Curragh Bord and Pillar Mine Project

Environmental Assessment Report

for Coronado Global Inc

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HANSEN ENVIRONMENTAL CONSULTING

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EXECUTIVE SUMMARY

INTRODUCTION

Hansen Environmental Consulting has prepared this Environmental Assessment Report (EAR) on behalf of Coronado Global Resources Inc. (Coronado) for the Curragh Bord and Pillar Mine Project (the project).

The project involves the development of an underground bord and pillar mine at Curragh Mine. It will be necessary to amend the Curragh Mine Environmental Authority (EA) to include the project. This EAR supports the Curragh Mine EA amendment application and has been prepared to comply with Section 226A of the *Environmental Protection Act 1994* (EP Act) which describes the requirements for EA amendment applications.

THE PROPONENT

The proponent and holder of the Curragh Mine EA is Coronado Curragh Pty Ltd (CCPL), a subsidiary of Coronado.

PROJECT DESCRIPTION

Curragh Mine is a large-scale open cut mine located approximately 6 km north of Blackwater township in Central Queensland (Figure 1). The mine has been operating since 1983 and produces export metallurgical and thermal coal. The Curragh Mine EA authorises a maximum coal extraction rate of 18 Million tonnes per annum (Mtpa) of Run-Of-Mine (ROM) coal.

Curragh Mine currently has two main operational areas, Curragh South and Curragh North (Figure 2). Curragh South is the original mining area and contains key mine infrastructure including the Coal Handling and Preparation Plant (CHPP), rail loop and train loading facility and Mine Industrial Area (MIA).

Curragh North is located at the northern end of Curragh Mine and commenced operations in 2006. Curragh North includes three open cut pits (Pit S, Pit T and Pit U) and large in-pit and out-of-pit overburden emplacement areas (Figure 2). There is a transport corridor from Curragh North to Curragh South that includes a haul road and overland conveyor used to transport ROM coal from Curragh North to the CHPP at Curragh South. Mine infrastructure at Curragh North includes:

- MIA including a workshop, vehicle servicing facilities, store and administration buildings;
- ROM coal stockpile area and conveyor loading facility; and
- Mine water management infrastructure including raw water supply, mine water dams, flood protection levees, pumps and pipelines.

The Curragh Central area adjoins the southern end of Curragh North (Figure 2). There are approved open cut mining areas in the Curragh Central area that have not been developed to date.

The project involves the development of an underground bord and pillar mine in the Mammoth coal seam accessed from the highwall of Pit S at Curragh North (Figure 3). The project underground mining areas are located within the existing Curragh Mine Mining Leases (MLs) and therefore a new ML will not be required for the project.

The underground bord and pillar mine will have a mine life of approximately 10 years and a peak production rate of approximately 3.2 Mtpa of ROM coal. The project does not involve an increase in the Curragh Mine approved peak production rate.

The project will utilise existing Curragh Mine infrastructure including:

- Curragh North haul roads and access roads, ROM coal stockpile area, overland conveyor and conveyor loading facility, and power, raw water and mine water supplies.
- Curragh South CHPP, rail loop and train loading facilities, and tailings and rejects storage areas.

New surface infrastructure required for the project will be limited to an Underground Mine Industrial Area (UMIA) located on the pit floor, at the southern end of Pit S adjacent to the underground mine access portals, and surface connections to existing Curragh North infrastructure for raw water supply, mine water supply and power (Figure 7). The underground mining operations will involve coal seam gas drainage to ensure a safe underground environment. Minor temporary surface gas drainage infrastructure will include gas drainage boreholes and flares, and associated access tracks.

Progressive rehabilitation and decommissioning activities for the project will be limited as the project surface infrastructure will be located in existing open cut mine disturbance areas. The relatively minor disturbance areas associated with surface gas drainage activities will be progressively decommissioned and rehabilitated over the life of the project.

The project will require approximately 20 megalitres per annum (MLpa) raw water supply and approximately 110 MLpa mine water supply. Curragh Mine has sufficient spare raw water allocation and mine water storage available to satisfy the project water supply requirements. The project will not create any additional mine water catchments or generate any excess mine water. Therefore, the project will not result in any significant change in the existing Curragh Mine water management system or mine water balance.

PROJECT NEED

Curragh Mine provides significant economic benefits to the local region, Queensland and Australia. Curragh Mine has a total workforce of approximately 2,800 people and generates additional indirect employment in the region and throughout Queensland. The Australian Government receives significant direct and indirect tax revenue from the mine, and the Queensland Government obtains significant royalties from the mine.

The project will provide access to an additional 19.2 Mt of export metallurgical and thermal coal and will require an additional workforce of approximately 250 people. The project will increase the associated employment and economic benefits of Curragh Mine. Without the project, the coal resource within the underground mining area will likely be sterilised and the economic benefits of mining the resource will be foregone.

The project will increase the productivity and enhance the economic viability of Curragh Mine.

PROJECT SETTING

The project is located within the Central Highlands Regional Council Local Government Area. The Jellinbah Mine is located to the east of the project underground mining area and adjoins the northern end of Curragh North (Figure 2).

The underground mine layout consists of the northern, central and southern mining areas (Figure 3). The surface area above the northern and central mining areas is within the existing Curragh North open cut mine disturbance area. The majority of the surface area above the southern mining area is located outside the Curragh North open cut mine disturbance area (Figure 3). The northern portion of this area has been extensively cleared in the past for cattle grazing and includes only limited patches of remnant vegetation. There are areas of remnant woodland vegetation above the southern portion of the southern underground mining area that include part of the Blackwater Creek floodplain (Figure 3).

The surface topography above the project underground mining area is dominated by the Curragh North out-of-pit overburden emplacement areas. Other surface areas above the project underground mining area are relatively flat. Blackwater Creek traverses the southern end of the southern mining area and is the only significant surface drainage feature above the project underground mining area. Blackwater Creek is a watercourse under the *Water Act 2000* and joins the Mackenzie River west of the Curragh North ML boundary. Both Blackwater Creek and the Mackenzie River are ephemeral drainage systems.

The land in the southern portion of the Curragh North ML is privately owned and Coronado has a land access agreement with the landowner in relation to mining activities within this area of the ML. All other land in the project underground mining area, including the northern end of the Curragh North ML and the Curragh Central area, is owned by Coronado.

ENVIRONMENTAL IMPACTS

A risk-based approach was used to scope the specialist studies included in this EAR. The scoping assessment was undertaken using environmental information from the existing Curragh Mine to identify potential environmental risks associated with the project.

The scoping assessment concluded that the key areas requiring specialist technical assessment were:

- Subsidence;
- Groundwater; and
- Terrestrial ecology.

A summary of each of these assessments is provided in the following sections.

SUBSIDENCE

Detailed subsidence predictions have been prepared for the project to enable the assessment of subsidence effects. The subsidence predictions are based on a strata compression analysis and published subsidence data from similar bord and pillar mining operations. This is a proven and reliable prediction methodology widely used throughout Queensland and New South Wales for bord and pillar mines.

The maximum predicted surface subsidence for the project is less than 50 mm. This is consistent with operational experience at similar bord and pillar mines. This low level of surface subsidence is not distinguishable from natural variations in ground surface levels due to seasonal changes in surface soil moisture content. Given the minimal amount of surface subsidence predicted on the project underground mining area, surface cracks and residual surface depressions that could potentially result in the ponding of surface runoff are not expected to occur. This is consistent with operational experience at other bord and pillar mines with low levels of surface subsidence where cracking and ponding has not been observed above bord and pillar mining areas.

The bord and pillar mining method does not result in caving of the mine roof strata or overburden that would result in sub-surface cracking.

GROUNDWATER

The local hydro-stratigraphy in the project area comprises:

- Localised alluvium associated with the remnants of the Mackenzie River floodplain;
- An extensive weathered profile;
- A thick upper sequence of fresh (i.e. unweathered) Permian bedrock above the Mammoth seam;
- The Mammoth coal seam (i.e. the target seam for underground mining); and
- A thick lower sequence of fresh Permian bedrock, including the deeper Mackenzie coal seam.

The project groundwater assessment included reviewing relevant groundwater databases and published reports, undertaking a targeted groundwater site investigation and conducting 3D numerical modelling to determine the effects of the project on groundwater levels.

Targeted field investigations confirmed that alluvium is only present above the northern underground mining area while the weathered profile is present over the entire underground mining area and surrounds (Figure 11). The localised alluvium exhibits high permeability but does not form an extensively and uniformly saturated aquifer in the vicinity of the project underground mining area. The weathered profile, fresh Permian bedrock and coal seams are aquitards that exhibit low permeability and restrict the movement of groundwater. There are no significant groundwater-bearing formations in the project underground mining area.

The groundwater assessment considered impacts on groundwater from the project and concluded that:

- Localised depressurisation of the Mammoth coal seam is predicted to occur in the vicinity of the project underground mining area.
- Drawdown of the unconfined water table in the overlying Permian bedrock is predicted to occur in the south-western corner of the project underground mining area (Figure 15).
- No depressurisation is predicted to occur in the weathered profile or the Mackenzie River floodplain alluvium.
- The project's contribution to cumulative groundwater drawdown with the approved open cut mining operations and neighbouring Jellinbah Mine is limited to the localised project drawdown extents.
- The underground bord and pillar workings will gradually fill with water following the completion of mining, allowing groundwater levels in the surrounding strata to gradually recover to baseline levels in the long-term post mining.
- No impacts on water supply bores are anticipated, given there are no water supply bores in the vicinity of the project underground mining area.

- The groundwater table does not intersect any creek bed or the ground surface within the project drawdown zone. Hence, drawdown on the groundwater table due to the project is not predicted to have any effect on Blackwater Creek or its tributaries.
- The project's effects on groundwater are not predicted to affect potential stygofauna habitat and therefore the project is unlikely to give rise to any impacts on stygofauna.
- The project is not expected to result in any adverse effect on groundwater quality or result in groundwater contamination.

An additional three groundwater monitoring bores have been installed in the vicinity of the predicted project drawdown zone. These monitoring bores will be included in the Curragh Mine groundwater monitoring program and will enable confirmation of the groundwater impacts of the project.

TERRESTRIAL ECOLOGY

The project ecological assessment included a desktop assessment, review of previous field survey results and a further field survey of the areas above the proposed underground mining areas that are located beyond the extent of the existing and approved open cut mine disturbance (Figure 17).

The assessment found that a large portion of the study area is cleared grazing land dominated by Buffel grass with only limited patches of remnant vegetation. The southern portion of the study area contains remnant vegetation associated with Blackwater Creek and its floodplain (Figure 17). The remnant vegetation along Blackwater Creek is dominated by Queensland Blue Gum and Coolabah woodland. The Blackwater Creek floodplain area vegetation includes Brigalow and Coolabah woodland.

The assessment identified areas of listed threatened ecological communities and flora and fauna habitat within the study area.

All underground mine surface infrastructure and the majority of the surface gas drainage activities required for the project will be located within existing Curragh North mine disturbance areas (Figure 7). Due to the low level of surface subsidence and absence of surface subsidence effects, there will be no surface disturbance associated with mine subsidence. Potential disturbance of ecology and prescribed environmental matters due to the project will therefore be limited to disturbance from up to eight new gas drainage boreholes (total disturbance area of less than 10 ha over the life of the project).

The proponent has confirmed that any new gas drainage borehole pads and associated access track connections will be located in areas that have been cleared for grazing and do not contain any areas of prescribed environmental matters. Hence, the project will not have any significant impact on ecology or prescribed environmental matters.

An assessment of the potential impacts of the project on Groundwater Dependent Ecosystems (GDEs) did not identify any potential aquatic or terrestrial GDEs within the study area. Within the study area, there are also no areas where the groundwater table would be accessible and able to support GDEs. Hence, the project is not predicted to give rise to any impacts on any potential terrestrial or aquatic GDEs.

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1 INTRODUCTION

This Environmental Assessment Report (EAR) has been prepared for the Curragh Bord and Pillar Mine Project (the project). The project involves the development of an underground bord and pillar mine at the Curragh open cut mine. This EAR supports an application to amend the Curragh Mine Environmental Authority (EA) (EPML00643713) to include the project.

This section of the EAR provides a high level overview of the project, the project proponent and the project need. It also outlines the structure of the EAR.

1.1 PROJECT OVERVIEW

Curragh Mine is a large-scale open cut coal mine located approximately 6 km north of Blackwater in Central Queensland (Figure 1). The mine has been operating since 1983 and produces export metallurgical and thermal coal.

Curragh Mine currently has two main operational areas, Curragh South and Curragh North (Figure 2). The project involves the development of an underground bord and pillar mine accessed from the highwall of Pit S at Curragh North. The project underground mining area is located within the existing Curragh Mine Mining Leases (MLs) (Figure 2).

The project will utilise existing Curragh Mine infrastructure, including the existing Curragh North Run-of-Mine (ROM) coal transport system and Curragh South Coal Handling and Preparation Plant (CHPP) (Figure 2). The project will not increase the approved peak production rate at Curragh Mine and consequently no upgrades to existing mine infrastructure are required.

New surface infrastructure for the project will predominantly be located in-pit at the southern end of Pit S (Figure 3). This will include bord and pillar mine access portals, a Run-of-Mine (ROM) coal stockpile area, and a bord and pillar Underground Mine Industrial Area (UMIA). Minor surface infrastructure, including electricity and water supply connections and gas drainage infrastructure, will be located at the surface above the project underground mining area (Figure 3).

Bord and pillar mining is scheduled to commence in 2025, subject to obtaining the relevant approvals. The project mining operations will involve extracting a total of approximately 23.4 Mt of ROM coal over a period of approximately 10 years.

1.2 THE PROPONENT

The proponent is Coronado Curragh Pty Ltd (CCPL). CCPL is a wholly owned subsidiary of Coronado Global Resources Inc. (Coronado) and is the holder of the Curragh Mine EA.

1.3 PROJECT NEED

The project will increase the productivity and enhance the economic viability of Curragh Mine. Curragh Mine provides significant economic benefits to the local region, Queensland and Australia. Curragh Mine has a total workforce of approximately 2,800 people. Curragh Mine also generates additional indirect employment in the region and throughout Queensland. The Australian Government receives significant direct and indirect tax revenue from the mine, and the Queensland Government obtains significant royalties from the mine.

The project will produce an additional 19.2 Mt of export metallurgical and thermal coal and will require an additional workforce of approximately 250 people. The project will increase the associated employment and economic benefits of Curragh Mine. Without the project, the coal resource within the underground mining area will likely be sterilised and the economic benefits of mining the resource will be foregone.

1.4 REPORT STRUCTURE

The EAR document is structured as follows:

- Section 1: Introduction;
- Section 2: Regulatory Framework;
- Section 3: Project Description;
- Section 4: Scoping Assessment;
- Section 5: Subsidence;
- Section 6: Groundwater;
- Section 7: Terrestrial Ecology; and
- Section 8: Proposed Amended EA Conditions.

The following technical studies are provided in the appendices:

- Appendix A: Subsidence Report;
- Appendix B: Groundwater Report;
- Appendix C: Terrestrial Ecology Report; and
- Appendix D: Greenhouse Gas Report.

2 REGULATORY FRAMEWORK

2.1 OVERVIEW

The existing Curragh Mine EA authorises mining within the Curragh Mine MLs. An amendment of the Curragh Mine EA will be necessary to authorise the project underground mining activities. This section provides an assessment of the likely EA amendment process required for the project. The Department of Environment, Science and Innovation (DESI) will determine the assessment process requirements for the project following the submission of the EA amendment application.

2.2 MINOR AND MAJOR EA AMENDMENT TRIGGERS

The triggers for Minor and Major EA amendments are provided in the DESI Guideline: *Major and minor amendments* (ESR/2015/1684, 12 February 2024). An assessment of the applicability of the Minor EA amendment triggers to the project is provided in Table 1. As indicated in Table 1, the project satisfies the requirements for a Minor EA amendment.

TABLE 1 MINOR EA AMENDMENT TRIGGERS

Minor EA Amendment (Threshold) Trigger	Satisfied
a) is not a change to a standard condition identified in the EA as a standard condition, other than a condition conversion or replacing a standard condition with a standard condition for the ERA; and	Yes.
b) does not significantly increase the level of environmental harm caused by the relevant activity; and	Yes – the environmental assessment presented in the EAR indicates that the project will not result in any significant adverse environmental impacts.
c) does not change any rehabilitation objectives in the EA in a way likely to result in significantly different impacts on environmental values than the impacts previously permitted under the EA; and	Yes.
d) does not significantly increase the scale or intensity of the relevant activity; and	Yes – The project does not involve any increase in the approved Curragh Mine peak ROM coal production rate
e) does not relate to a new relevant resource tenure for the EA that is - (i) a new mining lease; or (ii) a new petroleum lease; or	Yes – the project does not require a new ML.

Minor EA Amendment (Threshold) Trigger	Satisfied
(iii) a new geothermal lease under the *Geothermal Energy Act 2010*; or (iv) a new greenhouse gas injection and storage lease under the *Greenhouse Gas Storage Act 2009*; and	
f) increases the existing surface area for the relevant activity by 10% or less; and	Yes – the project involves underground mining activities that are wholly within the existing Curragh Mine MLs. The relatively minor new surface facilities required for the project will be within the existing open cut mine disturbance areas. The total additional surface disturbance for gas drainage activities over the life of the project will be less than 10 ha which is less than 0.12% of the current mine disturbance area (8,619 ha).
g) for an EA for a petroleum activity: (i) involves constructing a new pipeline that does not exceed 150km in length; and (ii) involves extending an existing pipeline by no more than 10% of the existing length of the pipeline; and	Not applicable.
h) is for a new relevant resource tenure for the authority that is an exploration permit or greenhouse gas permit—where the amendment application seeks an EA that is subject to the standard conditions for the relevant activity, to the extent it relates to the permit.	Not applicable.

2.3 EIS CRITERIA

The criteria considered by DESI in making a decision as to whether an Environmental Impact Statement (EIS) is required for a resource project Major EA amendment application are described in the DESI Guideline: *Criteria for environmental impact statements for resource projects under the Environmental Protection Act 1991* (ESR/2016/2167, 4 November 2020).

The criteria include specific EIS triggers in addition to a range of general criteria. An assessment of the applicability of the EIS triggers to the project is provided in Table 2. As indicated in Table 2, the project does not satisfy any of the EIS triggers.

TABLE 2 EIS TRIGGERS

EIS Trigger	Trigger Reached
For existing mines extracting between 2 – 10 million tonnes/year (t/y) ROM ore or coal, an increase in annual extraction of more than of 100% or 5 megatonnes/y (Mt/y) (whichever is the lesser)	Not applicable.
For existing mines extracting over 10 million t/y ROM ore or coal, an increase in annual extraction of more than 50% or 10 Mt/year (whichever is the lesser)	No – the project will not involve an increase in the approved Curragh Mine peak ROM coal production rate of 18 Mtpa.
For existing mines extracting more than 20 million t/y ROM ore or coal extraction, an increase in annual extraction greater than 25%	Not applicable.
Proposed activities in, and significant impact on, a Category A or B environmentally sensitive area, unless previously authorised under Queensland legislation	No – the project does not involve any activities in, or impacts on, Category A or B Environmentally Sensitive Areas (ESAs).
A substantial change in mining operations, e.g. from underground to open cut, or (for underground mining) a change from minor subsidence to substantial subsidence	No – the proposed underground bord and pillar mining operations will involve negligible surface disturbance compared to the existing open cut mining operations. Subsidence within the project underground mining area is predicted to be minor (i.e. maximum surface subsidence of less than 50 mm) and relatively minor new project infrastructure will be located within existing open cut mine disturbance areas.
The introduction of a novel or unproven resource extraction process, technology or activity	No – the proposed underground bord and pillar mining method is widely used throughout Australia and is comparable to other existing bord and pillar mining operations in Queensland's Bowen Basin.

DESI will determine the assessment process requirements for the project following the submission of the EA amendment application, including whether an EIS is required in the event the application is determined to be a Major EA amendment.

2.4 EA AMENDMENT APPLICATION REQUIREMENTS

The requirements for EA amendment applications are specified in Section 226A of the *Environmental Protection Act 1994* (EP Act). The requirements are re-stated in Table 3 with a reference to where each relevant requirement is addressed in the EAR.

TABLE 3 REQUIREMENTS FOR EA AMENDMENT APPLICATIONS (SECTION 226A OF THE EP ACT)

Requirements for EA Amendment Applications	EAR Reference
1. If the amendment application is for the amendment of an environmental authority, the application must also –	
a) Describe any development permits in effect under the Planning Act for carrying out the relevant activity for the authority; and	There are no development permits in effect under the *Planning Act 2016* for carrying out the relevant activity for the authority.
b) State whether each relevant activity will, if the amendment is made, comply with the eligibility criteria for the activity; and	The amendment will not change the relevant activities in the current EA. The EA is a site-specific EA and there are no relevant eligibility criteria for the mining activities.
c) If the application states that each relevant activity will, if the amendment is made, comply with the eligibility criteria for the activity – include a declaration that the statement is correct; and	The EA is a site-specific EA and there are no relevant eligibility criteria for the mining activities.
d) State whether the application seeks to change a condition identified in the authority as a standard condition; and	No.
e) If the application relates to a new relevant resource tenure for the authority that is an exploration permit or GHG permit – state whether the applicant seeks an amended environmental authority that is subject to the standard conditions for the relevant activity or authority, to the extent it relates to the permit; and	Not applicable.
f) Include an assessment of the likely impact of the proposed amendment on the environmental values, including –	
(i) A description of the environmental values likely to be affected by the proposed amendment; and	Sections 3, 4, 5, 6 and 7.
(ii) Details of emissions or releases likely to be generated by the proposed amendment; and	Sections 3, 4 and 6.
(iii) A description of the risk and likely magnitude of impacts on the environmental values; and	Sections 4, 5, 6 and 7.

Requirements for EA Amendment Applications	EAR Reference
(iv) Details of the management practices proposed to be implemented to prevent or minimise adverse impacts; and	Sections 3, 4, 5, 6 and 7.
(v) If a PRCP schedule does not apply for each relevant activity – details of how the land the subject of the application will be rehabilitated after each relevant activity ends; and	Section 3.3.9 and Section 4.
g) Include a description of the proposed measures for minimising and managing waste generated by amendments to the relevant activity; and	Section 4.
h) Include details of any site management plan or environmental protection order that relates to the land the subject of the application.	Not applicable.

3 PROJECT DESCRIPTION

3.1 INTRODUCTION

This section provides a description of the project, including the project setting and proposed mining activities. It also provides an overview of the approved Curragh Mine mining operations and mine infrastructure, to the extent they are relevant to the project.

