Fairhill Coal Project

Groundwater-dependent Ecosystems Management Plan
EPBC Ref. 2019/8549

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Signed 

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Date 3 June 2025

TABLE OF CONTENTS

FIGURES

TABLES

Executive Summary

Futura Resources Ltd (Futura) proposes to develop the Fairhill Coal Project (FCP). The FCP is a proposed small-scale greenfield coal project located north-east of Emerald in Central Queensland's Bowen Basin. The FCP will operate over seven years.

The FCP site is located in the Mackenzie River sub-basin of the Fitzroy River basin. Site hydrology is dominated by Cooroora Creek and two of its tributaries, Back Creek and Sandy Creek. Cooroora Creek is the main drainage feature on the FCP site. The creeks on the FCP site are ephemeral and only flow for short periods after rainfall, although permanent water exists in the dammed section of Cooroora Creek.

Geological, hydrogeological and ecological assessments determined it is possible that vegetation growing on the banks of Cooroora Creek has seasonal access to groundwater located in Quaternary alluvium. The nature of this groundwater (highly saline, limited flow and deep), along with the observation that vegetation composition and condition does not noticeably differ between areas where groundwater is present within the alluvium (downstream section of Cooroora Creek) and areas where this is absent (upstream of the FCP site boundary) suggests that, while some species of local trees may be able to access and utilise this groundwater, they are not dependent on it.

It is unlikely that vegetation elsewhere within the FCP site utilises groundwater in any capacity, including along Back Creek and Sandy Creek.

The coal seam to be mined at the FCP contains an aquifer that is confined and transmissive. Mining this seam will result in localised dewatering and/or a drawdown of groundwater within this aquifer. Such effects are likely to propagate as far as 1 km from the edge of the open pits. While connectivity between groundwater within the coal seam and Quaternary alluvium is expected to be low, the precise extent of connectivity is unknown. Potential groundwater-dependent ecosystems (riparian vegetation communities along Cooroora Creek and Sandy Creek) are located within this zone of predicted drawdown and have the potential to be affected by mining operations in the event that the aquifer within the Quaternary alluvium is connected to deeper aquifers experiencing drawdown.

This Groundwater-dependent Ecosystems Management Plan (GDEMP) has been developed to satisfy conditions of the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) Approval 2019/8549 and the Environmental Authority (EA) BRID0071 granted under the *Environmental Protection Act 1994* (EP Act). Specifically, the GDEMP has been prepared to comply with and facilitate compliance with EPBC Approval Conditions 2–6 and EA Approval Conditions D2.

The GDEMP has been designed to manage risks to potential groundwater-dependent ecosystems (GDEs) along Cooroora Creek and Sandy Creek that are attributable to the FCP.

Drawdown adversely affecting the riparian vegetation communities of Cooroora Creek and Sandy Creek beyond natural variation was identified as the main potential (low risk) impact of the FCP on GDEs.

A set of management strategies is proposed to specifically address potential impacts. Primary strategies include a monitoring program, a set of corrective actions and a risk assessment. Canopy cover will be monitored by utilising publicly available Landsat imagery. This imagery has a spatial resolution of 30 m and is therefore suitable for assessing narrow, potentially groundwater-dependent riparian vegetation. Multi-spectral indices such as NDVI (Normalised Difference Vegetation Index) can be calculated from this imagery and are ideal for tracking changes in vegetation greenness, particularly in the short term. Concurrent with NDVI analysis, in-field BioCondition assessments will be undertaken, where property access is granted.

A set of corrective actions are proposed for when the NDVI analyses reveal early signs of a deterioration in condition (greenness of vegetation) in the potential impact zone that is beyond rainfall-driven deterioration observed in nearby control sites unaffected by drawdown. The objective of GDE management is to maintain vegetation health/greenness and extent within the baseline range observed between 2013 and 2023. Monitoring of groundwater levels and quality will occur under the Groundwater Management Plan (GWMP) in parallel with vegetation health under this GDEMP, to assist with preventing any potential impacts.

The likelihood and potential consequence of each potential impact affecting riparian vegetation along Cooroora Creek and/or Sandy Creek, once mitigation measures are accounted for, was assessed using qualitative risk assessment methodology as per the Australian Government's *Environmental Management Plan Guidelines 2014*. The risk assessment identified a low residual risk to the riparian vegetation of the FCP for each potential impact identified.

1 Project Description

The FCP is a proposed open-cut mine that will produce approximately 5.5 million tonnes (Mt) of product coal over the course of its life. The mining operation involves mining Run of Mine (ROM) coal at a maximum rate of up to 1.7 million tonnes per annum (Mtpa) over a seven-year project life.

1.1 Location of the Project

Currently a greenfield site, the FCP is situated in the Bowen Basin coal-producing region, approximately 55 km north-east of Emerald, and is located on mining lease (ML) 700043 (**Figure 1-1**).

The site is in close proximity to a number of existing coal mines, coal-mining infrastructure and coal deposits. The Gregory Branch of the main Blackwater rail line is approximately 1.5 km east of the boundary of the ML and provides rail access to export infrastructure located at Gladstone.

The FCP is located near a number of existing mining operations (**Figure 1-2**), including:

- Ensham's Yongala Mine, 18 km to the south-west;
- Kestrel Coal Mine, 25 km to the west;
- Gregory Crinum Mine, 32 km to the west;
- Oaky Creek Mine, 24 km to the north-west; and
- Mackenzie Coal Project, 33 km to the east.

Figure 1-1 Locality

FR001_GDEMP_Fig1-1 Locality Map.pdf (Command Line)

Figure 1-2 Regional context

FR001_GDEMP_Fig1-2 Regional Context.pdf (Command Line)

1.2 Description of Activities

1.2.1 Project Overview

The FCP includes activities associated with construction, operation, decommissioning, and rehabilitation of the open-cut coal mine and associated infrastructure. These activities include:

- construction of the mine site infrastructure and water management infrastructure;
- construction of a haul road and site access road network;
- construction of associated ancillary facilities including offices, ablutions and workshop facilities;
- extraction of up to approximately 1.7 Mtpa of ROM coal for 7 years;
- temporary storage of ROM coal on site;
- transport of ROM coal via road train to a processing plant off site;
- formation of in-pit and out-of-pit waste dumps; and
- establishment of final landforms and associated drainage for decommissioning and rehabilitation.

1.2.2 Mining Method

The target coal occurs in the Fairhill Formation of the Fort Cooper Coal Measures at a depth favourable to open-cut mining. The mining operation involves mining ROM coal at a maximum rate of up to 1.7 million tonnes per annum (Mtpa) over a seven-year project life.

The shallow to moderate coal dips within the target area facilitate the application of bulk dozer push methods as an economical alternative to 'truck and shovel' methods.

The thin, shallow coal seams are proposed to be strip-mined utilising a surface miner and small excavators for coal recovery. A box-cut will be excavated using excavators and dump trucks in the first strip to establish the initial mining area, with waste material placed out of the pit. Once the box-cut is complete and the first strip is in place, waste will be mined with a combination of Cast–Doze–Excavate (CDX) with in-pit dumping of waste prioritised to minimise surface disturbance for out-of-pit dumps.

The shallow overburden will be removed using truck and excavator/shovel supported by dozers, with cast blasting used as required on specific portions of the waste material. The majority of waste material will remain in-pit, with cast-and-doze material directed into the void of the previous strip, and truck-and-shovel excavator being placed on top of earlier cast-and-dozed waste placement.

Mining shall commence via an initial box-cut to the west of the proposed Waste Rock Dump, with formed strips running north-east to south-west progressively, moving in an upslope north-westerly direction. Mine development is planned based on formation of two defined pits (northern and southern), initially offset by the Bedford Weir-Oaky Creek pipeline which will be moved between 18 to 24 months post commencement of mining.

A typical pit cross-section is provided in **Figure 1-3**, illustrating the concept of the stripping of waste with the bulk dozer push, prior to the extraction of coal and partings by a surface miner/backhoe excavator and trucks.

The overburden at the initial edge of the pit is pushed by dozers and is then handled again by truck and shovel during excavation of the coal. Excavated waste will be hauled and placed over the dozer push spoil piles during steady state strip mining to backfill the pit.

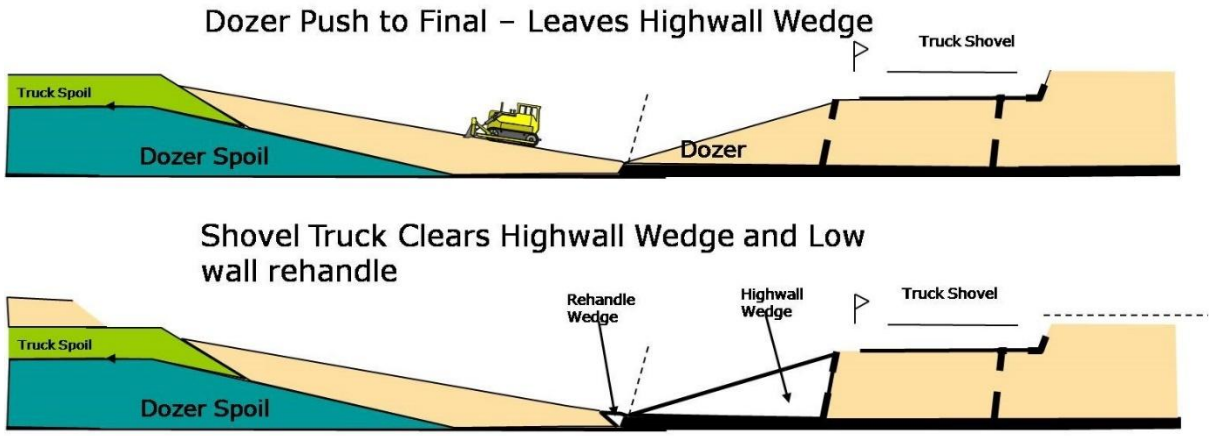


Figure 1-3 CDX methodology proposed for mining at the FCP

It is anticipated that the overburden will generally require blasting; however, mining of free-dig horizons will be prioritised utilising a large excavator and tracked dozers as required. Where drill-and-blast is required, blast patterns will be designed and completed by a specialist blasting contractor in conjunction with FCP technical staff.

ROM coal will be stockpiled on the basis of quality and seam source, with low-ash material being stockpiled separately from all other material.

A ROM stockpile will be managed at the FCP prior to the loading of road-legal trucks up to quad-sized assemblies for transporting ROM coal to the Gregory Crinum Mine Coal Handling and Preparation Plant (CHPP) for washing. Due to the thin coal seams present at the FCP site, the mining method proposed is strip mining, utilising a surface miner and small excavators. Blasting of overburden will occur as required, and overburden will be removed utilising a large excavator and tracked dozers.

1.2.3 Infrastructure Requirements

The infrastructure requirements for the FCP are small-scale due to the relatively low production intensity, as well as the proposed offsite processing of ROM coal.

Site infrastructure required for the FCP includes:

- transportable administration office blocks for personnel;
- transportable ablution facilities;
- surface water and mine-affected water (MAW) management structures (dams);
- maintenance workshop and laydown area;
- warehouse facilities for mining and haulage contractors;
- power generators for workshop (1) and administration facilities (1);
- communications infrastructure including towers and cabling;

- haul road network, and site access road network; and
- ROM coal stockpile area.

Factors that have been considered, where practicable, in locating mine infrastructure include:

- avoidance of Matters of National Environmental Significance (MNES) and other sensitive environmental values;
- avoidance of designated flood zones and surface water features;
- preferential location on flat topography to reduce required earthworks;
- reduction of impacts to local visual amenity (out of view from roads as far as practical); and
- connection to and use of existing infrastructure.

