



COWAL

SECTION 3 DESCRIPTION OF THE MODIFICATION

COWAL GOLD MINE EXTENSION MODIFICATION

TABLE OF CONTENTS

3	DESCRIPTION OF THE MODIFICATION	3-1	LIST OF FIGURES	
3.1	MINING TENEMENT	3-3	Figure 3-1	Modification Layout
3.2	ORE DEPOSIT DESCRIPTION AND LIFE OF MINE	3-3	Figure 3-2	Conceptual General Arrangement – Year 11 (2015)
3.3	MINING OPERATIONS	3-3	Figure 3-3	Conceptual General Arrangement – Year 16 (2020)
3.4	MINE WASTE ROCK MANAGEMENT	3-8	Figure 3-4	Conceptual General Arrangement – Post-Mining
3.5	ORE PROCESSING	3-10	Figure 3-5	Conceptual Embankment Section of Modified Northern Waste Rock Emplacement
3.6	TAILINGS MANAGEMENT	3-10	Figure 3-6	Conceptual Embankment Section of Modified Northern Tailings Storage Facility
3.7	SITE WATER MANAGEMENT INFRASTRUCTURE	3-12	Figure 3-7	Eastern Pump Station
3.8	WATER SUPPLY	3-13	Figure 3-8	Modified Water Management System
3.8.1	Site Water Supply Requirements	3-14		
3.8.2	Additional Water Supply Infrastructure	3-14		
3.8.3	Revised Site Water Balance	3-16		
3.8.4	Water Supply Sources	3-16		
3.9	VEGETATION CLEARANCE, SOIL STRIPPING AND SOIL MANAGEMENT	3-18		
3.10	INFRASTRUCTURE AND SERVICES	3-19		
3.11	MANAGEMENT OF CHEMICALS AND WASTES	3-20		
3.12	WORKFORCE AND OPERATING HOURS	3-20		
3.13	CONSTRUCTION ACTIVITIES	3-20		

LIST OF TABLES

Table 3-1	Indicative Mining and Ore Processing Schedule
Table 3-2	Contained Water Storages
Table 3-3	Simulated Water Balance of the Life of the CGM incorporating the Modification

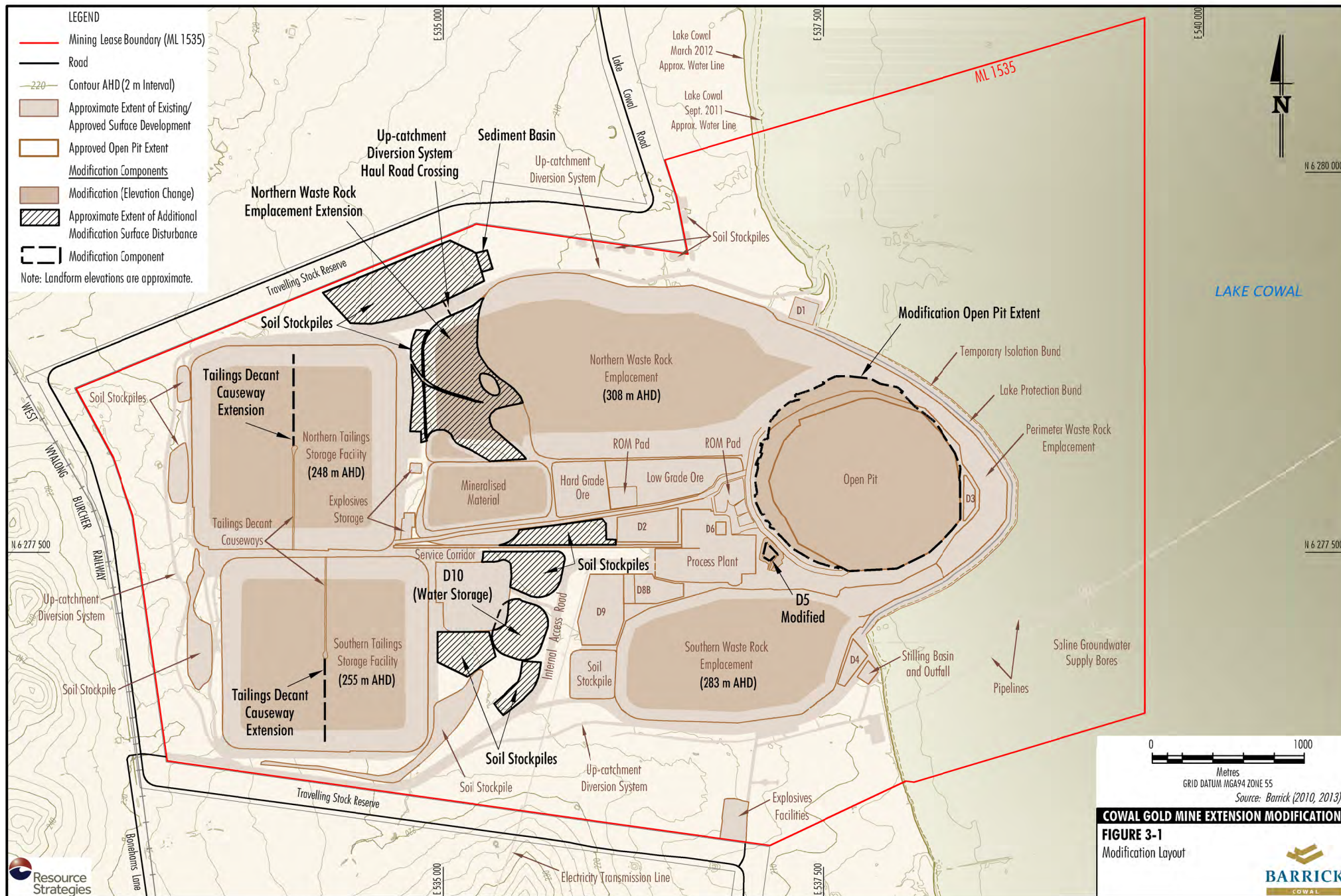
3 DESCRIPTION OF THE MODIFICATION

The Modification would involve the continued development of open pit mining operations at the CGM for an additional 5 years (i.e. until 2024).

In general, the Modification would not change the functionality of the currently approved CGM, as it would involve the continued use of the existing open pit, waste rock emplacements, tailings storage facilities and ore processing facilities within ML 1535, with some alterations where necessary to enable the increased gold production (i.e. extension to the existing open pit and existing northern waste rock emplacement) (Figure 3-1).

In comparison to the approved CGM, the Modification would involve:

- extension of the operational life of the CGM by an additional 5 years (i.e. until 2024);
- no change to ML 1535, and no requirement for additional mining lease tenement applications;
- continued development of open pit mining operations at the CGM, including expansion of the extent and depth of the existing open pit (Figure 3-1);
- an increase in the total quantities of waste rock, ore and tailings produced over the life of the mine;
- continued use of the existing mine fleet;
- an increase in total gold production to approximately 3.8 Moz;
- no change to the existing process plant or its currently installed capacity to continue ore processing at a rate up to 7.5 Mtpa;
- continued and expanded development of the existing northern and southern waste rock emplacements within ML 1535 for placement of mined waste rock over the life of the CGM, including (Figure 3-1):
 - raising the maximum design height of the northern waste rock emplacement to approximately 308 m AHD;
 - raising the maximum design height of the southern waste rock emplacement to approximately 283 m AHD; and
 - extension of the northern waste rock emplacement to the west with an additional disturbance footprint of approximately 39 ha;
- no change to the existing surface development extent of the CGM within Lake Cowal;
- continued and expanded development of soil stockpiles, the relocation of existing soil stockpiles and stockpiling of mineralised material (i.e. potentially commercial ore) within ML 1535 (Figure 3-1);
- an increase in the total disturbance area of approximately 122 ha (i.e. in addition to the currently approved disturbance area of 1,095 ha);
- continued use of the existing tailings storage facilities for the deposition of tailings produced over the life of the CGM, including raising the maximum design height of (Figure 3-1):
 - the northern tailings storage facility to approximately 248 m AHD; and
 - the southern tailings storage facility to approximately 255 m AHD;
- no change to the existing footprint of the tailings storage facilities;
- no change to the use of cyanide destruction in tailings prior to deposition in tailings storage facilities, with no change to the approved cyanide concentration limits in the aqueous component of the tailings slurry stream specified in the CGM Development Consent (DA 14/98);
- no change to the design objectives of the existing CGM water management system (i.e. UCDS, ICDS and lake isolation system);
- additional internal surface water management infrastructure, including (Figure 3-1):
 - modifications to the existing contained water storage D5 to maintain the storage capacity of the existing D5; and
 - construction of a new water supply storage (D10);
- additional sediment control system and associated dam for the topsoil stockpile located in the north of ML 1535;
- no change to the operation of the existing saline groundwater supply bores within ML 1535 during suitable lake conditions;
- no change to the use of other currently approved external water supply sources (e.g. Bland Creek Palaeochannel Borefield, eastern saline borefield and Lachlan River water entitlements via the Jemalong Irrigation Channel);



- no change to approved daily and annual extraction limits for the Bland Creek Palaeochannel Borefield;
- construction of a new pump station on the eastern side of Lake Cowal (Figure 1-2) to improve the capacity/flow of the existing mine water supply pipeline, and associated diesel generator and access track;
- no change to existing ETL supplying electricity to the mine site;
- no change to the approved operating hours (i.e. 24 hours per day, seven days per week) of the CGM;
- no change to the existing peak CGM workforce numbers;
- an additional 5 years of workforce employment for up to approximately 385 personnel;
- no change to existing deliveries and consumables;
- no change to the current storage and handling of hazardous materials;
- no change to other supporting infrastructure and services;
- no change to approved exploration activities;
- the treatment of some soil (e.g. with gypsum) in a dedicated stockpile to improve its characteristics as a plant growth medium prior to use in progressive rehabilitation; and
- a revised rehabilitation cover system to reflect the findings of ongoing rehabilitation trials at the CGM (Section 5).