3.2 CURRAGH MINE

Curragh Mine is a large-scale open cut coal mine located approximately 6 km north of Blackwater and 200 km west of Rockhampton in Central Queensland (Figure 1). The mine has been operating since 1983 and produces export metallurgical and thermal coal. Curragh Mine has an approved production rate of up to 18 Mtpa of ROM coal and utilises dragline and truck and shovel mining methods. Product coal is railed to the RG Tanna and Wiggins Island Coal Terminals in Gladstone, for export and to Stanwell Power Station.

Curragh Mine currently has two main operational areas, Curragh South and Curragh North (Figure 2). The Curragh South area is the original mining area and contains key mine infrastructure including:

- Coal Handling and Preparation Plant (CHPP);
- Rail loop and train loading facility;
- In-pit tailings and rejects storage areas;
- Mine Industrial Area (MIA) including:
  - Workshop and vehicle servicing facilities;
  - Warehouse and laydown areas;
  - Administration buildings; and
  - Bathhouse and gatehouse.
- Water management infrastructure including raw water supply, dams, in-pit mine water storages, pumps and pipelines.

Mining at Curragh North commenced in 2006. Curragh North includes three open cut pits (Pit S, Pit T and Pit U) and large in-pit and out-of-pit overburden emplacement areas (Figure 2). There is a transport corridor from Curragh North to Curragh South that includes an overland conveyor and haul road (Figure 2). ROM coal from Curragh North is transported to the CHPP at Curragh South via the overland conveyor. Mine infrastructure at Curragh North (Figure 2) includes:

- MIA including a workshop, vehicle servicing facilities, store and administration buildings;
- ROM coal stockpile area and conveyor loading facility; and
- Mine water management infrastructure including raw water supply, mine water dams, flood protection levees, pumps and pipelines.

The Curragh Central area adjoins the southern end of Curragh North. There are approved open cut mining areas in the Curragh Central area that have not been developed to date (Figures 2 and 3).

3.3 CURRAGH BORD AND PILLAR MINE PROJECT

3.3.1 PROJECT OVERVIEW

The project involves the development of an underground bord and pillar mine in the Mammoth coal seam accessed from the highwall of Pit S at Curragh North (Figure 3). The proposed underground mining areas are within the existing Curragh Mine MLs. The underground mine will have a mine life of approximately 10 years and a ROM coal production rate of up to approximately to 3.2 Mtpa. The project does not involve an increase in the approved Curragh Mine peak production rate.

The project will utilise existing Curragh Mine infrastructure including:

- Curragh North
  - Haul roads and access roads;
  - ROM coal stockpile area;
  - Overland conveyor and conveyor loading facility; and
  - Power, raw water and mine water supplies.
- Curragh South
  - CHPP;
  - Rail loop and train loading facilities; and
  - Tailings and rejects storage areas.

The project will not increase the approved peak production rate at Curragh Mine and consequently no upgrades of the existing mine infrastructure are required.

New mine surface infrastructure required for the project (Figure 3) will be limited to:

- An UMIA located on the pit floor at the southern end of Pit S adjacent to the underground mine access portals; and
- Connections to existing Curragh North infrastructure for raw water supply, mine water supply and power.

The underground mining operations will involve coal seam gas drainage to ensure a safe underground environment. Minor temporary surface gas drainage infrastructure will include gas drainage boreholes and flares.

3.3.2 PROJECT AREA

The project is located at the northern end of Curragh Mine. The project underground mining areas extend over approximately 10 km north to south, to the east and south of the Curragh North open cut pits (Figure 3). The project underground mining areas are wholly within the existing Curragh North and Curragh Central MLs (Curragh North - ML 80110 and Curragh Central – ML 700007 and ML 700008).

The project surface infrastructure will be located within the existing Curragh North open cut mine disturbance areas. The in-pit UMIA will be located on the pit floor at the southern end of Pit S (Figure 3). The connections to the existing Curragh North raw water, mine water and power supplies are also within the existing Curragh North mine disturbance area.

The underground mine layout consists of the northern, central and southern mining areas (Figure 3). The surface area above the northern and central mining areas is within the existing Curragh North open cut mine disturbance area. This area includes the eastern and southern out-of-pit overburden emplacement areas, Curragh North mine water dam (CN2), Curragh North MIA and sections of the Curragh North haul road and overland conveyor.

The majority of the surface area above the southern mining area is located outside the Curragh North open cut mine disturbance area (Figure 3). Existing Curragh North facilities in the area include the southern end of the southern out-of-pit overburden emplacement area, sections of the haul road and overland conveyor, explosives reload area and access tracks and drill pads from previous exploration in the area. A section of the old Jellinbah-Bluff Road also traverses the area. The southern end of the southern mining area extends into the Curragh Central area (Figure 3). There are approved open cut mining areas in the Curragh Central area that have not been developed to date.

The northern portion of the southern mining area within ML 80110 has been extensively cleared in the past for cattle grazing and includes only limited patches of remnant vegetation. There are areas of remnant woodland vegetation above the southern portion of the area that include part of the Blackwater Creek riparian zone (Figure 3).

The surface area above the southern mining area is in the Blackwater Creek catchment. The area is relatively flat and generally drains to the south-west. Significant drainage features in the area are limited to Blackwater Creek that traverses the southern end of the area. Blackwater Creek is a watercourse under the *Water Act 2000* and joins the Mackenzie River west of the Curragh North ML boundary. Both Blackwater Creek and the Mackenzie River are ephemeral drainage systems.

The surface topography in the project area is shown in Figure 4. The surface topography above the project underground mining area is dominated by the eastern and southern out-of-pit overburden emplacement areas that have approved heights of up to 90 m and 70 m above natural surface levels (i.e. RL 220 m and RL 210 m, respectively). Other surface areas above the project underground mining area are relatively flat.

The land in the southern portion of the Curragh North ML is privately owned and Coronado has a land access agreement with the landowner in relation to mining activities within this area of the ML. All other land in the project underground mining area, including the northern end of the Curragh North ML and the Curragh Central area, is owned by Coronado.

Jellinbah Mine is located to the east of Curragh North, and the project underground mining area, and adjoins the northern end of Curragh North (Figure 3). There is an area of privately owned cattle grazing land to the east of the Curragh North ML boundary, in between the Curragh North and Jellinbah Mine ML boundaries.

Curragh Mine and the project are located within the Central Highlands Regional Council Local Government Area.

3.3.3 BORD AND PILLAR MINING

OVERVIEW OF BORD AND PILLAR MINING

The bord and pillar mining method involves dividing the target coal seam with underground roadway excavations (Figure 5). The coal seam is initially excavated along mined roadways (called 'headings'). The headings are intersected at regular intervals by connecting roadways (called 'cut-throughs'). Collectively, the headings and cut-throughs are the bords. The cut-throughs are typically mined perpendicular to the primary headings creating a block-like array (or panel) of coal pillars bounded by the bords. Bell outs (small, fan shaped coal excavations) are also created at the ends of the bords to maximise coal extraction.

Mining is carried out by a continuous miner (cutting machine) that loads coal onto a shuttle car which transports and loads the coal onto an underground conveyor belt system (Figure 5). Once a bord is excavated to the required distance, the continuous miner moves to the next mining area and roof support is installed in the previous bord. The coal pillars support the overlying strata as the bords are mined and remain in place after the completion of mining.

Up to three mining units (continuous miner and shuttle cars) are proposed for the project underground mining operations.

BORD AND PILLAR MINE LAYOUT

The conceptual project bord and pillar mine layout is shown in Figure 6. Underground mine access is proposed from two locations in the Pit S highwall. The target Mammoth seam has been mined in Pit S and is exposed in the highwall allowing direct access into the seam from the highwall. There will be four access portals at each mine entrance location for the transport of personnel and equipment, the ROM coal conveyor and ventilation.

The underground mine layout consists of the northern, central and southern mining areas. The width of the roadways (bords) will be 6.5 m. The coal pillars will increase in size as the depth of mining increases. The coal extraction height will vary with coal seam thickness from 2.5 to 5 m.

The bord and pillar mine layout has been specifically designed with sufficient roadway and pillar strength to ensure that there will be no caving and the underground workings will be stable and safe. Consequently, the bord and pillar mining will not result in any significant surface subsidence above the underground bord and pillar workings (Section 5).

Modifications to the conceptual underground mine layout may be necessary following more detailed mine planning assessment. However, any revised mine plans would not have any significant additional impacts beyond those presented in this EAR.

3.3.4 MINE SURFACE INFRASTRUCTURE

The project will make significant use of the existing Curragh Mine infrastructure, including:

- Coal handling, transportation and processing infrastructure including the Curragh North haul roads, ROM coal stockpile area, conveyor loading facility, overland conveyor and the Curragh South CHPP and associated coal stockpiles, train load out and rail loop, and in-pit rejects and tailings storage areas; and
- Curragh North power and water supply infrastructure.

The project does not involve any increase in the approved peak mine production rate and no upgrades to the existing Curragh Mine infrastructure are required for the project. Consequently, there is limited new infrastructure required for the project.

New underground mine surface infrastructure required for the project is shown in Figure 7 and Figure 8, and will include:

- An UMIA located within Pit S (Figure 8), including:
  - Underground mine access portals directly into the Mammoth Seam in the Pit S highwall;
  - A ROM coal stockpile area;
  - Underground mine surface facilities including:
    - Administration, workshop and stores buildings;
    - Underground vehicle washdown, servicing and refuelling facilities;
    - Employee facilities, first aid and rescue facilities;
    - Sewage and water treatment facilities; and
    - Light vehicle access and car park.
  - Ventilation infrastructure including underground mine fans and compressors;
  - Electrical infrastructure including a sub-station and transformer; and
  - Water supply pipelines.
- Power and water supply connections to existing Curragh North infrastructure (Figure 7) including:
  - Power connection - an underground mine substation at the Curragh North 66 kV powerline near the Pit S highwall and an 11kV powerline from the substation to the in-pit UMIA;
  - Raw water supply connection – a raw water supply pipeline connection from the Curragh North MIA to the in-pit UMIA;
  - Mine water supply connection - a 22 kV powerline extension to a new electric pump at the Curragh North mine water dam (CN2) (replacing the existing diesel pump) and a mine water supply pipeline connection from the existing Curragh North – Curragh South mine water pipeline to the in-pit UMIA.

As described above and shown in Figure 7, the majority of the project surface infrastructure is located in-pit and all of the project infrastructure is located within the existing Curragh North open cut mine disturbance areas. Hence there will be no additional surface disturbance required for the project surface infrastructure.

3.3.5 COAL HANDLING AND PROCESSING

The target Mammoth coal seam that will be extracted from the underground mine is a primary target coal seam for the historical and ongoing Curragh North open cut mining operations. ROM coal from the project underground mining area will be stockpiled at the in-pit ROM coal stockpile area, near the underground mine access portals, via a radial stockpile stacker at the delivery end of the underground coal conveyor (Figure 8). ROM coal from the in-pit stockpile area will be transported by haul trucks to the Curragh North ROM coal stockpile area for loading to the overland conveyor to the Curragh South CHPP. Underground mine ROM coal will be processed at the Curragh South CHPP and product coal will be loaded to trains at the Curragh South train loading facility (Figure 2).

The washing and processing of coal at the CHPP produces fine (tailings) and coarse reject material. Tailings and coarse rejects are transferred to in-pit tailings and rejects storage areas at Curragh South (Figure 2). The proponent has confirmed there is sufficient in-pit storage capacity available at Curragh South for life-of-mine rejects and tailings storage, including the project.

3.3.6 COAL SEAM GAS DRAINAGE

LIFE OF MINE GAS DRAINAGE PROGRAM

The underground mining operations will involve coal seam gas drainage to ensure a safe underground work environment. The life-of-mine gas drainage program will involve the progressive installation of gas drainage boreholes to drain the coal seam gas from future underground mining areas, ahead of the active mining operations. Gas drainage will be achieved by dewatering the coal seam via the gas drainage boreholes, enabling the release of coal seam gas. In areas where the coal seam permeability is low, borehole stimulation will also be conducted to enhance the rate of gas drainage.

The gas drainage system will comprise of a network of underground-in-seam (UIS) boreholes that will connect to gas risers, and some new and existing surface to in-seam (SIS) boreholes. There is expected to be up to approximately 20 new surface gas drainage boreholes required over the life of the project. The gas risers and new SIS boreholes will require the preparation of a surface borehole pad area and an associated access track connection. The surface borehole pads will be approximately 60 m x 60 m (0.36 ha) and will have connections to existing access tracks, where necessary, that are approximately 3 m wide. The borehole pads will provide sufficient working area for the operation a drill rig and drilling activities, and the subsequent gas drainage activities. Once the surface boreholes are installed, the gas drainage activities will be conducted on the drill pad. These will include borehole dewatering, gas collection and flaring.

The majority of the new surface gas drainage boreholes will be located within existing Curragh North mine disturbance areas above the project underground mining area. It is expected that up to approximately 8 new surface boreholes will be required in areas above the southern mining area, that have not been previously disturbed or approved to be disturbed. As explained in Section 7.4, there are significant areas at the southern end of ML 80110 that have been cleared of vegetation for grazing and do not contain any areas of remnant vegetation or protected fauna habitat. The proponent has confirmed that any new surface gas drainage borehole pads and associated access track connections can be located in these areas and hence will not impact any protected vegetation or fauna habitat.

Surface gas drainage borehole pads will be progressively decommissioned and rehabilitated over the life of the underground mine, once gas drainage has been completed in an area. This will involve:

- Removal of the gas drainage equipment;
- Sealing of the borehole with grout and removal of the casing to 300 mm below ground surface;
- Backfilling any sumps and regrading of the pad area, where necessary; and
- Replacing topsoil and reseeding the pad areas with pasture grass.

BOREHOLE STIMULATION METHOD

The proposed borehole stimulation method is a proven low impact gas drainage method that has been used successfully at other underground coal mines in Queensland and New South Wales. The proposed method is distinct from conventional fraccing methods that can give rise to more significant effects.

The borehole stimulation method is as follows:

- Mine water (open cut pit water) containing very fine clean sand is pumped into the gas drainage boreholes.
- The pressure of the pumped stimulation water is just above the strength of the coal seam and opens cleats in the coal seam and creates additional fractures in the coal seam.
- The fine sand grains in the pumped stimulation water enter the open cleats and fractures and hold them open when the stimulation pump is turned off.
- The open cleats and fractures from the stimulation process result in an increase in the exposed surface area of the coal seam and this increases the rate of coal seam gas drainage.

The features of the borehole stimulation method that limit the potential effects on groundwater are as follows:

- The fresh Permian bedrock overburden and interburden, that forms the roof and floor of the Mammoth coal seam, has a higher strength than the coal seam. Whilst the pumped stimulation water pressure will be high enough to create fractures in the coal seam, it will not be sufficient to cause any fracturing of the higher strength fresh Permian bedrock coal seam roof and floor strata. The stimulation effects on strata permeability will therefore be limited to the coal seam only.
- The borehole stimulation fluid pumped into the coal seam will consist of only water and fine sand and will not contain any other additives, including chemicals or polymers. Hence, the borehole stimulation method does not introduce any source/s of potential groundwater contamination.

3.3.7 MINE WATER MANAGEMENT

APPROVED MINING OPERATIONS

Curragh Mine has an established water management system that is operated in accordance with a Water Management Plan prepared in accordance with the Curragh Mine EA.

The existing Curragh North water management system includes:

- Use of an external raw water supply to meet high quality water demands;
- Containment and reuse of open cut pit water and runoff from the ROM coal stockpile area and MIA for dust suppression water supply;
- Transfer of excess mine water to Curragh South for storage and/or re-use for mine water supply; and
- Discharge of excess mine affected water in accordance with the EA discharge conditions.

Curragh North has a 200 MLpa raw water allocation from Bedford Weir. Raw water is pumped from the Mackenzie River to the Curragh North raw water storage (CN4) near the ROM coal stockpile area and supplies the Curragh North MIA (Figure 3).

Water management system modelling conducted in 2023 for the next 5 years of operations indicates that Curragh Mine has a neutral water balance under average water management system performance conditions and has sufficient in-pit mine water storage capacity to contain pit water volumes for the worst case (high rainfall) conditions.

PROJECT MINE WATER MANAGEMENT

The project water management schematic is shown in Figure 9. The project's in-pit UMIA and ROM coal stockpile will be located within the existing Pit S open cut pit catchment. Runoff from these catchments will be collected as Pit S pit water and will continue to be managed as part of the existing Curragh North mine water management system.

The project will require a raw water supply of approximately 20 MLpa for the UMIA. This is available from the existing Curragh North raw water allocation and the existing Curragh North raw water storage (CN4). Raw water will be treated at a water treatment plant at the UMIA. Potable water will be used for UMIA drinking water, and bathhouse and ablutions water supply.

The project will also require a mine water supply of approximately 100 MLpa for cooling water, dust suppression, washdown water and fire water. Up to an additional 10 MLpa will be required for gas drainage activities that will be supplied to the surface gas drainage borehole pads by water cart. The total project mine water supply of 110 MLpa will be made up from underground mine dewatering, treated sewage effluent from the UMIA sewage treatment plant (Membrane Bio Reactor) and mine water from the Pit S mine water sump and/or the Curragh North mine water dam (CN2). The underground mine water supply will be stored in the Pit S in-pit mine water sump.

Based on the project groundwater assessment, underground mine dewatering rates are expected to be variable, from negligible amounts up to a peak of approximately 20 MLpa. The UMIA sewage treatment plant will produce approximately 19 MLpa of effluent treated to Class A standard. All underground mine dewatering and treated sewage effluent will therefore be used for underground mine water supply (100 MLpa).

The annual shortfall in total project mine water supply of 70 to 90 ML will be made up of mine water sourced from the Pit S in-pit mine water sump and/or the Curragh North mine water dam (CN2). The Curragh Mine water management system currently has a total of approximately 10 GL of stored mine water and hence has more than sufficient mine water supply for the project.

Overall, the project will not result in any significant change in the operation of the existing Curragh North water management system and will not have a significant impact on the Curragh Mine water balance.

3.3.8 CONSTRUCTION ACTIVITIES

As discussed in previous sections, the project will utilise existing Curragh Mine infrastructure and consequently involves limited and relatively minor construction activities for new project infrastructure.

Construction work will predominantly involve civil earthworks including hardstands for the UMIA, ROM coal stockpile area and substation. The majority of the construction will be in-pit. This work will require a small fleet of earthmoving equipment including an excavator, loader, dozer, trucks, grader, roller and water cart.

UMIA facilities and substation equipment will be either prefabricated or demountable type buildings. The UMIA and substation structures will require mobile cranes and minor erection works.

The initial construction phase of the project is likely to take approximately 6 months up to the commencement of underground mining. The majority of the project construction activities will occur during the day-time.

3.3.9 REHABILITATION AND MINE CLOSURE

All infrastructure required for the project is located within existing open cut mine disturbance areas, with the majority of the new project surface infrastructure located in-pit. The project surface infrastructure will therefore not result in any significant additional disturbance areas requiring rehabilitation.

The infrastructure in the in-pit UMIA will be dismantled and removed from site after the completion of underground mining. A contamination assessment of the UMIA site will be undertaken during decommissioning and the underground mine access portals in the highwall will be sealed with concrete plugs. The decommissioned in-pit UMIA site will eventually become inundated by the Pit S final void lake following mine closure.

The project power line and water supply pipeline connections at the surface will also be decommissioned and removed from site after the completion of underground mining. The relatively minor surface infrastructure areas will then be rehabilitated as part of final Curragh North open cut mine rehabilitation activities.

The project subsidence assessment (*Subsidence Report* (Appendix A)) concluded there will be no significant surface subsidence or subsidence effects, such as surface cracking or residual ponding, resulting from the project (Section 5). Hence, there will be no rehabilitation of subsidence effects required for the surface areas above the project underground mining area. The subsidence assessment also confirmed that the underground mine plan has appropriate factors of safety for long term stability.

The progressive decommissioning and rehabilitation requirements for the surface gas drainage boreholes are described in Section 3.3.6.

The proponent has a current application for a transitional Progressive Rehabilitation and Closure Plan (PRCP) for Curragh Mine. Once the EA amendment for the project is approved, the proponent will submit a change application for inclusion of the project in the PRCP/PRCP application.

The Curragh Mine PRCP concluded that the final voids for the approved open cut mining operations will remain permanent groundwater sinks post mining. The project groundwater assessment (*Groundwater Report* (Appendix B)) included an assessment of the post mining phase of the project including the effect of the underground mining area on groundwater recovery in the final voids. Post closure groundwater modelling predictions show that the project will not change the functioning of the open cut final voids as groundwater sinks in perpetuity. Hence, the project will not change the post mining groundwater impacts of the final voids for the approved open cut mining operations. The project does not otherwise affect the mine closure plan for the existing approved open cut mining operations in the PRCP.

3.3.10 PROJECT WORKFORCE

Curragh Mine has an existing workforce of approximately 2,800 people. Workforce accommodation is predominantly a mix of residential housing in Blackwater township and Drive-in Drive-out (DIDO) workers based in on-site and off-site worker accommodation camps.

The project will require an additional workforce of approximately 250 personnel. Coronado has an agreement with a private service provider to supply camp accommodation in Blackwater for the project workforce. The majority of the project workforce is anticipated to commute to larger centres in the region during roster breaks on a DIDO basis.

3.3.11 SOCIO-ECONOMIC BENEFITS

Curragh Mine provides substantial economic benefits to the local region, Queensland and Australia. Curragh Mine currently has a total workforce of approximately 2,800 workers and the mine generates additional indirect employment in the region and throughout Queensland. The Australian Government receives significant direct and indirect tax revenue from the mine, and the Queensland Government obtains significant royalties from the mine.

The project will produce approximately 19.2 Mt of export metallurgical and thermal coal over the 10 year project mine life, increasing the productivity and enhancing the economic viability of Curragh Mine. It will also increase the workforce by approximately 250 people, increasing the employment and associated economic benefits of the mine.

The majority of the project workforce will be accommodated in new camp accommodation in Blackwater whilst on rostered shifts and will DIDO to home bases in larger regional centres, including Rockhampton, during roster breaks. The project is therefore not likely to give rise to any significant negative social impacts.

4 SCOPING ASSESSMENT

4.1 INTRODUCTION

This section describes the process that has been followed to determine the scope of this EAR for the project. The process included pre-lodgement consultation with DESI as well as a review of the potential project environmental impacts and risks. The objective of the scoping assessment was to ensure that potential environmental risks were identified and assessed at an appropriate level of detail.

4.2 CONSULTATION PROCESS

A pre-lodgement meeting for the EA amendment application was held with the DESI on 20 May 2024. The purpose of the meeting was to provide an overview of the project and seek feedback from DESI on the likely EA amendment approval process and application requirements. DESI advised that the approval process can only be confirmed once a formal EA amendment application has been lodged.

4.3 ENVIRONMENTAL SCOPING ASSESSMENT

A risk-based approach was used to scope the studies included in this EAR. A scoping assessment was undertaken using environmental information from the existing Curragh Mine to identify potential environmental risks associated with the project.

