



## **SECTION 5**

Rehabilitation and Landscape Management Strategy

## **SECTION 6**

Planning Framework and Modification Justification

## **SECTION 7**

Summary of Environmental Management and  
Monitoring Measures

# **COWAL GOLD OPERATIONS PROCESSING RATE MODIFICATION**

Environmental Assessment  
2018



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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.

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 DRG.

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 (Evolution, 2016).

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:

- Native and/or endemic groundcover, understorey and tree species are to be used in the rehabilitation programme.
  - Rehabilitation concepts are to be flexible to allow for adjustments, based on investigations and trials, 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 are 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 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, 2010d).
  - 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 and MLA 1 to be excluded during operations and during rehabilitation of the mine site. At lease relinquishment, rehabilitated final landforms are excluded from grazing, with some areas suitable for grazing surrounding the rehabilitated final landforms.
- The rehabilitation of landforms is to be progressive (where possible) and conducted in accordance with approved 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.

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 tree species and native and exotic 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, rock armoured, topsoiled and revegetated with native tree species and native and exotic 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);
- portions of the northern and southern tailings storage facilities (lower embankments shaped and rock armoured and 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 tree and shrub species and native and exotic grass species establishing);
- southern waste rock emplacement lower, mid and upper outer batter slopes of southern section, lower slopes of eastern section and some upper batter slopes of northern section (shaped, rock armoured and topsoiled [with gypsum] with revegetation including native and exotic grass species establishing). The southern section also includes a small area direct seeded with native tree and shrub species and Eucalypt and Acacia tree and shrub species established within the rehabilitation trial 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 and plantings of Eucalypt and Acacia tree and shrub species established across the rehabilitation trial area) (the northern section also includes a small area direct seeded with native tree and shrub species);
- 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.

### 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 focused 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.



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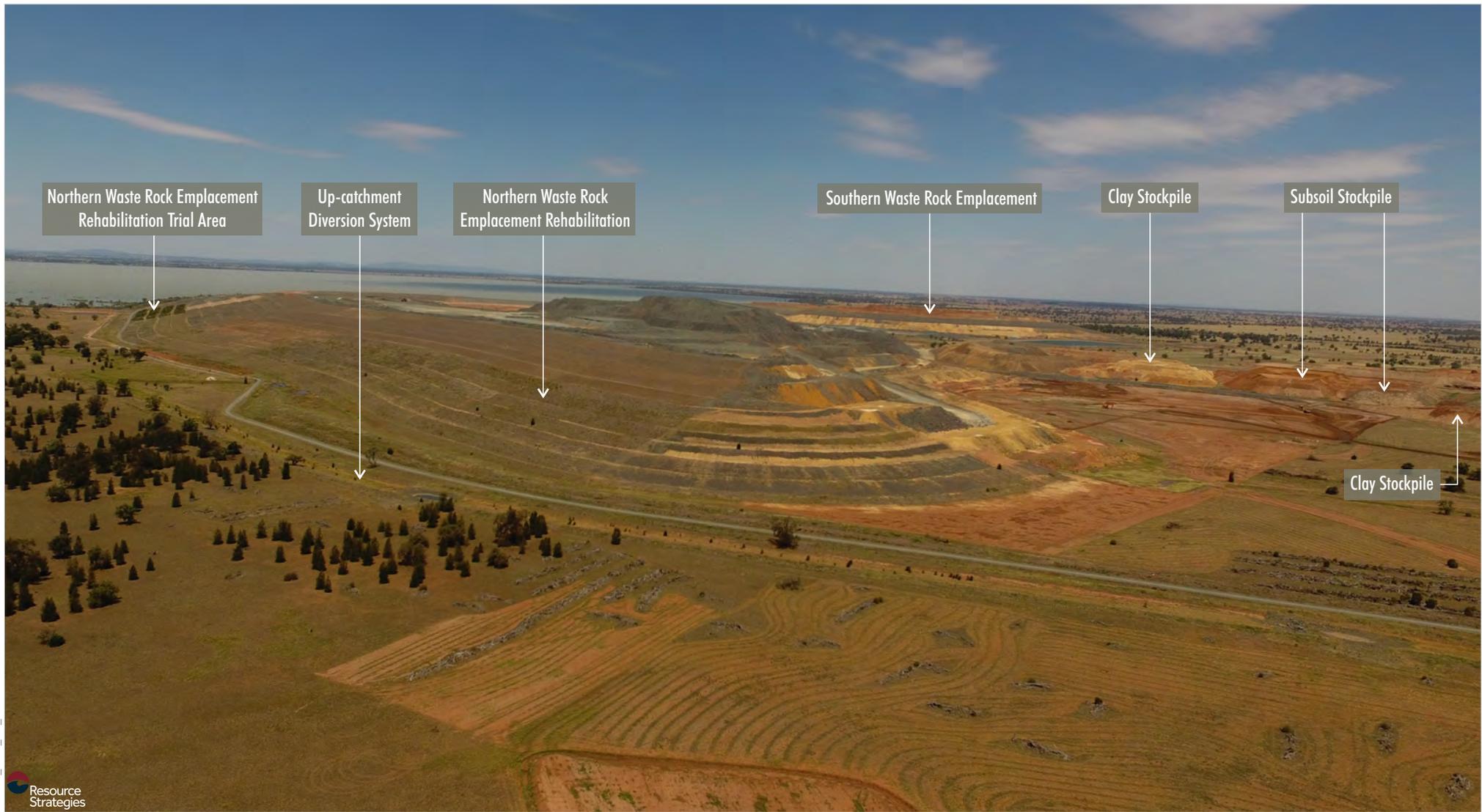


Source: Evolution (2018)



CGO PROCESSING RATE MODIFICATION  
Perimeter Waste Rock Emplacement, Lake  
Protection Bund and Temporary Isolation  
Bund Rehabilitation (February 2018)

Plate 5-1



HAL-16-41\_Modif4\_IPRM\_003A



Source: Evolution (2018)



CGO PROCESSING RATE MODIFICATION  
 Northern Waste Rock Emplacement  
 Rehabilitation (February 2018)



Source: Evolution (2018)



CGO PROCESSING RATE MODIFICATION  
Rehabilitation on Perimeter and  
Southern Waste Rock Emplacements  
(February 2018)



HAL-16-41\_Mod14\_PPM\_COISA

Resource  
Strategies

Source: Evolution (2018)



CGO PROCESSING RATE MODIFICATION  
Southern Waste Rock Emplacement  
Rehabilitation (February 2018)



3 Tiered Batter (1:3)					Single Continuous Slope (1:5)					Single Continuous Slope (1:5)					3 Tiered Batter (1:3)								
R	R+Wc	R,T+Wc	R+T	T	C	R	R+Wc	R,T+Wc	R+T	T	C	R	R+Wc	R,T+Wc	R+T	T	C	R	R+Wc	R,T+Wc	R+T	T	C
No Subsoil										Subsoil													

Southern Waste Rock Emplacement Trial Design

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- 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

Source: Evolution (2018)



CGO PROCESSING RATE MODIFICATION  
 Southern Waste Rock Emplacement  
 Trial Area Performance  
 including Trial Design

September 2016  
(looking south-west)



February 2018  
(looking south-west)



HAL-16-41\_Mod14\_PRM\_0078



Source: Evolution (2018)



CGO PROCESSING RATE MODIFICATION  
Northern Waste Rock Emplacement  
Trial Area Performance

- Investigation into the geochemical suitability of rock armour material for the outer batters/embankments of mine landforms.
  - **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.
- Appendix F of the Mine Life Modification 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:
- 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, if vegetation establishment is not adequate.
  - 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.
  - Direct seeding onto freshly topsoiled and deep ripped rocky surfaces has resulted in higher seedling densities compared with deep ripped grassland areas (DnA Environmental, 2018a).
  - Successful seedling establishment can be obtained in areas where a Wimmera Ryegrass cover crop has established by deep ripping prior to direct seeding (DnA Environmental, 2018a).
  - 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 (DnA Environmental, 2018b).
  - The inclusion of rock mulch in the surface cover placed on CGO landform slopes provides resistance to erosion and reduces surface water flow velocities on landform slopes during high rainfall events (Gilbert and Associates, 2009).
  - 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 oxide waste rock, this material is not suitable for armouring the batter slopes of the waste rock emplacements or IWL (GEM, 2008; 2013; 2016).

- 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 (GEM, 2008; 2013; 2016; Barrick, 2014).
- 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 may require treatment with lime or a gypsum-lime blend to reduce the acidity of the soil) (McKenzie Soil Management, 2013).
- Various methods for treating or ameliorating soil at the CGO have been recommended by McKenzie Soil Management (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, 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 results from tree root growth assessments of six year old trees planted in substrates including topsoil, subsoil and oxide waste rock indicate (DnA Environmental, 2017):
  - the root systems of the younger sapling plants preferred to grow laterally on top of dense clay oxide waste rock layers, but were capable of growing down into crumbly oxide waste rock layers;
  - as the tree and root system matures, the stronger and larger roots were able to penetrate the dense clay oxide waste rock; and
  - the chemical characteristics of the oxide waste rock has not been observed to be a constraint to plant growth.

Appendix F of the Mine Life Modification 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:
  - primary waste 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, if vegetation establishment is not adequate.
- The application of gypsum and then placement of a layer of primary waste rock 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. This method may be subject to further investigations and/or trials.

- Implementation of various soil amelioration methods to improve the structure and function of soil stocks and enhance suitability for plant growth including:
  - spreading gypsum on the surface of original soil profiles prior to soil stripping;
  - treating soil stockpiles with gypsum (or other relevant treatment material); and
  - treating soil with gypsum when re-applied to rehabilitation areas.
- Continued rehabilitation investigations and trials to determine:
  - the most effective combinations of the rock mulch and topsoil cover system materials;
  - the revegetation species most suited to the top surfaces of the waste rock emplacements and the TSFs; and
  - the most effective methods for managing Wimmera Ryegrass to maintain its benefits, yet provide for the establishment of native and/or endemic tree, shrub and grass 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 landforms and Section 5.3.2 details the final landform design concepts and conceptual rehabilitation domains. Figures 3-1 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 MLA 1 area, the modified landforms which would result from the Modification (i.e. the IWL) and the proposed Modification Offset Areas. A conceptual view of the proposed long-term land use areas and the conceptual post-mining landform is shown on Figure 5-1.