The sub-sections below describe the Modification in further detail. Where relevant, a description of additional measures incorporated into the Modification layout and operations, which have been designed to minimise potential environmental impacts, is also provided below.

Changes to the approved CGM layout as a result of the Modification are shown on Figures 1-3 and 3-1. Conceptual general arrangements of the Modification for Years 11 (2015), 16 (2020) and post-mining are shown on Figures 3-2 to 3-4.

3.1 MINING TENEMENT

Mining operations for the CGM are conducted within ML 1535.

No change to ML 1535 and no additional mining tenements would be required for the Modification.

3.2 ORE DEPOSIT DESCRIPTION AND LIFE OF MINE

The Modification would involve continued development of the existing open pit to access additional gold-bearing ore within the E42 ore deposit.

The Modification would extend the life of the CGM to approximately 20 years. Mining within the open pit would occur up to Year 17 of the Modification and ore processing would be undertaken up to Year 20.

An indicative mining schedule for the CGM incorporating the Modification is provided in Table 3-1.

3.3 MINING OPERATIONS

Mining Method and Schedule

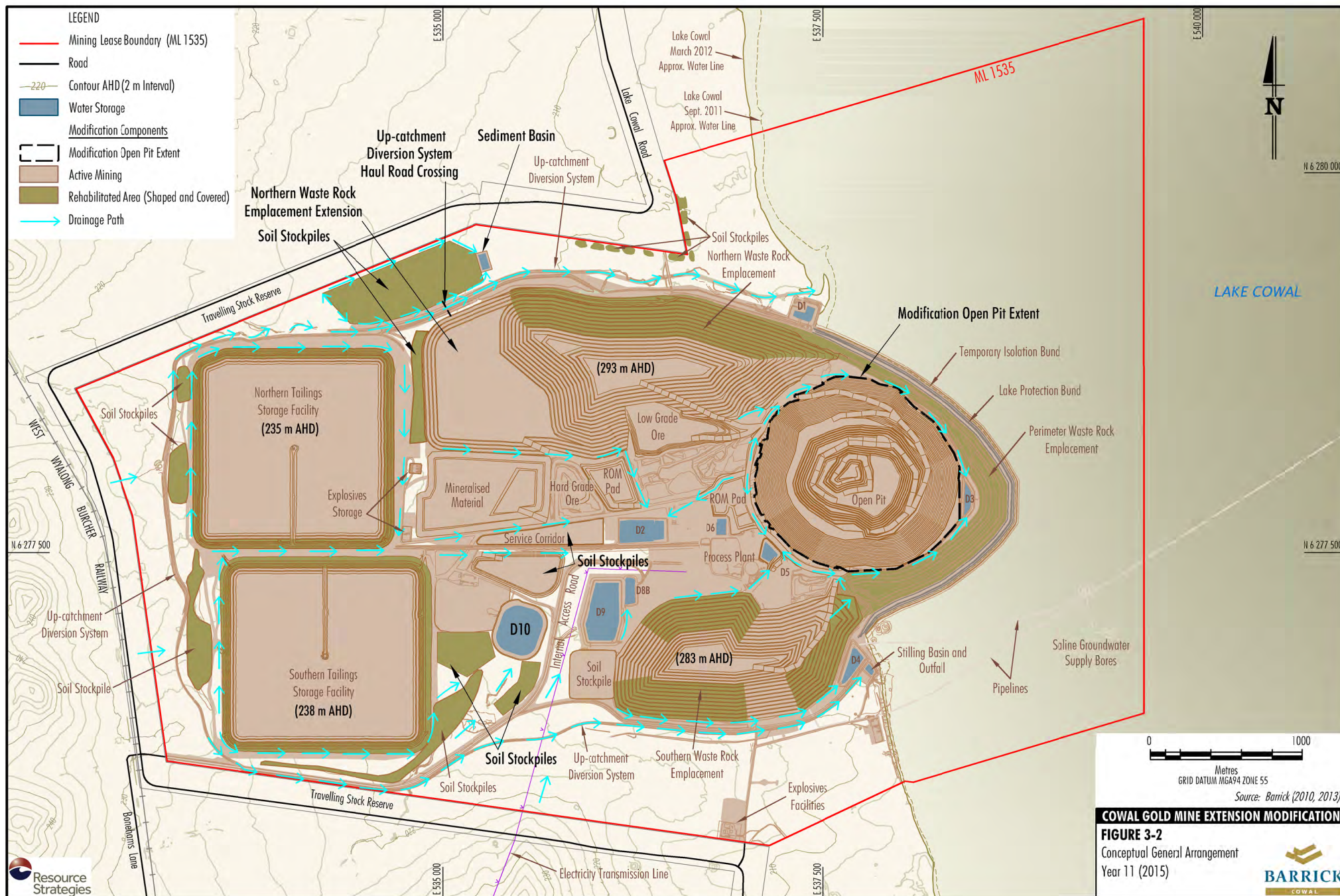
The Modification would involve the continuation of existing CGM open cut mining methods (Section 2.3). Mining operations would continue to be conducted 24 hours per day, seven days per week, with tailings lift construction limited to daytime hours only (i.e. 7.00 am to 6.00 pm).