The results of this assessment were used to inform the scoping of this EAR. For any environmental areas with potentially significant impacts, detailed assessments were undertaken to ensure all significant environmental risks were thoroughly assessed. In particular, detailed assessments have been conducted for subsidence, groundwater, and terrestrial ecology because of the relatively higher risk ratings for these areas. All other environmental areas were rated as having low risk and have therefore not been considered further in this EAR. A Greenhouse Gas (GHG) report has also been prepared to address the information requirements for EA amendments specified in the DESI Guideline: *Greenhouse gas emissions* (ESR/2024/6819, 15 May 2024).

The results of the scoping assessment are provided in Table 4.

TABLE 4 EAR SCOPING ASSESSMENT

Potential Impacts	Scope of Environmental Assessment
Subsidence	
In general terms, the proposed bord and pillar mining method typically does not give rise to significant subsidence or surface subsidence effects. However, subsidence from underground mining has the potential to result in the following effects and impacts: • Subsidence of the ground surface potentially resulting in alteration of drainage paths, increased	A specialist subsidence assessment has been conducted to confirm the predicted levels of subsidence from the proposed bord and pillar mining operations and the associated subsidence effects. The study scope included:

Potential Impacts	**Scope of Environmental Assessment**
erosion, residual ponding and reduction in catchment yields; • Surface cracking potentially resulting in increased erosion and disturbance of vegetation during crack rehabilitation; and • Subsurface cracking of overburden affecting the permeability of overlying strata and impacting groundwater aquifers.	• A site inspection of Pit S geology and the underground mine surface areas and surface features; • Review of relevant site and project geological and geotechnical information; • Subsidence assessment including stability assessments of the underground mine plan and surface subsidence predictions; and • Assessment of potential subsidence effects including sub-surface cracking, surface cracking and surface drainage effects. The specialist subsidence report is included in Appendix A and a high level summary is included in Section 5.
Mine Water Management	
Curragh Mine has an established mine water management system that is operated in accordance with a Water Management Plan prepared in accordance with the Curragh Mine EA. The project will make use of the existing Curragh North raw water and mine water supplies via pipeline connections to existing Curragh North raw water and mine water supply pipelines. As explained in Section 3.3.7: • Curragh North has sufficient raw water allocation to supply the project raw water demand. • The project UMIA and ROM coal stockpile areas will be located in Pit S and hence will not create any new mine water catchment areas or generate any additional Pit S mine water. The Pit S mine water will continue to be managed in accordance with the existing Curragh North mine water management system. • The project will consume all underground mine dewatering and treated sewage effluent for underground mine water supply. • The project will require a net mine water supply of approximately 70 to 90 MLpa. This can be readily supplied from the current Curragh Mine mine water storage of approximately 10 GL. Other than pipeline connections from existing Curragh North raw water and mine water pipelines to the UMIA, there are no upgrades to the existing Curragh Mine	An overview of the proposed project water supply and water management are described in Section 3.3.7. The project raw water and mine water supply demands can be met from spare capacity in the existing Curragh Mine raw water and mine water supplies. The project will not generate any additional or excess mine water requiring management. The project does not require any changes to the existing Curragh water supply or mine water management system. Further technical assessment of project water supply/management is not warranted.

<table>
<tr><th>Potential Impacts</th><th>Scope of Environmental Assessment</th></tr>
<tr><td>water management infrastructure, and no changes to the water management system required for the project.</td><td></td></tr>
<tr><td colspan="2">Groundwater</td></tr>
<tr><td>In general terms, underground mining has the potential to result in depressurisation and drawdown of groundwater levels in the vicinity of the mining excavations potentially resulting in:
Impacts on groundwater aquifers and supply bores;
Impacts on groundwater dependent features including Groundwater Dependent Ecosystems (GDEs) and stygofauna; and
Cumulative impacts on the groundwater regime.
The project also has the potential to impact on groundwater quality through the use of hydrocarbons and chemicals.</td><td>A specialist groundwater study was conducted to characterise the groundwater regime in the vicinity of the project and assess potential impacts on groundwater and groundwater dependent features. The study scope included:
A review of the existing information related to the hydrogeology of the project underground mining area and adjacent areas;
Design and implementation of a field investigation program, including additional groundwater monitoring bores, to supplement the existing groundwater dataset;
Development of a conceptual model of the groundwater regime for the project site and surrounds;
Development of a 3D numerical groundwater model to provide predictions of the effect of mining on groundwater levels;
Assessment of the impacts on groundwater users and groundwater dependent features; and
Assessment of the groundwater monitoring requirements for the project.
The specialist groundwater report is included in Appendix B and a summary is included in Section 6.</td></tr>
<tr><td colspan="2">Terrestrial Ecology</td></tr>
<tr><td>In general terms, the project has the potential to give rise to the following impacts on terrestrial ecology:
Loss of biodiversity values due to clearing for the mine surface infrastructure and/or clearing associated with the remediation of surface subsidence effects;
Impacts on any GDEs that may be present, including impacts due to clearing of vegetation and impacts due to changes in the hydrogeological regime.</td><td>A specialist terrestrial ecology study was conducted to confirm the ecological values in the project area. The study scope included:
A review of existing ecological assessments for the project area;
A terrestrial ecology field survey of the areas potentially disturbed by the project and above the underground mining areas;</td></tr>
</table>

Potential Impacts	Scope of Environmental Assessment
	• Identification of prescribed environmental mattes within the project study area; • Assessment of potential impacts on prescribed environmental matters present or likely to be present; and • Development of mitigation and management measures to address any potential significant impacts. The specialist terrestrial ecology report is included in Appendix C and a high level summary is included in Section 7. Assessment of the presence and potential impacts on GDEs, drawing on the results of the groundwater study and the terrestrial ecology assessment, is presented in Section 7.6.
Aquatic Ecology	
The specialist subsidence assessment conducted for the project concluded that there will be no significant surface subsidence or subsidence effects on surface areas above the project underground mining areas, including Blackwater Creek. The specialist groundwater assessment concluded that the water table was well below the bed of the creek in the project underground mining area and there is no interaction between groundwater and ephemeral surface flows. The project will not require any changes to the mine water management system and the project will not generate any additional or excess mine water requiring discharge. The majority of the new project surface infrastructure is located in-pit. Minor water and power supply connections and gas drainage infrastructure located at the surface above the project underground mining area will not impact surface water. Disturbance associated with new project surface infrastructure is therefore not likely to result in any significant surface water impacts. Given the lack of any significant impacts on surface water from subsidence, groundwater depressurisation, ground disturbance for new project surface infrastructure, or mine water management, the project is considered to have a very low potential to give rise to impacts on aquatic ecology.	Further assessment of aquatic ecology is not warranted, given the lack of potential impacts.

Potential Impacts	Scope of Environmental Assessment
Rehabilitation and Mine Closure	
The majority of the new project surface infrastructure is located in-pit and all of the project infrastructure is located within existing open cut mine disturbance areas. Hence, the project surface infrastructure will not result in any additional disturbance areas requiring rehabilitation. The project surface infrastructure will be decommissioned and removed from site after the completion of underground mining. The decommissioning of the in-pit UMIA will also include a contamination assessment and sealing of the highwall access portals with concrete plugs. The relatively minor infrastructure areas will then be rehabilitated as part of final Curragh North open cut mine rehabilitation. No additional rehabilitation activities will be required beyond those already proposed for the open cut mine disturbance. The specialist subsidence assessment concluded that there will be no significant surface subsidence (predicted maximum of <50 mm) or subsidence effects (such as surface cracking or residual ponding). Hence there will be no rehabilitation of subsidence effects required in the surface areas above the underground mining areas. The minor progressive decommissioning and rehabilitation requirements for the surface gas drainage boreholes are described in Section 3.3.6. The proponent has a current application for a transitional PRCP for Curragh Mine. Once the EA amendment for the project is approved, the proponent will submit a change application for the inclusion of the project in the PRCP/PRCP application.	The rehabilitation and mine closure requirements for the project are described in Section 3.3.9. The project groundwater assessment has confirmed that the underground mining operations will not change the open cut final voids functioning as groundwater sinks in perpetuity post mining. The project does not otherwise affect the mine closure plan for the existing approved open cut mining operations in the PRCP. The rehabilitation and mine closure requirements of the project will need to be approved in the Curragh Mine PRCP via a change application after the approval of the project EA amendment. No further assessment of rehabilitation and decommissioning is warranted.
Noise and Air Quality	
The Curragh Mine EA includes noise and dust compliance criteria and a complaints handling procedure for any complaints, including investigations of any noise or dust complaints. There have been no complaints in relation to noise or dust impacts from the Curragh North open cut mining operations in the last 2 years. The project's coal transport and processing activities are the same as the approved open cut mining operations. Hence, the project's coal transport and handling activities will not generate additional amenity impacts.	Further assessment of noise and air quality is not warranted, given the very low potential for significant impacts from the project.

Potential Impacts	Scope of Environmental Assessment
The potential for additional noise and dust emissions from the project, over and above the approved open cut mining operations, are limited to the construction and operation of the mine surface infrastructure. The majority of the infrastructure will be located in-pit at the southern end of Pit S. All other project infrastructure located on the surface will involve only minor construction activity that will be shielded by the large out-of-pit overburden emplacements. The surface gas drainage activities are also minor in nature and will not result in any significant noise or dust emissions. Any relatively minor noise or dust emissions from the construction or operation of the in-pit UMIA will be substantially screened by the pit walls and overburden emplacements that provide a minimum of 20 m effective screening height to the east and 40 m to the west. The closet sensitive receptor is approximately 5 km south-west of the southern end of Pit S, where the in-pit UMIA will be located. The construction and operation of the UMIA are therefore not likely to result in any significant noise or dust at any sensitive receptors or result in any increase in the noise or dust impacts from the approved open cut mining operations. Overall, the project has therefore been assessed as having a very low potential to give rise to significant noise or dust impacts at any sensitive receptors.	
Coarse and Fine Rejects	
Tailings and rejects generated from coal extracted from the project underground mining area will be stored in the existing approved Curragh Mine in-pit storage facilities. The project will produce approximately up to 3 Mt of reject material and 1.3 Mt of tailings over the life of the project. The proponent has confirmed there is sufficient in-pit storage capacity available at Curragh South for life-of-mine rejects and tailings storage, including the project.	No further assessment is warranted.

Potential Impacts	Scope of Environmental Assessment
Traffic	
The project will not increase the approved Curragh Mine peak ROM coal production rate. Hence, the project will not generate any additional production-related traffic on public roads. The project will require an increase in the current Curragh Mine workforce. However, the total workforce (including the project) will be comparable to previous operating levels and is anticipated to remain below the open cut mine workforce when operating at the maximum approved production capacity. Hence, the project will not result in any additional operating road traffic above either the previous or currently approved levels. The additional project construction phase road traffic will also be limited due to the relatively small scale and short-term nature of the construction activities. Overall, the project is not expected to result in any additional traffic impacts, beyond the approved open cut mining operations.	Further assessment of traffic impacts is not warranted, given the lack of any significant additional traffic generation, compared to the approved open cut mining operations.
Cultural Heritage	
The proponent has an existing Cultural Heritage Management Plan (CHMP) prepared in accordance with the *Aboriginal Cultural Heritage Act 2003* (ACH Act). The CHMP applies to the Curragh Mine MLs, including the project area. An assessment of non-Aboriginal heritage of the Curragh North ML area was conducted as part of the Curragh North EIS. The assessment concluded that there were no significant heritage items within Curragh North site. There is consequently a low potential for project impacts on non-Aboriginal cultural heritage.	Further assessment of non-Aboriginal cultural heritage is not warranted. Potential impacts on Aboriginal cultural heritage will be managed in accordance with the existing Curragh Mine CHMP.
Visual Amenity	
The project involves underground mining operations and relatively minor and small-scale surface infrastructure, compared to the existing large-scale open cut mining operations. The majority of the new project infrastructure will be located in-pit and all new project infrastructure will be located within the existing open mine disturbance area. Overall, the project will not have any significant additional visual effect or visual impact, beyond the existing large-scale open cut mining operations.	Further assessment of visual amenity is not warranted, given the lack of any significant visible elements and potential impacts.

Potential Impacts	Scope of Environmental Assessment
Socio-Economics	
The project will increase the productivity and enhance the economic viability of Curragh Mine. It will also increase the Curragh Mine workforce and associated employment benefits. The project workforce will be accommodated in an accommodation camp in Blackwater and the majority of employees are expected to DIDO from larger reginal centres, including Rockhampton. Overall, no negative socio-economic impacts are anticipated as a result of the project.	An overview of the positive socio-economic benefits associated with the project are discussed in Section 3.10.11. Further assessment of socio-economics is not warranted, given the low potential for any negative socio-economic impacts.
Non-mining Waste Management	
Curragh Mine has a Waste Management Plan developed in accordance with the EA. The plan includes waste management procedures, including the waste types that will be produced by the project mining activities. The project will operate in accordance with the established Curragh Mine waste management procedures and the relevant Curragh Mine EA waste conditions. The project will not increase the approved Curragh Mine peak production rate. Hence, the project will not generate any additional production waste. The project will require a new Sewage Treatment Plant at the in-pit UMIA. The sewage effluent will be treated to Class A standard and will be re-used for underground mine water supply.	
Greenhouse Gas Assessment	
The project will generate GHG emissions. Curragh Mine has an established GHG management and reporting program that includes compliance with the relevant requirements of the National Greenhouse and Energy Reporting Scheme (NGERS) and the emissions reduction requirements of the Safeguard Mechanism.	

5 SUBSIDENCE

5.1 INTRODUCTION

This section provides a high level overview of the specialist mine subsidence assessment conducted for the project. It is based on the subsidence predictions contained in the *Subsidence Report* (Appendix A) prepared by Gordon Geotechniques Pty Ltd.

5.2 SUBSIDENCE PREDICTIONS

5.2.1 INTRODUCTION

The bord and pillar mining method is described in Section 3.3.3. The project bord and pillar mine layout has been specifically designed with sufficient roadway and pillar strength to ensure that there will be no caving of the roof and that the underground workings will be stable and safe. Unlike the longwall mining method, bord and pillar mining operations do not typically result in significant subsidence of the surface above the underground mine workings. The results of the specialist subsidence assessment are summarised in the following sections.

5.2.2 PREDICTION METHODOLOGY

The subsidence assessment included the following key components:

- Review of the project site geology and mining method;
- Review and assessment of stability of the underground mine plan; and
- Prediction of subsidence and subsidence effects for the project bord and pillar mining operations.

The predicted vertical subsidence at the surface was calculated using a strata compression analysis. This is a proven and reliable prediction methodology widely used throughout Queensland and New South Wales for bord and pillar mines.

5.2.3 VERTICAL SUBSIDENCE PREDICTIONS

The review of the proposed mine plan and stability analysis has confirmed that the underground workings have suitable factors of safety to ensure long term stability. The predicted maximum vertical subsidence above the project bord and pillar mining area is predicted to be less than 50 mm. This is consistent with operational experience at similar operating bord and pillar mines, including Ensham Mine. It should be noted that the widely accepted limit of measurable subsidence is 50 mm i.e. it is not possible to differentiate surface subsidence of 50 mm or less from changes in surface elevation due to natural soil moisture variation.

Given the minimal amount of surface subsidence predicted above the project underground mining area, residual surface depressions that could potentially result in the ponding of surface runoff are not expected to occur. This is consistent with operational experience at other bord and pillar mines with low levels of surface subsidence where ponding has not been observed above bord and pillar mining areas.

5.2.4 SURFACE CRACKING

Based on operational experience at other similar bord and pillar mines in Queensland and New South Wales, surface cracking is not predicted to occur above the project underground mining area due to the low levels of predicted surface subsidence and associated strains (surface cracking has not been observed at similar mines where surface subsidence is less than 300 mm). This is consistent with operational experience at Ensham Mine where surface cracking has not been observed above bord and pillar mining areas.

5.2.5 SUB-SURFACE CRACKING

The nature of the proposed bord and pillar mining method results in minor surface subsidence due to elastic compression of the overburden strata. The mining method does not result in caving of the mine roof strata or overburden that would result in sub-surface cracking.

6 GROUNDWATER

6.1 INTRODUCTION

This section provides a summary of the key findings of the groundwater assessment undertaken by hydrogeologist.com.au for the project. The detailed assessment is provided in the *Groundwater Report* (Appendix B).

6.2 SCOPE OF WORK AND METHODOLOGY

The scope of work and methodology for the groundwater assessment included:

- A desktop study to obtain background information on the groundwater regime within the project underground mining area and its surrounds. This included a search of relevant groundwater databases and an extensive review of publicly available groundwater reports and information on local and regional geology. Figure 10 shows the locations of relevant groundwater bores and data points identified as part of the desktop study.
- A groundwater site investigation to develop a detailed understanding of the local groundwater regime. The groundwater site investigation is shown in Figure 10 and involved:
  - Installing a dedicated groundwater monitoring network of eight groundwater monitoring bores and 10 vibrating wire piezometer (VWP) arrays within the project underground mining area and the surrounding area to measure groundwater levels, groundwater quality and hydraulic parameters.
  - Installing a datalogger in each monitoring bore and VWP site to continuously record groundwater levels.
  - Collecting groundwater quality data from the groundwater monitoring bores over a period of seven months between August 2023 and March 2024. The groundwater quality data collected includes field measurements of pH and salinity and laboratory analysis of groundwater quality samples for a range of water quality characteristics including major ions, metals and metalloids.
  - A census of groundwater supply bores in the vicinity of the project underground mining area to confirm bore locations, usage and water quality.
  - A targeted creek and alluvium investigation to ground-truth the extent and depth of bed sediments and alluvium associated with watercourses and drainage features that traverse the project underground mining area and its surrounds, and to identify landform features relevant to the local groundwater regime. The creek and alluvium investigation involved:
    - Positioning five groundwater monitoring bores adjacent to Blackwater Creek and the Mackenzie River (Figure 10);
    - Drilling six test holes, arranged in a series of transects across Blackwater Creek (as shown in Figure 10), to confirm the presence and geometry of government mapped alluvium;
    - Visual inspections of surface geology within watercourse and drainage feature channels and/or overbank areas (Figure 10);

  - Undertaking a topographic landform assessment of the project underground mining area and its surrounds using high resolution aerial photography and detailed LiDAR data; and
  - Accurately mapping the confirmed extent of ground-truthed alluvium in the project underground mining area and its surrounds.
- Compiling and analysing the information collected from the desktop study and the groundwater site investigation to develop a conceptual model of the groundwater regime;
- Developing a 3D numerical groundwater flow model for the project to predict the potential effects of the proposed mining activities;
- Assessing potential impacts of the project, including:
  - The potential impacts of groundwater drawdown on groundwater supply bores and groundwater dependent features including watercourses and drainage features;
  - Potential cumulative drawdown impacts with other resource activities; and
  - Potential impacts on groundwater quality.
- Developing a groundwater monitoring program for the project and feasible mitigation and management strategies in the event of potential adverse project impacts being identified.

A detailed description of the groundwater assessment methodology is provided in the *Groundwater Report* (Appendix B). The raw and compiled data collected as part of the desktop study and groundwater site investigation are also presented in the *Groundwater Report* (Appendix B).

6.3 GROUNDWATER REGIME

6.3.1 HYDROGEOLOGICAL SETTING

The local hydro-stratigraphy comprises:

- Localised alluvium associated with the remnants of the Mackenzie River floodplain;
- An extensive weathered profile;
- A thick upper sequence of fresh (i.e. unweathered) Permian bedrock above the Mammoth seam;
- The Mammoth coal seam (i.e. the target seam for underground mining); and
- A thick lower sequence of fresh Permian bedrock, including the deeper Mackenzie coal seam.

Figure 11 shows the local surface geology. Figures 12 and 13 show conceptual hydrogeological cross-sections through the project underground mining area and approved Curragh mining operations. The cross-section alignments are shown in Figure 11.

Targeted field investigations show that the distribution of alluvium is limited to localised deposits associated with the Mackenzie River floodplain (Figure 11). In the north-western part of Curragh North, the alluvial floodplain deposits extend across the inside of a meander in the Mackenzie River. The remainder of Curragh North is located beyond the limit of alluvial deposition. Targeted field investigations also show that there is no alluvial floodplain associated with Blackwater Creek (Figure 11).

The alluvium above the northern end of the underground mining area exhibits high permeability but does not form an extensively and uniformly saturated aquifer in the vicinity of the project underground mining area.

The weathered profile, fresh bedrock and coal seams are aquitards that exhibit low permeability and restrict the movement of groundwater.

6.3.2 GROUNDWATER RECHARGE, MOVEMENT AND DISCHARGE

Rainfall is the main source of groundwater recharge. A very small portion of rainfall infiltrates the ground surface and moves through the unsaturated weathered profile and fresh bedrock aquitards to recharge the unconfined groundwater table. Groundwater monitoring data shows that groundwater levels are typically stable throughout each year with negligible response to seasonal rainfall. In addition, chloride mass balance calculations indicate low rates of groundwater recharge.

Groundwater recharge also occurs along the Mackenzie River channel to the west of the Curragh North open cut pits where the riverbed has been incised into the fresh bedrock. In the localised areas where fresh bedrock is exposed in the bed of the Mackenzie River channel, seepage of surface water flows recharges the underlying groundwater table. Groundwater monitoring data shows that groundwater levels along the river fluctuate in response to seasonal flow events.

Figure 14 shows the unconfined groundwater table depth and direction of flow. The groundwater table elevation is lowered in the vicinity of the approved open cut pits, creating a hydraulic gradient that induces groundwater flow towards the pits.

Groundwater discharge mainly occurs via dewatering and evaporation from the approved open cut pits.

6.3.3 GROUNDWATER DEPTH AND DISTRIBUTION

Figure 14 shows the effects of the approved open cut mining on the groundwater table depth in the vicinity of the project underground mining area. The groundwater table is deepest around the perimeter of the approved open cut pits, where the groundwater table is drawn down to the pit floor. In these areas, the groundwater table is located at depths of up to 150 m below ground level.

The depth of the groundwater table reduces with increasing distance from the approved open cut pits. Within the project underground mining area:

- The groundwater table is mainly located in the weathered profile at depths of approximately 20 to 70 m below ground level in the northern mining area;
- The groundwater table is mainly located in the fresh bedrock at depths of approximately 40 to 70 m below ground level in the central mining area; and
- The groundwater table is mainly located in the fresh bedrock at depths of approximately 20 to 50 m below ground level in the southern mining area.

The local hydro-stratigraphy is saturated below the unconfined groundwater table, and dry and unsaturated above the unconfined groundwater table.