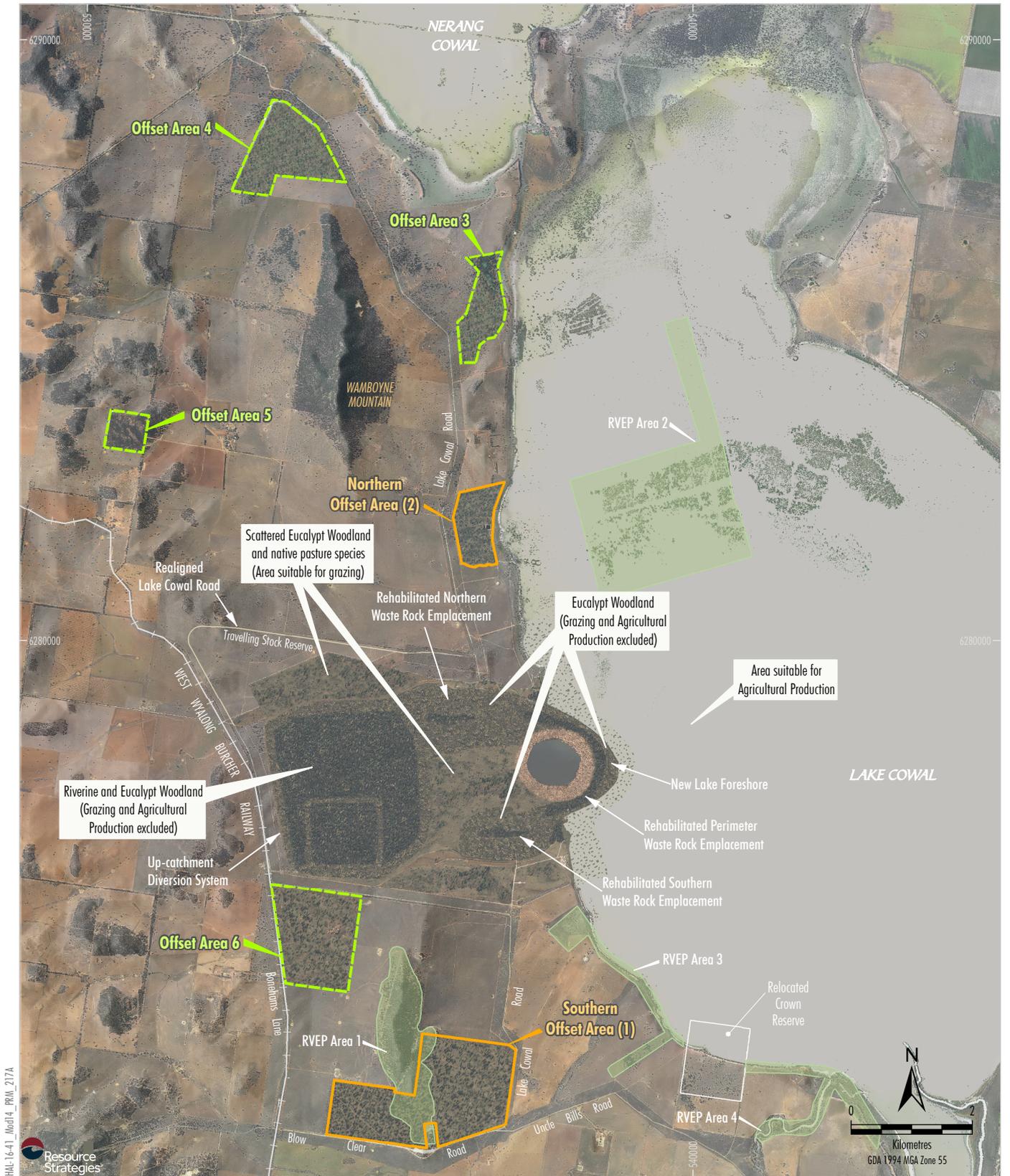
At lease relinquishment, it is proposed that land use within the ML 1535 and MLA 1 areas would include fenced rehabilitation areas with grazing excluded (i.e. elevated rehabilitated landforms such as rehabilitated waste rock emplacements and the IWL) and areas suitable for agricultural production including managed grazing by livestock (i.e. flat rehabilitation areas such as former infrastructure areas) and fishing of lake areas (Figure 5-1).

Evolution-owned land outside the ML 1535 and MLA 1 areas (with the exception of the Compensatory Wetland and Biodiversity 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 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 LMP, the RVEP Areas (Figure 5-1) would continue to be maintained for the term of Evolution's tenure of the relevant lands.

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.



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- LEGEND**
- Existing Offset Area  
(Voluntary Planning Agreement to be registered on the title of the lands)
  - Proposed Offset Area  
(Biobanking Agreement to be registered on the title of the lands)
  - Remnant Vegetation Enhancement Program Area  
(Management of these areas would be maintained for the term of Evolution's tenure of the land)



**CGO PROCESSING RATE MODIFICATION**  
**Conceptual Final Landform and Proposed Final Land Use Areas**

Source: Evolution (2018); © NSW Department of Finance, Services & Innovation (2017)  
 Orthophoto: Evolution (Oct 2017)

**Figure 5-1**

Consistent with Development Consent (DA 14/98) Condition 3.4(b) and the CGO's approved BOMP, long-term protection of the CGO's existing Offset Areas would be provided by a Voluntary Planning Agreement registered on the title of the lands. Long-term protection of the proposed Modification Biodiversity Offset Areas would be provided by a Biobanking Agreement between the Minister for the Environment and the landowner to establish a BioBank site (Appendix C). The Biobanking Agreement would be registered on the title of the Offset Areas so it is transferred to new owners if the land is sold.

The CGO's approved BOMP would be updated to reflect the modified offset strategy for the Modification.

### 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 native and/or 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 native and endemic vegetation within ML 1535 and MLA 1.

The rehabilitation concepts and objectives for the existing CGO final landforms (including the waste rock emplacements, TSFs, open pit, New Lake Foreshore and site infrastructure areas) would remain unchanged for the Modification and would be applied to the modified landforms (i.e. the IWL). The concepts and objectives are described below.

The Modification would not change the following key final landforms at the CGO:

- the final void;
- rehabilitated waste rock emplacements surrounding the final void to the north, east and south;
- areas surrounding the rehabilitated waste rock emplacements and existing TSFs associated with rehabilitated site infrastructure areas (e.g. former process plant area and former soil stockpile areas);
- permanent water management features (including the majority of the northern and southern sections of the UCDS, and ICDS east of the IWL); and
- permanent lake isolation embankments to hydrologically separate the open pit development area and Lake Cowal during mining and post-mining.

To allow for the proposed increase in processing rate for the Modification, the existing TSFs would be modified to form one larger TSF, which would also accommodate mine waste rock (i.e. the IWL).

In addition, relevant soil stockpiles within ML 1535 would be relocated and new soil stockpiles would be developed within ML 1535 and MLA 1.

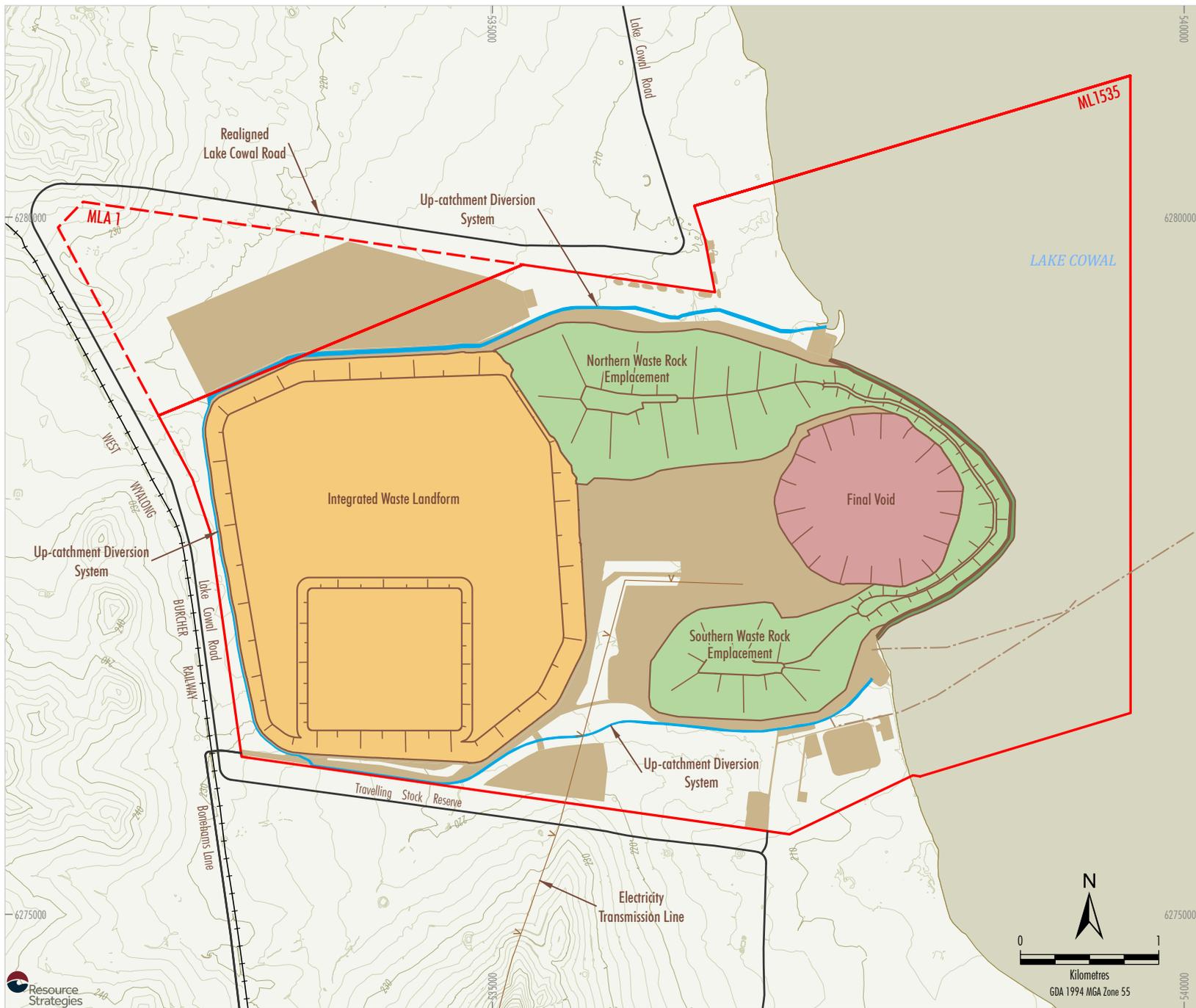
The Modification would also involve relocation of water management and other infrastructure displaced by the larger IWL footprint (including realignment of portions of the ICDS and UCDS, as well as relocation of the approved contained water storage D10, the explosives compound and magazine) in alternative locations within ML 1535 and MLA 1.

