prepared to reflect the Modification. The new MOP would be developed in accordance with the DRE's (2013) MOP Guidelines and would include a detailed description of proposed mining and rehabilitation activities.

6.2 MODIFICATION JUSTIFICATION

A description of the need for and objectives of the Modification and a justification of the carrying out of the Modification in the manner proposed is provided below. The discussion is provided having regard to the biophysical, economic and social considerations including consideration of alternatives, the principles of ESD, the consistency of the Modification with the objectives of the EP&A Act and the consequences of not carrying out the Modification.

6.2.1 Need for and Objectives of the Modification

Evolution exploration has identified additional gold resources within the E42 ore deposit located at depths greater than the currently approved final depth of the existing open pit.

The Modification provides for the continuation of open pit mining operations at the CGO for a period of approximately 8 years to produce an additional 1.7 Moz of gold (i.e. a total of approximately 5.5 Moz over the life of the CGO).

The Modification would facilitate the continuity of employment for the existing CGO workforce (i.e. the Modification would not result in any additional demand for employees/contractors), providing job security for local mine employees and contractors, and to continue to stimulate demand in the local and regional economy.

The Modification would include the implementation of mitigation measures, and management (including performance monitoring), to minimise potential impacts on the environment and community (Section 4).

The Modification would result in additional contributions to regional and NSW output and business turnover and household income for an additional 8 years.

Consideration of Alternatives to the Modification

The Modification involves the continuation of mining at the CGO within the E42 ore deposit.

Proposed changes to the CGO for the Modification (i.e. to the open pit, TSFs and process plant) have been designed in consideration of environmental and operational constraints.

Detail of these constraints, and where relevant, alternatives considered, are provided below.

CGO Location and Open Pit Development

As the location of mining is constrained by the E42 ore deposit, alternative mining locations are not considered further in this EA.

The deepening of the existing open pit has been designed to maximise ore recovery, and would not change the current offset distances to the existing lake isolation system to avoid additional impacts to Lake Cowal.

Tailings Storage Facilities

Additional tailings would be produced over of the life of the Modification.

These additional tailings could be accommodated in a new TSF outside of ML 1535. However, to avoid the requirement for additional mining tenements, the final elevations of the existing TSFs would increase and the area between the TSFs would be used to accommodate the additional tailings for the Modification.

Waste Rock Emplacement Areas

Additional waste rock would be produced over of the life of the Modification.

The additional waste rock produced for the Modification would be used for buttressing of the TSFs. In addition, some mineralised material would be processed (Section 3.4). Therefore, additional waste rock emplacement areas are not required for the Modification.

Ore Processing Schedule and Infrastructure

The Modification mine schedule has been developed such that no change to the existing ore processing or cyanide destruction methods would be required.

The processing schedule includes two oxide ore processing campaigns (Table 3-1). There is an operational cost associated with the transition from primary ore to oxide ore processing (i.e. due to processing downtime).

Processing oxide ore in a single campaign was considered for the Modification. As the water requirements for oxide ore processing are greater than for primary ore, a single oxide ore processing campaign would increase the duration of peak water requirements.

To meet this increased water requirement, additional water supply infrastructure (e.g. additional on-site water supply storage, or duplication of the existing water supply pipeline to the CGO) and an increase in the existing rate of water extraction from external water supplies would be required.

To avoid additional disturbance associated with additional water supply infrastructure, and to avoid increasing the existing rate of water extraction from external water supplies, the Modification involves two oxide ore processing campaigns, notwithstanding the additional operational cost associated with transitioning between primary ore and oxide ore processing twice.

The upgrades to the existing ore processing infrastructure are proposed to treat flotation tailings and improve gold recovery from the process plant. As a result, the modified CGO would recover additional ounces of gold over the life of the Modification. Were the upgrades to the existing ore processing infrastructure not to be implemented, additional gold recovery and the associated additional royalties to the State of NSW would not be generated.