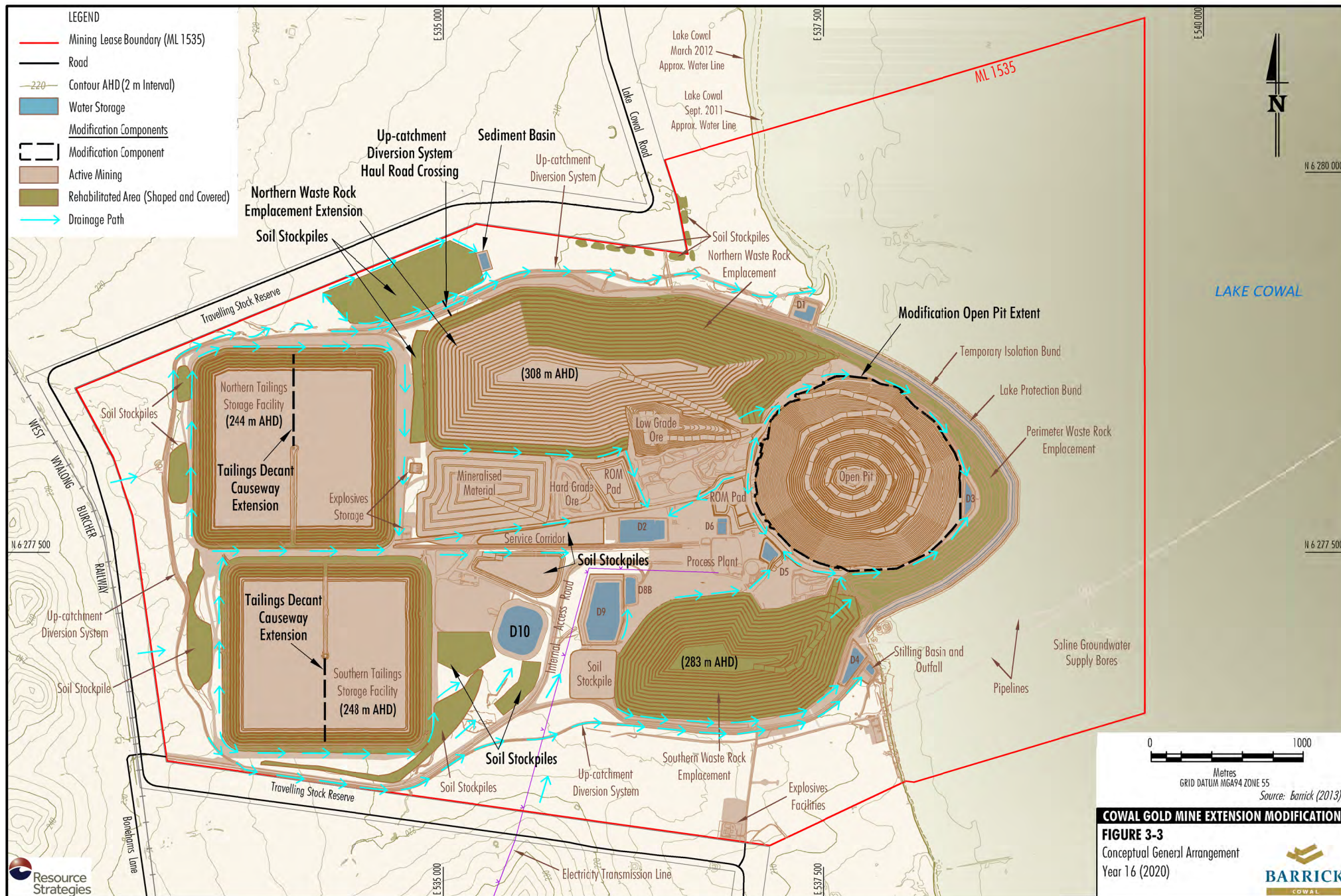
Open Pit Design

The existing/approved open pit would be deepened and widened to the west within existing disturbance areas (Figure 3-1).

The extension of the open pit has been designed to maximise ore recovery, while maintaining appropriate offset distances to the existing lake isolation system and processing facilities.

As such, the extended open pit would not change the existing isolation system that currently separates the open pit from Lake Cowal (comprising the temporary isolation bund, lake protection bund and perimeter waste rock emplacement).





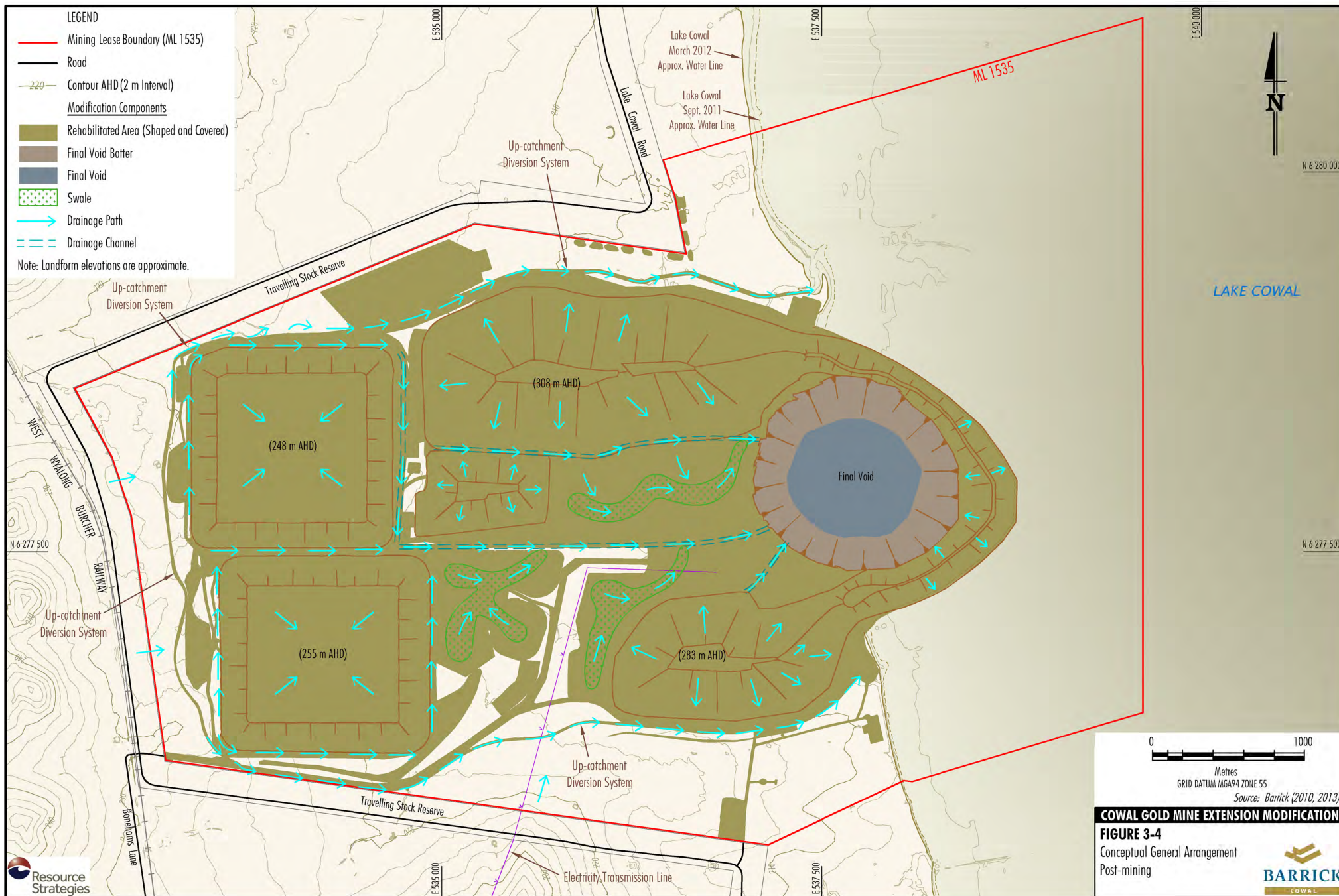


Table 3-1
Indicative Mining and Ore Processing Schedule

	Year	CGM Year	Waste Rock Mined (Mt)	Ore Mined (Mt)			Ore Processed ^{1,2} (Mt)		
				Oxide	Primary	Total	Oxide	Primary	Total
Existing CGM	2005 to 2013	1 to 9	203.1	16.5	52.9	69.4	8.0	44.4	52.4
CGM Incorporating the Modification	2014	10	22.4	-	8.0	8.0	-	7.2	7.2
	2015	11	26.9	-	6.8	6.8	1.8	5.5	7.3
	2016	12	18.8	-	6.8	6.8	1.8	5.6	7.4
	2017	13	11.8	-	8.9	8.9	-	7.4	7.4
	2018	14	9.2	-	9.8	9.8	-	7.4	7.4
	2019	15	2.1	-	11.2	11.2	-	7.4	7.4
	2020	16	1.8	-	5.9	5.9	0.9	6.5	7.4
	2021	17	0.2	-	1.4	1.4	4.0	3.5	7.5
	2022	18	-	-	-	-	-	7.4	7.4
	2023	19	-	-	-	-	-	7.3	7.3
	2024	20	-	-	-	-	-	2.1	2.1
	Sub-Total		93.2	-	-	58.8	8.5	67.3	75.8
Total			296.3	16.5	111.7	128.2	16.5	111.7	128.2

¹ The maximum annual ore processed would be 7.5 Mtpa.

² The sequence and quantities of processing primary and oxide ores may change over the life of the mine, subject to detailed mine planning requirements.

The Modification would increase the surface area of the open pit to approximately 131 ha, and at the end of mining the open pit would have a maximum depth at approximately -263 m AHD (i.e. approximately 470 m below the natural surface level).

Based on findings of geotechnical investigations, and consistent with existing operations, the pit slope design criteria of the extended open pit have been developed in consideration of maintaining factors of safety appropriate for operating conditions and the long-term stability of the lake isolation system. The geotechnical modelling and analysis undertaken to determine suitable pit slope design criteria considered historical slope performance, and geotechnical data gained over previous and current studies for the existing open pit for both surficial (soil/highly weathered rock) and hard rock material.

Single benches would be used for the oxide rock, with berms approximately 9 to 13 m in width, batter angles at 45 degrees (°) and with an inter-ramp angle of 23 to 36° (variable according to open pit sector).

Primary rock would be mined in multiple benches, with berms up to 13 m in width, batter angles between 60 to 75° and with an inter-ramp angle of 40 to 60° (variable according to open pit sector).

The berm widths and slope angles would continue to be reviewed and monitored through ongoing geotechnical studies and data collection during mine development. The design configuration for the modified open pit would be detailed in a revised MOP which would be prepared in consultation with and subject to approval by the DRE.

The LPBMP would be revised to include a description of the Modification open pit design and monitoring (i.e. survey assessment) requirements.

Mobile Mine Equipment Fleet

The existing mobile mine equipment fleet used at the CGM (Section 2.3.3) would generally remain unchanged for the Modification.