The approved operations include the processing of mineralised material and would therefore remove the mineralised material stockpile as a component of the northern waste rock emplacement landform (dependent on market conditions).

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 Division of Resources and Energy's (DRE's) (2013) *ESG3: Mining Operations Plan (MOP) Guidelines September 2013* (MOP Guidelines), conceptual rehabilitation domains have been developed based on the CGO final landforms (Table 5-1) shown on Figure 5-2. In summary the conceptual rehabilitation domains for the Modification include:

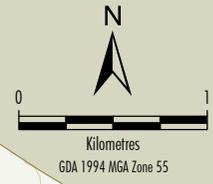
- Domain 1A – Final Void;
- Domain 2B – Permanent Water Management Infrastructure;
- Domain 3C – Infrastructure Area – Grassland/Scattered Eucalypt Woodland;



- LEGEND**
- Mining Lease Boundary (ML 1535)
  - Mining Lease Application Boundary (MLA 1)
  - Road
  - Contour m AHD (2 m Interval)
  - Rehabilitation Domains**
  - 1A Final Void
  - 2B Permanent Water Management Infrastructure
  - 3C Infrastructure Area
  - 4D Integrated Waste Landform
  - 5D Waste Rock Emplacement
  - 6E New Lake Foreshore
- Source: Evolution (2018); © NSW Department of Finance, Services and Innovation (2017)*



**CGO PROCESSING RATE MODIFICATION**  
**Conceptual Rehabilitation Domains**



**Figure 5-2**

**Table 5-1**  
**Primary and Secondary Rehabilitation Domains**

Code	Primary Domain	Code	Secondary Domain
1	Void	A	Final Void
2	Permanent Water Management Infrastructure	B	Permanent Water Management Infrastructure
3	Infrastructure	C	Grassland/Scattered Eucalypt Woodland
4	Integrated Waste Landform	D	Eucalypt Woodland
5	Waste Rock Emplacements	E	Riverine Woodland/Freshwater Communities
6	New Lake Foreshore		

- Domain 4D – Integrated Waste Landform – Eucalypt Woodland;
- Domain 5D – Waste Rock Emplacements – Eucalypt Woodland; and
- Domain 6E – New Lake Foreshore – Riverine Woodland/Freshwater Communities.

Due to the proposed integration of the northern waste rock emplacement and the IWL, the Woodland Corridor rehabilitation domain (previously Domain 6D in the approved Rehabilitation and Landscape Management Strategy [Evolution, 2016]) is no longer required.

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.

These concepts (and the long-term land use strategy) may be revised and refined as necessary throughout the life of the CGO based on the outcomes of ongoing consultation with relevant regulatory authorities and 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 (Evolution, 2016):

- 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 waste rock emplacements.

The approved maximum final depth of the final void is 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 final void is presented in Appendix B. Modelling indicates that the final void water level would rise slightly from the final void level predicted in the previous *Cowal Gold Operations Mine Life Modification Hydrological Assessment* (HEC, 2016), however is expected to reach equilibrium well below spill level (Appendix B). The process of trending towards this equilibrium is expected to take several hundred years (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 if necessary (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 IWL 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).

The Modification would involve minor changes to existing permanent water management structures to allow for the larger IWL footprint, including:

- realignment of the western and northern portions of the UCDS; and
- modification of the ICDS and removal of ICDS features within the IWL footprint.

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 realignment of the UCDS for the Modification would be constructed consistent with the principles outlined above to continue to minimise erosion.

The realigned UCDS would remain post-mining to facilitate permanent drainage of adjacent areas upslope of the site to Lake Cowal. In addition, new ICDS features (low bunding and/or drains) would be constructed east of the IWL to contain runoff generated within the site catchment and would remain post-mining.

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 (6E) has been developed for the New Lake Foreshore.

### **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 between Evolution, the ultimate landholder and relevant regulatory authorities); and

- establish vegetation communities (including scattered Eucalypt Woodland species and native and/or endemic pasture species) that are suitable for managed grazing.

Infrastructure areas associated with the Modification would largely remain the same as the existing infrastructure areas at the approved CGO, with the exception of relocation of soil stockpiles within ML 1535, development of additional soil stockpiles within ML 1535 and MLA 1, relocation of the explosives compound and magazine and duplication of the existing water supply pipeline across Lake Cowal.

Existing infrastructure which would continue to be used for the Modification would include the workshop, storage areas, process plant (with addition of a secondary crushing circuit), administration area, internal roads, transmission line and substation, borefields, water management structures, contained water storages 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 removed from site. The workshop would be dismantled at the end of mine life, at which time 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 native and/or endemic Eucalypt Woodland and 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 chemicals and any contaminated soils removed for proper disposal in accordance with EPA requirements. The area would then be contour ripped, topsoiled and revegetated with native and/or endemic Eucalypt Woodland and 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 and regulatory authorities. Alternatively, they would be broken and excavated for disposal in 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 native and/or endemic Eucalypt Woodland and pasture species.

Internal powerlines, pipelines and the explosives compound and magazine location would be dismantled and removed. Where required these areas would be topsoiled, contour ripped and revegetated with native and/or endemic Eucalypt Woodland and pasture species.

### *Internal Access Road and Other Roads*

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

### *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 long-term strategy and rehabilitation concepts for the duplicate pipeline across Lake Cowal would be the same as for the existing pipeline.

At the end of the mine life, the pipelines would either be raised and dismantled for recycling or kept in place if required for local use. If dismantled, the sections 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 pipelines 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.

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 regulatory guidelines.

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, the regulatory authority 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 regulatory guidelines and the associated pipelines and pump systems dismantled. The saline groundwater supply bores and pipeline in ML 1535 within Lake Cowal would be plugged, capped, decommissioned 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 DRG, EPA and DI-Water. Alternatively, the contained water storages may be retained for local landholder use upon agreement with Evolution and the regulatory authorities.

### *Exploration Areas*

All exploration drill holes would be plugged, capped and decommissioned in accordance with 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 – Integrated Waste Landform**

The Modification would involve modifying the design of the existing TSFs to form the IWL. The IWL would integrate with the existing northern waste rock emplacement and involve an extension to the existing approved TSF footprint.

Prior to commissioning of the IWL for tailings storage, the existing NTSF and STSF (Section 2.6) would continue to be used to store tailings. These facilities would be raised to STSF Stage 7 (248.4 m AHD) and NTSF Stage 6 (240.5 m AHD). The IWL would be constructed to a maximum height of 245 m AHD.

Notwithstanding, the Modification would apply the approved rehabilitation objectives for the existing TSFs to the IWL which would be:

- to establish a permanently stable landform;
- during operations, stabilise embankments so they provide minimal habitat value for bird life (i.e. rock mulch or pasture cover);
- post-operations, to establish vegetation 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 top surface of the landform;
- post-operations, to establish vegetation communities (including native and/or endemic Eucalypt Woodland, shrubland and grassland species) similar to those remnants in the surrounding landscape which are suited to the substrate materials and slope of the embankments; and
- to exclude grazing and agricultural production.

The currently approved rehabilitation strategy for the existing TSFs at the completion of processing would also be applied to the IWL and would include the following:

- The decant areas would be allowed to dry and the decant towers permanently capped with fill and/or a concrete plug.
- The underdrains 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 IWL would be fenced during operations to prevent access by terrestrial wildlife, and this fence would remain during rehabilitation and post-mining to exclude grazing and agricultural production.

#### *Embankment Construction*

The NTSF and STSF 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 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 continue to involve placement of an interim rock buttress cover on the outer slope of the embankment to enhance stability.

Rehabilitation materials (e.g. rock mulch and topsoil) on the existing TSF embankments would continue to 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 IWL for use during ongoing or final rehabilitation activities.

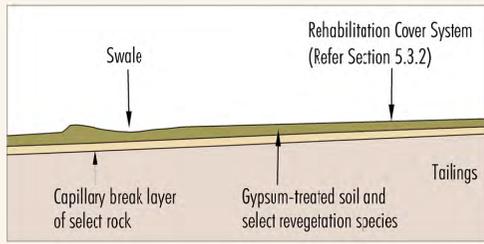
The outer downstream embankment of the IWL would be constructed using mined waste rock to provide long-term stability. The overall final slope of the outer downstream embankment of the IWL would be 1(V):4(H).

Figure 5-3 shows a conceptual embankment cross-section of the IWL, including rehabilitation cover system concept.

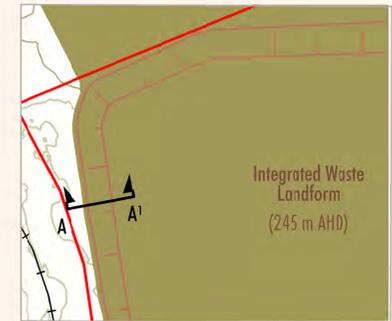
#### *Rehabilitation Cover System*

The Modification would apply the existing rehabilitation concepts for the top surface of the TSFs to the top surface of the IWL. The top surface of the IWL would include an upper and lower catchment area. Each area would form a low, internally draining landform, with drainage effected by controlled placement of cover materials and a number of shallow swales. The contained catchments would minimise surface water runoff from the top surface down the embankments. The rehabilitation cover system materials for the top surface would include a capillary break layer of rock, and layers of gypsum-treated subsoil and topsoil.