In the project underground mining area, the base of the alluvium is typically located several metres above the unconfined groundwater table due to the impacts of approved open cut mining, and therefore the alluvium is typically dry and unsaturated. Similarly, in the southern and central underground mining areas, the base of the weathered profile is typically located several metres above the unconfined groundwater table due to the impacts of approved open cut mining, and the weathered profile is dry and unsaturated in these areas. The areas of unsaturated alluvium and weathered profile do not interact directly with the unconfined groundwater table or the underlying groundwater regime.

There are no direct groundwater-surface water interactions or surface expressions of groundwater within the project underground mining area or its surrounds.

6.3.4 GROUNDWATER QUALITY

The *Groundwater Report* (Appendix B) provides a summary of the groundwater quality data for the local groundwater regime.

Groundwater quality is typically pH neutral (to slightly alkaline) and highly saline to briny, with low concentrations of metals, metalloids, and other solutes. In the vicinity of the Mackenzie River channel, the underlying groundwater quality is less saline due to the diluting effects of localised recharge from surface water flows.

6.4 IMPACT ASSESSMENT

6.4.1 GROUNDWATER EFFECTS OF THE PROJECT

The bord and pillar mine layout has been specifically designed to ensure that there will be no caving above the underground workings and consequently there will be no subsidence or associated subsidence effects on the groundwater regime. The project gas drainage activities are localised within the target Mammoth coal seam and will not result in any physical changes to the surrounding rock or any associated effects on the groundwater regime.

The underground workings will be located below the groundwater table.

The extraction of coal from the underground mine workings will create a void within the coal seam. The underground mine workings will intercept groundwater moving through the coal seam and the surrounding rock mass. Groundwater that seeps into the underground workings will be dewatered to enable the continuation of mining operations. The volume of groundwater seepage dewatered from the underground mining operations is expected to range from approximately 4 to 20 MLpa.

Underground mining will create a low pressure (i.e. depressurised) zone in the coal seam, forming a pressure differential that induces groundwater seepage from the surrounding rock towards the underground workings.

Due to the significant depressurisation effects of the approved open cut mining activities, depressurisation from the project will be generally constrained to the underground workings.

However, depressurisation from the project is predicted to extend into the fresh bedrock located above the western part of the Southern Mining Area, between Pit S and Pit X. In this area, the unconfined groundwater table is located in the fresh bedrock and therefore the pressure change in this formation will result in a corresponding lowering of the groundwater table (i.e. drawdown) (Figure 15). The maximum predicted drawdown due to the project is 19 m, increasing the depth to groundwater to approximately 40 to 70 m below ground level. The drawdown extent coincides with an area where the underground workings will be located at relatively shallow depths and there is limited thickness of fresh bedrock overburden separating the depressurised coal seam from the overlying groundwater table. Elsewhere, the underground workings will be deeper and the fresh bedrock overburden is thicker, and of lower permeability, which will collectively limit the propagation of depressurisation to the overlying groundwater table. As a result, there is no predicted drawdown of the groundwater table outside the drawdown extent shown in Figure 15.

No depressurisation of the weathered profile or the Mackenzie River floodplain alluvium is predicted as a result of the project underground mining activities.

The underground bord and pillar workings will gradually fill with water following the completion of mining, allowing groundwater levels in the surrounding strata to gradually recover to baseline levels in the long-term post mining. The Curragh Mine *Progressive Rehabilitation and Closure Plan* (PRCP) shows that the approved open cut mining activities will have final voids that will remain as permanent groundwater sinks. The project will not alter function of the open cut pit final voids as permanent groundwater sinks.

The following sections describe the potential impacts related to predicted changes in groundwater levels due to the project. Potential groundwater quality impacts associated with the use of hydrocarbons and chemicals are discussed in Section 6.4.7. Section 6.4.5 addresses potential impacts on stygofauna.

6.4.2 IMPACTS ON GROUNDWATER USERS

A bore census was carried out to identify any groundwater supply bores in proximity to the project underground mining area. The bore census confirmed there are no groundwater supply bores within a 2.5 km radius of the project underground mining area boundary. This is to be expected, given the generally saline groundwater quality and low bore yields which collectively limit groundwater use.

The nearest known groundwater supply bore is located more than 2.5 km from the project underground mining area and well beyond the maximum predicted extent of groundwater drawdown from the project. Hence, the project is not predicted to impact any groundwater users.

6.4.3 IMPACTS ON WATERCOURSES AND DRAINAGE FEATURES

Within the project groundwater drawdown zone, the unconfined groundwater table (following the effects of approved open cut mining) is located between 30 m and 40 m below the bed of Blackwater Creek and its tributaries. The groundwater table does not intersect any creek bed or the ground surface within the project drawdown zone. Hence, drawdown on the groundwater table due to the project is not predicted to have any effect on Blackwater Creek or its tributaries.

Figure 15 shows that the Mackenzie River is located outside the zone of maximum predicted drawdown on the groundwater table due to the project. Hence, drawdown on the groundwater table due to the project is not predicted to have any effect on the river.

On this basis, the drawdown effects of the project are not predicted to change surface water flows or give rise to adverse impacts on any aquatic habitats and ecosystems associated with the Mackenzie River, Blackwater Creek or their tributaries, or any downstream surface water users.

6.4.4 IMPACTS ON GROUNDWATER DEPENDENT ECOSYSTEMS

The potential for the project to impact terrestrial and aquatic Groundwater Dependent Ecosystems (GDEs) is discussed in Section 7.6. The GDE impact assessment concluded that the project is not predicted to give rise to any additional impacts on terrestrial or aquatic GDEs.

6.4.5 IMPACTS ON STYGOFAUNA

Subterranean GDEs are ecosystems associated with groundwater in caves and aquifers. Stygofauna are the aquatic animals (generally invertebrates such as crustaceans) that inhabit subterranean GDEs.

Stygofauna are known best from limestone, anchialine, calcrete and fractured rock aquifers, but can also occur in alluvial aquifers (Hancock *et al*., 2005; Hancock and Bolton, 2008). Within alluvial aquifers, stygofauna are typically concentrated in the hyporheic zone where surface waters and groundwater mix.

A desktop review of the Queensland Subterranean Aquatic Fauna Database (DESI, 2023), Queensland GDE mapping (DESI, 2024b), GDE Atlas (Bureau of Meteorology, 2024) and various regional and local groundwater and stygofauna studies was undertaken, to determine the potential presence of stygofauna assemblages and stygofauna habitat in the project underground mining area and its surrounds. The relevant findings of the desktop study are as follows:

- There are no mapped subterranean GDEs or groundwater dependent cave areas within the project underground mining area or its surrounds.
- There are no limestone or calcrete aquifers present within the project underground mining area.
- Blackwater Creek is ephemeral and lacks alluvium or other unconsolidated sediments, indicating that there is negligible potential for hyporheic mixing zones that typically host stygofauna.
- The coal seams provide unfavourable conditions for the presence of groundwater dependent stygofauna assemblages.
- The Mackenzie River floodplain alluvium provides favourable conditions for the presence of groundwater dependent stygofauna assemblages.
- Several stygofauna species have been detected in the saturated Mackenzie River floodplain alluvium at Jellinbah Mine, downstream of Curragh North.

Stygofauna sampling was undertaken to investigate the presence of stygofauna within the project underground mining area and its surrounds, and to confirm the findings of the desktop study. The sampling program encompassed the range of potential stygofauna habitats within the project underground mining area and its surrounds and included nine groundwater monitoring bores, as follows:

- Three bores screened within the fresh bedrock (HYDRO23_02MB, HYDRO23_06MB and HYDRO23_19MB);
- Three bores screened within the weathered profile (HYDRO23_07MB, HYDRO23_08MB and HYDRO23_09MB); and
- Three bores screened within the Mackenzie River floodplain alluvium (1426MB, 1531MB and 1312MB).

The bore locations are shown in Figure 13 of the *Groundwater Report* (Appendix B). The monitoring bores were sampled at least six months after bore construction to enable any stygofauna communities to establish prior to sampling, in accordance with the *Guideline for the Environmental Assessment of Subterranean Aquatic Fauna* (DSITI, 2015).

The samples were analysed for the presence of stygofauna by Professor Grant Hose, a taxonomist from the Department of Biological Sciences at Macquarie University.

No stygofauna assemblages were detected in the fresh bedrock aquitard. This result supports the findings of the desktop study that indicated stygofauna habitat and/or assemblages are unlikely to occur in the coal seams or the overlying bedrock.

Stygofauna assemblages were detected in the Mackenzie River floodplain alluvium. This is consistent with the findings of the desktop study and the reported presence of stygofauna in the Mackenzie River floodplain alluvium downstream of Curragh Mine.

Sampling also detected stygofauna in the weathered profile. As described in Section 6.3, the weathered profile is present across the entire project underground mining area and surrounds and is contiguous with the weathered profile in the surrounding area. Potential habitat provided by the weathered profile, therefore, is not considered to be unique.

As discussed in Section 6.4.1, no depressurisation of the weathered profile or the Mackenzie River floodplain alluvium is predicted as a result of project mining activities. The project's effects on groundwater are therefore not predicted to affect the potential stygofauna habitat that these formations provide, and therefore the project is unlikely to give rise to any impacts on stygofauna.

6.4.6 CUMULATIVE IMPACTS

The approved open cut mining activities in the vicinity of the project underground mining area include the approved Curragh North open cut pits to the west, Pit X at Curragh Central to the south and Jellinbah Mine to the east (Figure 3).

Other open cut mining operations in the region (such as Yarrabee Mine and Blackwater Mine) are located at significant distances from the project underground mining area, and well beyond the predicted groundwater effects of the project. On this basis, these distant mining operations are unlikely to add any significant drawdown to the local groundwater regime and are unlikely to give rise to any cumulative impacts with the project.

The numerical groundwater model was used to assess the cumulative groundwater impacts of Curragh Mine, Jellinbah Mine and the project during the life of the project and post closure.

As discussed in Section 6.3, the local groundwater regime is significantly affected by the approved open cut mining operations. Hence, the incremental drawdown from the project overlaps with the cumulative drawdown effects of the approved mining operations. In the area affected by incremental drawdown from the project (shown in Figure 15) the project will contribute to up to 19 m of the total cumulative drawdown on the groundwater table, corresponding to between 1 and 50 % of the total cumulative drawdown in this area. The project contribution to total cumulative drawdown reduces in proximity to Pit S and Pit X where the drawdown effect of the approved open cut pits is greatest.

The zone of predicted cumulative drawdown associated with the project does not include any groundwater users and cumulative drawdown is not expected to impact surface water due the lack of any groundwater surface water interaction in this area.

6.4.7 IMPACT ON GROUNDWATER QUALITY

The project is an underground extension of the existing Curragh Mine open cut mining operations and will be operated as part of the approved Curragh Mine.

The storage of hydrocarbons and chemicals will continue to be managed in accordance with the existing Curragh Mine management practices, which include bunding of storage areas and immediate clean-up of any spills. These measures are standard practice and legislated requirements at mine sites to prevent groundwater contamination. Given the limited hydrocarbon and chemical storage activities proposed, and the controls that will be adopted, the project is not expected to give rise to groundwater contamination as a result of hydrocarbon and chemical contamination.

Gas drainage bore stimulation will utilise water and clean sand and stimulation fluids and will not include any chemicals or polymers. Hence, the gas drainage activities do not have the potential to result in any adverse effect on groundwater quality or result in groundwater contamination.

Groundwater monitoring will be undertaken to confirm the groundwater quality throughout the mine life and post closure. The groundwater monitoring program is described in Section 6.5 and has been designed to detect any unanticipated groundwater quality issues.

6.5 GROUNDWATER MONITORING AND MANAGEMENT

The Curragh Mine EA groundwater conditions specify the groundwater monitoring and management requirements to be implemented throughout the life of the approved Curragh Mine operations, to confirm the actual extent of groundwater impacts. The key requirements include:

- Establishing and implementing a groundwater monitoring program; and
- Undertaking groundwater monitoring to ensure compliance with relevant groundwater trigger values.

The existing Curragh Mine EA groundwater monitoring network comprises 13 groundwater monitoring bores targeting the key hydro-stratigraphic units present at Curragh Mine.

Groundwater levels in these bores are recorded on a six-monthly basis and this data is used to enable natural groundwater level fluctuations (such as seasonal responses to rainfall) to be distinguished from potential groundwater level changes due to drawdown from the approved open cut mining activities.

Groundwater quality in these bores is monitored on a six-monthly basis to detect any changes in groundwater quality due to the approved mining activities. Groundwater samples are analysed for a comprehensive suite of parameters including pH, electrical conductivity, total dissolved solids, major ions (Ca, Mg, Na, K, Cl, SO_4 and alkalinity as CO_3 and HCO_3), nutrients (phosphate and nitrate), metals and metalloids (Al, As and Hg) and petroleum hydrocarbons.

The EA conditions require the proponent to conduct an investigation of any exceedances of EA trigger values within the required timeframes and notify DESI. The EA also requires that any corrective actions, identified by the investigation, are implemented to the satisfaction of DESI. This process ensures the early identification of any potential contamination or unexpected drawdown effects and allows the targeted application of corrective measures to minimise the potential for environmental harm to the groundwater regime.

The Curragh Mine groundwater monitoring program will be updated to include the additional monitoring required for the project, prior to the commencement of the project. This will include expansion of the Curragh Mine groundwater monitoring network to include three additional project monitoring bores (Figure 16). The monitoring bore details are provided in Table 5.

Similar to the existing Curragh Mine groundwater monitoring network, the additional project bores target the key rock formations (i.e. the weathered profile and fresh bedrock) and the unconfined groundwater table.

The additional bores (and the broader expanded monitoring network) include bores located outside the maximum predicted zone of project drawdown that can be used for monitoring background conditions for the project. They also include bores located within the zone of drawdown that can be used to validate the project groundwater drawdown predictions. The groundwater monitoring network is therefore suitable for identifying and monitoring the effects of the project on the groundwater regime.

Groundwater levels and quality in the additional bores will be monitored in accordance with the EA conditions. Monitoring results will be compared to the applicable EA groundwater level and quality trigger values.

The EA groundwater level and quality trigger values for the additional project monitoring bores will be developed in accordance with the existing procedures and in consultation with, and to the satisfaction of, DESI.

TABLE 5 ADDITIONAL GROUNDWATER MONITORING BORES

Monitoring Bore	Easting[1]	Northing[1]	Surface Elevation[2]	Target Unit
HYDRO23_02MB	691,426	7,413,825	119.74	Fresh bedrock
HYDRO23_06MB	691,307	7,414,493	120.51	Fresh bedrock
HYDRO23_07MB	692,292	7,413,360	127.67	Weathered profile

1: Coordinates provided in AGD84, Zone 55

2: Elevation provided for top of bore casing and presented in metres above Australian Height Datum mAHD

7 TERRESTRIAL ECOLOGY

7.1 INTRODUCTION

This section provides a summary of the key findings of the terrestrial ecology assessment undertaken by Eco Solutions and Management (ECOSM) for the project. The detailed assessment is provided in the *Terrestrial Ecology Report* (Appendix C). An assessment of the potential impacts of the project on GDEs, drawing on the results of the groundwater assessment and the terrestrial ecology assessment, is provided in Section 7.6.

7.2 METHODOLOGY

The study area for the terrestrial ecology assessment (Figure 17) included the following areas where they are located beyond the extent of the existing and approved open cut mine disturbance areas:

- Areas above the proposed underground mining areas;
- Areas potentially disturbed by gas drainage surface activities; and
- The terrestrial and aquatic GDE study area.

The methodology included in initial desktop assessment including database searches and review of previous ecology survey reports for the area prepared for the Curragh North and Curragh Central environmental approvals. A flora and fauna field survey of the study area was also conducted in December 2023.

7.3 RESULTS

The flora field survey found that the vegetation present within the study area closely aligned with the Queensland Herbarium vegetation mapping (version 13). A large portion of the study area in the south-eastern corner of ML 80110 is largely non-remnant vegetation in the form of cleared grazing land dominated by Buffel grass. The southern portion of the study area contains remnant vegetation associated with Blackwater Creek and its floodplain (Figure 17). The remnant vegetation along Blackwater Creek is dominated by Queensland Blue Gum and Coolabah woodland. The Blackwater Creek floodplain area vegetation includes Brigalow and Coolabah woodland. The study area regional ecosystems (REs) and their status are shown in Figure 17.

There were no threatened flora species listed under the *Nature Conservation Act* 1992 (NC Act) or the *Environment Protection and Biodiversity Conservation Act 2000* (EPBC Act) recorded in the study area and two NC Act listed species considered possible to be present (*Solanum elachophyllum* and *Solanum adenophorum*).

The Squatter Pigeon (southern) was the only threatened fauna species prescribed under the NC Act or EPBC Act recorded during the field survey. The following threatened fauna species listed under the NC Act and EPBC Act were also considered to potentially be present within the study area:

- Australian Painted Snipe;
- Koala;

- Greater Glider;
- Yellow-bellied Glider; and
- Ornamental Snake.

A range of exotic weed species and four feral fauna species were also recorded in the study area. The habitat areas for each of the flora and fauna species are provided in the *Terrestrial Ecology Report* (Appendix C).

7.4 IMPACT ASSESSMENT

As described previously, all new underground mine surface infrastructure required for the project will be located within existing Curragh North mine disturbance areas. The majority of the surface infrastructure will be located in the UMIA on the pit floor at the southern end of Pit S. Consequently, the construction of project surface infrastructure will not result in any additional impacts on prescribed environmental matters.

Surface activities associated with the life-of-mine gas drainage program are anticipated to involve in the order of 20 new surface boreholes and associated cleared pads for borehole drilling and gas drainage activities. The majority of these new surface boreholes will also be located within existing Curragh North mine disturbance areas. It is expected that up to approximately eight new boreholes will be required in the terrestrial ecology study area in areas not previously disturbed or approved to be disturbed. The total disturbance area for each borehole will be less than 1 ha. There are significant areas above the southern underground mining area at the southern end of ML 80110 that have been cleared of vegetation for grazing and do not contain any areas of prescribed environmental matters (Figure 17). The proponent has confirmed that any new gas drainage borehole pads and associated access track connections can be located in these areas and hence will not impact on any prescribed environmental matters.

The subsidence assessment (Section 5) concluded that the maximum surface subsidence above the underground bord and pillar mining areas will be less than 50 mm. The report concluded that this level of subsidence will not give rise to any significant surface effects, including surface cracking or surface ponding, and will not be distinguishable from natural variations in ground surface levels due to seasonal changes in surface soil moisture content. Hence surface subsidence will not impact any prescribed environmental matters.

Overall, the project is not predicted to have any additional impacts on any prescribed environmental matters.

7.5 MANAGEMENT MEASURES

Curragh Mine has a range of existing management measures and procedures that will be applied to the project to mitigate and manage potential impacts to prescribed environmental matters. These include:

- Permit to Disturb procedure – this procedure involves obtaining approval from the environmental officer prior to the commencement of any disturbance. The procedure ensures proposed disturbance areas are permissible in accordance with existing approvals and the application of appropriate controls during disturbance activities including use of spotter catchers for vegetation clearing, erosion and sediment control and weed control.

- Erosion and Sediment Control Plan – this management plan requires the installation of erosion and sediment control measures, where necessary, to minimise erosion and the release of sediment from disturbed areas.
- PRCP – new disturbance areas associated with the project will be required to be rehabilitated in accordance with the Curragh Mine PRCP. The rehabilitation methods for the gas drainage disturbance areas are described in Section 3.3.6.

7.6 GROUNDWATER DEPENDENT ECOSYSTEMS

7.6.1 INTRODUCTION

The guideline *Queensland groundwater dependent ecosystem mapping method* (DSITI, 2015) defines GDEs as *'Ecosystems that require access to groundwater to meet all or some of their water requirements so as to maintain the communities of plants and animals, ecological processes they support, and ecosystem services they provide'*. This guideline identifies three types of GDEs as follows:

- Terrestrial GDEs where an ecosystem relies on the subsurface presence of groundwater (such as a perched aquifer or a shallow water table).
- Aquatic GDEs where an ecosystem relies on the surface expression of groundwater. Aquatic GDEs may include riverine water bodies fed by groundwater baseflow, wetlands, lakes, springs and estuarine coastal, marine ecosystems.
- Subterranean GDEs which include cave and aquifer ecosystems.

The Independent Expert Scientific Committee (IESC) *Information Guidelines Explanatory Note – Assessing Groundwater-Dependent Ecosystems* (Doody, Hancock and Pritchard, 2019) (IESC GDE Guideline) provides the following additional information that is relevant to the definition and identification of GDEs:

- Groundwater is defined as '*water occurring naturally below ground level (whether in an aquifer or otherwise)*' that is within the saturated zone or the soil capillary fringe zone but does not include water held in the soil of the unsaturated zone, unless it is a perched aquifer;
- 'There are common decision rules of groundwater dependence that guide GDE identification. For example, vegetation associated with shallow groundwater (less than 10 m) is likely to be part of a GDE'; and
- 'As groundwater depth increases (> 20 m) … [there is] a low or no likelihood of groundwater dependence.'

7.6.2 ASSESSMENT METHODOLOGY

The GDE assessment was undertaken in accordance with the framework set out in the *Groundwater Dependent Ecosystems: EIS Information Guideline* (Department of Environment and Science (DES), 2022) and the IESC GDE Guideline. Within this framework, there are specific assessment methodologies for each type of GDE. For terrestrial and aquatic GDEs, the specific assessment methodologies are similar. Subterranean GDEs are assessed using a different assessment methodology and in accordance with a specific set of assessment guidelines. The subterranean GDE assessment is presented in Section 6.4.5.

For terrestrial and aquatic GDEs, the GDE assessment involved the following:

- Identifying the GDE study area based on the maximum predicted extent of direct and indirect impacts on terrestrial and aquatic GDEs. In the absence of any additional surface disturbance associated with the project, the GDE study area comprises the maximum predicted extent of the project's groundwater drawdown effects on the regional groundwater table. The terrestrial and aquatic GDE study area is shown in Figure 18.
- Identifying potential terrestrial and aquatic GDEs within the GDE study area based on a search of the following databases:
  - Queensland GDE mapping (DESI, 2024c);
  - GDE Atlas (Bureau of Meteorology, 2024);
  - Queensland Springs Database (DES, 2018); and
  - Queensland WetlandMaps (DESI, 2019);
- Rationalising the potential terrestrial and aquatic GDEs with the available site-specific groundwater and surface water data to develop a conceptual understanding of the hydrogeological regime and the presence of GDEs.
- Assessing the impacts to any confirmed GDEs and developing a GDE monitoring program, as necessary.

7.6.3 POTENTIAL GROUNDWATER DEPENDENT ECOSYSTEMS

AQUATIC GROUNDWATER DEPENDENT ECOSYSTEMS

The Queensland GDE mapping and GDE Atlas indicate there are no potential aquatic GDEs mapped within the GDE study area. This is consistent with the groundwater assessment (*Groundwater Report* (Appendix B)) that concluded there are no direct groundwater-surface water interactions or surface expressions of groundwater within the GDE study area (Section 6.3.3).