1.2.4 Clearance Footprint

The total FCP surface clearance footprint is 465.18 (ha). The proposed clearance footprint is conservative by design, as it encapsulates a buffer around the mine infrastructure facilities within the overall mine extent. A breakdown of the FCP clearance footprint areas is presented in **Table 1-1**.

The conservative clearance footprint has been developed to facilitate operational flexibility and to allow for surface disturbance requirements across the various project phases (construction through to rehabilitation). The footprint has been developed as a conservative estimate of the potential surface disturbance with the inclusion of a buffer in addition to the current planned area of clearance.

Table 1-1 Site infrastructure surface disturbance areas at the FCP

Site Infrastructure Element	Area of Potential Surface Disturbance (ha)
Open-cut pit (including in-pit waste dump)	311.01 ha
Out-of-pit overburden dump	53.57 ha
On-lease tracks and haul roads	16.07 ha
Water storage infrastructure (to be retained)	2.07 ha
Mine Infrastructure (site office, ROM pad, Workshop buildings) and water storage infrastructure to be decommissioned	82.46 ha

Site layout and the overall conservative clearance footprint are presented in **Figure 1-4**.

Figure 1-4 Site layout and clearance footprint

FR001_GDEMP_Fig1-4_Site Layout.pdf (Command Line)

1.2.5 Waste Material

1.2.5.1 Mineral Wastes

Results of the Overburden and Potential Coal Reject Characterisation Report (NRC, 2018), indicate that there is negligible potential for acid rock drainage to occur. Of the 27 samples that were taken for the study, 100% of the samples were classified as non-acid forming (NAF). Additionally, the materials sampled have demonstrated considerable buffering capacity, which is sufficient to buffer any acid that may be produced by waste rock.

All 27 overburden samples were subjected to initial acid/base account geochemical testing. Specifically:

- potential of hydrogen (pH) (1:2);
- electrical conductivity (EC) (1:2);
- total sulphur (wt%);
- Australian Standard Leaching Procedure (ASLP) metal concentrations - bulk rock trace metals;
- acid-neutralising capacity (ANC);
- net acid-producing potential;
- net acid generation pH 4.5; and
- net acid generation pH 7.

In addition, major ion analysis and heavy metal concentrations of EC 1:5 samples along with a full metal suite of overburden samples were conducted.

The ANC of samples varied from 2.5 to 120 kg H_2SO_4/tonne. The median value of ANC was 55 kg H_2SO_4/tonne.

As the geochemical characteristics of waste rock at the FCP site can be classed as NAF, there are currently no specific requirements to design overburden dumps to encapsulate potentially acid-forming (PAF) material. The large neutralising capacity of the overburden waste further reduces the potential for acid formation to occur.

Average EC and pH of 1:2 leachate extract waters suggest runoff/seepage associated with waste rock storage will be alkaline and fresh to moderately fresh. Salinity is not likely to pose a problem throughout the site; however, specific requirements for the management of alkaline waters may be necessary in the future and this will be addressed in mining planning procedures.

1.2.5.2 Tailings

ROM coal produced at the FCP site will be trucked off site for processing at existing infrastructure at Gregory Crinum mine, with all resulting waste material (tailings) to be disposed of within the existing tailings dams. As such, there is no requirement to manage process tailings at the FCP site.

1.2.5.3 Non-mineral waste

Due to the relatively short-term nature of operations proposed, regulated waste material is proposed to be stored in contractor-supplied waste containers and collected by an approved third-party contractor for ultimate disposal offsite at a regulated waste disposal facility. Recyclable waste will also be transported off site by a suitably licensed contractor.

1.2.6 Decommissioning and Rehabilitation

Rehabilitation will be undertaken progressively throughout the life of the FCP operation. Decommissioning will be required to comply with legislative requirements, including:

- the existing Environmental Authority (EA BRID007) conditions and mine closure criteria;
- the FCP Rehabilitation Management Plan (RMP) until replaced by an approved Progressive Rehabilitation and Closure Plan (PRCP); and
- the development of a Progressive Rehabilitation and Closure Plan in accordance with Queensland Government's Mined Land Rehabilitation Policy, under the *Mineral and Energy Resources (Financial Provisioning) Act 2018*.

All infrastructure constructed by the proponent will be removed from site except where it is to remain with the written agreement of the landholder. All decommissioning and rehabilitation activities will be undertaken in accordance with rehabilitation and acceptance criteria set out in the FCP EA conditions and will aim to return all disturbed areas to the agreed final land use of moderate intensity grazing. As such, post-mining land use for the final void surrounds, spoil dump domains, and mine infrastructure domains is proposed to be moderate intensity cattle grazing. The post-mining land use for the water storage infrastructure domain is to retain it for the post-mining landholder.

The proposed post-mining landform comprises a mosaic of low-slope gradients to facilitate grazing and native bushland habitat to be established on steeper spoil dump slopes. Following construction of an out-of-pit overburden landform during the first year of mining operations, the remaining overburden to be stripped during subsequent mining years will be progressively backfilled into the year 1 void and subsequent voids during progressive strip-mining operations. The final landform will be a backfilled landscape that approximately mirrors the original topography (though slightly raised above the natural surface), creating a low-risk rehabilitated landform.

For further detail on the final landform design, post-mining land use, schedule of progressive rehabilitation, and indicators related to groundwater that form part of the rehabilitation completion criteria/milestones, refer to the RMP.

1.2.7 Schedule of Activities

The schedule (**Table 1-2**) presented below provides an overview of key activities for the life of the FCP, along with anticipated timeframes.

Table 1-2 Schedule of activities

Time	Activity
2024 – 2025	Commencement of construction Conclusion of construction
2025 – 2032	Commencement of operations Conclusion of operations
2031 – 2038	Commencement of decommissioning Conclusion of decommissioning
2026 – 2049	Commencement of rehabilitation and monitoring Implementation of rehabilitation management plan (progressive rehabilitation through life of FCP) Completion of rehabilitation

1.2.8 Contingency Schedules

Due to the short life of the project, contingency schedules have not currently been prepared; however, as mining progresses and market conditions vary, contingency schedules may be developed.

1.3 Description of the Existing Environment

The primary land use in the Emerald area of the Bowen Basin is rural with some coal mining activities. Rural land uses are predominately cattle grazing and irrigated and rainfed broadacre cropping.

The FCP is wholly located on freehold property (Lot 2, Plan TT241), and the current land use of the site and immediate surrounds is primarily moderate-intensity cattle grazing on extensively cleared lands. Some areas under grazing have also been contoured and have been sown to improved pasture in the past. Tracks, fences, dams and yards are present across the area for the purpose of cattle grazing.

A water pipeline easement utilised for Oaky Creek Coal (a Glencore activity) currently crosses the site.

The FCP is bordered by two creeks, Cooroora Creek and Sandy Creek.

1.3.1 Soils and Geology

The FCP site contains clay soils of the Girrah Land System. The majority of the FCP site is dominated by Vertosol (cracking clay) soils on both the Fair Hill Formation and Quaternary alluvium geological units. Within both geological units, there were also occurrences of Dermosol (non-cracking) soils.

The local geology of the FCP site is composed of the Late Permian Fair Hill Formation, a coarse-grained, micaceous, calcareous sandstone, conglomeratic in places and interbedded with very minor brown calcareous mudstone and coal. In addition, the Burngrove Formation is present at the surface approximately 1 km west of the FCP site, while Tertiary sediments cover a small mesa 2 km north-east of the FCP site, and Quaternary alluvium occurs within and adjacent to Cooroora Creek.

The strata in the region generally strike north-south.

1.3.2 Water Resources

The FCP is located within the upper reaches of Mackenzie River sub-catchment of the Fitzroy Basin. Site hydrology is dominated by Cooroora Creek and two of its tributaries, Back Creek and Sandy Creek. Cooroora Creek is the main drainage feature on the FCP site. All creeks on the FCP site are ephemeral and only flow for short periods after rainfall events.

Cooroora Creek traverses the north-eastern boundary of the tenement, flowing in a north-west to south-east direction, connecting with the Mackenzie River approximately 21 km downstream of the FCP site. A man-made weir established on Cooroora Creek has created a small artificial wetland which is used as a cattle watering point adjacent to proposed FCP activities.

Sandy Creek and its minor tributaries traverse the southern boundary of the FCP site in a west to east direction. Sandy Creek joins Cooroora Creek to the east of the FCP.

Back Creek drains the northern part of the FCP tenement.

The FCP site experiences substantial temporal variability in rainfall and the drainage network is highly ephemeral, which is characteristic of the region.

Surface flows and temporary pools within Cooroora Creek in the wet season are not groundwater-dependent. Surface water chemistry analysed along Cooroora Creek and Sandy Creek indicate they are fed by freshwater sources, and are not influenced by the highly saline groundwaters (EC up to 45 dSm) of the local area.

The hydrologic cycle at the FCP site is dominated by low rainfall, high evaporation rates and limited infiltration to groundwater, which largely occurs uniformly over the landscape. As such, the groundwater quality measured at the FCP site is saline to very saline and is generally not suitable for stock watering or irrigation. There are no known private groundwater bores within the FCP site (other than FCP monitoring bores).

Regionally the main water resource aquifers are located within the Quaternary alluvial deposits that occur in discontinuous lenses along major streams and rivers throughout the Nogoa and Mackenzie River sub-catchments. The nearest major occurrence of alluvium with the potential to form a significant aquifer is associated with the Mackenzie River, approximately 15 km south-east of the FCP boundary.

At the FCP site, the alluvium appears to be predominantly dry or only partially saturated. Groundwater within the Permian coal measures predominantly occurs within the coal seams and is generally confined and transmissive. The non-coal sedimentary units tend to be tuffaceous in nature with high clay content. The fine grain size and well-consolidated and lithified nature of these non-coal sedimentary strata presents low aquifer potential.

1.3.3 Groundwater-dependent Ecosystems

There are three main categories of groundwater-dependent ecosystems (GDEs) (DSITIA 2015):

1) Aquatic GDEs: wetlands that receive groundwater discharge (e.g., springs);
2) Terrestrial GDEs: vegetation that accesses sub-surface groundwater through its roots; and
3) Subterranean aquatic ecosystems (stygofauna), and marine systems that receive sub-marine discharge of groundwater.

These ecosystems are discussed below.

1.3.3.1 Aquatic GDEs

The GDE Atlas (BoM 2020) identified a moderate potential for aquatic GDEs (surface expression of groundwater) within the upper reaches of Sandy Creek. However, no aquatic GDEs were found during ecological surveys, and low salinity within the surface water that occurs seasonally within Sandy Creek indicates that it is derived from rainwater runoff and not from groundwater.

The impounded water within Cooroora Creek upstream of the weir is not groundwater-dependent, as indicated by low salinity within surface water and a saline groundwater table that exists over 9 m beneath it. Furthermore, surface flow and temporary pools within Cooroora Creek in the wet season are also not groundwater-dependent, as evidenced by surface water quality at this time. Surface water chemistry analysed by NRC (2018) at three sites along Cooroora Creek and one along Sandy Creek indicated that all samples are fresh, with electrical conductivity EC values less than 0.2 dS/m. In contrast, the groundwater within the proposed disturbance area is saline, with EC values ranging between 15 and 44 dS/m (SLR 2019a).