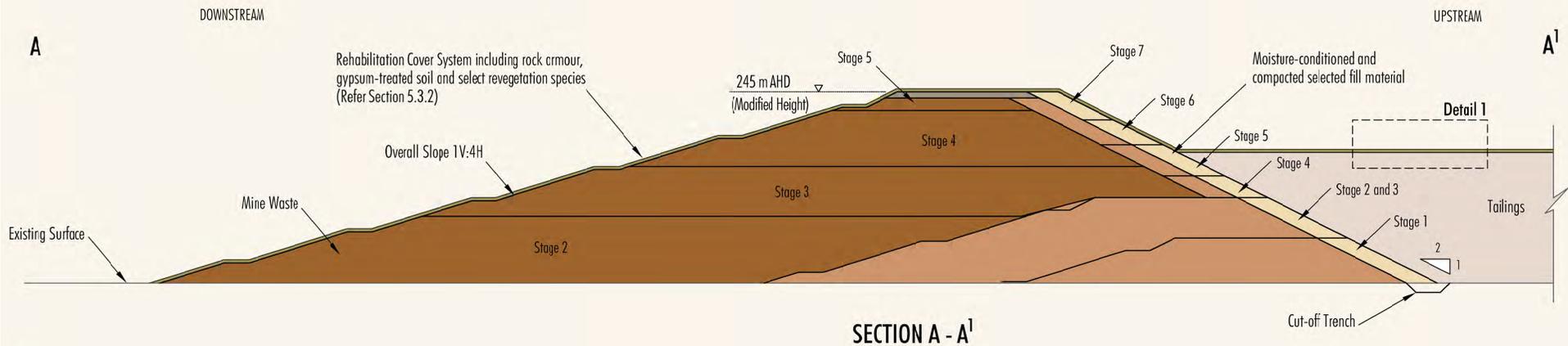
The rehabilitation methods for the IWL embankments would include spreading gypsum-treated topsoil over the surface of the embankment, cross-ripping along the contour of the slope and then revegetating with native and/or endemic Eucalypt Woodland, shrubland and grassland species suited to slope and elevated positions similar to those remnants in the surrounding landscape.



**DETAIL 1**



**INSET**  
Refer Figure 3-4



**SECTION A - A¹**

Not to Scale

HAL-16-41 Mod14 PRM 111B



Source: CMW (2018)



CGO PROCESSING RATE MODIFICATION  
Conceptual Embankment Cross-section  
of Integrated Waste Landform

**Figure 5-3**

During operations, the TSF and IWL 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 IWL would include selecting species suited to the hydrological features and substrate materials of the landform and would be based on results of rehabilitation investigations and trials in consultation with regulatory authorities.

Vegetation growth trials undertaken to date 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 viscosa* ssp. *cuneata*) and Nitre Goosefoot (*Chenopodium nitrariaceum*) may be suitable for revegetation of the IWL top surface (Evolution, 2016).

Based on the above, post-operation revegetation concepts for the IWL include:

- In the two central, occasionally wet areas, 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 IWL embankments, planting native and/or endemic species suited to the slope and substrate materials of the embankment.

Revegetation concepts would consider the results of hydrological modelling predictions for the IWL (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 surface and embankments of the IWL. A description of the rehabilitation trials that would be undertaken for the Modification is provided in Section 5.6.

Revegetation methods for the IWL would be described in detail in the MOP which would be prepared in consultation with and subject to approval by the DRG.

#### Domain 5D – Waste Rock Emplacements

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

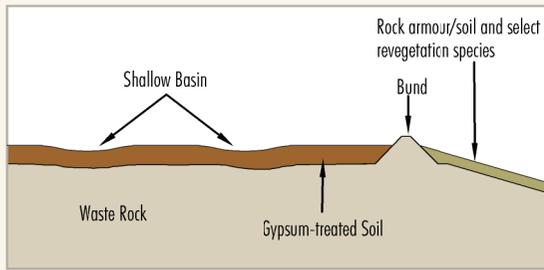
- stabilise batter slopes with rock armour (primary waste rock mulch) to control surface water runoff downslope and reduce erosion potential in the long-term;
- provide a stable plant growth medium able to support long-term vegetation growth including native and/or endemic Eucalypt Woodland, shrubland 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 223 m AHD, respectively) would remain unchanged, as would the footprints of the southern and perimeter waste rock emplacements. The footprint of the northern waste rock emplacement would be modified to fully integrate with the IWL.

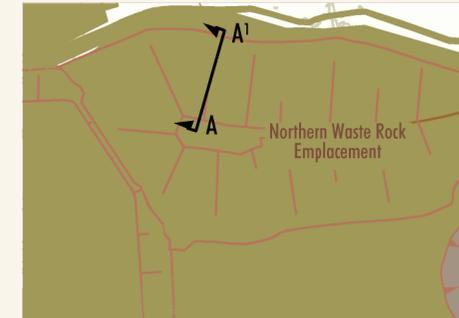
The Modification would involve temporarily increasing the height of the existing mineralised material stockpile adjacent to the northern waste rock emplacement (up to approximately 320 m AHD). Consistent with the approved operations, the Modification would involve the processing of this mineralised material. Therefore, the temporary mineralised material stockpile would be progressively removed (dependent on market conditions).

A conceptual cross-section of the northern waste rock emplacement is shown in Figure 5-4 and is also representative of the concept for the southern waste rock emplacement.

Development of the waste rock emplacements would continue to be consistent with currently approved designs. The development of the emplacements would meet the long-term goal of directing potential seepage generated from waste rock emplacement areas toward the open pit during operation and post-closure.

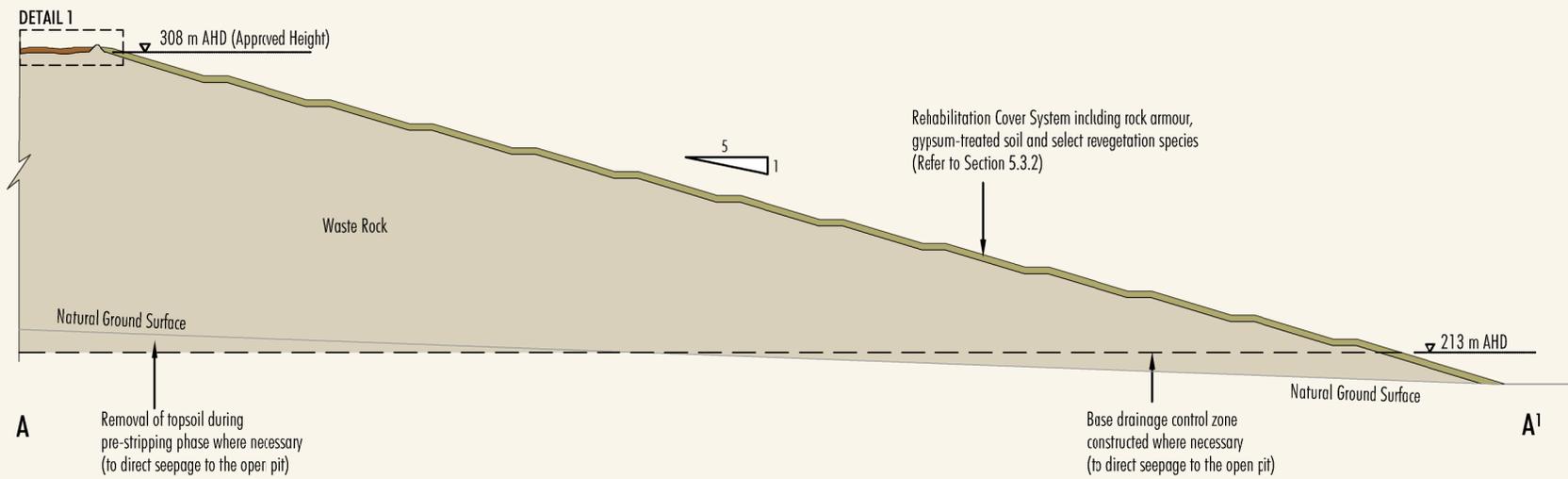


DETAIL 1



INSET

Refer Figure 3-4



SECTION A - A'

Not to Scale

HAL-16-41 Mod14 PPA 110A



Source: Evolution (2018)



CGO PROCESSING RATE MODIFICATION  
Conceptual Embankment Cross-section of  
Northern Waste Rock Emplacement

Figure 5-4

The waste rock emplacement batter slopes would be constructed to 1(V):5(H) and rock armoured with primary waste rock, topsoiled and cross-ripped along the contour of the slope 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 native and/or endemic Eucalypt Woodland vegetation (Evolution, 2016). The use of depressions would be aimed at maximising internal drainage without creating permanent ponding during normal and heavy rainfall events (Evolution, 2016).

As described in Section 5.2.1, a layer of gypsum and then primary waste rock may 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. Given the northern waste rock emplacement is mainly constructed of primary waste rock material, this practice is not required for this emplacement. This method may be subject to further investigations and/or trials.

A bund around the perimeter of the top surfaces of the waste rock emplacements 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 for the Modification 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 with native and/or endemic Eucalypt Woodland 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. As no change to the open pit is proposed, there would be no change to the waste rock geochemistry of the approved CGO. A description of the chemical characteristics of primary waste rock is provided in Section 5.2.1.

Results of rehabilitation investigations and 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 continue to inform the most suitable applications of rock mulch and topsoil and 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 native and/or endemic Eucalypt 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 (2016) with assistance from Diversity Native Seeds (a local native seed supplier) (Evolution, 2016). These species are associated with woodlands on low ridges and hills in the local landscape. A selection of these species have been used in the northern waste rock emplacement rehabilitation trial and would also be used in the large scale substrate profile 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 results of rehabilitation investigations and trials (Evolution, 2016).

### **Domain 6E – 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 slopes of the perimeter waste rock emplacement and the temporary isolation bund have been constructed at 1(V):5(H).

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 and 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 and Landscape Management 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 (Evolution, 2016). The mounds would comprise a mixture of inert bund rock and lakebed sediments (Evolution, 2016).

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 tubestock and planting of wetland species such as Lignum and Rushes from tubestock and cuttings (Evolution, 2016).

DnA Environmental (2018a) 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 and seed applied by hand broadcasting. DnA Environmental (2018a) notes that monitoring results indicate the rehabilitated lake foreshore sites are comparable to their relevant reference sites.

## **5.4 REHABILITATION MANAGEMENT PLAN**

In accordance with CGO Development Consent (DA 14/98) 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 and modified rehabilitation domains 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 CGO Development Consent (DA 14/98) 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 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 AQMP 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 SSMP, 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;

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

Soil management for the Modification would focus on soil stripping required for additional disturbance areas and ongoing soil stockpile management and soil amelioration measures.

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 construction of the interim rock buttressing of the TSF embankments. The stripped rehabilitation materials would be either directly transferred to a new rehabilitation area or stockpiled proximal to the IWL for use during ongoing or 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) Cowal Gold Mine *Soil Stockpile Characterisation Assessment*. These methods may include:

- spreading gypsum on the surface of original soil profiles prior to soil stripping;
- 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; and
- treating strongly sodic and dispersive soil stocks with gypsum, or acidic soils with lime or a gypsum-lime blend, in a dedicated soil amelioration farm.