Queensland WetlandMaps indicates there is a lacustrine wetland within the GDE study area that is described as 'artificial'. This 'artificial wetland' is an area within the approved open cut mine disturbance area that has no wetland features and is neither a wetland nor a potential aquatic GDE.

Queensland WetlandMaps also indicates there are riverine wetlands adjacent Blackwater Creek and its tributaries. The terrestrial ecology assessment (*Terrestrial Ecology Report* (Appendix C)) confirmed that the vegetation communities mapped at this location are not considered to be wetlands under the *Vegetation Management Act 1999* (VM Act). In addition, the groundwater assessment (*Groundwater Report* (Appendix B)) determined that the existing depth to groundwater within the GDE study area is between 10 m and 20 m below ground level. On this basis, the mapped riverine wetlands are not groundwater dependent. Hence, there are no potential aquatic GDEs within the GDE study area.

TERRESTRIAL GROUNDWATER DEPENDENT ECOSYSTEMS

The Queensland GDE mapping indicates there are derived terrestrial GDEs within the GDE study area with a low confidence in the prediction of groundwater dependence (Figure 18). The Queensland GDE mapping is based on the assumption that the area of derived terrestrial GDEs comprises 'treed regional ecosystems on alluvia with fluctuating, intermittent flow and unknown pH' and 'intermittently saturated alluvial aquifers with the potential to support terrestrial GDEs'. This indicates the low confidence classification is due to the lack of supporting groundwater data. The GDE Atlas maps these same areas as terrestrial GDEs with a low potential for groundwater interaction (Figure 18).

The extents of the mapped potential terrestrial GDEs are consistent with the extent of alluvium shown on the published regional-scale surface geology mapping. As discussed in Section 6, targeted field investigations undertaken as part of the groundwater assessment have ground-truthed the actual extent of alluvium in the mapped potential terrestrial GDE area. The ground-truthed alluvium mapping is presented in Figure 11 and shows that there is no alluvium or alluvial aquifer present in the Blackwater Creek area, and that the ground-truthed surface geology comprises a regionally extensive weathered profile that forms an aquitard across the ground surface in the GDE study area and its surrounds. Hence, there is no alluvium with fluctuating, intermittent flow and no intermittently saturated alluvial aquifers with the potential to support terrestrial GDEs within the GDE study area.

The Queensland GDE mapping indicates that the weathered profile aquitard is classified locally as a GDE 'exclusion zone'. A GDE 'exclusion zone' is defined as a low permeability surface that inhibits rainfall infiltration and groundwater recharge and limits the availability of groundwater, such that it is unable to support terrestrial GDEs. The groundwater assessment (*Groundwater Report* (Appendix B)) has confirmed that the weathered profile within the GDE study area is consistent with the GDE 'exclusion zone' definition. Hence, the weathered profile that is present within the GDE study area is an 'exclusion zone' that precludes the presence of terrestrial GDEs. This conclusion is consistent with the GDE Atlas that indicates there is low potential for groundwater interaction in the mapped potential terrestrial GDE area.

The terrestrial ecology assessment (*Terrestrial Ecology Report* (Appendix C)) identified there are only limited areas of remnant vegetation remaining above the project underground mining area, primarily associated with Blackwater Creek and its floodplain, and consisting predominantly of woodland vegetation (Section 7.3).

Terrestrial GDEs may occur where vegetation is underlain by an aquifer and the aquifer is accessible by the roots of vegetation. Root penetration in bedrock and heavy clay soils occurs where these materials are highly weathered and/or contain networks of connected cracks and fissures (Canadell et al., 1996). Root penetration into fresh, unweathered bedrock with limited cracking networks is unlikely.

With regard to root penetration, the relevant aquifer characteristics within the GDE study area are summarised as follows:

- There is an extensive veneer of Tertiary sediments across the entire GDE study area. The Tertiary sediments are expected to have relatively low physical strength and low to moderate bulk density and exhibit low permeability. The physical characteristics of the Tertiary sediments are unlikely to be physical barriers or significant constraints to root penetration.
- The Permian bedrock is a sedimentary rock formation, comprising mainly sandstone, with minor conglomerate, siltstone and claystone. This formation is expected to have relatively high physical strength and bulk density and low porosity. Hence, the physical characteristics of the Permian bedrock are likely to be a significant physical constraint to root penetration.

Based on the IESC GDE Guideline, terrestrial GDEs are highly unlikely to occur where groundwater is greater than 20 m below ground level.

The groundwater assessment (*Groundwater Report* (Appendix B)) determined that, within the GDE study area, the baseline groundwater table (following effects of approved open cut mining) is located at depths of 30 m to 50 m below ground level, the groundwater table is in fresh bedrock and the tertiary weathered profile is unsaturated (Figure 20). Hence, there are no areas within the GDE study area where the groundwater levels following the effects of the approved open cut mining could support terrestrial GDEs.

Groundwater quality in the fresh Permian bedrock ranges from brackish to saline, with the areas of lower salinity where there is localised recharge from the Mackenzie River (i.e. outside the GDE study area).

Figure 19 presents the conceptual hydrogeological model for the GDE study area for the baseline project conditions and illustrates the lack of groundwater dependency in the woodland vegetation areas due to the depth and inaccessibility of the groundwater. On this basis, there are no potential terrestrial GDEs within the GDE study area.

7.6.4 IMPACT ASSESSMENT

The GDE assessment undertaken for the project did not identify any potential terrestrial or aquatic GDEs within the GDE study area. Regardless, the project's effects on groundwater are not predicted to give rise to any additional impacts on any potential terrestrial or aquatic GDEs.

8 PROPOSED AMENDED EA CONDITIONS

The required amendments to the Curragh Mine EA conditions for the inclusion of the project are as follows:

- Amend Condition A11 to include *underground bord and pillar mining* to the sources of the approved ROM coal production; and
- Update of Table C12 to include the project groundwater monitoring bores.

9 GLOSSARY

Term	Definition
Alluvium	Sediment deposited by a flowing stream, consisting of unconsolidated materials including gravel, clay, silt and sand.
Bord and Pillar Mining	A method of underground coal mining using a regular grid of mining tunnels/roadways to progressively cut panels (bords) into the coal seam whilst leaving behind pillars of coal to support the mine roof.
Catchment	The surface drainage area from which a river, stream or reservoir receives its water.
Coarse rejects	Coal material between 50 mm and 4 mm in size.
Limit of measurable subsidence	Vertical ground movement of 50 mm or less, used to define the extent of subsidence.
Permian	The period of geological time beginning from 280 million to 230 million years ago.
Product coal	Coal that has been processed in a coal processing plant, ready for export to market.
Raw water	External raw water supply likely to be provided by a piped water supply. This water is suitable for use in the mine but would require treatment prior to use as potable water.
Regional ecosystem	A vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil.
Rehabilitation	Reshaping of a disturbed area to a geotechnically and geochemically stable condition, followed by revegetation.
Reject material	Coal materials between 50 mm and 0.3 mm in size (comprising coarse and fine reject materials) and non-coal materials rejected from the coal preparation plant.
Remnant vegetation	Native vegetation remaining after an area has otherwise been cleared.
Run-of-Mine Coal	Newly mined coal that has not undergone processing.
Runoff	The portion of rainfall that is not infiltrated or evaporated, and flows along the ground surface.
Seam	A thin layer or stratum of coal or rock.
Strata	Layers of rock or soil with internally consistent characteristics that distinguish it from contiguous layers.
Subsidence	The expression, at ground level, of the controlled collapse or compression of overlying strata following extraction of the coal seam.
Tailings	Tailings are reject coal and non-coal materials that are less than 0.3 mm in size, and that will be subject to dewatering.

Term	Definition
Topography	The surface features of an area of land.
Underground mining	The mechanical extraction of minerals from a deep mine, usually several hundred metres below the surface.

10 ABBREVIATIONS

Abbreviation	Definition
ACH Act	*Aboriginal Cultural Heritage Act 2003*
BoM	Bureau of Meteorology
CCPL	Coronado Curragh Pty Ltd
CHMP	Cultural Heritage Management Plan
CHPP	Coal Handling and Preparation Plant
DAWE	Department of Agriculture, Water and the Environment
DES	Department of Environment and Science
DESI	Department of Environment, Science and Innovation
DIDO	Drive-in Drive-out
DoR	Department of Resources
EA	Environmental Authority
EAR	Environmental Assessment Report
ECOSM	Eco Solutions and Management
EIS	Environmental Impact Statement
EP Act	*Environmental Protection Act 1994*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ERA	Environmentally Relevant Activity
ESA	Environmentally Sensitive Area

Abbreviation	Definition
GDE	Groundwater Dependent Ecosystem
GHG	Greenhouse Gas
ha	Hectare
HES	High Ecological Significance
HEV	High Ecological Value
HRA	High Risk Area
IESC	Independent Expert Scientific Committee
km	kilometres
m	metre
mAHD	Metres Australian Height Datum
MIA	Mine Industrial Area
ML	Mining Lease or Mega Litre, depending on the context
MLpa	Mega Litre per annum
mm	millimetre
MR Act	*Mineral Resources Act 1989*
Mt	Million tonnes
Mtpa	Million tonnes per annum
NC Act	*Nature Conservation Act 1992*
Planning Act	*Planning Act 2016*
PRCP	Progressive Rehabilitation and Closure Plan
RE	Regional Ecosystem
ROM	Run-of-Mine
SIS	Surface to in-seam
UIS	Underground-in-seam

Abbreviation	Definition
UMIA	Underground Mine Industrial Area
VM Act	*Vegetation Management Act 1999*
VWP	Vibrating Wire Piezometer
Water Act	*Water Act 2000*

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Planning Act 2016

Vegetation Management Act 1999

Water Act 2000

12 ENVIRONMENTAL ASSESSMENT REPORT STUDY TEAM

This EAR has been prepared by Hansen Environmental Consulting in association with a series of technical specialists as listed below. Table 6 lists the Environmental Assessment Report components and study team members involved in researching, writing and reviewing the section. Table 7 provides the qualifications and experience of the team members.

TABLE 6 EAR STUDY TEAM

Section	EAR Component	Team Member and Company	
EAR Management			
	Project Director	Peter Hansen	Hansen Environmental Consulting
	Project Manager	Belinda Hayter	Hansen Environmental Consulting
Drafting and Review of EAR			
	Project Director	Peter Hansen	Hansen Environmental Consulting
	Project Manager	Belinda Hayter	Hansen Environmental Consulting
EAR Specialist Reports			
A	Subsidence Report	Nick Gordon	Gordon Geotechniques
B	Groundwater Report	Daniel Barclay	Hydrogeologist.com.au
C	Terrestrial Ecology Report	Steve Marston	Ecological Survey & Management
D	Greenhouse Gas Report	Steph Byrom	Talisman Technical

TABLE 7 EAR STUDY TEAM QUALIFICATIONS

Team Member	Company	Title	Qualifications/ Experience	Years of Experience
Peter Hansen	Hansen Environmental Consulting	Project Director	BE (Hons)	31
Ross Edwards	Hansen Environmental Consulting	Senior Environmental Scientist	BSc (Hons), MSc	21
Belinda Hayter	Hansen Environmental Consulting	Senior Environmental Engineer	BE (Hons), BSc	15
Nick Gordon	Gordon Geotechniques	Principal Geotechnical Engineer	BAppSc (Hons), MAppSc (Mining Geomechanics)	36

Team Member	Company	Title	Qualifications/ Experience	Years of Experience
Daniel Barclay	Hydrogeologist.com.au	Principal Hydrogeologist	MScHydrGeo & EngGeo, PhD	24
Steve Marston	Ecological Survey & Management	Director/Principal Ecologist	BEng (Env) (Hons), MWildMgt	25
Steph Byrom	Talisman Technical	General Manager - Decarbonisation	Master of Sustainable Systems, BA, PhD Candidate	13

FIGURES

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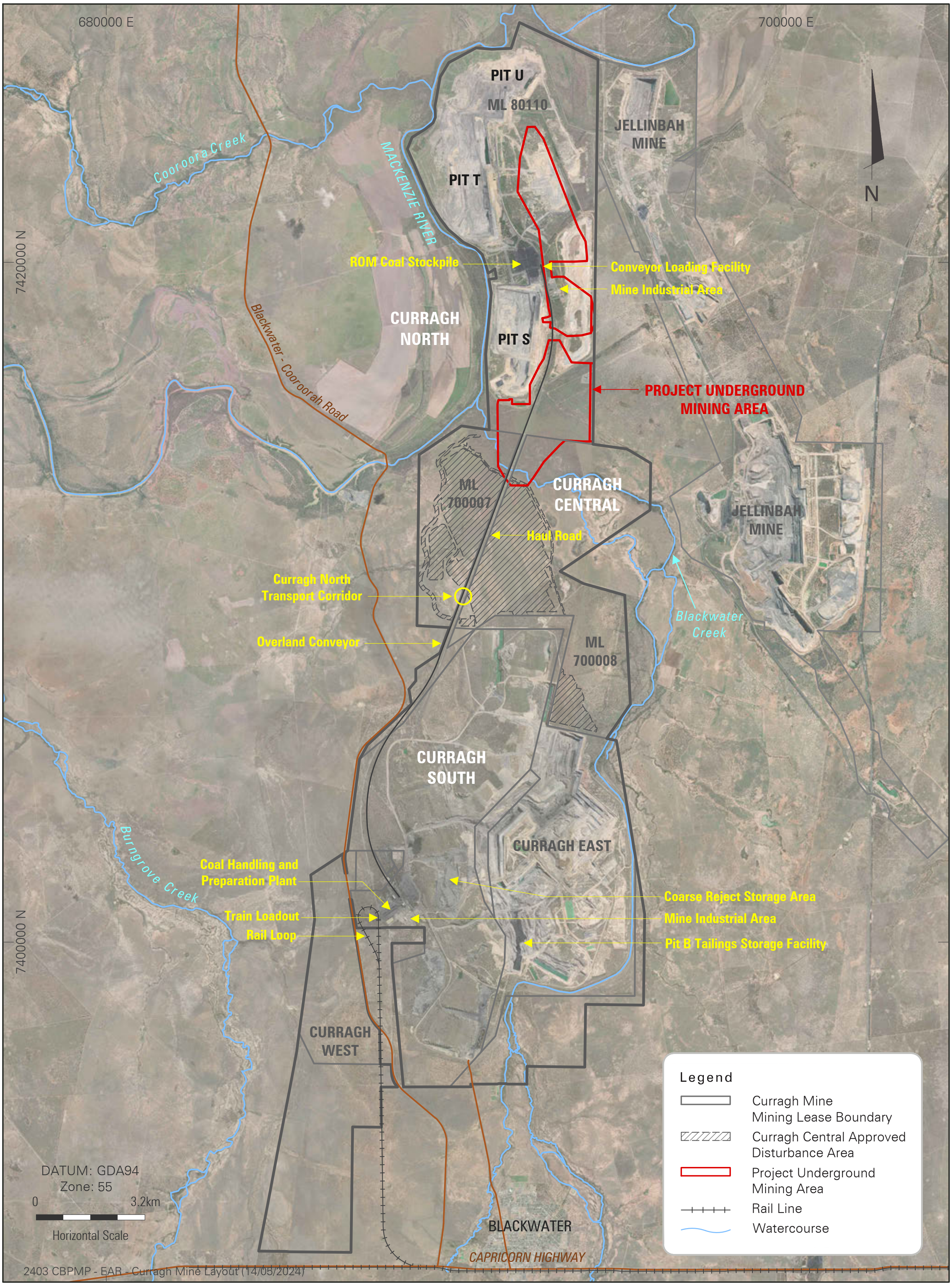
CURRAGH BORD AND PILLAR MINE PROJECT

Location Plan

FIGURE 1



CURRAGH BORD AND PILLAR MINE PROJECT

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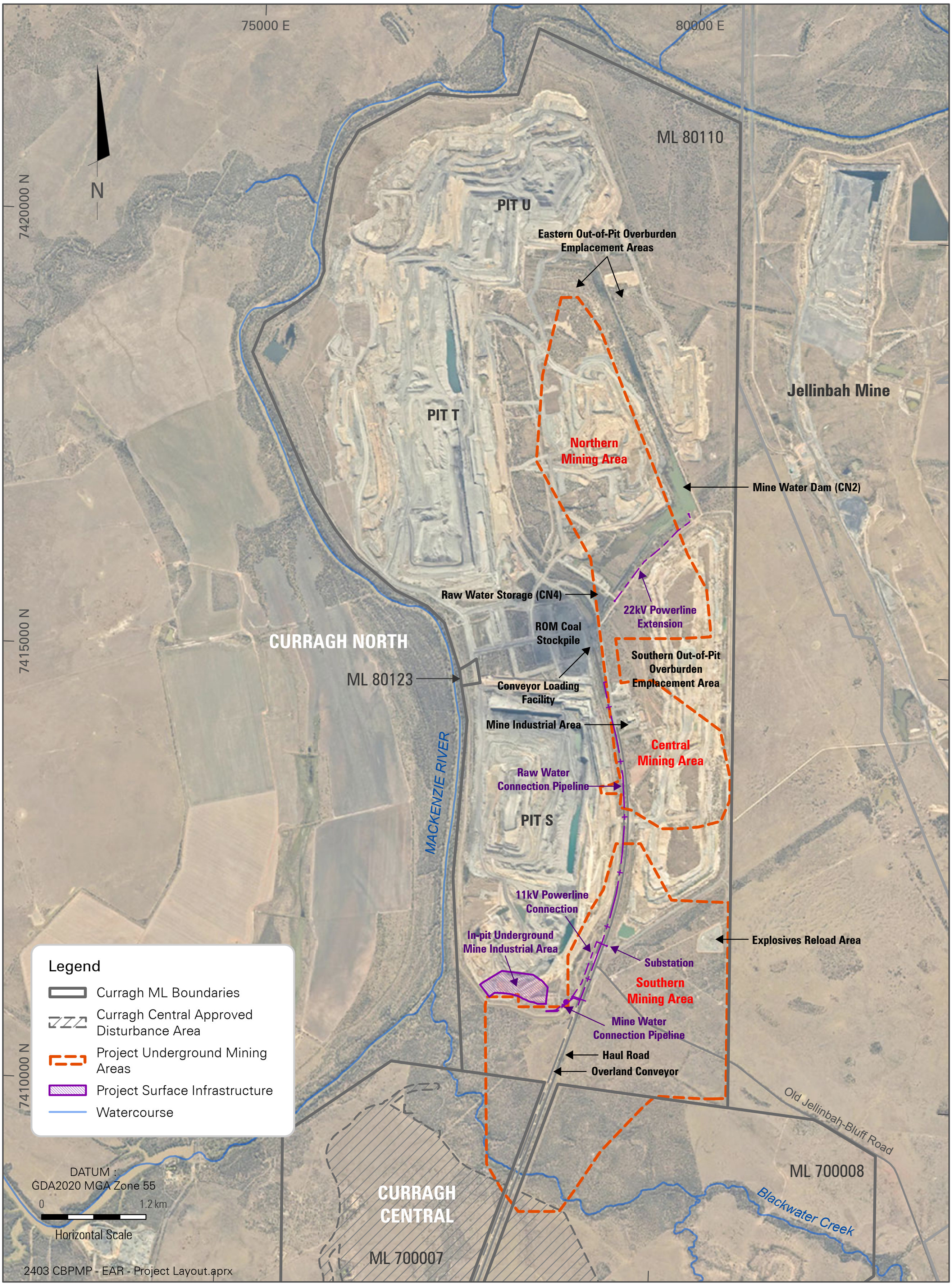
Curragh Mine Layout Plan

FIGURE 2



CURRAGH BORD AND PILLAR MINE PROJECT

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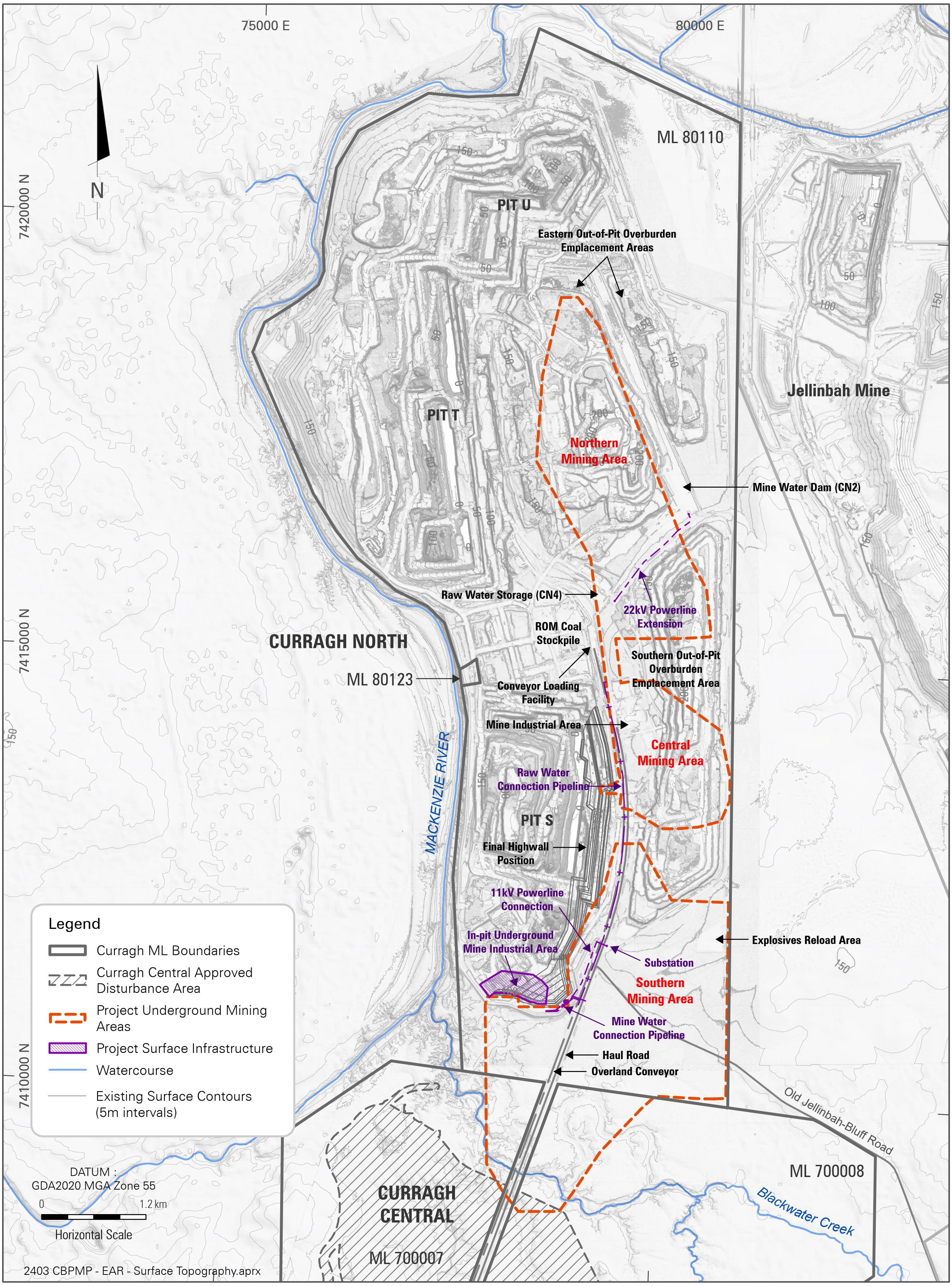
Project Layout