Following Year 13 (2017), the mobile mine equipment fleet required would decrease proportionally with the decrease in the total waste and ore mined (Table 3-1).

Blasting

The typical blast design details and the average blasting frequency (i.e. generally limited to one blast event per day) for the existing operations (Section 2.3.4) would remain unchanged for the Modification. The typical blast design details for the Modification are provided in Appendix E.

3.4 MINE WASTE ROCK MANAGEMENT

Mine Waste Rock Schedule

Approximately 93 Mt of waste rock (i.e. a total of approximately 296 Mt of waste rock) would be mined during the life of the CGM incorporating the Modification (Table 3-1).

The maximum quantity of waste rock mined in any one year would be approximately 26.9 Mt (Table 3-1). As such, the Modification would not increase the maximum quantity of annual waste rock mined compared to the approved CGM.

Following Year 11 (2015), annual waste rock quantities would progressively decrease as the ore-to-waste ratio improves.

Consistent with existing operations, mineralised material would be separately stockpiled adjacent to the northern waste rock emplacement (Figure 3-1) and processed in the future, subject to market conditions. If appropriate market conditions do not prevail, the mineralised material would remain part of the final northern waste rock emplacement landform (Figure 3-4; Section 5).

Mine Waste Rock Geochemistry

An assessment of the acid-generating potential and metal-leaching behaviour of mine waste rock associated with the development of the CGM incorporating the Modification has been undertaken (Appendix C).

The waste rock produced from the CGM incorporating the Modification would have similar geochemical characteristics to waste rock from the approved CGM (Appendix C). On this basis, existing mine waste rock management strategies would continue to be implemented for the Modification.

Mine waste rock material suitable for use as a cover system for the waste rock emplacements (i.e. prior to rehabilitation) would also be segregated for use as described in Appendix I.

Waste Rock Emplacement Construction

The additional waste rock produced from the expansion of the open pit would be emplaced at the northern and southern waste rock emplacements, which would be expanded for the Modification.

The design configurations for the expanded northern and southern waste rock emplacements would be detailed in a revised MOP which would be prepared in consultation with and subject to approval by the DRE.

Northern Waste Rock Emplacement

The northern waste rock emplacement is constrained to the north by the northern UCDS diversion, to the south by existing processing infrastructure and to the east by the location of the open pit.

In consideration of these constraints, the northern waste rock emplacement would be expanded to the west and its elevation would be increased to accommodate additional waste rock produced during the life of the CGM incorporating the Modification (Figure 3-1).

The expanded northern waste rock emplacement has also been designed to remain entirely to the south of the existing northern up-catchment diversion drainage channel (i.e. the northern waste rock emplacement would remain entirely within the current ICDS).

The final height of the northern waste rock emplacements would increase to approximately 308 m AHD.

The western extension of the northern waste rock emplacement (Figures 3-2 and 3-3) would increase the footprint of the northern waste rock emplacement by approximately 39 ha.

The low permeability basal layer of the existing northern waste rock emplacement (Section 2.4) would be extended for the western extension area, such that any waters permeating through the expanded emplacement are intercepted by this layer and preferentially flow towards the open pit.

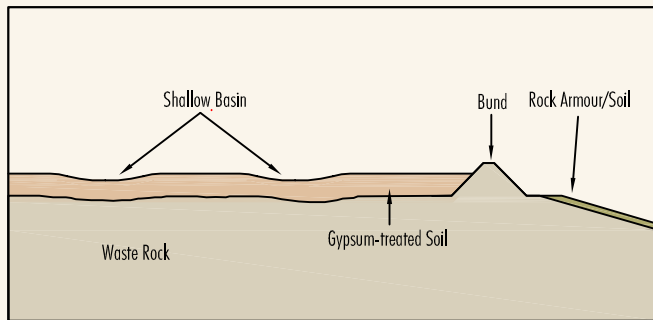
Consistent with the existing design (Section 2.4), the outer batters of the expanded northern waste rock emplacement would be designed to have a final profile with an overall 1(V):5(H) slope.

A conceptual cross-section of the modified northern waste rock emplacement is shown on Figure 3-5.

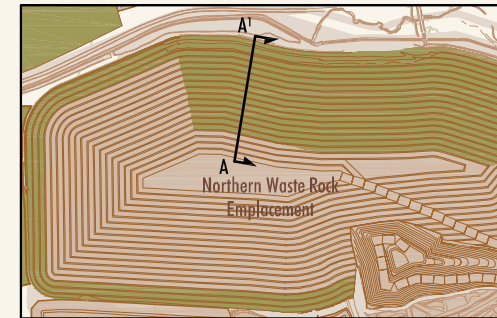
Southern Waste Rock Emplacement

The existing southern waste rock emplacement (Section 2.4) is constrained on all sides by existing infrastructure (including the southern up-catchment diversion drainage channel), the open pit and Lake Cowal.

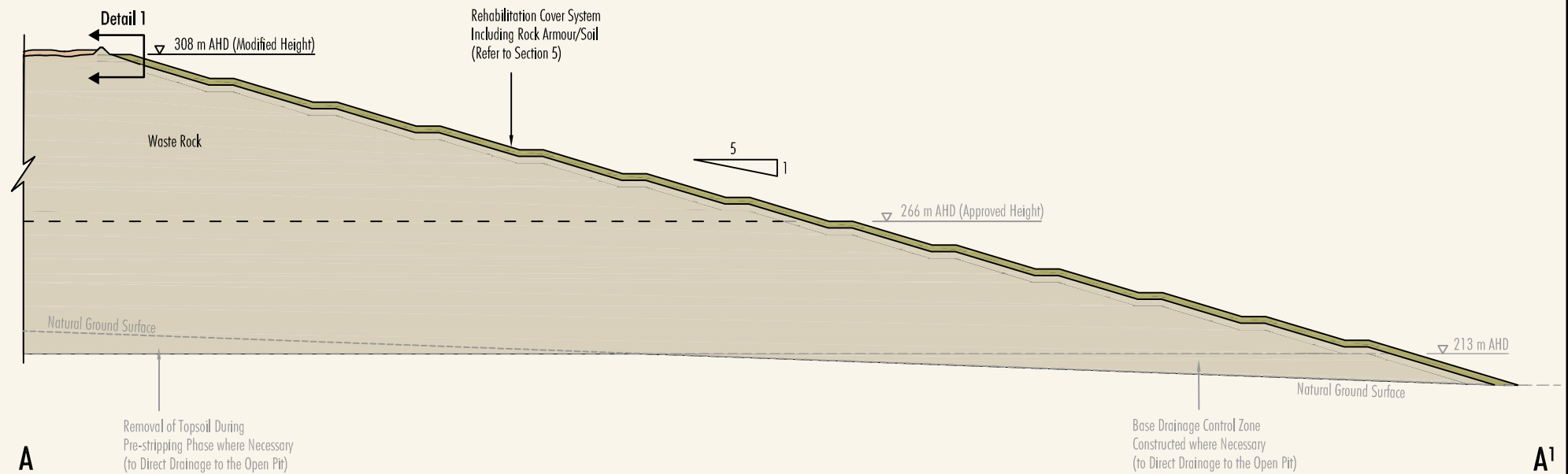
Therefore, there would be no change to the existing footprint of the southern waste rock emplacement for the Modification (Figure 3-1).



DETAIL 1



INSET
Refer to Figure 3-3



Not to Scale

COWAL GOLD MINE EXTENSION MODIFICATION

FIGURE 3-5
Conceptual Embankment Section
of Modified Northern Waste Rock
Emplacement

The final height of the southern waste rock emplacement would increase to approximately 283 m AHD to accommodate additional waste rock produced for the Modification. It is expected that the development of the southern waste rock emplacement would be completed in approximately Year 11 of the CGM incorporating the Modification (Figure 3-2).

Consistent with the existing design (Section 2.4), the outer batters of the southern waste rock emplacement would be designed to have a final profile with an overall 1(V):5(H) slope.

Perimeter Waste Rock Emplacement

No additional waste rock would be emplaced at the perimeter waste rock emplacement for the Modification.

As the open pit is extended to the north, it would encroach upon the existing perimeter waste rock emplacement.

To maintain geotechnical factors of safety appropriate for the long-term stability of the perimeter waste rock emplacement, a small section of the perimeter waste rock emplacement would be mined out, with this mined out material emplaced at the northern waste rock emplacement.

3.5 ORE PROCESSING

Ore Processing Rate and Methods

The approved ore processing rate of up to 7.5 Mtpa and the existing ore processing methods used at the CGM (Section 2.5) would not change for the Modification.

As such, for the Modification there would be:

- No change to the use of cyanide for ore processing (Section 2.5.1), and cyanide would continue to be used in accordance with the existing Cyanide Management Plan.
- No change to the existing cyanide destruction methods currently used at the CGM (i.e. either Caro's Acid or the INCO process) (Section 2.5.2).
- No change to the approved CN_{WAD} concentration limits of the aqueous component of the tailings slurry stream, which have not been exceeded during the operation of the existing CGM (Section 2.5.2).