External Water Supply

There would be no change to the existing daily or annual extraction limits from external water supplies for the Modification, or the existing Groundwater Contingency Strategy used to manage groundwater levels in the Bland Creek Palaeochannel. As such, no additional impacts to other groundwater users are predicted due to the Modification (Appendix A).

However, as the Modification would involve the continuation of operations at the CGO for an additional 8 years, total life-of-mine water demand would increase. HEC (2016) (Appendix B) considers the existing water supply sources would meet the water requirements for the Modification.

Given that the continued use of existing external water supply sources is predicted to meet the water requirements for the Modification, and not result in additional impacts to other users, alternative water supplies have not been considered further in this Modification.

Final Void and Landforms

A final void would form part of the final landform of the Modification. This is consistent with the final landform concept for the approved CGO.

The final void would continue to act as a localised groundwater sink and, therefore, any groundwater seepage from the TSFs and the waste rock emplacements would continue to migrate towards the final void.

Justification for the final design heights of the modified TSFs, in consideration of environmental constraints, is provided in the sub-sections above.

In addition, the final landforms of the CGO have been designed to be compatible with the surrounding landscape. The final elevations of the modified TSFs would be lower than other CGO final landforms (e.g. waste rock emplacements) and would be lower than other topographic features in the region. In addition, the CGO final landforms would be revegetated with native and/or endemic species characteristic of remnant vegetation within the surrounding landscape (Section 5.3.2).

No Modification

Consideration of the potential consequences of not proceeding with the Modification is provided in Section 6.2.3.

6.2.2 Consideration of the Modification against the Objects of the EP&A Act

Section 5 of the EP&A Act describes the objects of the EP&A Act as follows:

(a) to encourage:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,

(ii) the promotion and co-ordination of the orderly and economic use and development of land,

(iii) the protection, provision and co-ordination of communication and utility services,

(iv) the provision of land for public purposes,

(v) the provision and co-ordination of community services and facilities, and

(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and

(vii) ecologically sustainable development, and

(viii) the provision and maintenance of affordable housing, and

(b) to promote the sharing of the responsibility for environmental planning between the different levels of government in the State, and

(c) to provide increased opportunity for public involvement and participation in environmental planning and assessment.

The Modification is considered to be generally consistent with the objects of the EP&A Act, because it is a Modification which:

- incorporates:
  - measures for the management and conservation of resources including water, agricultural land and natural areas (Section 4);
  - development of the State's mineral resources (i.e. gold resources) (Sections 2 and 3);

  - measures to minimise potential amenity impacts associated with noise, blasting, air quality and visual impacts on surrounding land uses (Section 4); and
  - continued employment and other socio-economic benefits to the community (Section 4);
- would allow for the economic use and development of land, while maintaining key existing land uses including grazing uses on surrounding Evolution-owned lands;
- would support the provision of community services and facilities through significant contributions to State royalties, State taxes, Commonwealth tax revenue and any applicable contributions to local councils;
- incorporates a range of measures for the protection of the environment, including the protection of native plants and animals, threatened species and their habitats (Section 4);
- incorporates relevant ESD considerations in the design, planning and assessment of the Modification, through:
  - incorporation of risk assessment and analysis at various stages in the Modification design, environmental assessment and decision-making;
  - adoption of high standards for environmental and occupational health and safety performance;
  - consultation with regulatory and community stakeholders;
  - assessment of potential greenhouse gas emissions associated with the Modification; and
  - optimisation of the economic benefits to the community arising from the development of the Modification;
- is a State Significant Development Project that would be determined by the Minister (or delegate), however, consultation with other levels of government and a range of stakeholders has been undertaken and issues raised have been considered and addressed where relevant (Section 1.4); and
- includes public involvement and participation through the EA consultation program (Section 1.4), the public exhibition of the EA document and DP&E assessment of the Modification in accordance with the requirements of the EP&A Act.