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

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 be detailed in the revised CGO MOP.

The CGO's approved SSMP 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 native and/or 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 and MLA 1. 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 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.

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 and habitat features (i.e. hollows and logs) would be salvaged for use in rehabilitation or habitat enhancement programmes within ML 1535, MLA 1 and/or within the Biodiversity 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 ESCMP would continue to be implemented for the Modification.

The ESCMP 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). 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 [if considered necessary]).

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**

Grazing and cropping activities would continue to be excluded within ML 1535 during operation and rehabilitation of the CGO, in accordance with the LMP. 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.

These management measures would also be applied to the proposed MLA 1 area. Once the MLA has been granted, the new ML area would be fenced, however the fence adjoining the ML 1535 boundary would be removed to facilitate the proposed operations within the new ML area. The LMP would be updated to reflect this.

As described in Section 5.3.2, rehabilitation objectives for the waste rock emplacements and the IWL involves exclusion of grazing and agricultural production from these areas post-mining. The IWL would be fenced during operations, and this fence would remain post-closure.

Evolution-owned lands outside the CGO area (with the exception of RVEP Areas and Northern and Southern Offset Areas) is farming/agricultural production by Evolution and/or licensees that sign agreements to conduct agricultural activities on Evolution-owned land (Section 5.3.1). The proposed Modification Offset Areas would also have grazing and cropping excluded.

#### **5.5.8 Landscaping to Minimise Visual Impacts**

Progressive rehabilitation of waste rock emplacements would continue to be undertaken to reduce the contrast between the CGO landforms and the surrounding landscape. This includes progressive rehabilitation with selected native and/or endemic grass, shrub and/or tree species. These progressive rehabilitation methods would also be applied to the IWL.

Vegetation screens have been planted along sections of the western, southern 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. Vegetation screens may be implemented within the proposed MLA 1 area if considered necessary.

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 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 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 depth and hay cover materials in stabilising landform slopes (i.e. controlling erosion) and providing a suitable medium for revegetation.
  - Implementation of substrate profile trials to investigate revegetation species suited to the top surface rehabilitation materials of CGO final landforms, including the proposed IWL and waste rock emplacements, to refine revegetation objectives.
- **Revegetation**
  - Continued investigation of the most effective methods for direct seeding rehabilitation areas following the establishment of the initial Wimmera Ryegrass cover crop.

A summary of the proposed rehabilitation investigations and trials is provided below. Detailed design of the proposed trials would be provided in the revised MOP and results reported in the Annual Review.

### **Rehabilitation Media**

#### *Northern Waste Rock Emplacement Trial*

As described in Section 5.2, a rehabilitation trial area has been established on the northern slopes of the northern waste rock emplacement to investigate the performance of various applications associated with the rock mulch, topsoil and hay cover materials. The trial includes plots assessing different topsoil depths, applications of seed bearing native pasture hay compared with clean wheaten straw hay or no hay with select native and/or endemic tubestock planted across all plots.

Results from this trial are anticipated to inform the most effective combination of rock mulch, topsoil and hay cover materials for final landform slopes and inform the suitability of selected Eucalypt and Acacia revegetation species. Erosion incidence will continue to be monitored to confirm the effectiveness of the cover materials in stabilising landform slopes in the long-term.

#### *Substrate Profile Trial*

Revegetation trials would continue to be undertaken for the Modification to assess the performance of select native and/or endemic tree and shrub species in various CGO substrate materials including tailings and waste rock.

Large scale substrate profile trials are proposed to be undertaken for the Modification to expand on the trials that have been conducted to date and would include various topsoil, subsoil and waste rock depths and various tailings types (e.g. oxide tailings and sulphide tailings) compared with a control (topsoil only).

Given the existing TSFs (and the proposed IWL) would continue to be operational and dynamic landforms, the opportunity to implement rehabilitation trials on the top surface of these areas is currently unavailable. Once an area on the top surface of the TSFs or IWL becomes available, the trial would be implemented.

As the southern waste rock emplacement will reach the final approved design height in 2019, the trial component relevant to the waste rock emplacement top surface cover materials would be implemented on an area on its top surface.

The objective of this trial would be similar to the previous vegetation growth trials and would assess the performance of select revegetation species in various material combinations and depths associated with the IWL and waste rock emplacement top surfaces.

The trial would include gypsum-treated soils to confirm that the ameliorated soil is suitable as a plant growth medium.

### **Revegetation**

#### *Wimmera Ryegrass Investigation and Trial*

Based on rehabilitation monitoring results to date and the preliminary findings of the northern waste rock emplacement trial (Section 5.2.1), the annual exotic plant species Wimmera Ryegrass, present in the soil seed bank, rapidly establishes once soil is spread across CGO rehabilitation areas. This cover crop provides rapid soil surface protection and stabilises newly profiled landform slopes. Given DnA Environmental recommends direct seeding as the most effective and cost efficient revegetation method for the CGO's extensive rehabilitation areas, Evolution has implemented a trial and commenced investigation to determine the most effective methods for direct seeding rehabilitation areas prior to and following the establishment of the Wimmera Ryegrass cover crop.

The design of the trial has been developed in consultation with DnA Environmental and the results would continue to be detailed in the Annual Review.

## **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/embankment 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 the RMP.

### **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.

The performance indicators and completion criteria reflect the 'rehabilitation phases' (at which ecological targets are relevant) defined in the MOP Guidelines:

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

Table 5-2 outlines the rehabilitation performance indicators and completion criteria which have been developed by DnA Environmental (2018a) to assess rehabilitation performance at the CGO.

DnA Environmental has identified an upper and lower range of criteria values based on monitoring data collected across the reference sites. It is important to note that these upper and lower criteria values are dynamic and change each year based on monitoring results from reference sites. This is undertaken to reflect the seasonal and climatic conditions at the time of monitoring.

Consistent with the approved Rehabilitation and Landscape Management Strategy (Evolution, 2016), 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.

**Table 5-2**  
**Quantitative Rehabilitation Performance Indicators and Completion Criteria**

Rehabilitation Phase	Aspect or Ecosystem Component	Completion Criteria	Performance Indicators	Unit of Measurement	Lake Foreshore Ecosystem Range 2017		Grassland Ecosystem Range 2017		Hill Ecosystem Range 2017		Slopes Ecosystem Range 2017		
					Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	
<i>Performance indicators are quantified by the range of values obtained from replicated reference sites</i>					Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	
Landform establishment and stability	Landform slope, gradient	Landform suitable for final land use and generally compatible with surrounding topography	Slope	Degrees	1	5	4	6	2	7	1	4	
	Active erosion	Areas of active erosion are limited	Number of rills/gullies	Number	0	0	0	0	0	0	0	0	
			Cross-sectional area of rills/gullies	Square metre (m <sup>2</sup> )	0	0	0	0	0	0	0	0	
Growth medium development	Soil chemical, physical properties and amelioration	Soil properties are suitable for the establishment and maintenance of selected vegetation species	pH	pH	6.73	6.77	5.90	6.10	4.50	5.80	7.75	8.32	
			EC	< deciSiemens per metre (dS/m)	0.065	0.091	0.066	0.082	0.045	0.151	0.297	0.503	
			Organic Matter	%	1.4	1.8	3.2	3.4	4.6	21.0	3.0	3.4	
			Phosphorous	Parts per million (ppm)	14.4	20.3	13.1	28.2	9.8	42.3	14.8	25.6	
			Nitrate	ppm	4.4	11.0	3.4	9.0	1.5	8.1	5.5	6.9	
			Cation Exchange Capacity	Centimoles of positive charge per kilogram (Cmol+/kg)	10.1	21.0	8.6	10.1	7.1	10.2	33.5	51.3	
			Exchangeable Sodium Percentage	%	3.1	3.5	2.5	6.0	1.6	3.3	2.3	8.9	
Ecosystem and Land Use Establishment	Landscape Function Analysis (LFA) Landform Stability and Landscape Organisation indices	Landform is stable and performing as designed	LFA Stability	%	42.7	70.0	67.5	70.5	60.9	73.5	54.7	76.0	
			LFA Landscape Organisation	%	51	88	100	100	77	100	56	100	
	Vegetation diversity	Vegetation contains a diversity of species comparable to that of the local remnant vegetation	Diversity of shrubs and juvenile trees	Species/area		3	4	1	1	1	4	3	4
				% population		100	100	100	100	98	100	97	100
			Total species richness	Number/area	35	37	31	38	9	42	22	41	
			Native species richness	> Number/area	20	29	24	26	9	38	21	35	
			Exotic species richness	< Number/area	8	15	7	12	0	5	1	6	
	Vegetation density	Vegetation contains a density of species comparable to that of the local remnant vegetation	Density of shrubs and juvenile trees	Number/area	41	274	1	1	32	379	31	59	

**Table 5-2 (continued)**  
**Quantitative Rehabilitation Performance Indicators and Completion Criteria**

Rehabilitation Phase	Aspect or Ecosystem Component	Completion Criteria	Performance Indicators	Unit of Measurement	Lake Foreshore Ecosystem Range 2017		Grassland Ecosystem Range 2017		Hill Ecosystem Range 2017		Slopes Ecosystem Range 2017	
					Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
<i>Performance indicators are quantified by the range of values obtained from replicated reference sites</i>					Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
<b>Ecosystem and Land Use Establishment (Cont.)</b>	Ecosystem composition	The vegetation is comprised by a range of growth forms comparable to that of the local remnant vegetation	Trees	Number/area	1	1	0	1	1	4	1	3
			Shrubs	Number/area	2	3	0	1	2	3	1	2
			Sub-shrubs	Number/area	2	3	2	6	0	9	8	9
			Herbs	Number/area	18	23	18	20	3	15	7	17
			Grasses	Number/area	7	11	8	10	2	12	3	11
			Reeds	Number/area	0	1	0	1	0	1	0	0
			Ferns	Number/area	0	0	1	1	0	1	0	0
			Aquatic	Number/area	0	0	0	0	0	0	0	0
			Parasite	Number/area	0	0	0	0	0	0	0	1
<b>Ecosystem and Land Use Development</b>	LFA Landform Function and Ecological Performance indices	Landform is ecologically functional and indicative of a landscape on a trajectory towards a self-sustaining ecosystem	LFA Infiltration	%	40.4	44.9	31.7	34.4	40.1	58.8	30.3	37.3
			LFA Nutrient Cycling	%	22.5	34.6	33.2	34.4	43.7	56.4	29.1	44.4
	Protective ground cover	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation	Litter cover	%	30	61	63	83	67	88	58	75
			Annual plants	< %	1	14	7	9	0	0	0	0
			Cryptogam cover	%	0	0	1	2	0	6	4	6
			Rock	%	0	0	0	1	0	2	0	0
			Log	%	0	1	0	0	0	10	0	3
			Bare ground	< %	32	32	1	18	5	14	4	27
			Perennial plant cover (< 0.5 m)	%	6	25	6	12	1	21	9	15
	Total Ground Cover	%	68	69	82	100	86	96	74	96		
	Ground cover diversity	Vegetation contains a diversity of species per square meter comparable to that of the local remnant vegetation	Native understorey abundance	> Species/m <sup>2</sup>	2.6	5.8	4.0	6.0	1.8	5.0	4.0	5.0
			Exotic understorey abundance	< Species/m <sup>2</sup>	0.8	1.6	1.0	3.0	0.0	0.2	0.0	0.8
	Native ground cover abundance	Native ground cover abundance is comparable to that of the local remnant vegetation	Percent ground cover provided by native vegetation <0.5 m tall	%	72.2	85.0	53.2	82.7	96.0	100	86.4	100