Ore Processing Schedule

Oxide ore would be processed in two separate campaigns over the life of the CGM incorporating the Modification (i.e. during Years 11 and 12 and Years 16 and 17). The majority of oxide ore would be processed during Year 17 of the CGM incorporating the Modification. The sequence of processing primary and oxide ore however may change over the life of the CGM incorporating the Modification, subject to detailed scheduling of mining and processing requirements.

Any changes to the ore processing schedule would be detailed in a revised MOP which would be prepared in consultation with and subject to approval by the DRE.

3.6 TAILINGS MANAGEMENT

Geochemical Characteristics of Tailings

It is expected that the tailings generated from the Modification would have similar geochemical characteristics to those from the approved CGM tailings geochemistry (Appendix C). As such, existing tailings management strategies would continue for the Modification (Appendix C).

Tailings Storage Facilities

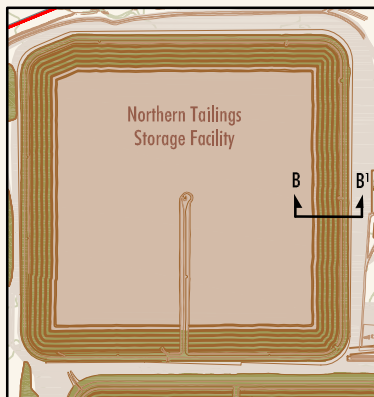
The existing northern and southern tailings storage facilities (Section 2.6) would continue to be used to store the additional tailings produced during the life of the CGM incorporating the Modification.

There would be no change to the existing footprint of either the northern or southern tailings storage facilities due to the Modification.

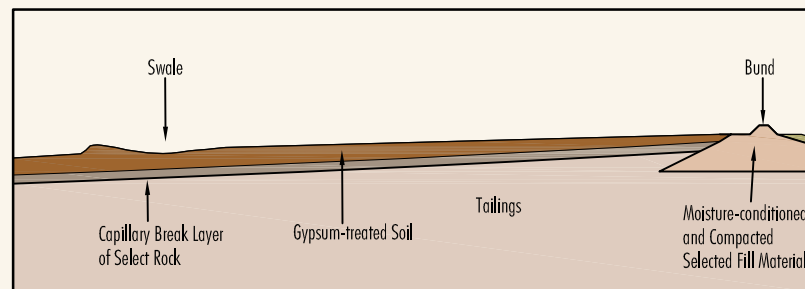
The approximate final heights of the northern and southern tailings storage facilities for the Modification would increase to 248 m AHD and 255 m AHD, respectively, to accommodate the additional tailings.

A conceptual cross-section of the modified northern tailings storage facility is shown on Figure 3-6.

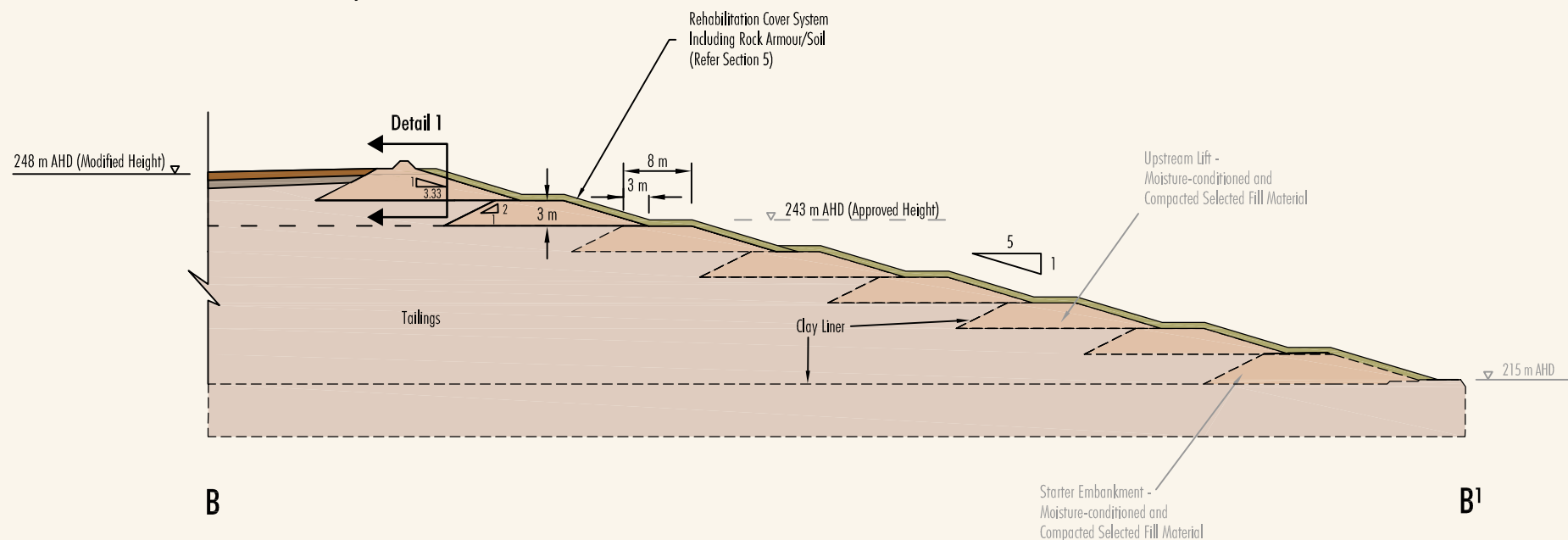
As the tailings storage facilities are filled, the embankments would continue to be raised in a series of upstream lifts (Figure 3-6). The additional upstream lifts would use the same construction materials and follow the same lift construction methodology as the existing CGM (Section 2.6), with an overall slope of 1(V):5(H) maintained for tailings storage facility embankments.



INSET
Refer to Figure 3-3



DETAIL 1



Not to Scale

COWAL GOLD MINE EXTENSION MODIFICATION

FIGURE 3-6

Conceptual Embankment Section
of Modified Northern Tailings
Storage Facility



Consistent with existing operations, the tailings storage facilities would be progressively raised during Years 10 to 20 (i.e. over the life of the Modification) at a rate of not more than approximately 5 m per year.

As the heights of the tailings storage facilities increases, and the effective area for tailings deposition decreases, the effective rate of rise of the tailings beaches would increase.

To increase the area available for tailings deposition, the top surfaces of the tailings storage facilities would be subdivided into two cells by extending the existing decant causeways (Figure 2-1) to the opposite sides of the storages. This would allow simultaneous deposition of tailings into three of the four resulting cells at any one time, while the remaining cell is being lifted/raised (i.e. upstream lift).

The design configuration for the tailings storage facilities would continue to be detailed in a revised MOP which would be prepared in consultation with and subject to approval by the DRE. The design, construction, operation and monitoring of the tailings storage facilities would continue to be conducted in consultation with and to the satisfaction of the NSW Dams Safety Committee.

Tailings Storage Facility Water Management

No changes to the existing tailings storage facility water management processes (Section 2.6) would be required for the Modification.

Tailings storage facility water management would continue to involve maximising water re-use through the under-drainage pipe network, decant towers and water return pipeline to the contained water storage (D6).

The low permeability basement layer constructed for the existing tailings storage facilities and other existing seepage control measures (Section 2.6) would continue to control seepage from the tailings storage facilities for the life of the CGM incorporating the Modification.

Given this, no changes to seepage flows are expected for the Modification (i.e. the open pit would continue to act as a sink for seepage flows from the tailings storage facilities) (Appendix A).

As for the approved CGM tailings storage facilities, the modified tailings storage facilities would provide for sufficient freeboard to store water from a 1 in 1,000 year ARI rainfall event.

3.7 SITE WATER MANAGEMENT INFRASTRUCTURE

There would be no change to the design objectives of the existing surface water management system (Section 2.7). That is:

- the UCDS would continue to divert up-catchment runoff around the CGM;
- the ICDS would continue to control runoff from active mining areas; and
- the lake isolation system would continue to separate Lake Cowal from the CGM.

Changes to the water management infrastructure required to maintain the design objectives of the existing water management system for the Modification are described below.

Up-catchment Diversion System

There would be no change to the existing location or function of the up-catchment diversion drainage channels that form the UCDS (Section 2.7.2) due to the Modification.

Notwithstanding, a haul road crossing across the northern up-catchment diversion drainage channel would be required for the transportation of soil to the proposed soil stockpile located in the north of ML 1535. The haul road crossing would be designed such that it would not constrict flows in the diversion drainage channel (e.g. through an appropriate sized culvert) during flow conditions (Appendix B).