All surface soils throughout the FCP site, including within alluvial areas, possess high clay content that significantly restricts the potential connectivity between surface and groundwater on site. This poor connectivity not only restricts the potential for surface expression of groundwater, but also the infiltration of surface water into the aquifer systems. Ephemeral ponds within gilgais and relic creek channels are derived from rainwater (not groundwater), which is prevented from infiltrating by the impermeable clay surface soils.

1.3.3.2 Terrestrial GDEs

Terrestrial GDEs are those ecosystems that are dependent on access to groundwater on a permanent or intermittent basis to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services. For vegetation to access groundwater, the roots must be able to reach the capillary zone above the groundwater table and the water quality of the groundwater must be adequate.

The GDE Atlas mapped (with low confidence) terrestrial GDEs alongside Cooroora Creek and its tributaries. Small sections of upper Sandy Creek (upstream of the FCP site) are mapped with moderate confidence as terrestrial GDEs. These areas are mapped on the basis of them potentially utilising water within Quaternary alluvium along the watercourses.

Groundwater and geological assessments of the FCP area (SLR 2019a, 2019b; hydrogeologist.com.au 2021) suggested that Quaternary alluvium is absent along Sandy Creek, but is present as a 200-m to 800-m-wide band along Cooroora Creek. Where this Quaternary alluvium contains groundwater, it is the shallowest groundwater present on site and is the most likely to be potentially accessed by the roots of vegetation. However, much of this alluvium does not contain any groundwater (at least permanently). Where groundwater is present, it is limited in depth; groundwater was only recorded within alluvium in a single bore (absent from two others within Quaternary alluvium), where the standing water level was measured at 9.36 metres below ground level (mBGL), and the saturated thickness of the alluvium was about 0.6 m. Measured yield from this bore was very low (<0.1 L/s) and water quality was highly saline (44.6 dS/m). Riparian vegetation composition and condition did not noticeably differ between areas where groundwater is present within the alluvium (downstream section of Cooroora Creek) and areas where this is absent (upstream of the FCP site boundary). This suggests that, while some species of local trees may be able to access and utilise this groundwater, they are not dependent on it.

Remote-sensing-derived 'inflow dependence' data available in the GDE Atlas at 25-m resolution, identifies landscape areas where evaporative loss from the landscape exceeds rainfall. Areas with higher evaporative losses indicate additional but undefined water sources (e.g., groundwater or surface flows from upstream). Vegetation along Sandy Creek does not show evaporative loss exceeding rainfall, indicating that this vegetation solely obtains its water from local rainfall. Vegetation along the banks of Cooroora Creek does exhibit higher evapotranspiration than rainfall. This finding indicates that this vegetation either accesses groundwater or surface flows within Cooroora Creek.

Of the species of trees and shrubs that grow on Quaternary alluvium along Cooroora Creek, most are not typically groundwater-dependent. This vegetation comprises a mix of regional ecosystem (RE) 11.9.1 and RE 11.3.25. The dominant species in RE 11.9.1 is *Acacia harpophylla*, which is unlikely to be groundwater-dependent.

Tunstall and Connor (1981) found *Acacia harpophylla* roots to penetrate to at least a depth of 4 m, although high salt content of the soil caused plants to experience strong water deficiencies except immediately after rain. This dependence on rain for growth implied a failure to utilise groundwater. Subsoils beneath *A. harpophylla* communities tend to be heavy, saline and/or sodic, impeding water availability (Tunstall and Connor 1981). Furthermore, *A. harpophylla* often grows at sites with very deep groundwater that is beyond the reach of roots. The leaf tissues of *A. harpophylla* are even more resistant to desiccation than that of other shallow-rooted arid-zone *Acacia* spp. (Connor and Tunstall 1968), implying a lack of reliance on groundwater. Most sub-dominant species within RE 11.9.1 (e.g. *Lysiphyllum hookeri* and *Terminalia oblongata*) are deciduous in the dry season, implying a lack of access to year-round water.

Unlike RE 11.9.1, RE 11.3.25 contains several species that are phreatophytes (able to utilise groundwater) elsewhere in their range. River Red Gum (*Eucalyptus camaldulensis*) is the dominant species in this ecosystem, and it is often dependent on shallow aquifers and watercourses (Bacon et al. 1993). Isotope studies elsewhere indicate that *E. camaldulensis* accesses groundwater up to a depth of 9.4–11.2 m, but not deeper (Rumman *et al.* 2018). A

similar finding—that *E. camaldulensis* commonly accesses groundwater to a depth of 12.5 m—was revealed by studies of tree condition (Kath *et al.* 2014). The latter study revealed that groundwater may also be accessed to a limited extent up to 20 m, but not deeper.

Not only is *E. camaldulensis* able to access groundwater, but it is tolerant of high salinity. Isotope analyses have confirmed that adult trees growing above a 2–3 m deep, highly saline (30–50 dS/m) water table were able to use this groundwater, despite experiencing substantial water stress as a result (Mensforth *et al.* 1994). While saline groundwater can potentially sustain *E. camaldulensis* during dry periods, most growth occurs in response to saturation of the upper soil profile with freshwater during floods. These intermittent flooding events provide half to two-thirds of the water requirements of the species and are vital for maintaining their health (Eamus *et al.* 2006b; Wen *et al.* 2009). *E. camaldulensis* was equally abundant and healthy in stretches of Cooroora Creek that lacked groundwater as in sections that had groundwater, and the fact that it was rarely observed to grow far from the banks of the creek channel suggests that surface and shallow subterranean creek flows during and following the wet season are the principal sources of water for the species locally.

Like *E. camaldulensis*, *Eucalyptus coolabah* (a sub-dominant species in RE 11.3.25) is an opportunistic phreatophyte in response to varying depths and salinities of groundwater (Costelloe 2016). In the Lake Eyre Basin, this species utilises groundwater up to 6 m deep with salinity up to 49 dS/m, although deeper groundwater is not used (Costelloe *et al.* 2008; Costelloe 2016). In reaches with hypersaline groundwater, *E. coolabah* can only persevere close to zones of most frequent surface flow (i.e., on the banks of the major channels). The species has evolved very low transpiration rates to deal with prolonged periods without access to water (Costelloe *et al.* 2008). Like *E. camaldulensis, E. coolabah* may utilise groundwater within the vicinity of the FCP where it is available, although it is near the limit of its salt tolerance, and is unlikely to be an important water source for the species. As the species was only observed close to the channel of Cooroora Creek, local populations most likely depend on surface flows (and bank storage: Costelloe *et al.* 2008), rather than groundwater per se.

Corymbia tessellaris, a sub-dominant species in RE 11.3.25, is relatively salt-sensitive (Sun and Dickinson 1995). *Eucalyptus crebra*, another subdominant species in RE 11.3.25, has moderate salt tolerance only (Gill and Abrol 1991; Sun and Dickinson 1993; Hoy *et al.* 1994), is sensitive to die-back during drought, and exhibits xylem flows and root depths consistent with a lack of access to groundwater (Rice *et al.* 2004; Fensham and Fairfax 2007). Neither species is likely to be groundwater-dependent within the FCP site and neighbouring areas.

In summary, some constituent species of the riparian vegetation along Cooroora Creek (namely, *E. camaldulensis* and *E. coolabah*) may utilise groundwater intermittently, or where it is available, but no species is likely to be dependent on the limited, poor-quality groundwater reserves within Quaternary alluvium in the vicinity of the FCP. Nevertheless, vegetation that uses groundwater episodically or opportunistically qualifies as a GDE according to the *Information Guidelines Explanatory Note: Assessing groundwater-dependent ecosystems* (Doody *et al.* 2019). No alluvium aquifers are present along Sandy Creek, and none of the riparian vegetation there is groundwater-dependent.

1.3.3.3 Stygofauna

Stygofauna are subterranean aquatic animals that live in the pores, voids and cavities of aquifers and other groundwater ecosystems. Many species of stygofauna have specialised adaptations to underground life, including:

- small body size (e.g. many species have a total body length <1 mm);
- lack of pigmentation;
- absence of eyes; and
- elongated appendages (for tactile sensing of the surrounding environment).

Crustaceans, including copepods, amphipods, isopods and syncarids, typically dominate the composition of stygofaunal communities, although oligochaetes, molluscs, mites, insects and rotifers are also common. Blind fish and eels are also known from some cave systems, such as those in Western Australia.

Stygofauna taxa are grouped into one of several classes based on the degree of their requirement for subterranean life (Tomlinson & Boulton 2008). Two classes of stygofauna are considered here:

- stygobites: obligate groundwater aquatic fauna that have specialised adaptations to underground life and that live within groundwater systems for their entire life, and
- stygoxenes: aquatic fauna that facultatively use groundwater ecosystems, but are not dependent on groundwater to complete their life cycle.

Many species are restricted to very small geographical areas (high endemism). Therefore, where proposed developments extend below the water table, potential for stygofauna presence, potential impacts and mitigation measures should be considered (EPA, 2003).

Stygofauna are found predominantly in aquifers with large (one millimetre or greater) pore spaces, especially alluvial, karstic and some fractured rock aquifers. The size of the pore spaces is a key determinant of the suitability of an aquifer as stygofauna habitat. Stygofauna have been recorded occasionally in coal seam aquifers, particularly where those aquifers are hydrologically connected to a shallow alluvial aquifer (Hose *et al.* 2015). Karstic and limestone habitats host the highest stygofauna diversity; however, these habitats are somewhat rare in Eastern Australia (Hose *et al.* 2015) and are absent from the region containing the FCP.

The CSIRO reviewed the status of knowledge regarding stygofauna diversity, ecology and biogeography within Australia (Hose *et al.* 2015), including 12 stygofauna studies within the Bowen Basin. The attributes of sites at which stygofauna were recorded within the Bowen Basin were as follows:

- stygofauna were most frequently recorded from alluvial aquifers but also from basalt aquifers and coal seams;
- coal seams supporting stygofauna were shallow and connected to an alluvial aquifer;
- fauna were recorded from bores where EC was below 10 dS/m;
- pH was between 6.39 and 10.27;
- dissolved oxygen was at or above 0.93 mg/L; and

- standing water level was between 1.4 and 45.0 mbgl (Hose *et al.* 2015).

Stygofauna assemblages in alluvial aquifers typically contain common stygobionts such as copepods, amphipods and syncarids.

Bore data across the FCP shows that the water-bearing potential of alluvium is variable across the site (two out of three bores did not intercept any water in the alluvium). Where groundwater did occur in the alluvium, south-east of the site, it remains well below the ground surface (stream bed) (>9 m below the ground surface) and is highly saline, with water at the base of the alluvium possessing electrical conductivity values up to 45 dS/m.

While no stygofauna assessments have been carried out at the FCP site, assessments for other mining projects have been carried out at Washpool located 20 km south of the FCP site (Subterranean Ecology 2010), and Taroborah located 70 km south-west of the FCP (AARC 2013). There was no evidence of stygofauna at either site.

The highly saline groundwater and limited alluvium-coal seam aquifer connectivity suggest a low likelihood of stygofauna being present at the FCP site.

A pilot survey for stygofauna within the Quaternary alluvium and Permian coal seam aquifers will be undertaken in accordance with the Queensland Government's *Guideline for the Environmental Assessment of Subterranean Aquatic Fauna* (DSITIA 2015) to establish whether or not stygofauna are present on site.

1.3.4 Biodiversity

1.3.4.1 Overview

No threatened flora or fauna species protected under the EPBC Act or *Nature Conservation Act 1992* were identified on site during surveys. Ecological surveys undertaken within the FCP study site recorded 71 species of plant, 30 species of mammal, 19 species of reptile, 11 species of amphibian and 77 species of bird.