FIGURE 3



CURRAGH BORD AND PILLAR MINE PROJECT

Surface Topography

FIGURE 4

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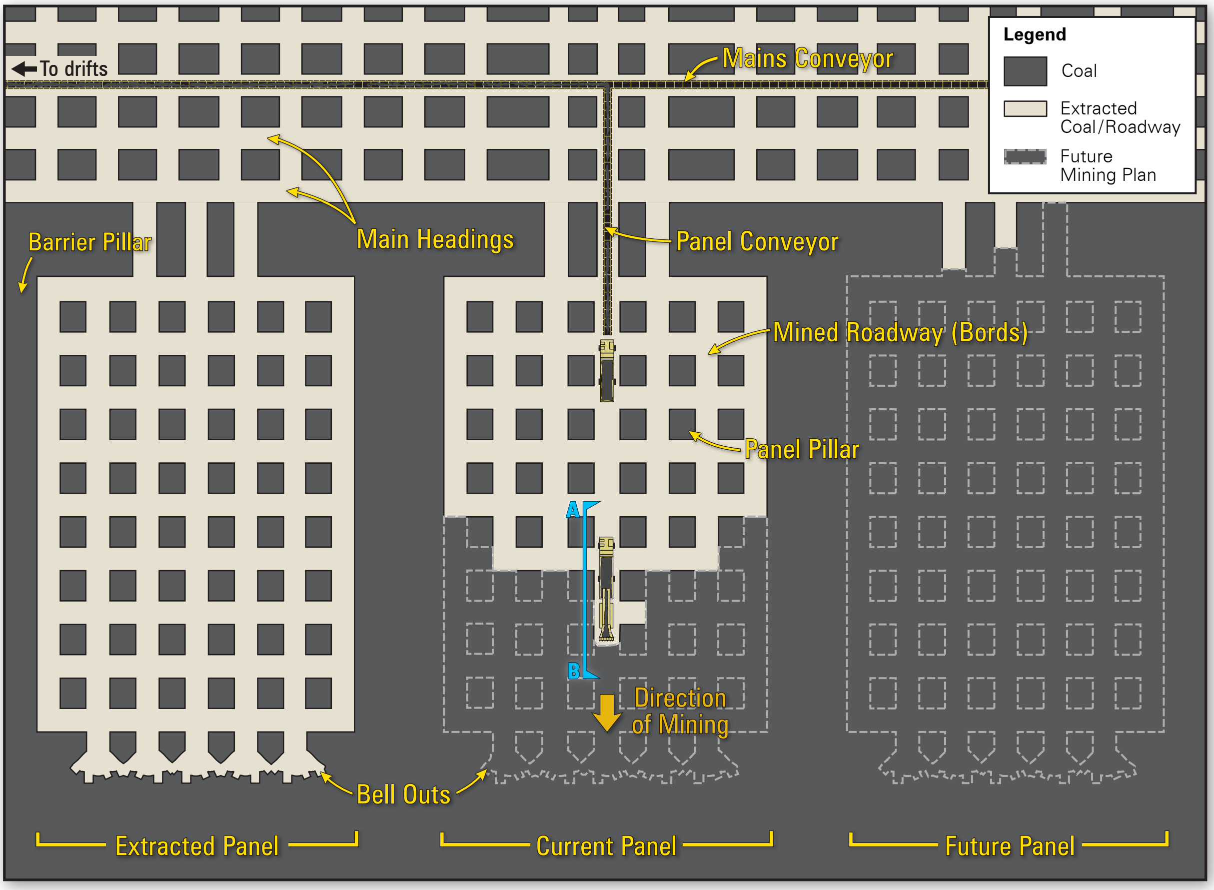
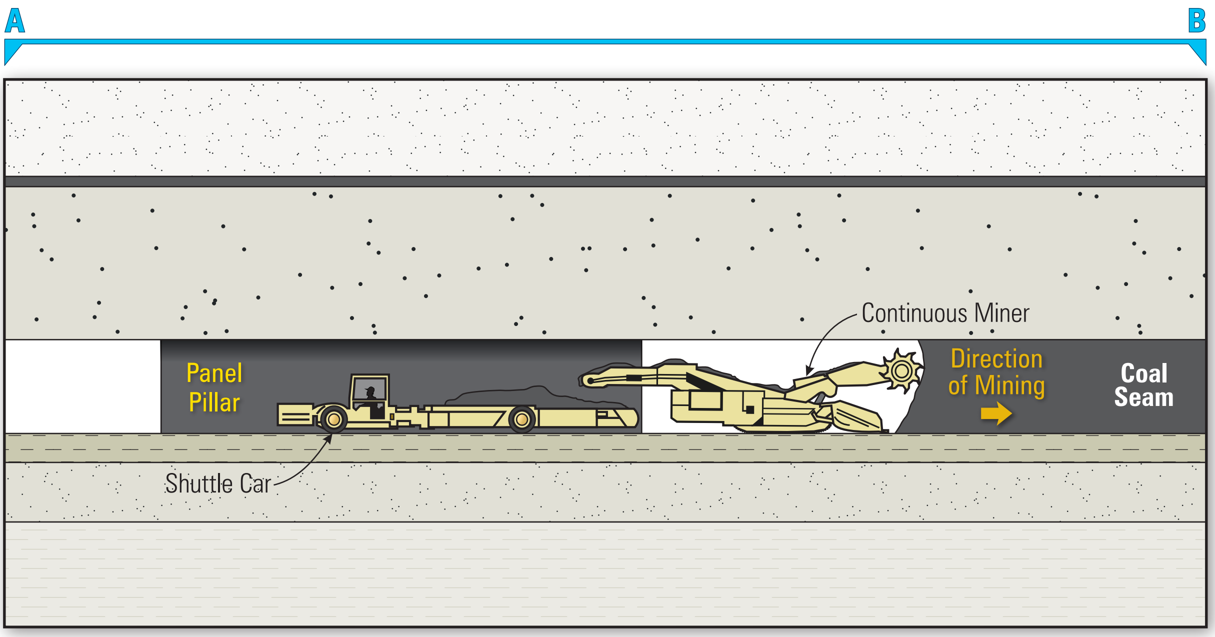


Plan View of Bord and Pillar Coal Mining



Cross Section of Active Bord and Pillar Mining Roadway

Not to scale

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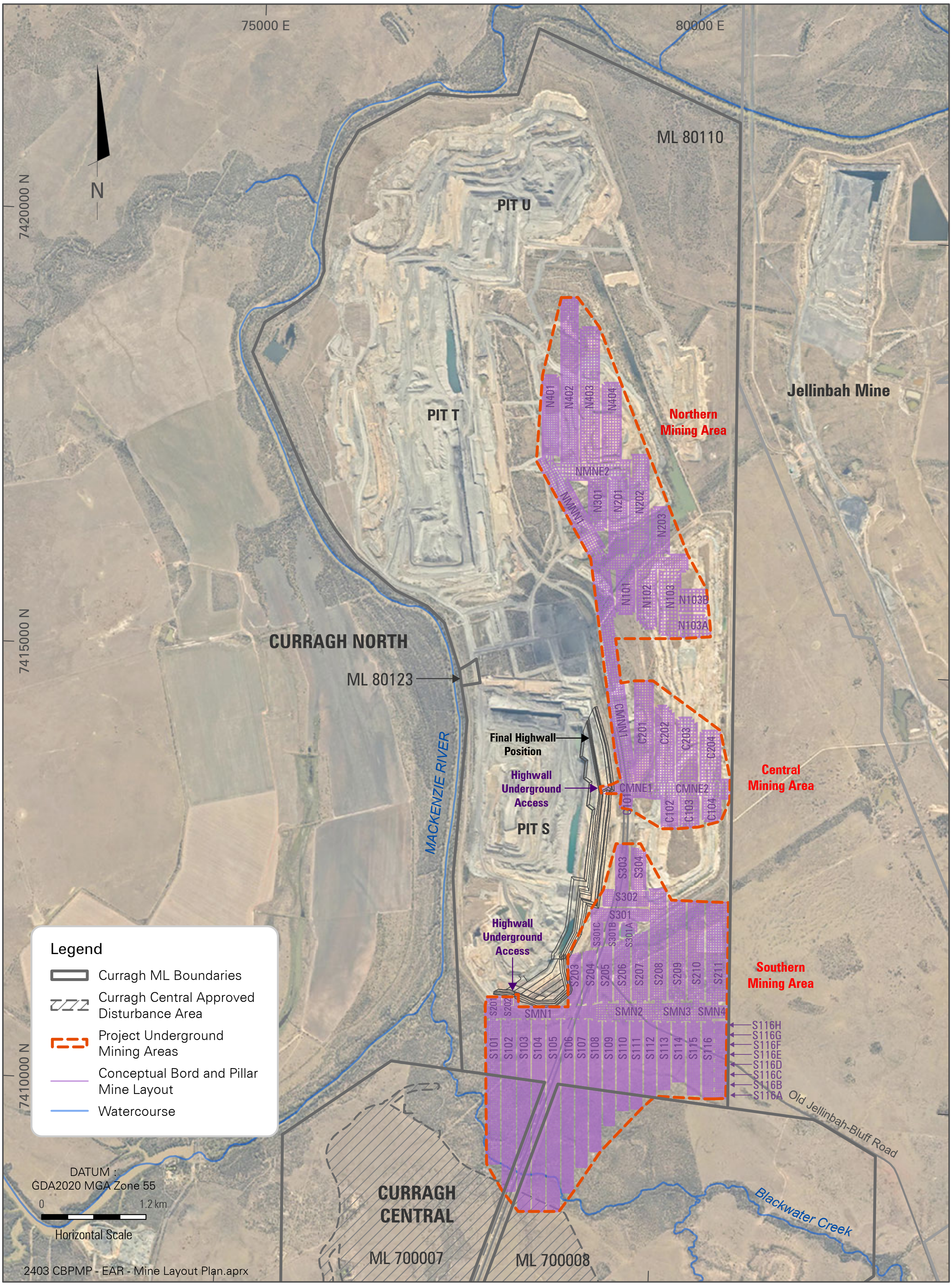
CURRAGH BORD AND PILLAR MINE PROJECT

Bord and Pillar Operation Schematic

FIGURE 5



CURRAGH BORD AND PILLAR MINE PROJECT

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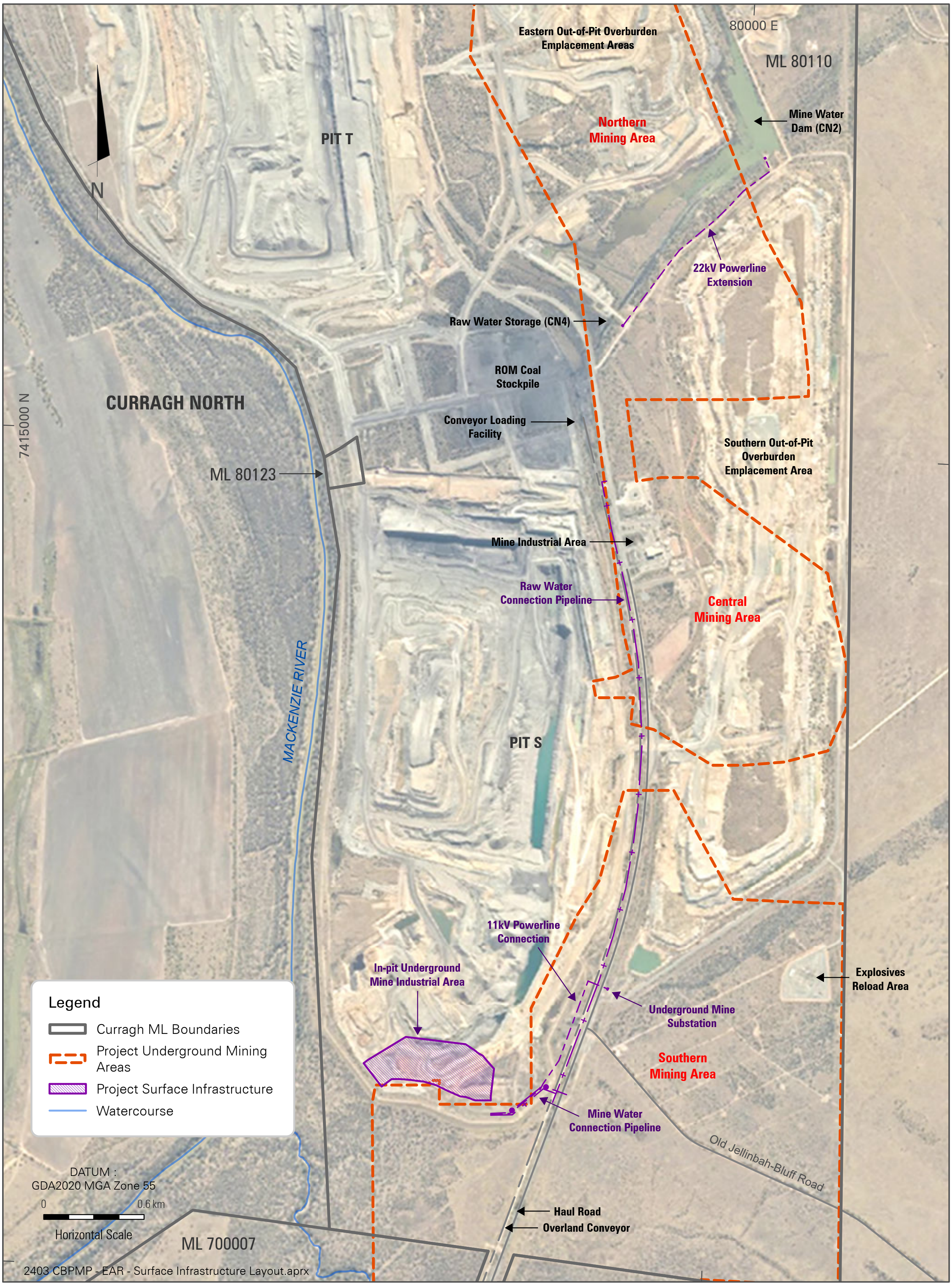
Conceptual Bord and Pillar Mine Layout

FIGURE 6



CURRAGH BORD AND PILLAR MINE PROJECT

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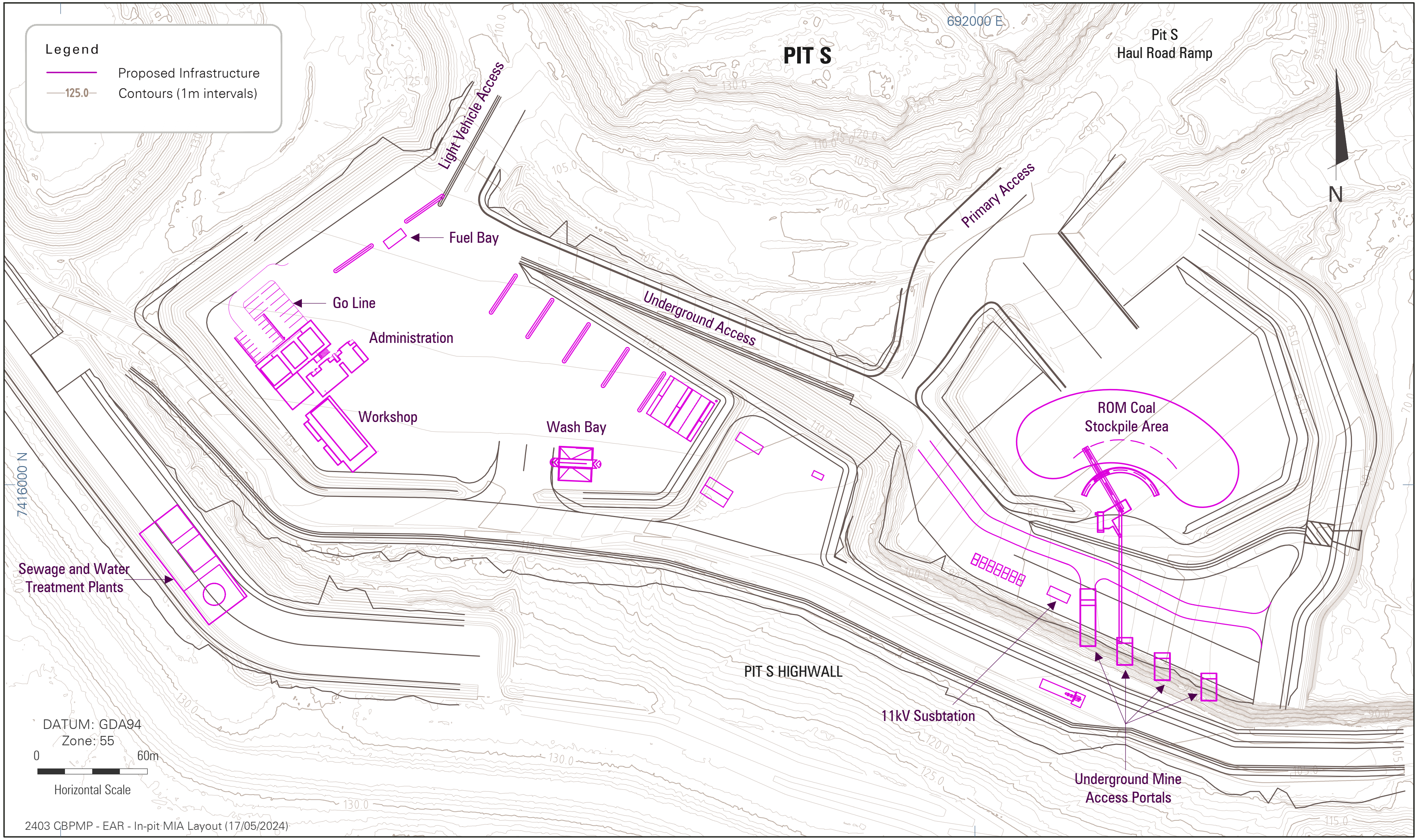
Surface Infrastructure Layout

FIGURE 7



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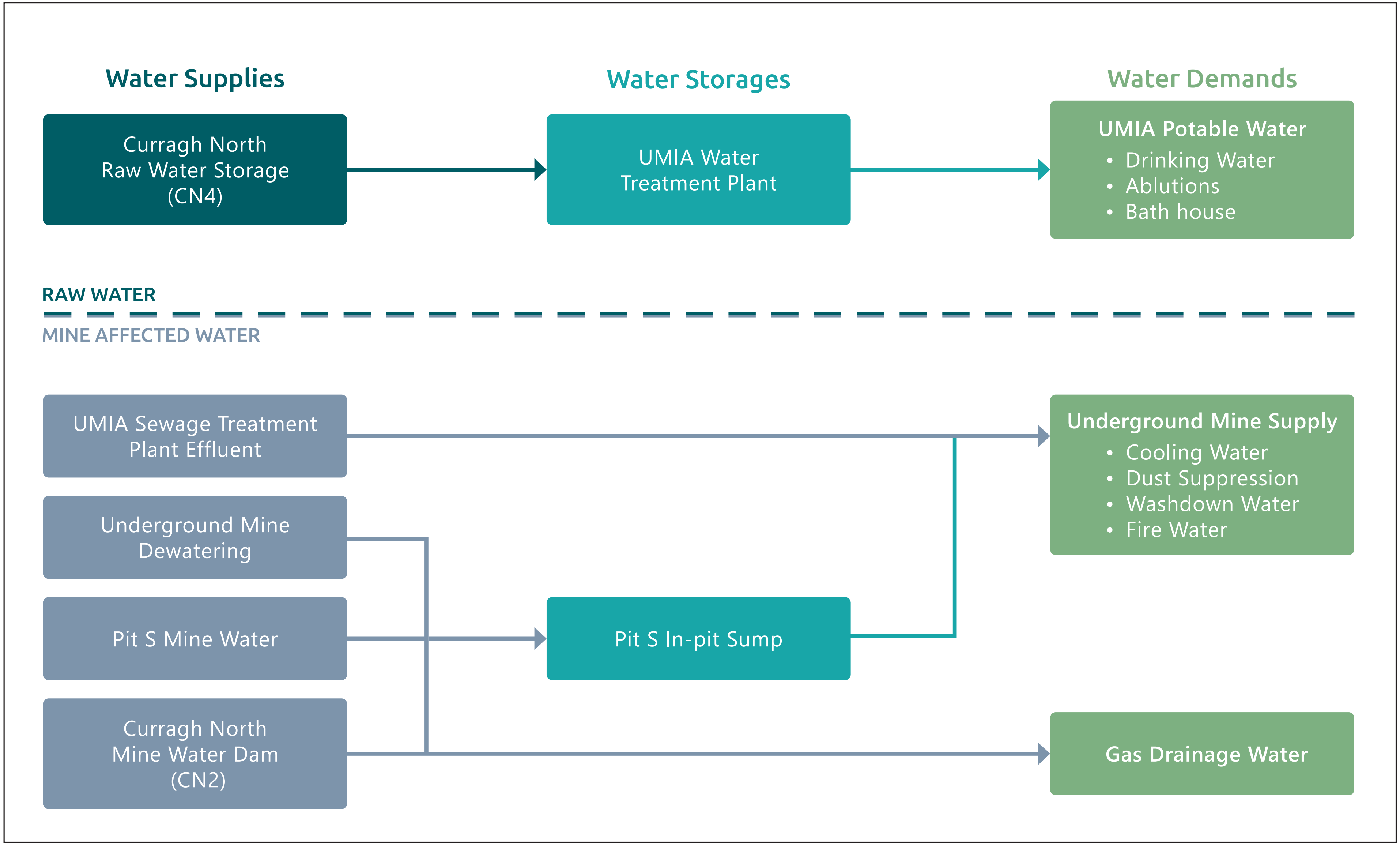
CURRAGH BORD AND PILLAR MINE PROJECT