**Table 5-2 (continued)**  
**Quantitative Rehabilitation Performance Indicators and Completion Criteria**

Rehabilitation Phase	Aspect or Ecosystem Component	Completion Criteria	Performance Indicators	Unit of Measurement	Lake Foreshore Ecosystem Range 2017		Grassland Ecosystem Range 2017		Hill Ecosystem Range 2017		Slopes Ecosystem Range 2017	
					Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
<i>Performance indicators are quantified by the range of values obtained from replicated reference sites</i>					Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Ecosystem and Land Use Development (Cont.)	Ecosystem growth and natural recruitment	The vegetation is maturing and/or natural recruitment is occurring at rates similar to those of the local remnant vegetation	Shrubs and juvenile trees 0 - 0.5 m in height	Number/area	15	236	1	1	1	364	7	12
			Shrubs and juvenile trees 0.5 – 1 m in height	Number/area	4	7	0	0	1	17	5	9
			Shrubs and juvenile trees 1 - 1.5 m in height	Number/area	2	2	0	0	0	5	7	7
			Shrubs and juvenile trees 1.5 – 2 m in height	Number/area	2	4	0	0	0	3	4	8
			Shrubs and juvenile trees >2 m in height	Number/area	13	30	0	0	0	53	8	23
	Ecosystem structure	The vegetation is developing in structure and complexity comparable to that of the local remnant vegetation	Foliage cover 0.5 – 2 m	% cover	6	13	0	0	0	6	0	17
			Foliage cover 2 – 4 m	% cover	0	3	0	0	0	11	8	10
			Foliage cover 4 – 6 m	% cover	4	4	0	0	0	16	3	7
			Foliage cover >6 m	% cover	0	7	0	0	5	29	0	20
	Tree diversity	Vegetation contains a diversity of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree diversity	Species/area	1	2	0	0	2	5	1	2
				%	100	100	0	0	100	100	100	100
	Tree density	Vegetation contains a density of maturing tree and shrubs species comparable to that of the local remnant vegetation	Tree density	Number/area	2	12	0	0	6	59	11	26
				Average diameter at breast height (dbh)	centimetre	23	50	0	0	11	50	11
	Ecosystem health	The vegetation is in a condition comparable to that of the local remnant vegetation	Live trees	% population	100	100	0	0	57	100	88	91
			Healthy trees	% population	0	92	0	0	16	100	64	85
			Medium health	% population	8	100	0	0	0	39	4	27
			Advanced dieback	% population	0	0	0	0	0	26	0	0
Dead Trees			% population	0	0	0	0	0	36	9	12	
Mistletoe			% population	0	0	0	0	0	0	0	4	
Flowers/fruit: Trees			% population	33	100	0	0	12	50	0	8	
Hollows: Trees	% population	0	50	0	0	0	33	0	0			

Source: DnA Environmental (2018a)

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 Independent Monitoring Panel inspection and review process. Results of these processes are reported quarterly to the CGO's CEMCC and are publicly available on the CGO website.

These measures would remain unchanged for the Modification.

Mine closure concepts and management measures would continue to be developed via the MOP in consultation with the DRG and other relevant regulatory authorities.

## **5.8 MINE CLOSURE AND LEASE RELINQUISHMENT**

Upon cessation of mining operations, tenure of ML 1535 and MLA 1 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 and MLA 1 conditions (including public safety considerations) and Development Consent (DA 14/98) conditions have been satisfied.
- Hard-stand and infrastructure components have been removed (unless otherwise agreed with the ultimate landholder and regulatory authorities).

The *Strategic Framework for Mine Closure* published by the Australian and New Zealand Minerals and Energy Council and Mineral Resources Council of Australia (2000) and the *Leading Practice Sustainable Development Program for the Mining Industry – Mine Closure* published by the Commonwealth Department of Industry, Innovation and Science (2016) 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.

The request to modify Development Consent (DA 14/98) in the manner generally described in this EA, was made prior to the cut-off date of 1 March 2018. As a result, this Modification may be determined under section 75W of the EP&A Act, in accordance with clause 3BA of Schedule 2 of the *Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017*<sup>3</sup>.

Before its repeal, section 75W of the EP&A Act stated:

#### 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 in addition to the proposed IWL for the placement of waste rock extracted from the open pit;
- continued use of existing ore processing infrastructure, along with the installation of a secondary crushing circuit within the existing process plant area; and
- continued storage of tailings on-site within the existing TSFs and within the IWL.

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

- life of the CGO;
- mining methods;
- extent and depth of the open pit;
- lake isolation system;
- maximum waste rock emplacement heights;
- cyanide leaching circuit;
- cyanide destruction method;
- approved cyanide concentration limits in the aqueous component of the tailings slurry;

<sup>3</sup> It is noted that the CGO was taken to be an approved project under the Part 3A of the EP&A Act pursuant to clause 8J of the *Environmental Planning and Assessment Regulation 2000* for the purpose of a modification application made under section 75W.

- water supply sources;
- approved daily or annual extraction limits of the Bland Creek Palaeochannel Borefield;
- site access road;
- power supply;
- exploration activities; 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 emissions), additional management measures are proposed (i.e. implementation of additional haul road watering) 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 Other State Legislation

In addition to the EP&A Act, the following NSW Acts may be applicable to the Modification:

- *Aboriginal Land Rights Act, 1983*;
- BC Act;
- *Contaminated Land Management Act, 1997*;
- *Crown Lands Act, 1989 (Crown Lands Act)*;
- *Dams Safety Act, 1978*;
- *Dams Safety Act, 2015*;
- *Dangerous Goods (Road and Rail Transport) Act, 2008*;
- *Explosives Act, 2003*;
- FM Act;
- *Heritage Act, 1977*;
- *Mining Act, 1992*;
- *NPW Act*;
- *Native Vegetation Act, 2003*;
- *Noxious Weeds Act, 1993*;
- *Roads Act, 1993*;
- *Water Management Act, 2000*; and
- *Work Health and Safety (Mines and Petroleum Sites) Act, 2013*.

Relevant licences or approvals required under these Acts would continue to be obtained for the CGO as required. Key plans, licences and agreements that would require revision to incorporate the Modification are outlined in Section 7.

Additional details on the likely requirements of key Acts are provided in the sub-sections below.

Under the NSW *Mining Act, 1992*, environmental protection and rehabilitation are regulated by conditions of mining leases, including requirements for the submission of a MOP prior to the commencement of operations, and subsequent Annual Environmental Management Reports (or Annual Reviews).

The current MOP would require revision to reflect the Modification.

#### **Roads Act, 1993**

Works or structures that disturb the surface of a public road or connect a road to a classified road require consent under section 138 of the NSW *Roads Act, 1993*. The *Roads Act, 1993* applies to all public roads in NSW, and is typically administered by the local council for local roads.

The Modification would involve the realignment of Lake Cowal Road around MLA 1 and also a number of other minor road treatments on local roads.

If the Modification is approved, Evolution would apply to the relevant roads authority for the necessary consents under section 138 of the *Roads Act, 1993* for the new infrastructure within the public road network.

Detailed design for any roadworks would be undertaken in accordance with the *Austrroads Guide to Road Design* and to the satisfaction of the Bland Shire Council or Lachlan Shire Council (where relevant).

### **Protection of the Environment Operations Act, 1997**

The PoEO Act and the NSW *Protection of the Environment Operations (General) Regulation, 2009* set out the general obligations for environmental protection for development in NSW, which is regulated by the EPA.

The CGO operates under EPL 11912, granted under the PoEO Act. The EPL contains conditions that relate to emission and discharge limits, environmental monitoring and reporting.

Approval of the Modification may necessitate a variation of EPL 11912 such as updates to environmental monitoring sites.

### **Crown Lands Act, 1989**

The *Crown Lands Act, 1989* aims to ensure that Crown land is managed for the benefit of the people of NSW.

For any Crown land directly affected by the Modification (e.g. the existing TSR), Evolution would enter into necessary leases or licences under the *Crown Lands Act, 1989*.

Evolution has been consulting with DI - Crown Lands about the proposed relocation of a portion of the existing TSR, and will continue with consultation regarding this matter.

### **Water Management Act, 2000**

The NSW *Water Management Act, 2000* contains provision for the licensing, allocation, capture and use of water resources.

Water sharing plans establish rules for sharing water between different users and between the various environmental sources (namely rivers or aquifers).

Evolution would continue to use the existing WALs under the *Water Management Act, 2000* for the Modification.

### **Biodiversity Conservation Act, 2016**

The BC Act was recently enacted by the NSW Parliament to replace:

- the *Threatened Species Conservation Act, 1995*;
- the *Nature Conservation Trust Act, 2001*; and
- the animal and plant provisions of the NPW Act.

The overarching objective of the BC Act is to 'maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development'.

One of the main purposes served by the BC Act is to prescribe the approach to be followed for conducting assessment of biodiversity for different activities and developments (see Part 7 of the BC Act).

This Modification proposes to modify a development consent that was granted before the commencement of the BC Act and, more specifically, before the commencement of Part 7, Division 4 of the BC Act. Section 7.17(1) of the BC Act states that:

- (1) *Subsection (2) applies to an application for the modification of a development consent, or State significant infrastructure approval, that was granted after the commencement of this Division.*

Because the development consent for the CGO was not granted 'after the commencement of this Division', section 7.17 of the BC Act will not apply to this Modification. This is consistent with the SEARs (Attachment 2).