Internal Catchment Drainage System

The Modification would involve the following changes to the current ICDS:

- redesign of existing contained water storage D5 to maintain its existing storage capacity due to the relocation of the perimeter haul road required to accommodate the extended open pit; and
- changes to collection drains around the modified soil stockpiles and waste rock emplacements.

The Modification would also involve the construction of process water supply dam D10, which would be used to provide storage of raw water for use in the processing facilities (Section 3.8).

A summary of the function and characteristics of the contained storages is provided in Table 3-2.

**Table 3-2
Contained Water Storages**

Storage Number	Catchment/Function	Approximate Storage Capacity (ML)
D1 (Existing)	Runoff from northern perimeter of the northern waste rock emplacement. Collected water is pumped to D6.	57
D2 (Existing)	Runoff/seepage from ROM and low grade stockpile areas from the northern waste rock emplacement area, the batters of the northern tailings storage facility and other areas within the ICDS. Collected water is pumped to D6 or D9.	195
D3 (Existing)	Runoff from perimeter catchment surrounding the open pit and the perimeter waste rock emplacement areas. Collected water is pumped to D6.	39
D4 (Existing)	Runoff from the southern perimeter of the southern waste rock emplacement. Collected water is pumped to D6 or D9.	69
D5 (As modified for the Modification)	Process plant area drainage collection. Water is pumped to D6.	92
D6 (Existing)	Process water supply storage. Main source of process plant make-up water requirements.	10
D8B (Existing)	Runoff from southern waste rock emplacement, the batters of the southern tailings storage facility and other areas within the ICDS. Water is pumped to D9.	43
D9 (Existing)	Process water supply storage. Storage for raw water. Water is pumped to D6. Some water used for tailings storage facilities lift construction.	726
D10 (Additional storage for the Modification)	Process water supply storage. Storage for raw water. Water is pumped to D9.	1,500

Source: After Appendix B.

Integrated Erosion, Sediment and Salinity Control System

The Modification would result in the relocation of some existing sediment and erosion control structures to accommodate the increase in the area of the northern waste rock emplacement.

An additional sediment dam would be constructed for the Modification to manage surface water runoff from the additional topsoil stockpile area located in the north of ML 1535 (Figure 3-1). Design characteristics for the additional sediment dam are provided in Appendix B.

Lake Isolation System

The extended open pit for the Modification has been designed such that there would be no change to the existing isolation system that currently separates the open pit from Lake Cowal (comprising the temporary isolation bund, lake protection bund and perimeter waste rock emplacement) (Section 3.3). Therefore, there would be no change to the existing surface development extent of the CGM within Lake Cowal (Figure 3-1).

Open Pit Dewatering

The Modification would not change the approved CGM pit dewatering methods.

Existing dewatering bores would be decommissioned and replaced in consultation with the NOW, as required, as the extended open pit extends beyond the ring of currently installed dewatering bores.

3.8 WATER SUPPLY

The Modification would not change existing annual water supply requirements, or sources of internal and external water supply for the approved CGM (Section 2.8).

Some additional water supply infrastructure would be required for the Modification (i.e. D10 dam and eastern booster pump) to improve the CGM's water security while maintaining the approved annual and daily extraction limits of the existing external water supply sources.

Given there would be no increase in the ore processing rate for the Modification, annual water demand would not materially change in comparison to the existing operations. However, as the Modification would involve the continuation of operations at the CGM for an additional 5 years, total life-of-mine water demand would increase.

3.8.1 Site Water Supply Requirements

Water supply for the Modification would continue to be required for ore processing in the process plant, as well as dust suppression (e.g. haul roads) and other potable and non-potable uses. Supply sources are described in Section 3.8.4.

Consistent with existing operations, the total water supply requirement for the process plant is estimated to be approximately 0.9 kL/t for primary ore processing and 1.7 kL/t for oxide ore processing (Section 2.8).

3.8.2 Additional Water Supply Infrastructure

Eastern Pump Station

To improve the capacity and flow of the existing water supply pipeline to the CGM prior to the first oxide ore processing campaign in Years 11 and 12, a booster pump would be constructed on the eastern side of Lake Cowal (i.e. the eastern pump station).

The eastern pump station would be located within a privately-owned cultivated paddock, subject to agreement with the landowner (Figure 3-7).

The location of the eastern pump station is constrained by the location of the existing water supply pipeline. For operational reasons (i.e. minimising the additional water pressure required to be delivered by the booster pump), the eastern pump station would be located as close to eastern side of Lake Cowal as possible. Notwithstanding, the proposed location has been designed to avoid the lake foreshore itself, to minimise potential impacts to ecology and Aboriginal heritage.

The construction of the booster pump would return the capacity of the water supply pipeline to its design capacity of approximately 14 ML/annum.

A diesel generator would power the booster pump. Diesel would be stored in a 10,000 litre double-skinned storage tank. Diesel would be delivered by a licensed contractor. It is expected that a peak of one diesel delivery would be required per week.

The eastern pump station and associated diesel generator and storage tank would be constructed on a gravel and concrete pad (Figure 3-7), which would be raised above the surrounding cultivated paddock to avoid potential flooding impacts (Section 4.2).

An all-weather access track would be constructed within the privately-owned cultivated paddock in agreement with the landowner (Figure 3-7), and would run parallel to the alignment of the existing water supply pipeline to Lake Road located to the east.

Construction activities are expected to take approximately 3 months, and would be conducted during daylight hours (7.00 am to 6.00 pm) Monday to Friday, and 8.00 am to 1.00 pm Saturday.

D10 Process Water Storage

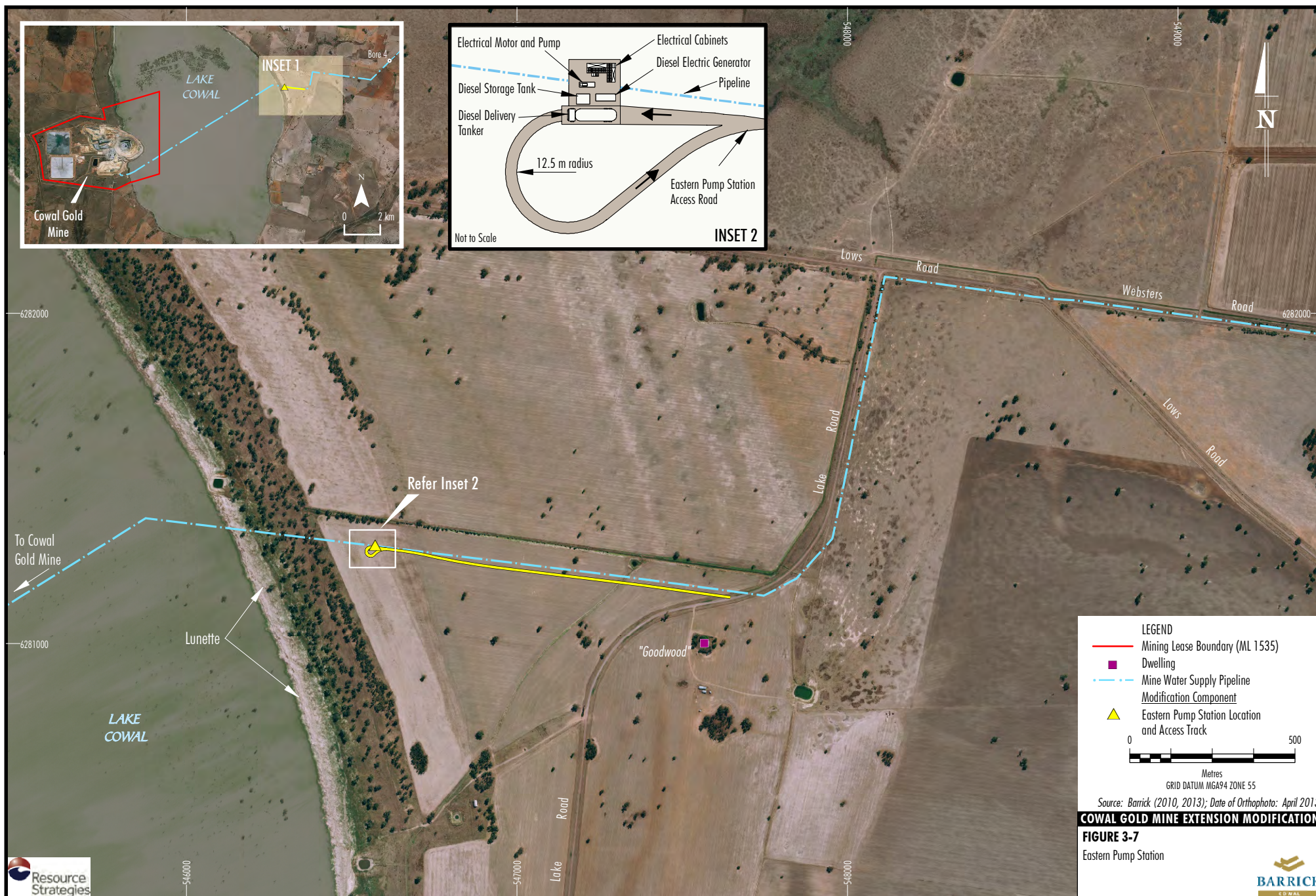
The D10 process water storage would be constructed to provide additional water supply security for the first oxide ore processing campaign in Years 11 and 12. D10 would be constructed at the commencement of the Modification and would be used as required for the life of the CGM incorporating the Modification.