6.2.3 Consideration of the Consequences of not Carrying out the Modification

Were the Modification not to proceed, the following consequences are inferred:

- The existing CGO would continue to operate, as currently approved.
- There would be no additional employment for the existing CGO workforce, thereby forgoing job security for local mine employees and contractors.
- The incremental net benefit would be foregone if the modification is not implemented.
- Additional tax revenue from the Modification would not be generated.
- Additional royalties to the State of NSW would not be generated.
- The additional potential social and environmental impacts for the Modification described in this EA would not occur.

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8 ABBREVIATIONS, ACRONYMS AND GLOSSARY

8.1 ABBREVIATIONS AND ACRONYMS

AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AQMP	Air Quality Management Plan
ARI	average recurrence interval
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
Barrick	Barrick (Cowal) Limited
Bland LEP	*Bland Local Environmental Plan 2011*
BLMP	Blast Management Plan
BoM	Bureau of Meteorology
BOMP	Biodiversity Offset Management Plan
CEMCC	Community Environmental Monitoring and Consultative Committee
CGM	Cowal Gold Mine
CGO	Cowal Gold Operations
CMP	Cyanide Management Plan
CN_{WAD}	weak acid dissociable cyanide
Coffey	Coffey Services Australia Pty Ltd
Coffey Partners International	Coffey Partners International Pty Ltd
CWMP	Compensatory Wetland Management Plan
dB	decibel
dBA	A-weighted decibel
DECCW	NSW Department of Environment, Climate Change and Water (now OEH and NOW)
DISRD	NSW Department of Industry, Skills and Regional Development
DP&E	NSW Department of Planning & Environment
DPI	NSW Department of Primary Industries
DPI-Water	NSW Department of Primary Industries – Water
DRE	NSW Division of Resources and Energy (within the DTIRIS)
DUAP	NSW Department of Urban Affairs and Planning
EA	Environmental Assessment
EC	electrical conductivity
e.g.	example
EIS	*Cowal Gold Project Environmental Impact Statement*
EL	Exploration Licence
EMS	Environmental Management Strategy
EP&A Act	NSW *Environmental Planning and Assessment Act, 1979*
EP&A Regulation	NSW *Environmental Planning and Assessment Regulation, 2000*
EPA	NSW Environment Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act, 1999*
EPL	Environment Protection Licence
ERP	Emergency Response Plan
ESCMP	Erosion and Sediment Control Management Plan
ESD	ecologically sustainable development

ETL	electricity transmission line
et al.	and others
Evolution	Evolution Mining (Cowal) Pty Limited
FFMP	Flora and Fauna Management Plan
FHA	Final Hazard Analysis
Forbes LEP	*Forbes Local Environmental Plan 2013*
GEM	Geo-Environmental Management Pty Ltd
GL	gigalitres
H	horizontal
ha	hectare
HAZOP	Hazard and Operability Study
HEC	Hydro Engineering & Consulting Pty Ltd
HIPAP	Hazard Industry Planning Advisory Page
HWCMP	Hazardous Waste and Chemical Management Plan
IACHMP	Indigenous Archaeology and Cultural Heritage Management Plan
ICDS	Internal Catchment Drainage System
INP	NSW *Industrial Noise Policy*
i.e.	that is
kg	kilogram
kL/t	kilolitres per tonne
km	kilometre
km^2	square kilometre
kV	kilovolt
L_{Aeq}	equivalent continuous noise level
LMP	Land Management Plan
LCF	Lake Cowal Foundation
LGA	Local Government Area
LPBMP	Monitoring Programme for Detection of any Movement of Lake Protection Bund, Water Storage and Tailings Structures and Pit-Void Walls
m	metre
m/s	metres per second
m/day	metres per day
mg/L	milligram per litre
Mining SEPP	S*tate Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*
ML	Mining Lease
ML/annum	megalitre per annum
ML/day	megalitre per day
MOP	Mining Operations Plan
MOP Guidelines	NSW Division of Resources and Energy's *ESG3: Mining Operations Plan (MOP) Guidelines September 2013*
Moz	million ounces
Mt	million tonnes
Mtpa	million tonnes per annum
NAF	non-acid forming
NGER Act	Commonwealth *National Greenhouse and Energy Reporting Act, 2007*
NOW	NSW Office of Water
NMP	Noise Management Plan
NPW Act	NSW *National Parks and Wildlife Act, 1974*
NPWS	NSW National Parks and Wildlife Service
NSW	New South Wales