One of the regulations made under the BC Act is the *Biodiversity Conservation (Savings and Transitional) Regulation, 2017* (BC Savings Regulation). Clause 28 of the BC Savings Regulation states that:

- (1) *The former planning provisions continue to apply (and Part 7 of the new Act does not apply) to the determination of a pending or interim planning application.*

The phrase 'pending or interim planning application' is defined within clause 27(1) of the BC Savings Regulation. The application made by Evolution for this Modification satisfies the criteria contained in the definition of 'pending or interim planning application' in clause 27(1) of the BC Savings Regulation.

As such, it enjoys the benefit of the savings provision in clause 28 of the BC Savings Regulation which provides that the former planning provisions continue to apply to the determination of this Modification.

### 6.1.3 Environmental Planning Instruments

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

It is noted that many of the clauses from the environmental planning instruments that are considered below impose conditions precedent on the relevant consent authority when determining an application for development consent. Given that this Modification is a modification application under section 75W, rather than an application for development consent, the Minister (or delegate) would not, strictly speaking, need to be satisfied of these conditions precedent before determining Evolution's application in respect of this Modification.

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

The 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:

- improves the financial resilience of the CGO, provides job security for local mine employees and contractors, and continues to stimulate demand in the local and regional economy;
- involves the continued orderly economic use and development of land containing mineral resources;
- has been developed in consideration of environmental planning instruments and the 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 [Section 2.14]) 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 the continuation of mining activities within the existing ML 1535. The Modification would also require development within MLA 1 which would be considered activities ancillary to mining. MLA 1 is located on land where development for the purposes of industry is permissible under the *Bland Local Environmental Plan 2011* (Bland LEP).

*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 MLA 1 and Evolution-owned lands are predominantly used for agriculture (e.g. livestock grazing and grain cropping) with some areas forming the biodiversity offsets and RVEP for the existing CGO.

The Modification would involve the continuation of mining activities within ML 1535 and would therefore not change the existing land use within ML 1535.

The Modification would not change the CGO water supply borefields and the proposed duplicate pipeline would be constructed within the existing 40 m pipeline corridor, therefore no change to the existing surrounding land uses would occur as a result of the duplicate pipeline.

The Modification would result in a land use change (i.e. ancillary to mining activities) to the MLA 1 area. The Modification would also result in a land use change (i.e. to conservation) to the proposed Modification Biodiversity Offset Areas

Consideration of the potential impacts of the Modification on the other land uses is summarised in Section 4.7.2.

*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.

The potential impacts of the Modification on threatened species and biodiversity including measures to minimise potential impacts are as described in Section 4.3 and Appendix C.

Greenhouse gas emission estimates for the Modification are described in Section 4.11.1, and Appendix F.

*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, specifically the construction and operation of a new secondary crushing circuit, would maximise the efficiency of gold recovery from the CGO process plant (e.g. through improved economics of scale).

Evolution has presented information on the Modification to the DRG 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 processing rate increase would require additional deliveries of some process consumables. No new process consumables would be required for the Modification. Additional heavy vehicle deliveries would be undertaken in accordance with the ADG Code.

The Modification would result in an additional 10 employees/contractors and a short-term construction phase involving 100 employees. Employee movements would continue to be managed via the use of buses.

Given the above, and with the implementation of the road treatment measures proposed (Section 4.9), 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 MOP. The RMP would be revised to reflect the rehabilitation concepts for Modification (Section 5.3).

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 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 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. 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 No. 4 *Risk Criteria for Land Use Safety Planning* (DoP, 2011b) and HIPAP No. 6 *Guidelines for Hazard Analysis* (DoP, 2011c) for tolerable fatality, injury, irritation and societal risk (Pinnacle Risk Management, 2004b).

The annual 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 and FHA would generally remain unchanged.

Additional heavy vehicle deliveries would be undertaken in accordance with the ADG Code.

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 4.11.5.

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<sub>WAD</sub> 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 or FHA. Subsequently, no change to the overall PHA, HAZOP 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 CGO would occur as a result of the Modification except for the MLA 1 area and the proposed Modification Biodiversity Offset Areas. (Section 4.7.2).

#### **State Environmental Planning Policy No. 44 – Koala Habitat Protection**

*State Environmental Planning Policy No. 44 (Koala Habitat Protection)* (SEPP 44) requires councils in certain LGAs 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.

The CGO on the western side of Lake Cowal is located within the Local Government Area of Bland, which is not listed in SEPP 44. Therefore SEPP 44 does not apply to clearance at the mine site.

The pipeline duplication on the eastern side of Lake Cowal is located within the Local Government Area of Forbes which is listed in SEPP 44. Of the SEPP 44 preferred feed trees, only River Red Gum (*E. camaldulensis*) is present along the pipeline duplication corridor within River Red Gum Forest (Moderate Condition) (LA191). Less than 0.4 ha of River Red Gum Forest (Moderate Condition) (LA191) which meets the definition of potential koala habitat would be cleared for the pipeline duplication within the Local Government Area of Forbes.

No Koalas have been recorded in the River Red Gum Forest associated with the pipeline duplication, therefore no core koala habitat would be cleared.

#### **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:

- it has considered whether the land is contaminated, and*
- 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*
- 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. A Land Contamination Assessment has been prepared and is provided in Appendix G.

### **Bland Local Environmental Plan 2011**

The CGO mining area is located wholly within the 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 Local Government Area) 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 area of the CGO (incorporating the Modification) is zoned as RU1 “Primary Production”.

“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 result in short-term additional demand for employees/contractors during the construction phase, and only minor additional ongoing employment, 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 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 because the pipeline duplication would be constructed adjacent to the existing pipeline and within the existing 40 m pipeline corridor.

“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 the Modification would not change the existing land uses within or surrounding the CGO water supply, borefields or pipeline. Further, 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.

#### **6.1.4 Commonwealth Legislation**

##### ***Environment Protection and Biodiversity Conservation Act, 1999***

Relevant components of the Modification were referred to the DEE (Reference 2017/7989). The DEE’s Referral decision (dated 6 November 2017) was that the Modification is a controlled action, and therefore, approval under the EPBC Act is required.

The controlled action will be assessed under the assessment bilateral agreement with the NSW Government, and as such, this EA has also been prepared to address the DEE’s assessment requirements, which are included in the SEARs (Attachment 2).

A reconciliation against the SEARs and the DEE’s assessment requirements is provided in Tables 1-1 and 1-2.

##### ***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.

### 6.1.5 Plans, Licences and Agreements that Require Revision

#### *Management/Monitoring Plans*

Some management plans (e.g. the NMP and IACHMP) would require revision to reflect updated environmental management measures or changes to CGO 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 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

Recent feasibility studies have identified potential opportunities to maximise the ore processing capacity of the CGO's existing processing plant. On this basis, Evolution proposes to increase the CGO's approved ore processing rate of 7.5 Mtpa to 9.8 Mtpa.

The Modification would improve the financial resilience of the CGO against rising operational costs, such as electricity or other external economic factors.

The Modification would include a small increase in the operational workforce and would assist to facilitate the continuity of employment for the existing CGO workforce, 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 measures (including performance monitoring), to minimise potential impacts on the environment and community (Section 4).

The cost benefit analysis estimated the incremental (i.e. in comparison to the approved CGO) net production benefits of the Modification to Australia (over and above the economic benefits of the approved CGO) to be some \$62 M (present value) and to NSW to be some \$27 M (Appendix I). The Modification would result in additional contributions to regional and NSW output and business turnover and household income. Contributions to the regional economy were estimated to include:

- the CGO itself being located within the region and the direct economic activity that it brings including direct employment and wages;
- expenditure by the CGO on inputs to production that can be sourced from the region such as repairs and maintenance etc.; and
- expenditure of employee wages in the regional economy.

#### *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. IWL and secondary crushing circuit) 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. No change is proposed to the open pit as part of the Modification.

#### *Tailings Storage Facilities/Integrated Waste Landform*

Additional tailings storage capacity is required as part of the Modification as the annual rate of tailings rise associated with the processing rate increase would be incompatible with the existing NTSF and STSF.

An IWL is proposed to be developed to facilitate emplacement of both tailings and waste rock as part of the Modification.

The tailings could alternatively be accommodated in a new TSF located outside of ML 1535. However, the IWL was selected as it would contain tailings storage to within ML 1535, would result in improved factors of safety of IWL free standing embankments relative to TSF embankments and has a lower operational cost basis relative to new a TSF.

#### *Waste Rock Emplacement Areas*

No additional waste rock would be produced over of the life of the Modification. Waste rock would be emplaced at the IWL in addition to the existing waste rock emplacements.

A waste rock balance was conducted for the Modification and it was found that the volume of waste rock required for the IWL is offset by the volume of waste emplacement that is foregone from the portion of the northern waste rock emplacement that is displaced by IWL development. The outer embankment of the north-eastern portion of the IWL would be constructed to form an integrated landform with the adjacent northern waste rock emplacement.

#### *Ore Processing Schedule and Infrastructure*

The processing schedule includes an increase in the ore processing rate up to 9.8 Mtpa (Table 3-1). The Modification mine schedule has been developed such that no change to the existing ore processing or cyanide destruction methods would be required.

The upgrades to the existing ore processing infrastructure (i.e. secondary crushing circuit) are proposed to increase throughput of ore at the CGO process plant on an annual basis. The modified CGO would recover additional ounces of gold on an annual basis. Were the upgrades to the existing ore processing infrastructure not to be implemented, additional annual gold recovery and the associated additional annual royalties to the State of NSW would not be generated.

#### *External Water Supply*

As the Modification would involve a processing rate increase, the annual groundwater demand would similarly increase.

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).

HEC (2018) (Appendix B) considers the existing water supply sources would meet the water requirements for the Modification. Additional water from the Lachlan River largely supplies this additional demand for the Modification. As for the existing CGO, this additional demand would be met by purchasing temporary water available from the regulated Lachlan River trading market.

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.

The Modification includes duplication of the existing water supply pipeline from Bore 4 (on the eastern side of Lake Cowal) to the CGO. The new pipeline would be designed to supply all the external water for the CGO, with the existing pipeline to be retained to provide additional contingency capacity, be left on standby or decommissioned. Some minor alterations to the alignment of the pipeline were incorporated into the conceptual location to reduce biodiversity impacts, which is assessed in the Biodiversity Assessment Report and Biodiversity Offset Strategy (Appendix C).