D10 would have a storage capacity of approximately 1,500 ML (Table 3-2). Water would be supplied to D10 from external sources via the existing water supply pipeline during primary ore processing, which has lower water requirements compared to oxide ore processing (Section 3.8.1). Water from D10 would be pumped to D9 prior to use in the processing facilities.

The revised site water balance conducted for the Modification (Section 3.8.3) includes the water requirements associated with filling D10 (in addition to ongoing operational water requirements) prior to the first oxide ore processing campaign in consideration of licensed extraction limits of external water sources and operational constraints (e.g. capacity of the water supply pipeline).

The location of D10 (Figure 3-1) has been designed to avoid endangered ecological communities (EECs) mapped as occurring within ML 1535 (Appendix D), to minimise potential impacts to Aboriginal heritage, and to provide a minimum 50 m offset distance to the toe of the southern tailings storage facility so that the construction of D10 would not compromise the stability of the southern tailings storage facility.

D10 would be constructed as a burrow dam. The internal dam wall would have a 2.5(H):1(V) slope for the upper 10 m of the wall, and 2(H):1(V) to the floor of the dam. The external batters would have a slope of 4(H):1(V). Any excess clay excavated during the construction of the dam would be used for construction of the tailings storage facility lifts.



Existing mine fleet would be preferentially used for construction activities, and would operate in accordance with approved hours of operation.

3.8.3 Revised Site Water Balance

A revised site water balance has been conducted for the life of the CGM incorporating the Modification, and for post-mining, and is presented in Appendix B. A summary of the simulated water balance for the life of the CGM incorporating the Modification under various climatic scenarios is provided in Table 3-3.

It is expected that the majority of total water requirements for the CGM incorporating the Modification would continue to be supplied from internal water sources, with the remainder supplied from external water sources (Table 3-3).

3.8.4 Water Supply Sources

Consistent with existing operations, site water supply would continue to be preferentially supplied from internal and external water sources according to the following priority (Figure 3-8):

1. Tailings storage facility return water.
2. Open pit sump dewatering borefield.
3. Contained water storages.
4. External water sources (i.e. water supply priority from external water sources subject to water market conditions):
 - Saline groundwater supply bores within ML 1535.
 - Eastern saline borefield.
 - Bland Creek Palaeochannel Borefield.
 - Lachlan River licensed extraction.

Further detail regarding external water sources is provided below.

Table 3-3
Simulated Water Balance for the Life of the CGM Incorporating the Modification

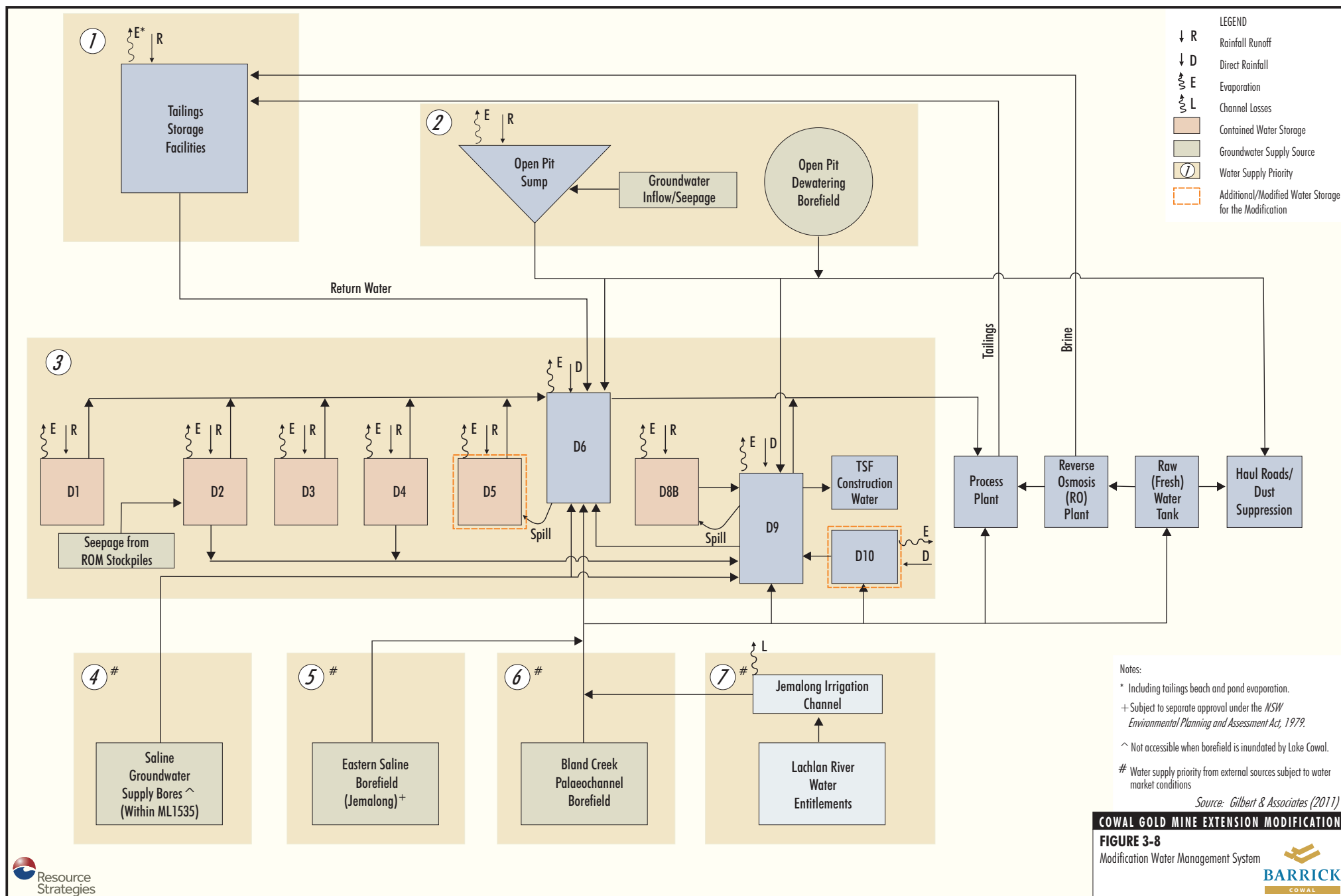
Expected Water Demand/Supply	10 th Percentile Rainfall Sequence (Dry)	Median Rainfall Sequence	90 th Percentile Rainfall Sequence (Wet)
	(ML/annum)		
Outflows			
Total Expected Water Requirements ¹	8,758	8,778	8,819
Inflows			
Internal Water Sources			
Catchment Runoff	962	1,334	1,438
Tailings water return	3,686	3,686	3,686
Open Pit Groundwater	190	190	190
Subtotal – Internal Water Sources	4,838	5,210	5,314
External Water Sources			
Saline Groundwater Supply Bores within ML 1535	161	148	133
Eastern Saline Bores	141	140	140
Bland Creek Palaeochannel Borefield	1,993	1,868	1,819
Lachlan River Licensed Extraction ²	1,773	1,588	1,567
Subtotal – External Water Sources	4,068	3,744	3,659
Total Expected Water Supply	8,908	8,955	8,974

Source: After Appendix B.

Note: Discrepancies in totals due to rounding.

¹ Includes water requirements/losses associated with ore process, evaporation, haul road dust suppression and tailings lift construction.

² Modelled volume of water actually reaching the CGM – excludes irrigation channel losses.



Saline Groundwater Supply

The existing saline groundwater supply bores within ML 1535 (Section 2.8.1) would continue to be used for the Modification (during suitable lake conditions) in accordance with existing licence conditions under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.

The revised site water balance for the Modification has considered the expected availability of the existing saline groundwater supply bores due to the inundation of Lake Cowal (Appendix B).

Eastern Saline Borefield

The operation of the existing eastern saline borefield (Section 2.8.2) would continue for the Modification in accordance with Development Consent (DA 2011/64) and relevant licence conditions.