OEH	NSW Office of Environment and Heritage
PEL	Pacific Environment Limited
PHA	Preliminary Hazard Analysis
PIRMP	Pollution Incident Response Management Plan
$PM_{2.5}$	particulate matter less than 2.5 micrometres in size
PM_{10}	particulate matter less than 10 micrometres in size
PSNL	project-specific noise limit
RL	relative level
RMP	Rehabilitation Management Plan
RMS	NSW Roads and Maritime Services
RO	Reverse Osmosis
ROM	run-of-mine
RVEP	Remnant Vegetation Enhancement Programme
SEPP 33	*State Environmental Planning Policy No. 33 (Hazardous and Offensive Development)*
SEPP 55	*State Environmental Planning Policy No. 55 (Remediation of Land)*
SMBS	sodium metabisulfite
SSMP	Soil Stripping Management Plan
SWGBMP	Surface Water, Groundwater, Meteorological and Biological Monitoring Programme
t/ha	tonnes per hectare
tph	tonnes per hour
the Modification	Cowal Gold Operations Mine Life Modification
THMS	Transport of Hazardous Materials Study
TSF	tailings storage facility
TSP	total suspended particulate
TSMP	Threatened Species Management Protocol
UCDS	Up-catchment Diversion System
V	vertical
VCP	Vegetation Clearance Protocol
WAL	Water Access License
WCC	Wiradjuri Condobolin Corporation
WMP	Water Management Plan
XQ	extra quiet
µS/cm	microSiemens per centimetre
%	percent
°	degrees

8.2 GLOSSARY

Alluvial

A general term for clay, silt, sand and gravel transported by water and deposited on the bed of a floodplain, river or stream.

Amenity

Useful and enjoyable quality.

Aquifer

A sub-surface rock formation containing water in recoverable quantities.

Average recurrence interval (ARI)

The expected value or average value of the periods between exceedances of a given event magnitude. A term used in water engineering. Also known as "return period".

Background

The condition (e.g. noise levels) already present in an area before the commencement of a specific activity.

Baseflow

The discharge of sub-surface water into a stream (i.e. groundwater seepages).

Baseline data

A body of information collected over time to define specific, characteristics of an area (e.g. species occurrence or noise levels) prior to the commencement of an activity (e.g. a mining operation).

Batter

An engineered slope of soil or rock fill on either side upslope or downslope of a road, embankment or waste rock storage; the sloping banks of cut earth separating different levels in an open pit.

Berm

A low bank or steep slope built onto a slope to improve its structural stability and reduce erosion.

Bund

An earth, rock or concrete wall or mound constructed to restrict the inflow or outflow of liquids or noise.

Carbon-in-leach process

Process of gold extraction where gold is leached from ore and adsorbed onto carbon in the same tanks.

Caro's Acid

A cyanide destruction method involving the use of sulphuric acid and hydrogen peroxide.

Catchment

The entire land area from which water (e.g. rainfall) drains to a specific watercourse or water body.

CN_{WAD}

Weak acid dissociable cyanide; cyanide existing in complexes, generally with metal ions, which break up (dissociate) in the presence of weak acid; includes free cyanide.

Concentration

The amount of a substance per unit of mass or volume of the medium in which it occurs.

Cross-section

A two-dimensional diagram of an object presented as if the object had been cut across its length.

Crusher

That part of an ore-processing plant where the ore is mechanically crushed into smaller pieces.

Cut-off trench

Trench placed underneath and parallel to an embankment or dam wall and filled with material of low permeability (e.g. compacted clay) to prevent seepage underneath the embankment or wall.

Cyanate

A chemical species (CNO^-) formed by the oxidation of cyanide.

Cyanide
: A chemical (CN-) capable of dissolving gold and used in the extraction of gold from ore.