In-pit Underground Mine Industrial Area

FIGURE 8



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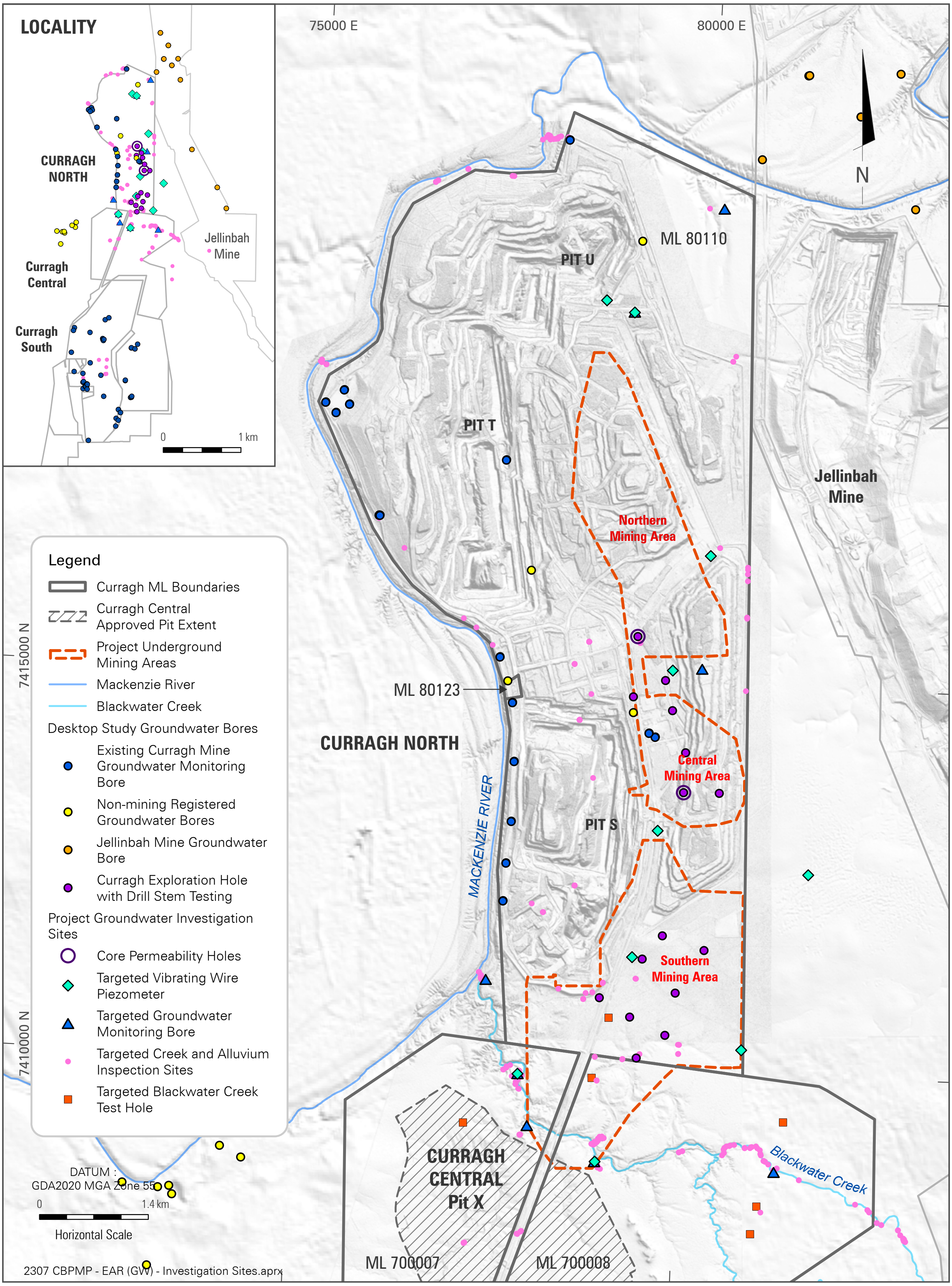
CURRAGH BORD AND PILLAR MINE PROJECT

Water Management Schematic

FIGURE 9



CURRAGH BORD AND PILLAR MINE PROJECT

Groundwater Bores and Investigation Sites

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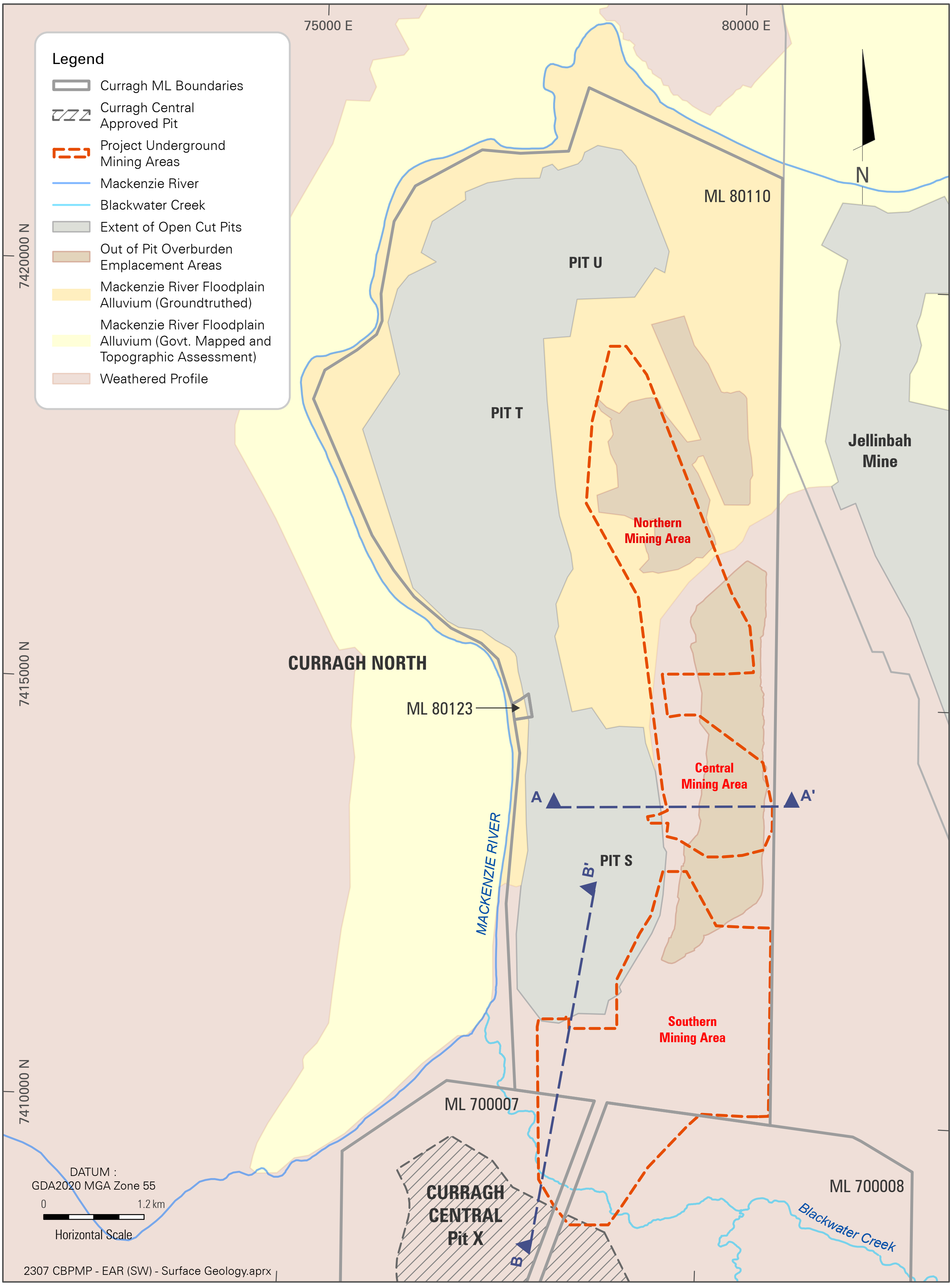
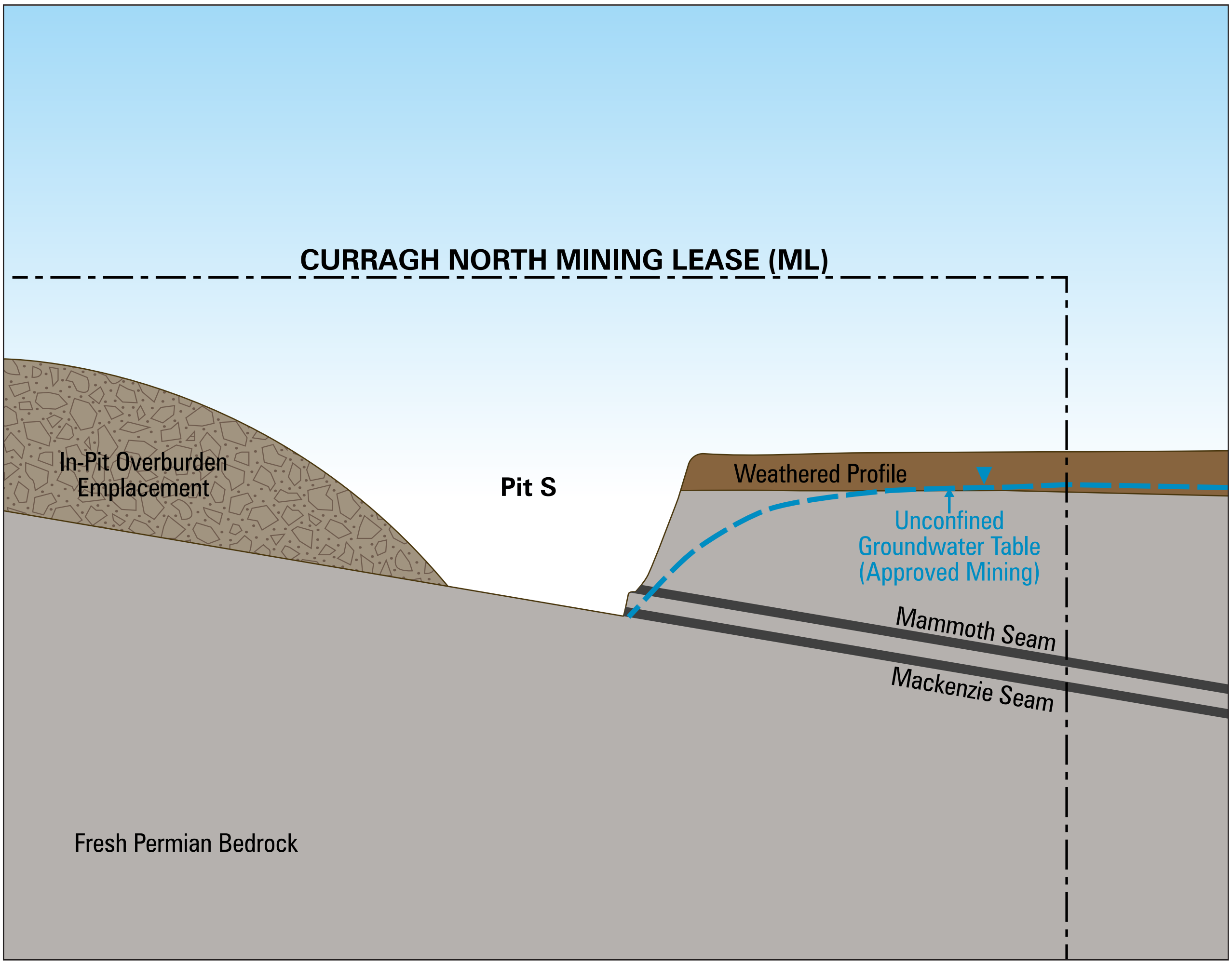
FIGURE 10

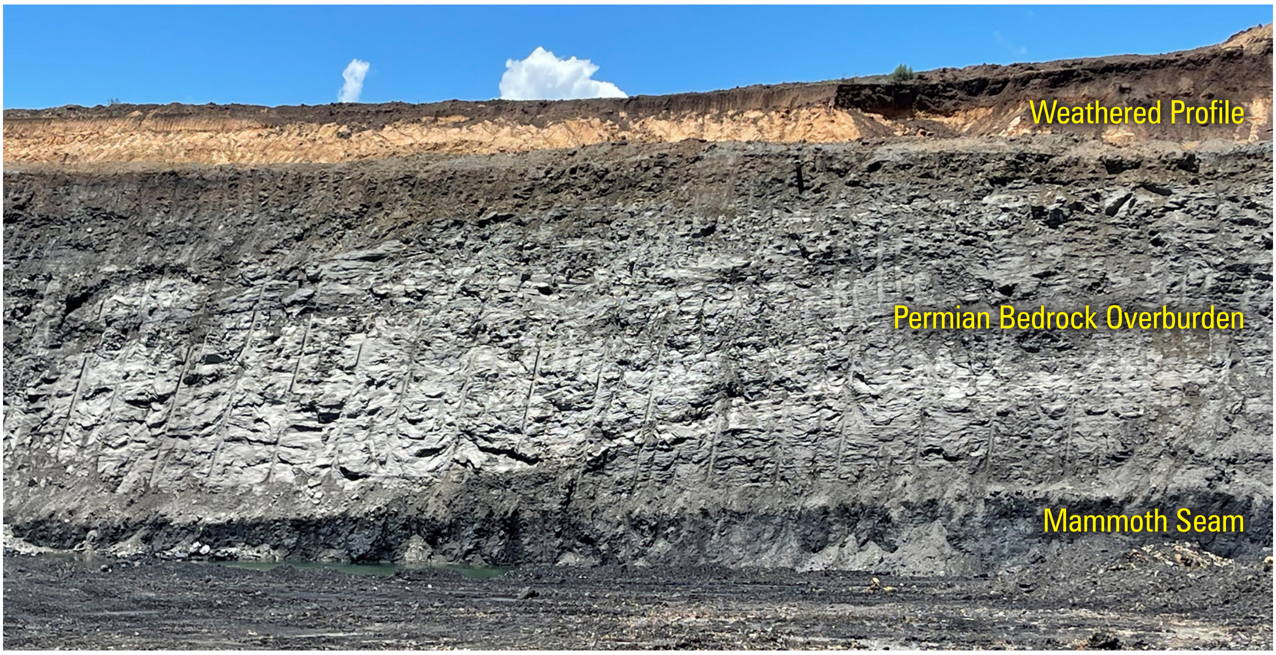


CURRAGH BORD AND PILLAR MINE PROJECT

Surface Geology

FIGURE 11





Pit S Highwall

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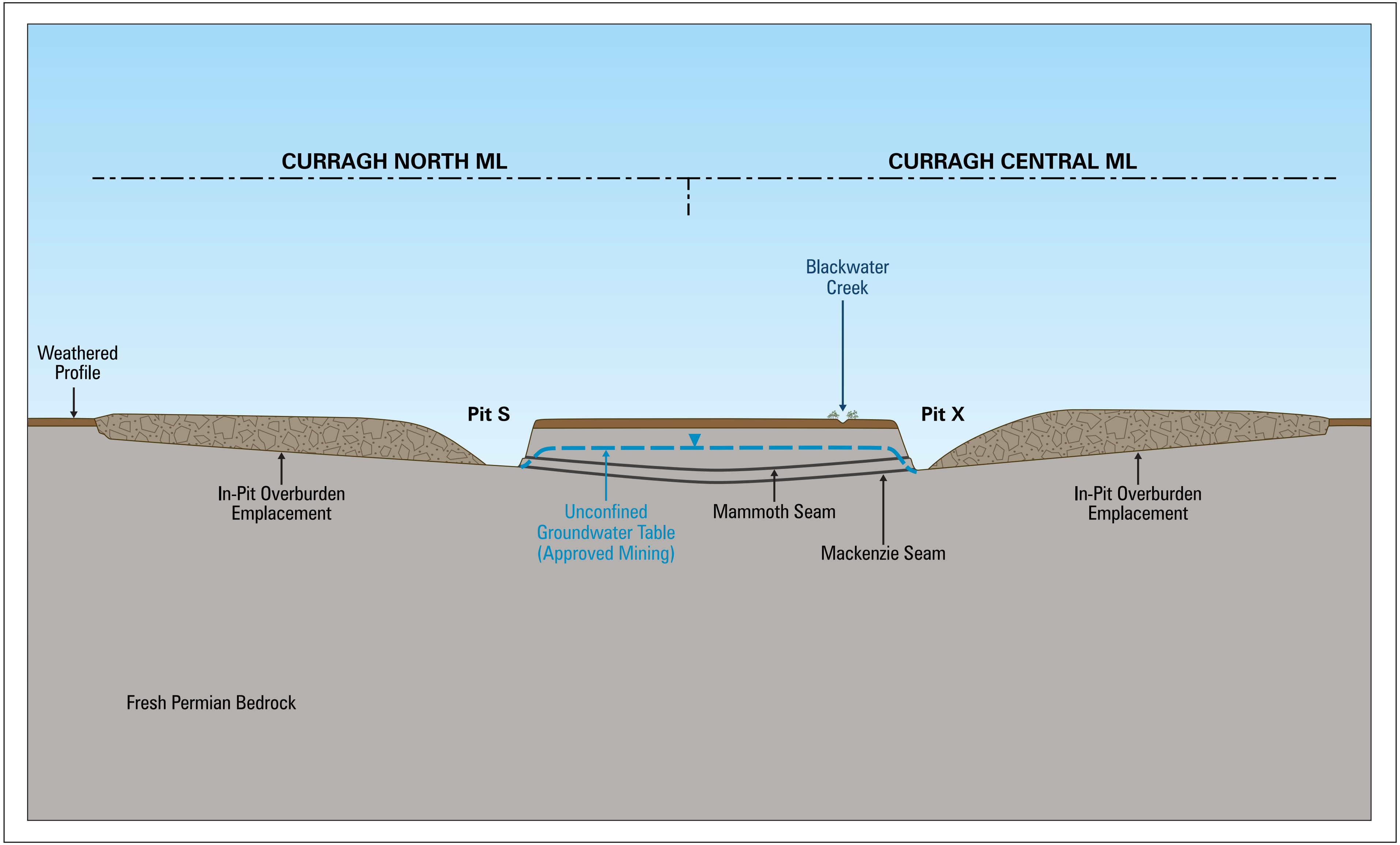
Conceptual Groundwater Regime (Section A-A[1])

FIGURE 12



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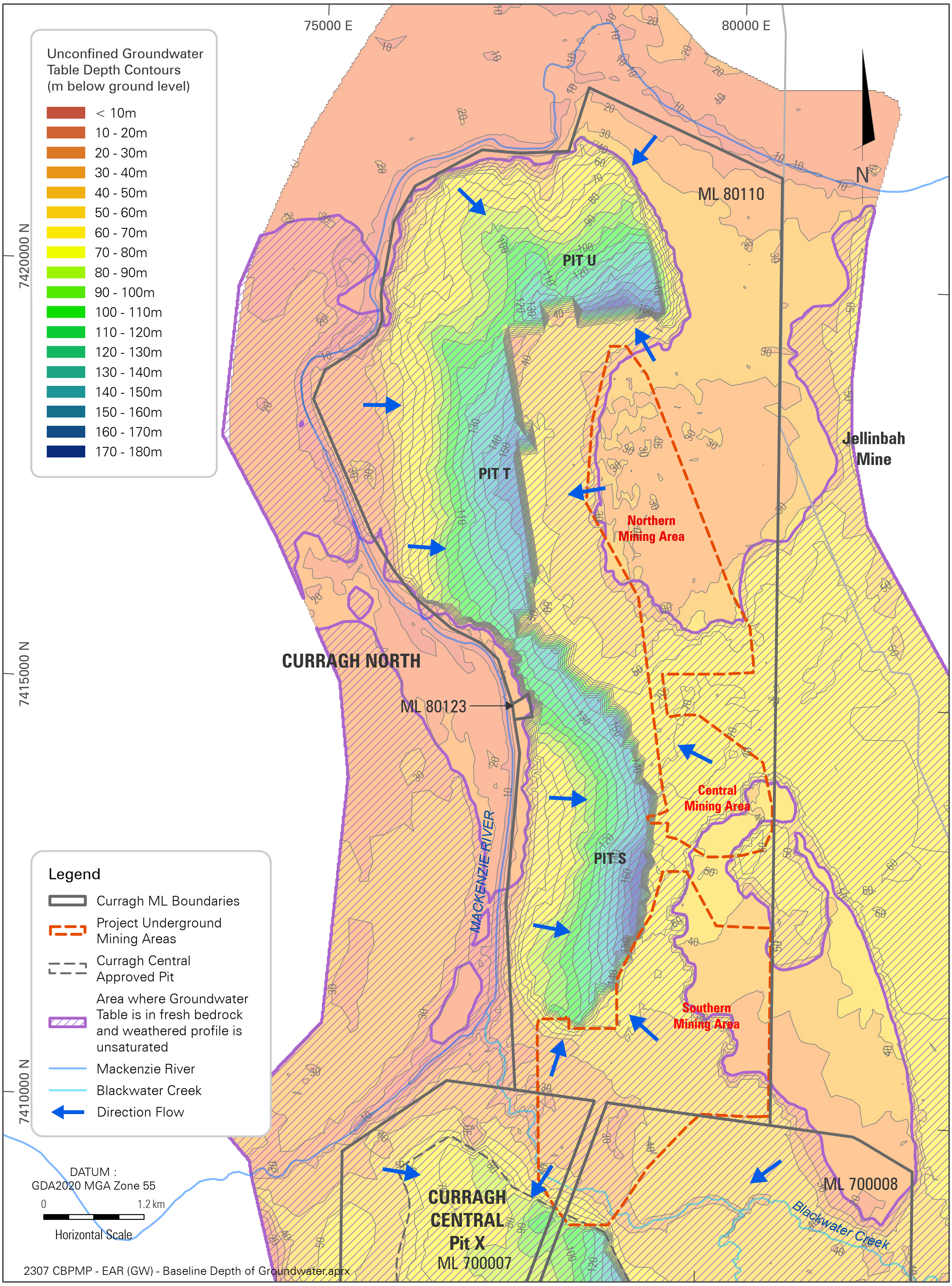
CURRAGH BORD AND PILLAR MINE PROJECT

Conceptual Groundwater Regime (Section B-B[1])