Although they were not detected on site, the EPBC public environment report identified a low probability that the Koala (*Phascolarctos cinereus,* endangered) and Greater Glider (*Petauroides volans,* endangered) may disperse along the ribbon of riparian vegetation along Cooroora Creek, which is mapped as a possible terrestrial GDE.

The following six non-native animals were recorded on site:

- Common Myna (*Acridotheres tristis*);
- European Rabbit (*Oryctolagus cuniculus*);
- House Mouse (*Mus musculus*);
- Feral Pig (*Sus scrofa*);
- Feral Cat (*Felis catus*); and
- Cane Toad (*Rhinella marina*).

Twelve of the 71 flora species identified were introduced species, including three Weeds of National Significance:

- Parthenium (*Parthenium hysterophorus*);

- Prickly pear (*Opuntia stricta*); and
- Velvety tree pear (*Opuntia tomentosa*).

1.3.4.2 Threatened Ecological Communities

One threatened ecological community (TEC) occurs within the FCP site. Field surveys confirmed the presence of RE 11.9.1 (a constituent of the Brigalow TEC) as a dominant component of mixed mosaics of vegetation along Cooroora Creek and Sandy Creek. Along Cooroora Creek, this vegetation is remnant, while along Sandy Creek the vegetation is primarily "high-value regrowth" (category C regulated vegetation under Queensland's *Vegetation Management Act 1999*). Both classes potentially qualify as the Brigalow TEC.

Along both creeks, RE 11.9.1 was intermixed with RE 11.3.25 (*Eucalyptus camaldulensis* forest along drainage channels). Spatial separation of these vegetation communities was not possible as, while *E. camaldulensis* was present and dominant to co-dominant along the bed and bank of the watercourse, *A. harpophylla* remained sub-dominant to co-dominant. Away from the bank of the watercourse, there was a broad ecotone over which the dominance of *A. harpophylla* steadily increased. Away from the watercourse, *A. harpophylla* tended to be dominant to co-dominant with *Terminalia oblongata*.

1.3.4.2.1 Extent of Brigalow TEC on FCP site

No extent of the Brigalow TEC will be cleared for the FCP. Outside the clearance footprint, the FCP site contains 43.7 ha of the Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC. Of this, 30.4 ha is remnant vegetation and 13.3 ha is regrowth that meets the condition threshold of the TEC. The location of the Brigalow TEC is presented in **Figure 1-5**. While the Brigalow TEC may not be a GDE itself (refer to **Section 1.3.3.2**), it occurs on site as a mosaic with 11.3.25, which is a potential GDE.

Figure 1-5 Brigalow threatened ecological community

FR001_GDEMP_Fig1-5_Brigalow TEC.pdf (Command Line)

1.3.5 Vegetation

1.3.5.1 Overview

The natural vegetation of the FCP site has largely been cleared and replaced with treeless pastures dominated by exotic pasture grasses, such as Buffel Grass (*Cenchrus ciliaris*), Indian Couch (*Bothriochloa pertusa*) and Sabi Grass (*Urochloa mosambicensis*).

The only remnant vegetation remaining within the FCP site occurs on the banks and lower terraces of Cooroora Creek, with a small fragment along Sandy Creek. This remnant vegetation comprises a mix of two REs: Brigalow (*Acacia harpophylla*) open forest (RE 11.9.1) and River Red Gum (*Eucalyptus camaldulensis*) riparian forest (RE 11.3.25).

Remnant and regrowth vegetation found within the FCP site has been heavily grazed and is of poor quality. Despite having a native canopy layer, the shrub layer is sparse and the ground layer is dominated by weed species. Remnant *E. camaldulensis* along Cooroora Creek possesses hollows that provide fauna habitat.

Cleared pastures have little habitat value, except where gilgais are present. Here, dense tussocks of sedges and grasses occur along the banks and provide shelter for wetland fauna species.

1.3.5.2 Groundwater-dependent vegetation on FCP site

Potentially groundwater-dependent vegetation occurs on site within the riparian vegetation communities along Cooroora Creek (refer to **Figure 1-5**). Most species on site within this zone are not typically groundwater-dependent. This vegetation comprises a mix of RE 11.9.1 (43.7 ha) and RE 11.3.25 (24.9 ha). The dominant species in RE 11.9.1 is *Acacia harpophylla*, which is unlikely to be groundwater-dependent. The constituent species of RE 11.3.25 that may utilise groundwater intermittently, or where it is available, are *E. camaldulensis* and *E. coolabah* (for further detail refer to **Section 1.3.3.2**).

2 Legislation

Table 2-1 provides the Commonwealth and State approval conditions relevant to the GDEMP and a reference to where the requirements are addressed in the GDEMP.

Table 2-1 Commitments relevant to the GDEMP

Approval & Condition Number	Description of Commitment or Condition	How Addressed/Section of GDEMP
EPBC Act Approval, condition 2	The approval holder must submit a Groundwater Dependent Ecosystem Management Plan (GDEMP) for the Minister's approval that ensures there are no adverse impacts on the biocondition and extent (in hectares) of terrestrial groundwater-dependent ecosystems (GDEs) associated with the alluvium aquifer of Cooroora Creek and Sandy Creek as a result of the action. If the Minister approves the GDEMP then the GDEMP must be implemented.	This plan (GDEMP) in its entirety addresses condition 2 of the EPBC Act approval.
EPBC Act Approval, condition 3	The approval holder must not commence the action unless the Minister has approved the GDEMP in writing.	Mining operations will not commence until this plan has been approved.
EPBC Act Approval, condition 4	The GDEMP must be consistent with the Department's Environmental Management Plan Guidelines, and must include: a. The GDEMP environmental objectives, relevant EPBC Act protected matter/s and a reference to EPBC Act approval conditions to which the GDEMP refers b. A table of commitments made in the GDEMP to achieve the objectives, and a reference to where the commitments are detailed in the GDEMP c. Reporting and review mechanisms, and documentation standards to demonstrate compliance with the GDEMP d. An assessment of risks to achieving GDEMP environmental objectives and risk management strategies that will be applied e. Impact avoidance, mitigation and/or repair measures, and their timing f. A monitoring program, which must include: i. measurable performance indicators ii. the timing and frequency of monitoring to detect changes in the performance indicators iii. trigger values for corrective actions iv. proposed corrective actions, if trigger values are reached.	a. Section 3; Section 1.3.4.2; Executive Summary. b. Section 2 (this table). c. Section 8; Section 9; Section 11.2. d. Section 4 and Section 12; Section 5. e. Section 5. f. Section 6. i. Section 6.2. ii. Section 6.2 and Section 6.3. iii. Section 6.2. iv. Section 6.5. g. Appendix A.

Approval & Condition Number	Description of Commitment or Condition	How Addressed/Section of GDEMP
	g. Provide any links to other plans or conditions of approval (including State/Territory approval conditions).	
EPBC Act Approval, condition 5	If the approval holder detects that a trigger value has been reached or exceeded, the approval holder must report this to the Minister within 5 business days of the detection. Unless evidence can be provided, to the Minister's satisfaction, that the trigger value exceedance is not attributable to mining activities, corrective actions must be implemented within 30 business days of the detection.	Section 6.5
EPBC Act Approval, condition 6	If corrective actions fail to halt or reverse impacts to GDEs within 24 months from the detection of a breached trigger value, and a disturbance threshold has been exceeded, the approval holder must submit a GDE Offset Strategy in accordance with the Environmental offsets policy within 6 months for the written approval of the Minister. The approved GDE Offset Strategy must be implemented within 12 months of submission and for the remaining duration of the approval.	Section 6.6
Environmental Authority, condition D2	The biocondition and extent of groundwater dependent ecosystems associated with the alluvium aquifer of Cooroora Creek and Sandy Creek must remain unchanged. Note: The biocondition must be determined by the methodology in BioCondition: a condition assessment framework for terrestrial biodiversity in Queensland: assessment manual. T.J. Eyre et. al. Version 2.2 (2015 or later versions).	The BioCondition methodology is addressed in Section 6.4.2.

3 Objectives

The preparation of, and adherence to, a GDEMP is a condition of the project's Commonwealth approval under the EPBC Act. This GDEMP has been prepared to comply with EPBC Approval Conditions 2–6 and to provide a framework for compliance with EA Approval Condition D2 (refer to **Section 3**).

The following are the objectives of this GDEMP:

1) to provide Futura with a complete management framework for potential GDEs and prevent them from being impacted by the FCP;
2) to identify the risks to GDEs posed by the FCP;
3) to propose sufficient controls and management strategies to minimise risk to potential groundwater-dependent ecosystems along Cooroora Creek and Sandy Creek in compliance with conditions of approval;
4) to describe monitoring methodology, triggers and responses in the event that triggers are encountered;
5) to nominate roles and responsibilities for undertaking all aspects of managing, monitoring and reporting on GDEs; and
6) to describe reporting requirements pertaining to GDE management.

4 Potential Environmental Impacts to GDEs

4.1 Construction Phase

4.1.1 Direct mortality of, or damage to, riparian vegetation as a result of accidental vegetation clearing and/or soil compaction

All riparian vegetation on the FCP site lies outside the clearance footprint and none is to be cleared for the FCP (refer to **Figure 1-5**). Within this riparian zone, 24.9 ha of RE 11.3.25 (a potential groundwater-dependent ecosystem) occurs along the banks of Cooroora Creek. Most of this occurs outside 100 m but within 500m of the edge of the clearance area. There is a very low potential risk that riparian vegetation in close proximity to the clearing area could be accidentally cleared, trampled or driven on. The FCP surface disturbance footprint is at least 50 m from riparian vegetation (RE 11.3.25) and signage will already be in place for the Brigalow TEC explaining the significance of the vegetation and prohibiting access by vehicles or machinery. Therefore, the FCP is highly unlikely to cause direct removal of, or damage to, riparian vegetation as areas will be buffered and clearly marked with pegs delineating a 'no-go' zone.

4.2 Operation Phase

4.2.1 Groundwater Drawdown

The open-cut pit created for the FCP will intercept coal seam aquifers, and water seeping from these aquifers into the pit will result in localised desaturation and/or drawdown within adjacent aquifers. The FCP is likely to reduce the availability of water within this aquifer over an area that extends up to 3.7 km (the upper 95% confidence interval) from the centre of the proposed mine pit. It is doubtful whether any vegetation within this zone of groundwater drawdown is groundwater-dependent. However, this drawdown has the potential, although unlikely, to affect the health of *Eucalyptus camaldulensis* and *Eucalyptus coolabah,* the most likely tree species to be groundwater-dependent.

Ground water levels are expected to stabilise approximately 5 m below the pre-mine groundwater level within the pit area, approximately eight years post-mining, at approximately 137 mAHD (D Barclay 2021, pers. comm., 19 May).

The zone of potential impact (**Figure 4-1**) contains 180.5 ha of vegetation mapped (with low probability) as a terrestrial GDE in the GDE Atlas (BoM 2020). This zone of potential drawdown is highly conservative. Drawdown predictions from 3D numerical flow models in the Bowen Basin indicate that the drawdown will more than likely propagate along the strike of the coal seams rather than up and/or down the dip of these coal seams. Typically, the permeability of coal seams decreases with depth and, with this reduction in permeability (down the dip of the coal seams), the extent and magnitude of drawdown will reduce. The drawdown zone will most likely be confined to within 1 km of the edge of the open pits.