#### *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 IWL and the waste rock emplacements would continue to migrate towards the final void.

Justification for the IWL, 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 IWL assists with this objective as it is lower in height than the approved TSFs and integrates with the northern waste rock emplacement. 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).

### Other Infrastructure

Construction of the IWL results in the displacement of several infrastructure features which are proposed to be relocated as part of the Modification (e.g. portions of the UCDS and ICDS, soil stockpiles, D10 contained water storage, explosives compound and explosives magazine).

Realignment of portions of the UCDS and ICDS is required as part of the Modification to maintain the design objectives of the existing water management system.

Relocation of soil stockpiles to the north of ML 1535 is required as part of the Modification as the IWL displaces a number of existing stockpiles.

Establishment of a new Mining Lease to accommodate these stockpiles is required, along with relocation of a portion of Lake Cowal Road and the TSR. Given the lack of available space on ML 1535, no viable alternative to MLA 1 was available for the Modification. Relocation of the soil stockpiles would allow soil to continue to be stored to provide rehabilitation media for the CGO.

The footprints for the relocated explosives compound and magazine have been adjusted to minimise clearance of woodland vegetation.

### 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 1.3 of the EP&A Act describes the objects of the EP&A Act as follows:

- (a) *to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources,*
- (b) *to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment,*
- (c) *to promote the orderly and economic use and development of land,*
- (d) *to promote the delivery and maintenance of affordable housing,*
- (e) *to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats,*

- (f) *to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),*
- (g) *to promote good design and amenity of the built environment,*
- (h) *to promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants,*
- (i) *to promote the sharing of the responsibility for environmental planning and assessment between different levels of government in the State*
- (j) *to provide increased opportunity for community 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);
- facilitates development of the State's mineral resources (i.e. gold resources) (Sections 2 and 3);
- includes measures to minimise potential amenity impacts associated with noise, blasting, air quality and visual impacts on surrounding land uses (Section 4);
- would support social and economic welfare of the community through ongoing stimulation of the regional economy;
- 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 threatened species and other species of native animals and plants 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;
- would allow for the orderly and economic use and development while maintaining existing land uses on Evolution-owned lands (e.g. grazing and conservation);
- would incorporate measures for the management of Aboriginal cultural heritage consistent with relevant Permits and Consents;
- 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);
- is a Controlled Action, therefore would involve regulation at Commonwealth Government level, if approved; and
- includes public involvement and participation through the EA consultation process (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.

## 7 CONSOLIDATED SUMMARY OF ENVIRONMENTAL MANAGEMENT AND MONITORING MEASURES

### **Groundwater**

Existing groundwater monitoring and management measures, as detailed in the WMP and the SWGMBMP would continue for the Modification.

The WMP and the SWGMBMP would be updated, as required, to incorporate the Modification and the recommendations made by Coffey (2018), including:

- Continued groundwater monitoring to validate the predictive modelling, particularly in the vicinity of the open pit, TSF/IWL and ML 1535 saline groundwater supply borefield (when in use).
- Continued monitoring of groundwater salinity in the Bland Creek Palaeochannel Borefield to assess potential saline migration.
- A final pit void water balance post-mine closure would be conducted to assess long-term water levels in the pit void and the potential impact on groundwater quality in the immediate vicinity of the pit void.
- Establishment of new monitoring bores and piezometres to replace those that would be displaced by the IWL.

The existing Groundwater Contingency Strategy (Section 4.1.1), as described in the WMP, would continue to be implemented to manage groundwater levels within the Bland Creek Palaeochannel. No additional groundwater licences are required.

It is anticipated that Evolution would also be required to seek a variation to EPL 11912.

### **Surface Water**

Existing surface water management measures and monitoring as detailed in the WMP, SWGMBMP and ESCMP would continue for the Modification. The WMP and SWGMBMP and ESCMP would be updated to reflect the Modification.

The UCDS and ICDS would be modified, as required, to accommodate the IWL.

Runoff from the soil stockpile area in MLA 1 would be directed to a currently approved sediment basin to be constructed at the eastern boundary of the stockpile area (Appendix B). The upslope stockpile diversions and the sediment basin would be constructed and maintained in accordance with the WMP and ESCP.

### **Geochemistry**

Waste rock geochemistry investigations (North Limited, 1998; Environmental Geochemistry International Pty Ltd, 2004; GEM, 2008; 2013; and 2016) have been conducted for the waste rock mined at the CGO, which have classified waste rock NAF. The results indicate:

- oxide waste rock will typically be saline but NAF; and
- primary waste rock will typically be non-saline and NAF, however sulphate salts will be generated if exposed to surficial weathering processes.

As the waste rock is typically NAF, no specific acid rock drainage management measures have been required at the CGO. However, due to the potential for saline seepage occurring from the waste rock emplacements, the waste rock emplacements have been constructed to direct any permeating waters towards the open pit (Section 2.4.2).

### **Biodiversity**

Potential impacts to flora and fauna are currently managed through implementation of measures included in the FFMP, TSMP, BOMP, RMP, CWMP, LMP and AQMP (Section 4.3.2). These measures would continue to be implemented and management plans would be updated where relevant.

Four land-based offset areas are proposed for the Modification, and provide a “like-for-like” offset outcome. The offset areas have a combined area of 486.5 ha. Ecosystem and species credits generated from the four proposed offset areas would meet (and exceed) the credit requirements of the Modification (Appendix C).

### **Rehabilitation**

A Rehabilitation and Landscape Management Strategy has been developed for the Modification (Section 5). The strategy details the overall rehabilitation philosophy, principles and objectives and describes the long-term land use strategy, the conceptual rehabilitation domains and final landform and revegetation concepts.

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 current rehabilitation management measures and 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.

The soil management measures described in the existing SSMP would continue to be implemented for the Modification. Details of soil stripping procedures and soil re-handling activities would continue to be provided in the MOP. In addition, erosion and sediment control systems detailed in the ESCMP would also continue to be implemented for the Modification.

### **Aboriginal Cultural Heritage Assessment**

A new AHIP (and/or a variation to existing Permits/Consents) would be sought as part of the Modification for the proposed MLA 1 area.

The approved IACHMP would be reviewed and revised as necessary to include the Modification and any recommendations made by Niche Environment and Heritage (2018), including:

- Salvage excavation of known oven sites to collect dating samples prior to disturbance (i.e. Lake Cowal 2017-057, Lake Cowal 2017-030, Lake Cowal 2017-012, Lake Cowal 2017-055 and Lake Cowal 2017-037).
- Salvage excavation of sites Lake Cowal 2017-023 (if required, otherwise avoidance) and Lake Cowal 2017-036, prior to any further disturbance.
- Surface collection of visible artefacts at known sites prior to any surface disturbance, if required, otherwise avoidance.
- Existing management measures currently employed at the CGO would continue to be implemented for the Modification.
- The background distribution of artefactual material would be managed in accordance with the requirements of Permits and Consents and the approved IACHMP.
- Items collected would be analysed consistent with current requirements and protocols.

- In the unlikely event that human skeletal remains are identified during the life of the CGO (incorporating the Modification), ground disturbance works in the vicinity of the human skeletal remains would cease immediately and the discovery immediately reported to the NSW Police. If it is suspected that the remains may be of Aboriginal origin then this would also be reported to the NSW Police. Evolution would then contact the OEH and representatives of the Aboriginal community. Work would not recommence in the location of the remains unless authorised in writing by the OEH.
- Evolution would continue to allow access to the Temporary Keeping Place for all RAPs, consistent with the protocols in the currently approved IACMP.
- Evolution would continue to involve the RAPs in relevant matters regarding the Modification.

Measures to avoid and minimise potential additional impacts to Aboriginal heritage are described in Section 4.4.2.

The mitigation and management measures for potential residual impacts have been developed in consultation with the RAPs. The consultation process with RAPs is described in Section 4.4.1 and Appendix D.

### **Noise**

The existing mitigation, management and monitoring measures described in the NMP would continue to be implemented for the Modification.

The NMP would be reviewed and revised to incorporate the Modification. This would include additional provisions in accordance with the Voluntary Land Acquisition and Mitigation Policy and provisions to consult with nearby landowners prior to construction of the pipeline duplication and Lake Cowal Road realignment.

It is anticipated that Evolution would also be required to seek a variation to EPL 11912.

### **Blasting**

Blast monitoring and management would continue in accordance with the currently approved BLMP.

The typical blast design details and the average blasting frequency for the existing CGO operations would remain unchanged for the Modification (Section 3.3), and the location of blasts would not change relative to privately-owned receivers.

### **Air Quality**

The existing mitigation, management and monitoring measures described in the AQMP would continue to be implemented for the Modification. In addition, additional haul road watering would be undertaken during construction of the IWL.

The AQMP would be revised as necessary for the Modification. This may include review and rationalising the number and/or location of dust deposition gauges in consultation with the EPA and DP&E.

### **Visual Amenity**

Mitigation and management measures described in the LMP would continue to be implemented for the Modification. In addition, progressive rehabilitation would continue for the Modification.

### **Road Transport**

The Road Transport Assessment has examined the likely road transport implications of the Modification. It concluded that the Modification can be satisfactorily accommodated by the existing road network, with acceptable impacts on the capacity, condition, safety and efficiency of the road network, subject to some minor road treatments (Table 4-20), including:

- signage;
- guide posts; and
- localised pavement upgrades and surface sealings.

A Traffic Management Plan would be prepared and implemented in consultation with the relevant Councils and the RMS to manage the movement of trucks transporting gravel from the CGO during haulage campaigns.

A Construction Traffic Management Plan would also be prepared and implemented to manage the vehicles associated with the pipeline and Lake Cowal Road realignment construction.

### **Socio-Economics**

Consistent with the existing CGO Development Consent (DA 14/98), prior to closure of the CGO, Evolution would work with local shire councils and the community to prepare a workforce phase-out plan to minimise potential impacts associated with CGO employment cessation.

### **Public Safety**

The Modification would not change the potential impact mechanisms to the 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 or FHA.

### **Greenhouse Gas Emissions**

Evolution would continue to calculate and report annual greenhouse gas emissions and energy consumption from the CGO in accordance with its existing requirements under the Commonwealth National Greenhouse and Energy Reporting System (Appendix F).

### **Historic Heritage**

No historic heritage items would be potentially impacted by the Modification.