Cyanide leaching circuit
: Circuit where gold is removed from ore by dissolution in cyanide solution.

dB
: Decibel; unit used to express sound intensity.

dBA
: Decibels (A-weighted scale); unit used for most measurements of environmental noise; the scale is based upon typical responses of the human ear to sounds of different frequencies.

Decommissioning
: Removal or reuse of infrastructure.

Drawdown
: The localised lowering of groundwater level.

Electrical conductivity (EC)
: The ability of a substance (either solid, liquid or gas) to transmit electricity.

Emission
: The discharge of a substance (e.g. dust) into the environment.

Embankment lifts
: An embankment is constructed by the placement of a series of progressively higher and narrower earth or rock layers; each separate layer is called a lift.

Endemic
: Native plant or animal restricted to a specific locality or geographic region.

Final void
: A completed (mined-out) open pit.

Freeboard
: Excess water storage capacity (usually designed to contain rainwaters).

Grade
: The concentration of gold either in an individual rock sample or averaged over a specified volume of rock; gold grade is usually given in grams per tonne.

Greenhouse gases
: Gases with potential to cause climate change (e.g. methane, carbon dioxide and non-methane volatile organic compounds). Usually expressed in terms of carbon dioxide equivalent.

Groundwater
: All waters occurring below the land surface; the upper surface of the soils saturated by groundwater in any particular area is called the watertable.

Hydraulic gradient
: The change in static head (i.e. elevation and pressure) per unit of distance in a given direction. (Units: dimensionless).

ibid.
: In the same place.

INCO
: Cyanide destruction method involving the introduction of sulphur dioxide as sodium metabisulphite.

In situ
: A term used to distinguish material (e.g. soils, minerals, fossils, etc.) found in its original position of formation, deposition, or growth, as opposed to transported material.

Lacustrine
: Pertaining to lakes.

LAeq
: The equivalent continuous noise level – the level of noise equivalent to the energy-average of noise levels occurring over a measurement period.

Leach
: Dissolution and removal of a soluble substance from a soil or a rock, e.g. the leaching of salt (by water) from a soil or the leaching of gold (by cyanide) from a rock.

Mitigation
: Measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards.

Noise contours
: Theoretical lines connecting points of equal noise value.

Mineralised Material
: Material that contains a potentially economically recoverable quantity of gold.

Ore
: Rock containing commercially viable quantities of metals (e.g. gold).

Orebody
: A solid mass of ore (both high and low grade) that is geologically distinct from the rock that surrounds it and that is commercially extractable.

Oxide ore
: That component of the ore reserve composed of weathered (oxidised) rock.

Palaeochannel
: An ancient stream channel that is now buried.

Permeability
: The ability of a rock or soil to allow fluid to pass through it.

pH
: A measure of the degree of acidity or alkalinity of a solution; expressed numerically (logarithmically) on a scale of 1 to 14, on which 1 is most acid, 7 is neutral, and 14 is most basic (alkaline).

Primary crusher
: The machine that crushes the excavated ore feed.

Primary ore
: The compound of the ore which is composed of unweathered rock.

Process plant
: The place where the extraction of the gold from the mined ore occurs.

Rehabilitation
: The restoration of a landscape and especially the vegetation following its disturbance.

Runoff
: A portion of precipitation (rain, hail and snow) that flows across the ground surface as water.

Salinity
: The total content of dissolved solids in groundwater or surface water, commonly expressed as parts of dissolved solids per million parts of solution, or milligrams of dissolved solids per litre of solution (mg/L).

Seepage
: Liquid or fluid such as water, seeping or flowing from beneath the ground to the surface.

Stakeholder
: Any individual, group or organisation that can affect, be affected by, or perceive itself to be affected by the behaviour of a company or an organisation.

Tailings
: Finely ground residue from processing and extraction of product from ore.

Topsoil
: The upper or top layer of soil, that typical has higher levels of organic matter and associated micro-organisms.

Total suspended particulate matter (TSP)
: The mass of all particulate matter suspended in a solution (e.g. the air).

WAD
: Weak acid dissociable.