Furthermore, much of the vegetation presented in the GDE Atlas is either comprised of vegetation that does not utilise groundwater (e.g., the *Acacia harpophylla* ecological community) or occurs along stretches of the alluvium that lack groundwater (refer to **Section 1.3.3.2**). Nevertheless, as the zone of potential drawdown extends beyond the boundaries of field-verified vegetation mapping and groundwater depth sampling, the GDE Atlas represents the most useful data available.

The ecological responses by GDEs to localised desaturation of the alluvium aquifer are expected to be minimal. As discussed in **Section 1.3.3.2**, there are several reasons to expect that local *E. camaldulensis* and *E. coolabah* do not depend on groundwater for their ecological needs. Both species were observed to grow equally abundantly in naturally unsaturated stretches of the alluvium as at sites where groundwater was present. Where groundwater is present, it is at a depth and salinity that approaches the limits of these species' tolerance. In the vicinity of the FCP, both species only grow on the banks of channels, where they have access to surface water flows. Alluvium away from the channels does not support either species, suggesting negligible importance of groundwater within the alluvium to the establishment and/or growth of *E. camaldulensis* and *E. coolabah*.

No aquatic GDEs were identified within the vicinity of the FCP, and no impacts to these are anticipated.

Figure 4-1 Potential terrestrial GDEs within the maximum zone of drawdown

FR001_GDEMP_Fig4-1_Potential Terrestrial GDEs.pdf (Command Line)

4.2.2 Soil compaction affecting health of riparian vegetation

As vehicles and people will remain on site for the life of the mine, potential impacts of soil compaction on riparian vegetation may persist during operations.

4.2.3 Dust deposition affecting health of riparian vegetation

There is a potential risk that air quality in close proximity to mining operations may be affected due to dust from activities of the FCP. Potential sources of dust include driving on unsealed haul roads and activities associated with the extraction of coal (mining process). It is possible such dust may settle on riparian vegetation within 100 m of the pit, affecting the health of such vegetation and causing degradation.

The risk to riparian vegetation of dust is very low, considering that sources of most dust will be greater than 100 m from riparian vegetation. Most of the riparian vegetation on site occurs outside 100 m but within 500m of the edge of the clearance area.

4.2.4 Water Quality

As groundwater quality within Quaternary alluvium along Cooroora Creek is already near the threshold of acceptability for *Eucalyptus camaldulensis* and *Eucalyptus coolabah*, any increase in salinity resulting from the FCP could render this water source unsuitable for local GDEs.

Geochemical assessments of the coal rejects and waste rock have been undertaken (refer to **Section 1.2.5**). No significant change in groundwater quality is expected to occur as a result of mining at the FCP, and no impacts to GDEs are anticipated from the groundwater quality at the FCP site. Groundwater quality and levels are assessed in the GWMP.

4.3 Decommissioning and Rehabilitation Phase

4.3.1 Groundwater drawdown

As groundwater levels are not expected to stabilise until approximately eight years after mining operations cease (refer to **Section 4.2.1**), potential impacts of groundwater drawdown on riparian vegetation may persist during rehabilitation.

4.3.2 Soil compaction affecting health of riparian vegetation

As vehicles and people will remain on site for the life of the mine, potential impacts of soil compaction on riparian vegetation may persist during rehabilitation.

4.4 Summary of Potential Impacts

In summary, the potential impacts to potential GDEs arising from all FCP activities are presented in **Table 4-1**.

Table 4-1 Potential environmental impacts to potential GDEs arising from FCP activities

Aspect of Project/Impact	Phase	Potential environmental impact	Inherent risk
Accidental clearing	Construction	Loss of riparian vegetation.	Very low
Soil compaction/vegetation damage from vehicles and people	Construction, operation and rehabilitation	Damage to riparian vegetation.	Very low
Groundwater drawdown	Operation and rehabilitation	Drawdown adversely affecting (significant alteration beyond natural variation) the riparian vegetation communities of Cooroora Creek and/or Sandy Creek.	Low
Groundwater Quality	Operation and rehabilitation	Increased salinity of groundwater could render this unusable for GDEs	Very Low
Dust	Construction and operation	Degradation of riparian vegetation.	Very low

4.4.1 Very low inherent risk of direct mortality of, or damage to, riparian vegetation through vegetation clearing and/or soil compaction

In light of no groundwater-dependent ecosystems occurring within at least 50 m of the clearance footprint of the FCP, coupled with signage and pegs to delineate disturbance limits/no parking/ No Go Zones, the inherent risk of direct mortality or damage to riparian vegetation resulting from the FCP is very low and will therefore not be considered any further in this management plan.

4.4.2 Very low inherent risk of dust deposition affecting health of riparian vegetation

Dust will be managed for health and safety reasons using a designated water truck (refer to the Air Quality Management Plan). In light of the distance between riparian vegetation and the dust sources, coupled with existing dust-management practices (refer to the Air Quality Management Plan), the inherent risk of dust deposition affecting the health of riparian vegetation is very low and will therefore not be considered any further in this management plan.

5 Environmental Management Measures

Proposed environmental management measures are presented to mitigate the low potential risk of drawdown identified.

5.1 Groundwater drawdown affecting the health of riparian vegetation

5.1.1 Environmental Management Activities, Controls and Performance Targets

To reduce the risk of groundwater drawdown affecting the health of riparian vegetation, a number of control measures have been proposed (**Table 5-1**).

Table 5-1 Control measures for managing the risk of groundwater drawdown

Risk Control Measures	Timing	Performance Target
The mine pit that is ultimately constructed will conform to the original specifications of the drawdown model.	Construction	The health and extent of GDEs within the zone of potential drawdown does not decline below the baseline range of values measured between 2013 and 2023.
A chain of communication will be implemented to ensure that the pit does not expand beyond its approved boundaries.	Operation	
The pit will progressively be refilled with waste rock to reduce the total time that drawdown will occur.	Operation, and decommissioning and rehabilitation.	

6 Environmental Monitoring Program

A monitoring program has been developed to monitor potential impacts, track vegetation health, and demonstrate that the FCP will not have an impact on potential GDEs as described in **Section 4**. This program will address the monitoring conditions outlined in EA BRID007 (**Appendix A**) and EPBC approval 2019/8549.

6.1 Program summary

An effective long-term riparian vegetation health monitoring program is adaptive. Innovations in monitoring techniques and methods will be incorporated into the program design over time. This would, however, be dependent on, and driven by, the quality and quantity of data collected. Further, program design is based on replicable sampling at impact and reference sites.

The program involves two concurrent monitoring components. The primary component is Normalised Difference Vegetation Index (NDVI) analysis (refer to **Section 6.4.1**) and with a secondary BioCondition assessment (refer to **Section 6.4.2**). NDVI analysis will monitor the riparian vegetation along Cooroora Creek and Sandy Creek and outside the modelled drawdown zone (impact zone) using Landsat Imagery, while BioConditon will specifically target monitoring sites via an in-field assessment of relevant parameters, where property access is granted.

NDVI analysis will serve as the primary mechanism for detecting changes in vegetation health and condition over time. While BioCondition assessments are incorporated to meet approval condition requirements, NDVI remains the most effective tool for assessing potential impacts of groundwater drawdown on vegetation at a landscape scale.

Initial baseline survey(s) will be conducted to assess the health and cover of riparian vegetation prior to the first operational phase monitoring event.

6.2 Performance Targets

The performance targets of the monitoring program—and the GDEMP itself—are listed in **Table 6-1**. Failure to meet these performance targets constitutes an "incident", which is subject to the processes and corrective actions described in **Section 6.6.**

Table 6-1 Performance targets

Objective	Indicator	Timing	Performance target
Demonstrate no decline in the condition of potential terrestrial GDEs below baseline values as a result of the FCP	NDVI analysis of Landsat imagery within the zone of potential impact	Annually, in September-November, throughout all stages of the project	Average NDVI values within the zone of potential impact remain above 0.304.
	BioCondition surveys at accessible sites	Annually, in September-November,	Over two consecutive time periods[1], average BioCondition scores at sites within the zone of

Objective	Indicator	Timing	Performance target
	within and outside the zone of potential impact	throughout all stages of the project.	potential impact do not decline by a greater percentage than declines[2] in average BioCondition scores at control sites in the same time period.
Demonstrate no decline in the extent of potential terrestrial GDEs	NDVI analysis of Landsat imagery within the zone of potential impact	Annually, in September-November, throughout all stages of the project	The number of 90 m × 90 m cells within the mapped GDEs within the zone of impact that maintain a mean NDVI >0.1636 is to remain above 208.
Adherence to the commitments of this GDEMP	Annual audit	Annually, in January-February, throughout all stages of the project.	All management measures and monitoring commitments prescribed by this GDEMP have been adhered to.

[1]Two consecutive time periods have been chosen over any one period of time in case the impact site receives less rain in one year than the reference sites.

[2]Tree health is expected to fluctuate naturally with annual variation in rainfall, temperature, fire and insect damage. Fluctuations in tree condition outside the potential zone of impact are intended as controls for this natural variation.

To reduce the risk that performance targets are not met, an early warning trigger will be in place to instigate corrective actions to protect GDEs from declines in health beyond natural variation. This trigger will occur when:

Over two consecutive time periods, average NDVI values within the zone of potential impact declines by a statistically significantly greater amount than declines in average NDVI values observed at analogous control sites in the same time period.

A power analysis informed by the number of data cells contained in the impact and proposed control areas, and the standard deviation in the extent to which cells change NDVI between any two years revealed that the study design has the power to detect (with a <0.05 statistical significance) when the impact site declines by an average of 0.0121 NDVI units more than the control site in any one year. Given that the impact site naturally varied by up to 0.2036 NDVI units in the pre-mining state, the differences that can be detected using this method are relatively subtle.

Studies elsewhere revealed that *Eucalyptus camaldulensis* begins to show canopy stress after five to seven years without groundwater, and widespread canopy death after 10 years (Doody 2018). This means that there is ample scope for corrective actions to be implemented following the early warning trigger before irreversible impacts occur. NDVI values that represent “irreversible impacts” are not known, but it can be safely assumed that such values lie outside the variation observed pre-mining. Therefore, the nominated performance target based on minimum NDVI values observed pre-mining can be interpreted as a conservative estimation of when irreversible impacts may begin to be evident.

An example of an early warning trigger, and how this compares to the performance targets shown in **Table 6-1**, is shown in **Figure 6-1**.