FIGURE 13



CURRAGH BORD AND PILLAR MINE PROJECT

Depth to Groundwater - Approved Open Cut Mining

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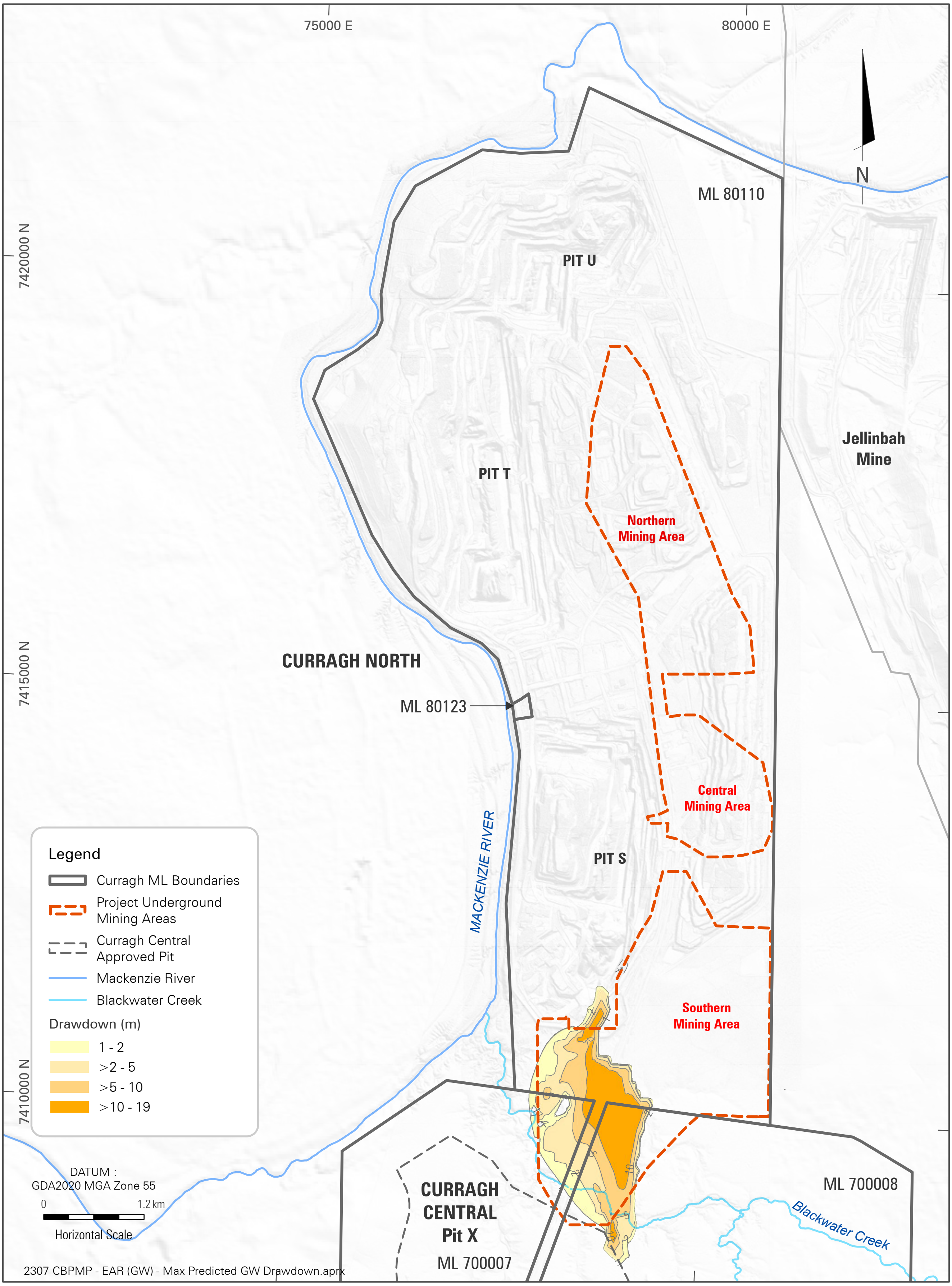
FIGURE 14



CURRAGH BORD AND PILLAR MINE PROJECT

Maximum Predicted Drawdown from the Project on the Unconfirmed Groundwater Table

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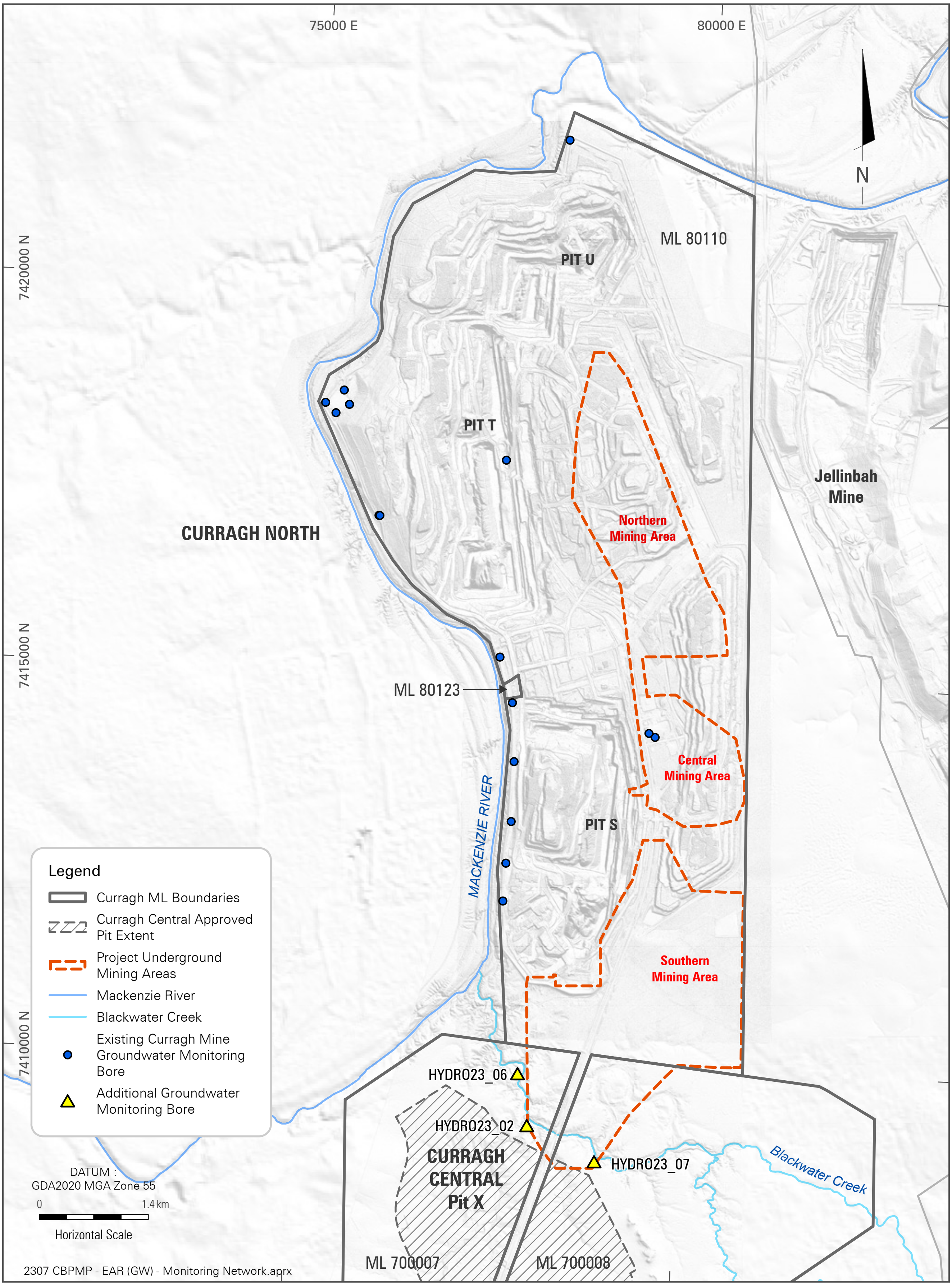
FIGURE 15



CURRAGH BORD AND PILLAR MINE PROJECT

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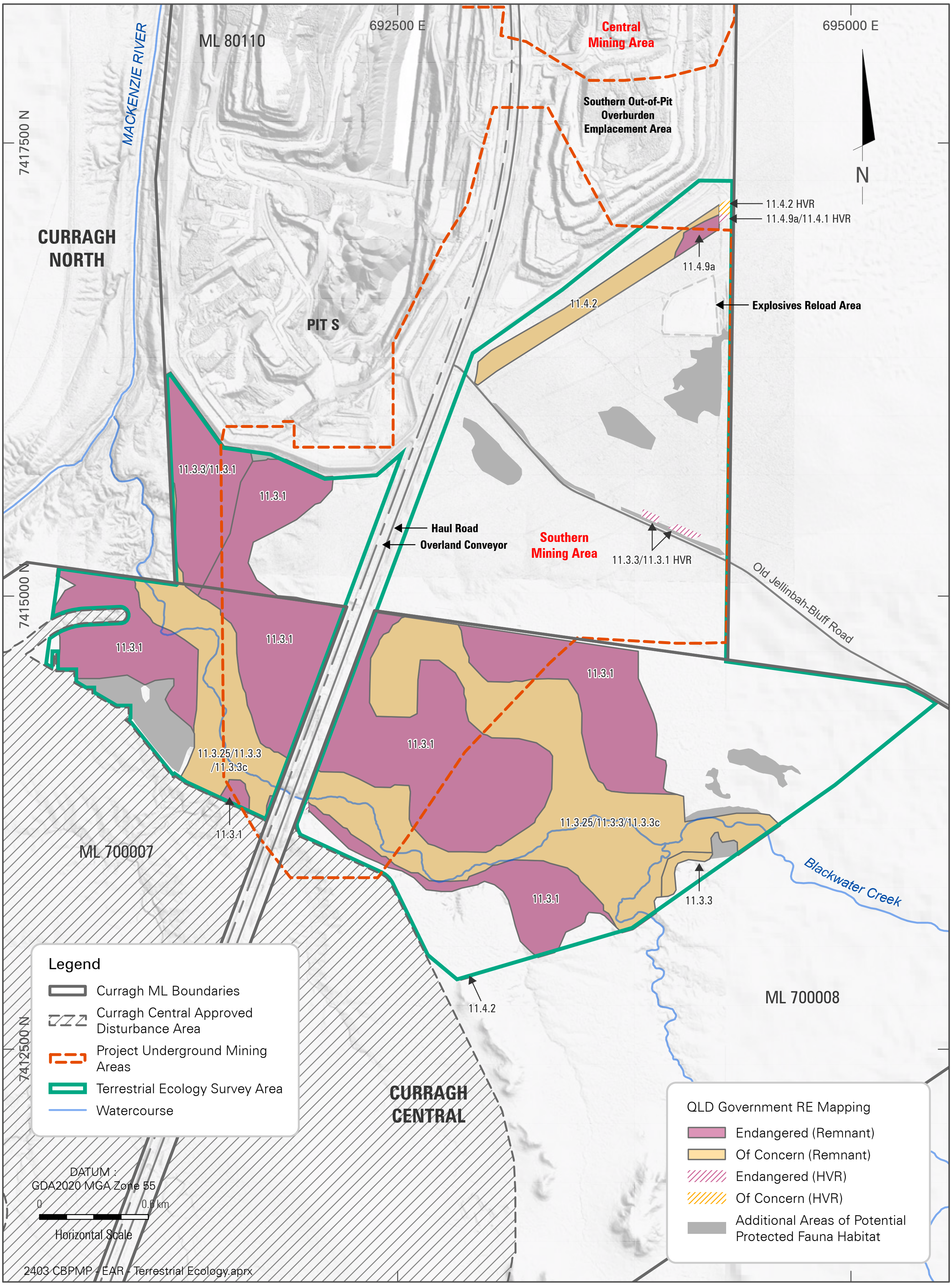
Groundwater Monitoring Network

FIGURE 16



CURRAGH BORD AND PILLAR MINE PROJECT

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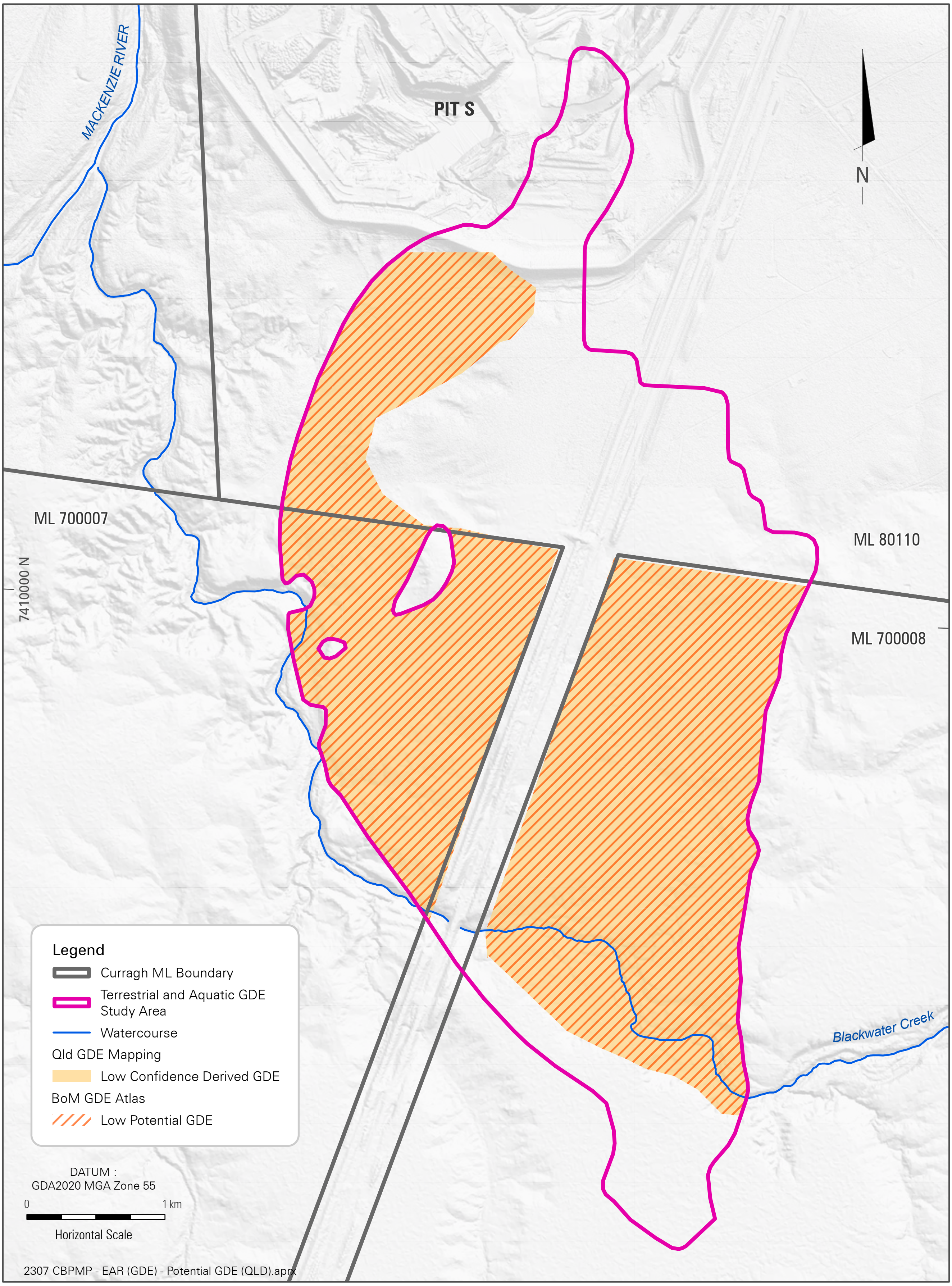
Terrestrial Ecology

FIGURE 17



CURRAGH BORD AND PILLAR MINE PROJECT

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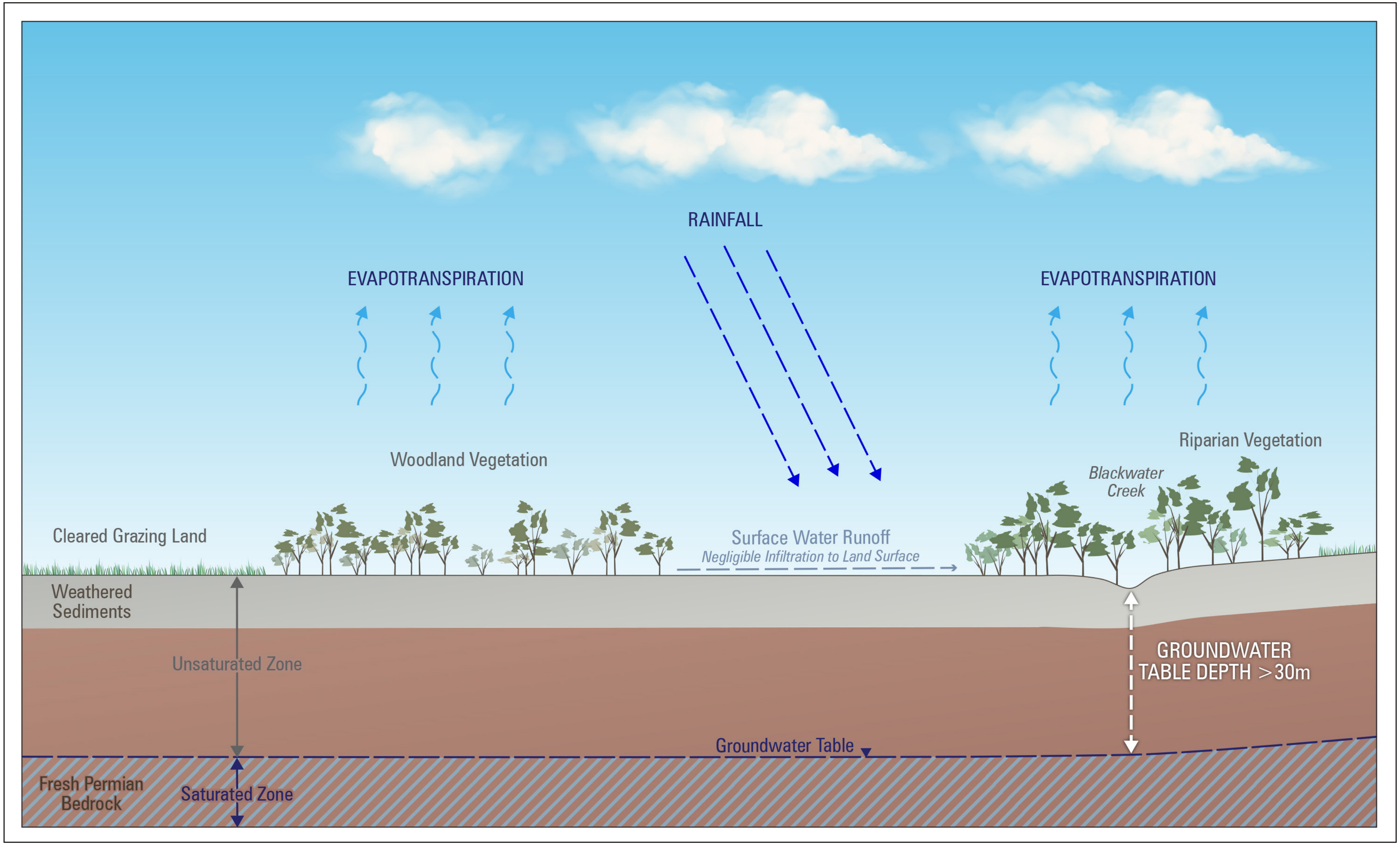
Potential Terrestrial GDEs

FIGURE 18



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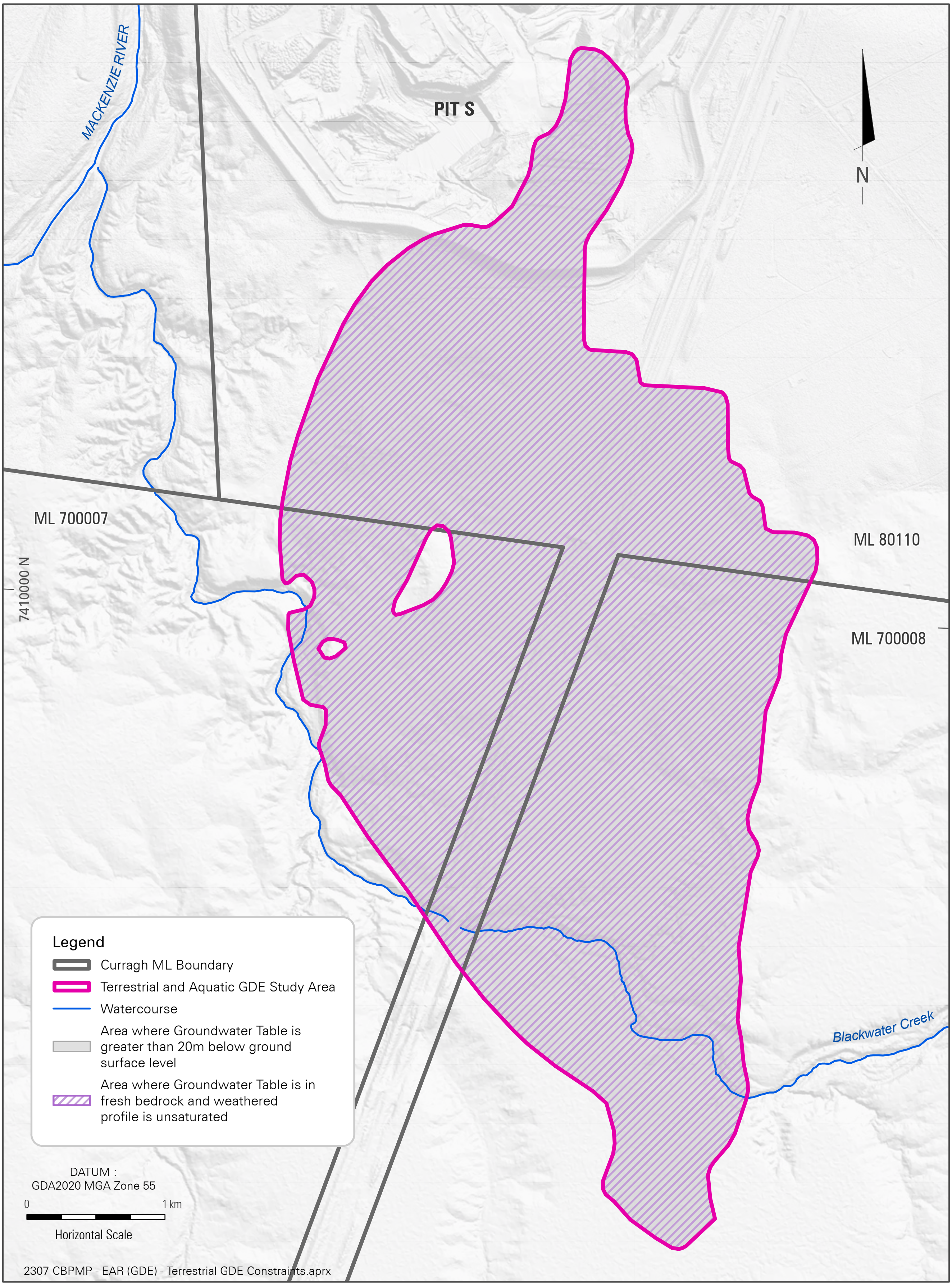
CURRAGH BORD AND PILLAR MINE PROJECT

Conceptual Ecohydrogeological Model of GDE Study Area

FIGURE 19



CURRAGH BORD AND PILLAR MINE PROJECT

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Terrestrial GDE Constraints following Approved Open Cut Mining

FIGURE 20