Bland Creek Palaeochannel Borefield

The operation of the existing Bland Creek Palaeochannel Borefield (Section 2.8.3) would continue for the Modification in accordance with existing licence conditions under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.

There would be no change to the existing Groundwater Contingency Strategy (i.e. trigger levels) for the management of groundwater levels in the Bland Creek Palaeochannel (Section 2.8.3) due to the Modification.

The Hydrogeological Assessment for the Modification (Appendix A) predicts that a maximum sustainable yield of 7.2 ML/day from the Bland Creek Palaeochannel Borefield over the life of the CGM incorporating the Modification would maintain groundwater levels above the relevant trigger levels at groundwater bores GW036553, GW036597 and GW036611.

To date, the effect of the Groundwater Contingency Strategy is that pumping from the Bland Creek Palaeochannel Borefield ceases, as required, to maintain groundwater levels above the agreed trigger levels specified in the Site Water Management Plan. Water requirements at the CGM are then met by alternative internal or external water supplies, including Lachlan River Water Entitlements.

As there be would no change to the existing Groundwater Contingency Strategy (i.e. agreed trigger levels) for the ongoing management of groundwater levels in the Bland Creek Palaeochannel or existing daily and annual extraction limits, no additional impacts to other groundwater users are predicted due to the continued use of the Bland Creek Palaeochannel Borefield for the Modification (Appendix A). Therefore, the life of mine extraction limit for the Bland Creek Palaeochannel Borefield as prescribed in the current Development Consent (DA 14/98) is redundant.

Alternative water supply sources considered for the CGM are described in Section 6.

Lachlan River Water Entitlements

Water from the Lachlan River would continue to be accessed for the Modification by purchasing temporary water available from the regulated Lachlan River trading market.

During the life of the existing CGM there has been reliable supply of temporary water available from the Lachlan River trading market, including during periods of drought. NOW trading records show that between approximately 4,000 ML and 202,000 ML of temporary water has been traded annually since records began in 2004 (Appendix B). By comparison, the predicted average water requirement from the Lachlan River under a 10th percentile (dry) rainfall sequence is 1,773 ML over the life of the CGM incorporating the Modification (Table 3-3).

Given the above, it is expected there would be continued reliable supply of water available from the Lachlan River trading market for the Modification (Appendix B).

3.9 VEGETATION CLEARANCE, SOIL STRIPPING AND SOIL MANAGEMENT

Additional Disturbance Areas with ML 1535

Additional disturbance areas within ML 1535 would be associated with the (Figure 3-1):

- extension of the northern waste rock emplacement;
- construction of D10; and
- establishment of additional stockpiles.

Vegetation Clearance

Progressive vegetation clearing would be undertaken ahead of any additional disturbance within ML 1535 associated with the Modification.

Vegetation clearance would be undertaken in accordance with the existing Vegetation Clearance Protocol (Appendix D).

Soil Stockpiles

Soil (i.e. topsoil and subsoil) would be stripped and stockpiled ahead of the extension of the northern waste rock emplacement and construction of D10.

The locations of additional stockpiles for the Modification are shown on Figure 3-1, and have been designed to avoid EECs mapped as occurring within ML 1535 and to minimise potential impacts to Aboriginal heritage. These stockpiles would also accommodate relocated soil currently stockpiled within the footprint of the northern waste rock emplacement extension.

Soil Management

Some stockpiled soils stripped at the CGM are identified as being sodic and dispersive (Appendix I).

To enhance the suitability of these soils for use as a plant growth medium in the CGM's rehabilitation programme, the Modification would include a soil amelioration farm.

The soil amelioration farm would involve a dedicated stockpile, which would be located immediately north of the service corridor road and west of contained water storage D2 (Figure 3-1).

Soil in the farm would be treated/ameliorated with gypsum to reduce the sodicity and dispersiveness of the soil (and to improve other chemical characteristics) (Appendix I).

The surface of the soil amelioration farm would be deep-ripped to incorporate as much gypsum through the soil profile to optimise the calcium/sodium exchange process (Appendix I).

A spray irrigation system may be required should rainfall provide insufficient water for successful amelioration.

A drainage collection system (including a toe drain around the perimeter of the farm, a seepage collection dam and a pump system) would be installed to collect and transfer sodium rich leachate to a suitable contained water storage.

Some vegetation would be established on the soil surface to increase infiltration of water into the soil profile.

Once soil testing results indicate the soils are likely suitable for rehabilitation use, the treated soil would be directly used on rehabilitation areas, or stored in another soil stockpile.

The design concepts for the soil amelioration farm described above are provisional. Detailed design concepts would be confirmed from further research and investigations. A description of the design, implementation and management of the soil amelioration farm would be included in the MOP and developed in consultation with and subject to approval by the DRE. Further detail regarding soil management is provided in Section 5 and Appendix I.

3.10 INFRASTRUCTURE AND SERVICES

ROM Stockpile Areas

The existing ROM stockpile area would be modified due to the extension of the open pit. The modified ROM stockpile area would be located to the north of contained water storage D6 (Figure 3-1).

A second ROM stockpile area would also be required to accommodate overflow from the modified ROM stockpile area and would be located adjacent to the low grade ore stockpile area (Figure 3-1).

Low Grade Ore

The existing low grade ore stockpile would be expanded (Figure 3-1) to accommodate additional ore produced during the Modification. The low grade ore stockpile would reach a maximum elevation of approximately 320 m AHD in 2020. The stockpiled low grade ore would be processed during the final years of the Modification.

Administration Buildings, Exploration and Workshop Facilities

The existing administration buildings, exploration and workshop facilities on-site would continue to be used during the life of the Modification.

Mine Access

There would be no change to the preferred access routes to the CGM for the Modification.

Use of the primary access road from West Wyalong for light and heavy vehicles would continue for the Modification. Light vehicle and employee shuttle bus access from Condobolin and Forbes would also continue for the Modification.

Electricity Supply and Distribution

Electricity to the site would continue to be provided via the existing 132 kV ETL from Temora.

Power on-site would continue to be transferred either by overhead cable or underground cable. Standard electrical safety laws and practices (including vehicle clearance considerations) would apply.

Site Security and Communications

Existing site security measures (including the ML 1535 perimeter fence and perimeter buoys during periods of lake inundation) would be retained for the Modification. The existing communications systems would also be retained with augmentations as required over the life of the CGM incorporating the Modification (i.e. as technological advances allow).

Potable Water

The potable water supply for use on-site would continue to be trucked to the CGM. The existing potable water supply network on-site would continue to service the CGM incorporating the Modification.

3.11 MANAGEMENT OF CHEMICALS AND WASTES

The management of chemicals and wastes for the Modification, as described below, would be the same as for the approved CGM.

Dangerous Goods and Hazardous and Liquid Wastes

The transport and storage of dangerous goods and hazardous and liquid wastes required for the approved CGM would continue to be conducted in accordance with the relevant legislation, Australian Standards and codes.

The approved CGM management plans, studies and analyses would be updated to incorporate the relevant Modification activities as required.

Recyclable Domestic Waste

Recyclable domestic waste from office buildings and workforce areas would continue to be collected regularly and managed by waste disposal contractors.

Putrescible and Non-Putrescible Waste

General solid (putrescible) waste and general solid (non-putrescible) waste (as defined in the Waste Guidelines) would continue to be disposed in the waste rock emplacements on-site.

Bioremediation Waste

Site-generated hydrocarbon-impacted material (general solid [putrescible] waste) would continue to be treated in the on-site designated Bioremediation Facility, and would continue to be disposed within the waste rock emplacements.

Trash Screen Oversize Waste

Trash screen oversize waste from the milling circuit (general solid [putrescible] waste) would continue to be disposed within the waste rock emplacements.

Waste Tyres

Waste tyres would continue to be disposed of within the waste rock emplacements.

Sewage Treatment and Effluent Disposal

Sewage would continue to be treated in the on-site sewage treatment plant and would continue to be disposed of to the satisfaction of the Bland Shire Council and the EPA.

3.12 WORKFORCE AND OPERATING HOURS

Consistent with the existing operating hours at the CGM, operation of the CGM incorporating the Modification would generally be 24 hours a day, seven days a week. Construction of tailings storage facilities embankment lifts would continue to be generally restricted to daytime hours only.

The Modification would facilitate the continuity of employment for the existing CGM workforce. There would be no change to the peak CGM workforce due to the Modification.

3.13 CONSTRUCTION ACTIVITIES

The major components of the Modification (i.e. expansion of the open pit and waste rock emplacements, and increased heights of the tailings storage facilities) are considered to be part of the continuation of mining operations of the CGM, as opposed to construction activities.

Notwithstanding, the Modification would involve minor construction activities for the establishment/modification of the following:

- D10; and
- eastern pump station.

Descriptions of construction activities associated with D10 and the eastern pump station are provided in Section 3.8.2.