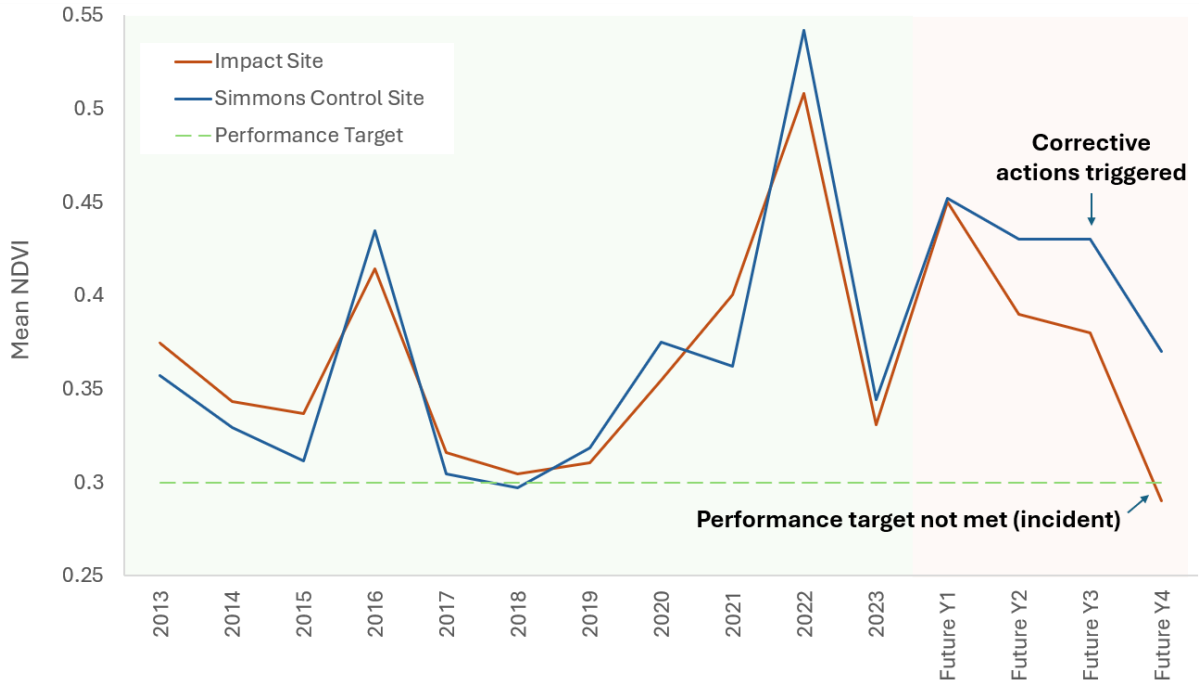


Figure 6-1 Diagrammatic illustration of how the trigger values for corrective actions compare to the performance target

Data presented in the green zone (years 2013 to 2023) represents actual variation observed under baseline conditions at the impact site and a control site on the Simmons property. The red zone shows a hypothetical example of deteriorating GDE condition coinciding with consecutively drier years. Dry weather results in declining NDVI values even at the control site, but more extreme declines at the impact site if groundwater drawdown worsens vegetation health. Two consecutive years of more extreme declines at the impact site than the control site would trigger corrective actions. This will allow corrective actions to commence while vegetation health remains within the range of natural variation observed between 2013 and 2023. A failure to implement corrective actions or a failure of these actions to achieve the desired result could result in vegetation health declining beyond the performance target based on natural variation in NDVI. This would trigger a reportable incident.

6.3 Duration

Monitoring of vegetation condition will commence during the construction phase of the FCP, before any significant interference with coal seam aquifers has commenced (i.e., during the operations phase).

As there may be long lag times between an action occurring and symptoms appearing in a GDE (Doody *et al.* 2019), monitoring is to continue for a number of years after operations cease in order to demonstrate that there will be no adverse impacts on terrestrial GDEs. Monitoring is to cease once either of the following conditions have been met:

- Groundwater level monitoring within bores FHMB01 and FHMB07 indicate that groundwater levels within the Quaternary alluvium have returned to pre-mining conditions; or

- Groundwater level monitoring within bores FHMB01 and FHMB07 indicate that groundwater levels within the Quaternary alluvium have remained stable (considering natural fluctuations) over ten years AND no declines in GDE condition have been demonstrated over this time.

6.4 Monitoring Methodology

6.4.1 Multispectral Imagery

Eucalyptus camaldulensis (a good measure of riparian ecosystem health) begins to show canopy stress after five to seven years without water, and after 10 years without water the canopy is likely to be absent. Irrigation or flooding at this point every two years for eight years is required for the trees to recover to good condition (Doody 2018).

Canopy cover will be monitored using publicly available Landsat imagery, which has a spatial resolution of 30 m, making it suitable for assessing narrow, potentially groundwater-dependent riparian vegetation. Multi-spectral indices such as NDVI can be derived from this imagery and are particularly effective and ideal for tracking changes in vegetation greenness. As a result, NDVI serves as the primary mechanism for assessing changes in plant health and condition over time.

Greenness fluctuates seasonally with rainfall, in response to pasture growth and desiccation. To minimise the extent of these background fluctuations between years, imagery collected late each dry season (July-November) is to be used. If unseasonal rainfall occurs during this period, an earlier or later time can be selected, provided that negligible rain (<10 mm) fell in the preceding two months. By utilising imagery collected during dry periods, most of the greenness will reflect woody vegetation, rather than pasture. Woody vegetation is that which has the greatest likelihood of being groundwater-dependent. Such times also represent periods when the health of vegetation with access to groundwater is expected to exceed the health of vegetation reliant on rainwater. Thus, this ensures that vegetation health is being monitored during periods where GDEs are most likely to rely on groundwater, if at all. Impacts of drawdown are thereby most easily detected then.

NDVI is a vegetation density index derived from multispectral imagery to provide a quantitative measure of plant health/vigour. NDVI is a modulation ratio between near infra-red (NIR) and red radiation as per the formula NDVI = (NIR – red)/ (NIR +red). Values range from -1 (red dominant) to 1 (NIR dominant). Healthy green vegetation (chlorophyll content) exhibits low red and high NIR reflectance, resulting in positive NDVI values. The more positive the value, the greener the vegetation.

The archive of Landsat imagery from the years 2013 to 2023 has been used as baseline data on natural fluctuations in vegetation condition over time. This temporal range spans wet years (2022 = 876.2 mm total rainfall) to severe drought (2019 = 264 mm total rainfall) (data from Emerald Airport weather station 35264: BoM 2020), and pre-dates any disturbance to local aquifers by the FCP.

The following are the assessment units to be assessed and are described in the following two subsections:

- potential impact zone (180.5 ha); and
- two control zones in spatially distant locations (each ~180 ha).

6.4.1.1 Impact zone

The impact zone is defined as the area mapped (albeit with low probability) as a terrestrial GDE in the GDE Atlas (BoM 2020) that occurs within the zone of potential drawdown shown in **Figure 4-1**. A total of 180.5 ha of possible GDEs are contained within this impact zone. This impact zone is divided into 90 m × 90 m cells, which are treated as independent samples for analysis. Cells of 90 m, instead of 30 m (the resolution of the published spectral data), are chosen as replicates because individual trees spanning two cells may create a problem with independence. If 30 m sampling was used instead, neighbouring cells may be highly correlated with one another, which could be incorrectly perceived as drawdown impacts. Cells of 90 m are only likely to be correlated with neighbours in the event of drawdown or other localised events (e.g., localised rainfall). To be included within the impact zone, at least 50% of each 90 m cell must contain mapped GDEs. There are 208 such cells located within the impact zone.

Analysis of variance (ANOVA) or similar statistical test is to be used to compare the annual change in NDVI between impact and control sites.

6.4.1.2 Control zone

Using 11 years (2013-2023) of NDVI baseline data, two other polygons of a similar size (e.g., 180 ha) were selected in spatially distanced locations within a 20 km radius. To act as valid reference sites, it is important that control zones experience a similar degree of access to groundwater and surface flows as the impact zone. The potential GDEs onsite have relatively little access to groundwater. Therefore, it is important not to select other GDEs with permanent access to groundwater as a control, because the impact zone will show much bigger declines in condition in response to drought than the control sites. This could be incorrectly perceived as drawdown impacts. Conversely, if non-GDEs are selected as controls, the impact zone may be less affected by drought.

Control zones were favoured if they contained similar stream orders to the impact zone and had a similar likelihood of containing terrestrial GDEs according to the GDE Atlas.

Two control zones have been selected, one on the Simmons property (primarily on lots 4CP843145 and 3CP911006) and one on the Chapman property (lot 1SP165518) (**Figure 6-2**).

Prior to the adoption of the two control zones, their suitability as analogues for the impact zone was investigated by analysing NDVI data from these control zones over the same baseline timeframe (2013-2023) as the impact zone. They were analysed in the same way (by dividing into 90 m cells, calculating mean NDVI in each cell in each year, then averaging

across all cells to derive a single NDVI mean for the control zone). The Simmons control zone contains 230 such cells and the Chapman control zone contains 221 cells.

Figure 6-2 Impact and control monitoring locations

The results were compared to the impact zone, revealing similar annual variation in greenness (**Figure 6-3; Table 6-2**). This indicates (a) that the vegetation present in these control zones is of a similar starting density/health to the impact zone, and (b) that groundwater is utilised (or not) to a similar degree in the impact and control zones. Neither control zone is a perfect match to the impact zone; both exhibit slightly more annual variation in NDVI than the impact site (expressed as slightly larger standard deviations and range of values in **Table 6-2**). However, a perfect match is unrealistic. As these differences are very slight in comparison to the large annual changes in NDVI due to rainfall (see **Figure 6-1** for a clearer depiction of annual variation in the Simmons control zone compared to the impact zone), they are fit for purpose as reference sites for monitoring changes at the impact zone. Of the two control zones, the Simmons site is a slightly better analogue of the impact zone.

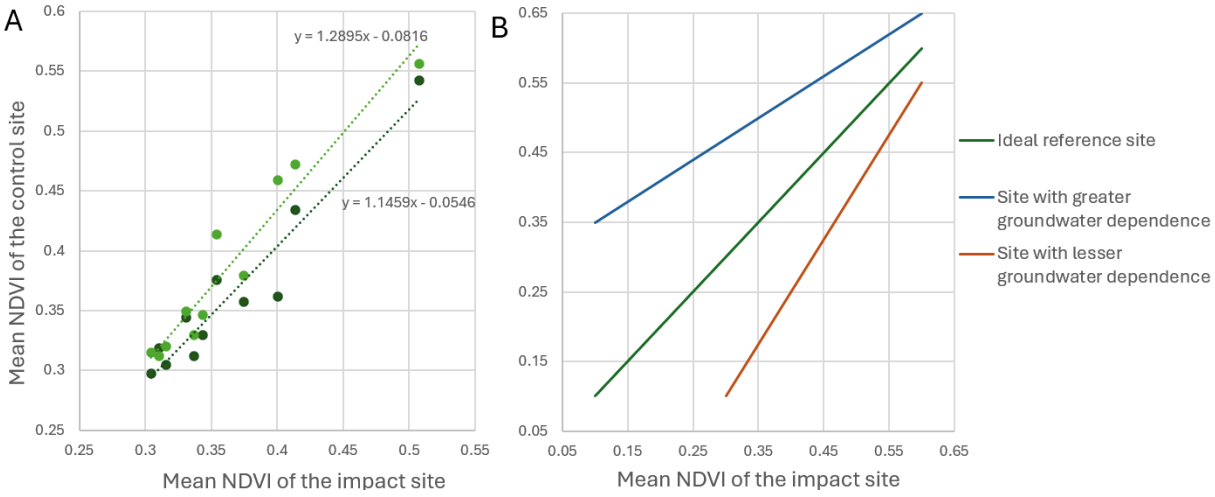


Figure 6-3 Relationship between average greenness (NDVI) of the potential GDEs within the impact site in any one year and the greenness of potential GDEs in two control sites

On panel A, the two control sites are represented by different colours: dark green = Simmons, light green = Chapman. Panel B shows hypothetical examples of an expected pattern if a control site shows identical annual variation in greenness to the impact site (a perfect control site), compared with two examples of control sites with more or less access to groundwater. The relationship between the NDVI at a perfect control site and the impact site should have a slope of 1 and a y-intercept of 0. Both control sites show an overall pattern that is similar to the desired relationship with the impact site, although the Simmons property is a slightly better control overall.

Table 6-2 Variation in NDVI observed at impact and control zones during baseline monitoring

Zone	Mean NDVI (2013-2023)	Standard deviation NDVI (2013-2023)	Range $NDVI_{max-min}$
Impact	0.363	0.0625	0.204
Control: Simmons	0.361	0.0708	0.245
Control: Chapman	0.387	0.0783	0.241

6.4.1.3 NDVI analysis

NDVI data is used to assess the early warning trigger for correction actions, as well as the two performance targets monitoring the condition and extent of GDEs. How each is to be analysed and assessed is described below.

Trigger for Corrective Actions

The trigger for corrective actions requires a comparison between the annual changes in NDVI at the impact and control zones. This is assessed through the following steps:

1. obtain Landsat 8 satellite imagery for the impact zone and control zones that corresponds to the driest period of the year (<10 mm of rain has fallen over the previous two months). Images containing no clouds over any of the focal zones are required;
2. import the red (band 4) and near-infrared (band 4) images from each satellite scene into ArcGIS Pro and calculate NDVI rasters using the *Raster Calculator* tool. To reduce processing time, NDVI rasters are masked (*Extract by Mask*) to a smaller area of interest. Grids of 30 m × 30 m are generated using *Create Fishnet*, and the NDVI image is used as the extent of processing to ensure that the grid cells align exactly with the pixels of the source image;
3. overlay the 90 m × 90 m grid and calculate the mean NDVI for each cell contained within the impact zone and both control zones. The *Summarize (summary Statistics*) tool in ArcGIS Pro can be used for this purpose;
4. for each individual cell, subtract the mean NDVI value recorded in the previous year from the value recorded in the same cell in the current year; and

using ANOVA, compare the mean change in NDVI in the impact zone with each control zone. If the impact zone shows a statistically significantly greater decline in NDVI than both control zones, this counts as a 1-year "impact". Based on power analyses of the baseline data, a significant difference is likely to be detected if $\Delta NDVI_{impact} > 0.0121 + \Delta NDVI_{control}$. Such one-off events are often caused by highly localised differences in rainfall. However, if significantly excessive declines are observed at the impact zone over two consecutive years (a 2-year "impact"), corrective actions are triggered.

Performance Targets

Two performance targets are based on NDVI. To assess each of these, steps 1 and 2 are taken as described above, although only data from the impact zone is required. The data generated by step 2 can be used to assess performance targets in the following ways:

1. to assess whether the extent of GDEs has declined, sort the NDVI values of each cell from lowest to highest using the "Sort" tool in Excel. Any cells that drop below 0.1636 in any one year fall outside the baseline variation observed between 2013 and 2023. These are likely to have experienced some mortality of woody vegetation and are thus considered "GDE loss of extent"; and
2. to test whether there has been an overall decline in GDE greenness that exceeds baseline variation, calculate the mean NDVI across all 208 cells within the impact zone. If this mean is less than 0.304 (the lowest value observed between 2013 and 2023), the performance target has not been achieved.

6.4.2 BioCondition

BioCondition is an in-field assessment that produces a score for the overall condition of the vegetation, relative to benchmark values reflecting a high-quality example of the same regional ecosystem. BioCondition assessments are undertaken within 100 m × 50 m quadrats installed at sampling locations. The number of sampling locations assessed per assessment unit is to follow the recommendations of the *Guide to determining terrestrial habitat quality version 1.3* (**Table 6-3**). The following are the assessment units to be assessed:

- potential impact zone (180.5 ha); and
- one of the two control zones identified by NDVI analysis (see **Section 6.4.1**).

The control zone on the Simmons property will not be monitored as part of the BioCondition Assessment as property access was not available at the time of writing.

Table 6-3 Recommended number of BioCondition sites per assessment unit

Assessment unit size	Number of sampling sites
1-50 ha	At least two
50-100 ha	Three
100-500 ha	Four
500-1,000 ha	Five
More than 1,000 ha	Six

Based on the above guidelines, monitoring will require four BioCondition sites in the impact zone and four BioCondition sites in the control zone. The locations of these sites are shown on **Figure 6-2** and **Table 6-4**.

The start and end points of monitoring sites will be permanently marked with steel star pickets. The same sites are to be monitored in each round of monitoring.

BioCondition will be assessed following the methodology prescribed by the *BioCondition Assessment Manual version 2.2* (Eyre et al. 2015). As the performance targets are based on changes in BioCondition score over time, it is important that the methodology remains constant. This means that the above version of the methodology should be adopted, even in the event that this is superseded by later versions. Furthermore, the current benchmark values for regional ecosystem 11.3.25 (published by the Queensland Herbarium in 25/06/2013) are to be adopted, even if the Queensland Government publishes new benchmarks at a later date based on additional data. The benchmarks to be used are included in **Appendix B.**

BioCondition scores are to be derived from site-based attributes that are particularly relevant for detecting vegetation stress associated with groundwater drawdown, only. These attributes, which may be influenced by changes in groundwater availability, include:

- numberNumber of large trees;
- treeTree canopy height;
- Recruitment of dominant canopy species;
- treeTree canopy cover;
- shrubShrub layer cover; and
- nativeNative plant species richness (trees and shrubs only).)

Consequently, only site-based attributes are to be considered when assessing potential impacts of the FCP on GDEs. Given this focus, the maximum score that can be attained based on site-based attributes alone is 80.

Table 6-4 Locations of proposed BioCondition sites

Site	Type	Property	Latitude (GDA2020)	Longitude (GDA2020)	Easting (m) (GDA2020 MGA zone 55)	Northing (m) (GDA2020 MGA zone 55)
I1	Impact	Comiskey	-23.21226	148.62875	666670	7432048
I2	Impact	Comiskey	-23.21788	148.63683	667490	7431416
I3	Impact	Comiskey	-23.23226	148.65020	668840	7429809
I4	Impact	Chapman	-23.24674	148.58800	662458	7428276
C1	Control	Chapman	-23.31319	148.62918	666589	7420871
C2	Control	Chapman	-23.30714	148.61187	664826	7421561
C3	Control	Chapman	-23.32592	148.59640	663220	7419499
C4	Control	Chapman	-23.29348	148.57435	661005	7423116

6.4.2.1 Assessing the Performance Target

Unlike NDVI, no baseline BioCondition data exists for the impact or control sites. Therefore, rather than nominate an arbitrary BioCondition score for impact sites to maintain, performance targets are based on a comparison with changes at control sites

Impact and control sites will be first monitored within the first optimal survey period (September - October) following commencement of construction. Vegetation, particularly groundwater-dependent species, require sufficient hydrological stress to exhibit observable stress symptoms in response to declining groundwater availability. Conducting surveys prior to the seasonal depletion of soil moisture and groundwater reserves may result in an incomplete assessment of baseline conditions. Additionally, studies indicate that *Eucalyptus camaldulensis* can take several years to respond to groundwater depletion (Doody 2018), further highlighting the importance of selecting an appropriate monitoring timeframe. This data will form a baseline. The same 8 sites will be monitored annually within the optimum survey period.

For each sampling site, the BioCondition score from the previous year is subtracted from the score at the same site in the current year. Using the change in score as the response variable, analysis of variance is to be used to test whether the mean change in score at the impact sites is statistically different ($p < 0.05$) from the change in score at each offset site. The performance target is not achieved if:

1. BioCondition scores in the impact zone decline by more than the scores at both control zones, and statistically significantly so for at least one of the control zones; **AND**
2. these more extreme declines are observed over two consecutive years.

6.5 Additional Monitoring Programs

In addition to the mitigation measures and monitoring strategy outlined within this GDEMP, Futura will prepare and implement the following management plans as required by the Environmental Authority (BRID0071) issued by the Queensland Department of Environment, Science and Innovation (DESI) for the project.

Each of the plans and respective management actions are required to be submitted to DESI prior to the commencement of mining activities.

Monitoring data collected via these plans will provide useful supporting information and monitoring of potential impacts under this GDEMP.

6.5.1 Groundwater Monitoring and Management Plan

Condition D13 of EA BRID0071 states that a Groundwater Monitoring Program (GMP) must:

a) be developed prior to commencing mining activities; and
b) be implemented for the duration of mining activities.

The GMP required by condition D13 of the EA will include:

a) the identification of potential sources of contamination to groundwater from the activities authorised under the environmental authority;
b) the identification of the environmental values that need to be protected;
c) the identification, monitoring and mitigation of all potential groundwater impacts due to the activity;
d) the documentation of the sampling and monitoring methodology;
e) adequate groundwater monitoring and data analysis to achieve the following objectives:
    I. detect any impacts to groundwater levels due to the activity;
    II. detect any impacts to groundwater quality due to the activity;
    III. determine compliance with environmental authority condition D1; and
    IV. determine trends in groundwater quality.
f) an appropriate quality assurance and quality control program;
g) a numerical groundwater model;
h) a conceptual groundwater model; and
i) an annual review process to identify improvements to the program.

6.5.2 Water Management Plan

Condition C28 of EA BRID0071 states a Water Management Plan (WMP) must:

a) be developed prior to commencing mining activities; and
b) be implemented for the duration of mining activities.

The WMP required by Condition C28 must meet the following conditions:

a) provide for effective management of actual and potential environmental impacts resulting from water management associated with the mining activity carried out under the Fairhill environmental authority; and
c) be developed in accordance with DESI guideline *Preparation of Water Management Plans for Mining Activities* (DESI Reference ESR/2016/3111) and include:
    i. a study of the source of contaminants;
    ii. a water balance model for the site;
    iii. an updated flood model for the site;
    iv. a water management system for the site;
    v. measures to manage and prevent saline drainage;
    vi. measures to manage and prevent acid rock drainage;
    vii. contingency procedures for emergencies; and
    viii. a program for monitoring and review of the effectiveness of the water management plan.

6.6 Corrective Actions

In the event of an early warning trigger (see **Section 6.4.1.3**), investigation and corrective actions will be activated as per **Table 6-5**. The aim of these corrective actions is to halt or reverse decline in GDE condition and continue to achieve performance targets listed in **Section 6.2**. A failure to achieve performance targets constitutes a reportable incident. Processes to follow in the event of an early warning trigger or a reportable incident are described in **Table 6-6** and **Table 6-7.**

Table 6-5 Process to be taken in the event of an early warning trigger

Step	Description	Timeframe	Responsible person
1	Implement corrective irrigation of affected vegetation to prevent further deterioration in condition until further investigation and corrective actions can be implemented. Approximately 30 litres of water per tree (*E. camaldulensis* and *E. coolabah*) every five days will be required (Grant 2021) for 30 days. Irrigate the entire area beneath the tree canopy and extend 1-2 metres out from the canopy edge to capture the lateral root tips where most of the nutrients and moisture are harvested. This may be best achieved using a fire hose from the water truck to address beneath the entire canopy. Irrigate early morning or evening. This action is not required if the impact zone has experienced rainfall >70 mm in the previous 30 days.	Within 48 hours of the detection.	Environmental Manager
2	Notify the Department of Climate Change, Energy, the Environment and Water (DCCEEW) that corrective actions have been triggered.	Within 5 days of the detection.	Environmental Manager
3	Engage with a suitably qualified, independent, GDE specialist to investigate the causes of declining vegetation health.	Within 1 week of the detection.	Environmental Manager
4	Undertake a review of all available data (rainfall, fire scars, groundwater bore logs, groundwater quality tests, vegetation clearing evident in satellite imagery) for the impact and control zones to investigate the causes of declining vegetation health at the impact zone. The objectives of this review are (1) to determine whether the early warning trigger detected impacts of the FCP or background environmental variation, and (2) to recommend corrective actions to mitigate impacts of the FCP on GDEs.	Within 2 months of the detection.	Specialist to be commissioned by the Environmental Manager

5	Implement all recommendations of the review in step 4.	Within 1 month of the completion of step 4.	Environmental Manager

Table 6-6 Process to be taken in the event of an incident involving reduced condition or extent of GDEs

Step	Description	Timeframe	Responsible person
1	Notify DCCEEW that an incident has occurred. Notify DESI if BioCondition has reduced.	Within five business days of receiving an audit report that identifies that an incident has occurred.	Environmental Manager
2	Commence investigation into likely causes of loss of GDE quality/extent and effectiveness of corrective actions taken in response to the early warning trigger.	Within five business days of receiving an audit report that identifies that an incident has occurred.	Environmental Manager
3	Implement corrective irrigation of affected vegetation to prevent further deterioration in condition until corrective actions can be implemented. Approximately 30 litres of water per tree (*E. camaldulensis* and *E. coolabah*) every five days will be required (Grant 2021) for 30 days. Irrigate the entire area beneath the tree canopy and extend 1-2 metres out from the canopy edge to capture the lateral root tips where most of the nutrients and moisture are harvested. This may be best achieved using a fire hose from the water truck to address beneath the entire canopy. Irrigate early morning or evening.	Within 48 hours of the detection.	Environmental Manager
4	Investigate whether pre-impact groundwater regimes and water quality can be reinstated and whether cumulative impacts during the time taken for this to be achieved do not lead to irreversible damage to the GDE.	Immediately after the detection.	Environmental Manager

Step	Description	Timeframe	Responsible person
5	Implement appropriate corrective actions, decided in consultation with DCCEEW and DESI.	Within 30 business days of the detection.	Environmental Manager
6	Revise the GDEMP with additional control measures.	After corrective measures have been implemented.	Environmental Manager
7	Consult with DCCEEW whether offsets are appropriate to counteract impacts to habitat for threatened fauna.	Within 24 months of the detection	Environmental Manager
8	Submit GDE Offset Strategy in accordance with Environmental Offsets Policy	Within 6 months of offset consultation with DCCEEW.	Environmental Manager
9	Implement GDE Offset Strategy	Within 12 months of submission and for the remaining duration of the approval.	Environmental Manager

Table 6-7 Process to be taken in event of a failure to adhere to this plan

Step	Description	Timeframe	Responsible person
1	Notify DCCEEW that an incident has occurred.	Within five business days of receiving a monitoring report that identifies that an incident has occurred.	Environmental Manager
2	Notify DESI that an incident has occurred.	Within five business days of receiving a monitoring report that identifies that an incident has occurred.	Environmental Manager

3	Implement appropriate corrective actions, decided in consultation with DCCEEW and DESI (e.g., undertake required tasks).	Within 30 business days of the detection.	Environmental Manager
4	Revise the GDEMP with additional control measures.	After corrective measures have been implemented.	Environmental Manager

7 Emergency Contacts and Procedures

Any impacts to GDEs from the FCP are expected to be slow and gradual, such that the appropriate response in case of an emergency (i.e., an "incident" occurs) is to notify the authorities and commence planning control measures, rather than the standard emergency responses associated with more acute environmental hazards like fires and chemical spills.

For example:

1. if a monitoring report identified that GDE health or extent declined to such a degree that it triggered an "incident", the Environmental Manager should contact DCCEEW and DESI within five working days of receiving the report from the specialist consultant undertaking the health assessment; and
2. if an annual audit found that the FCP did not adhere to this GDEMP (e.g. monitoring was not undertaken as required), the authorities are to be notified, followed by corrective actions at the mine (e.g., undertaking the required task/s).

8 Reporting

Reporting will consist of both internal and external reports. Internal reports will make up the majority of the reporting requirements and include monitoring reports, annual reports and audits.

External reports will be required as a condition of approval, at the specific request of a key stakeholder or after a notifiable environmental incident.

8.1 Required Reports

- reports on GDE condition (after monitoring). Following each monitoring survey, a brief letter report will be prepared summarising the work completed and any problems encountered;
- corrective action and incident trigger communication to authorities;
- annual report summarising the works that were completed each year and overall compliance with this GDEMP. A report will be prepared annually, which will provide a detailed summary of monitoring, analysis of results and any corrective actions undertaken. The annual report will assist in evaluating the effectiveness of the management and monitoring program and will provide information on the current status of the riparian vegetation in relation to the FCP;
- an annual audit. An internal report will be prepared that lists the tasks undertaken for the year and cross-checks against this GDEMP; and
- a Completion Report for when the project has concluded, and GDEs have been monitored for a sufficient time to be certain that ongoing risks are nil.

8.2 Schedule for Reporting

A reporting schedule will be documented to include any conditions of approval requiring reporting prior to activity commencing at the FCP.

9 Audit and Review

9.1 GDEMP Audit

Internal auditing of activities associated with the GDEMP will be carried out in accordance with Futura's internal annual audit schedule in January.

Audit criteria may include, but are not limited to:

- management actions within this document;
- implementation of the monitoring program; and
- applicable conditions and commitments within Ministerial Statements.

Where non-conformance issues or opportunities for improvement are identified these will be documented and tracked via Futura's business management system.

9.2 GDEMP Review

Review and revision of the GDEMP will occur:

- in the event an incident occurs; or
- every three years.

When a review is required, it will take into account monitoring records, corrective actions and results of audits. In the event that the management plan is altered, the revised plan will be submitted to DCCEEW.

10 Environmental Training

Environmental training relevant to the GDEMP will be facilitated through site inductions and tool box talks. The site induction will be provided to all staff and include the following:

- an awareness of the GDEMP;
- an awareness of those responsible for implementing the GDEMP and its components; and
- potential consequences of not meeting environmental responsibilities.

Any involvement of staff members with the implementation of any component of this GDEMP will be communicated to them during daily toolbox talks.

Copies of the GDEMP will be available on site.

11 GDEMP Management Roles and Responsibilities

All Futura employees and contractors are required to comply with the requirements of this GDEMP.

During all phases of the mine (construction, operations, decommissioning and rehabilitation), the Environmental Manager will be accountable for ensuring the requirements of this GDEMP are met.

Management actions have been developed to ensure the impacts from Futura's operations are managed, and that appropriate monitoring, reporting and corrective actions are implemented to support the successful implementation of the management actions. The Environmental Manager will be responsible for coordinating monitoring, internal reporting, audits, reviews and corrective actions, which should be undertaken by qualified ecologists, in consultation with DCCEEW and DESI.

11.1 Environmental Manager

The Environmental Manager will be responsible for the implementation of the GDEMP. To maximise the effective implementation of the GDEMP, the Environmental Manager will be responsible for:

- overseeing compliance with this GDEMP;
- revision of the GDEMP;
- reporting triggers and non-compliances;
- reporting environmental incidents;
- implementing monitoring programs; and
- implementing management measures.

11.2 Document Control

Futura Resources have a document control system that will be implemented for the FCP.

All environmental documentation is to be managed by the Futura Resources Environmental Manager. No other staff are authorised to make changes to FCP environmental documentation.

Hard copies of the GDEMP will be kept onsite. It is the responsibility of Environmental Manager to ensure that the latest plans are being implemented.

11.3 Training

The Environmental Manager is responsible for identifying training needs so that all FCP personnel receive an appropriate level of training to understand and implement the requirements of the GDEMP. The Environmental Manager is responsible for coordinating such training.

12 Residual Risk Assessment

The likelihood and potential consequence of drawdown impacts, once mitigation measures are accounted for, were assessed using qualitative risk assessment methodology recommended in the *Environmental Management Plan Guidelines* (Commonwealth of Australia, 2014) (**Table 12-1**). These guidelines were used to generate a risk rating using **Table 12-2**. The section concludes with a discussion of the determination of the consequence and likelihood classification identified for drawdown impacts.

Table 12-1 Qualitative risk assessment definitions

Qualitative measure of likelihood after control strategies have been put in place	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the life of the project
Possible	Might occur during the life of the project
Unlikely	Could occur but considered unlikely or doubtful
Rare	May occur in exceptional circumstances
Qualitative measure of consequences if this issue does occur	
Minor	Minor incident of environmental damage that can be reversed
Moderate	Isolated but substantial instances of environmental damage that could be reversed with intensive efforts
High	Substantial instances of environmental damage that could be reversed with intensive efforts
Major	Major loss of environmental amenity and real danger of continuing
Critical	Severe widespread loss of environmental amenity and irrecoverable environmental damage

Table 12-2 Risk rating methodology

	Consequence				
Likelihood	Minor	Moderate	High	Major	Critical
Highly likely	Medium	High	High	Severe	Severe
Likely	Low	Medium	High	High	Severe
Possible	Low	Medium	Medium	High	Severe
Unlikely	Low	Low	Medium	High	High
Rare	Low	Low	Low	Medium	High

12.1 Groundwater drawdown affecting the health of riparian vegetation

The likelihood of drawdown affecting riparian vegetation along Cooroora Creek is considered Rare. This is because the likelihood that this vegetation is a GDE is low (refer to **Section 1.3.3.2**), and corrective actions will be in place to prevent riparian vegetation health deterioration.

Consequence of the impact was considered Moderate (an environmental incident that is isolated but substantial, and that could be reversed with intensive efforts). The intensive effort that may be required includes irrigating the riparian vegetation at regular intervals over several weeks and the reconnection of groundwater flows to pre-mining conditions.

The residual risk assessment for drawdown affecting riparian vegetation along Cooroora and Sandy Creeks is Low.

13 Glossary

ANC: acid neutralising capacity

ASLP: Australian Standard Leaching Procedure

BioCondition: A condition assessment framework for Queensland that provides a measure of how well a terrestrial ecosystem is functioning for biodiversity values.

CDX: Cast-Doze-Excavate

CHPP: Coal Handling and Preparation Plant

Construction Phase: The phase of the FCP that involves the mobilisation to site, site preparation and infrastructure establishment, construction of roads and tracks, progressive clearing of vegetation throughout life of mine.

DCCEEW: Department of Climate Change, Energy, the Environment and Water

DESI: Department of Environment, Science and Innovation

EA: Environmental Authority

EMP: Environmental Management Plan

EP Act: Environmental Protection Act 1994

EPBC Act: Environment Protection and Biodiversity Conservation Act 1999

FCP: Fairhill Coal Project

Futura: Futura Resources Pty Ltd

GDE: Groundwater-dependent Ecosystem

GDEMP: Groundwater-dependent Ecosystems Management Plan

GWMP: Groundwater Management Plan

mAHD: elevation in metres (with respect to the) Australian Height Datum

MAW: Mine affected water

mBGL: metres below ground level

ML: Mining Lease

MNES: Matters of National Environmental Significance

NDVI: Normalised Difference Vegetation Index

Operation Phase: The phase of the FCP that involves the extraction, loading and transportation of coal.

PAF: Potenially acid forming

pH: potential of hydrogen

Decommissioning and rehabilitation Phase: The phase of the FCP that involves the placement of fill, movement of topsoil, final profiling, revegetation, removal of site infrastructure and final rehabilitation of mine.

ROM: Run-of-mine (coal)

Significant Impact: as defined under Commonwealth Government's *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance*

14 References

Australian Koala Foundation (2015). National Koala Tree Planting List. Available online at: https://www.savethekoala.com/about-koalas/trees-koalas.

Bacon, P. E., Stone, C., Binns, D. L., Leslie, D. J., & Edwards, D. W. (1993). Relationships between water availability and *Eucalyptus camaldulensis* growth in a riparian forest. Journal of Hydrology, 150(2-4), 541-561.

Bureau of Meterology (BoM). (2020). Groundwater Dependent Ecosystems Atlas. Accessed online: http://www.bom.gov.au/water/groundwater/gde/map.shtml

Commonwealth of Australia (2014). Environmental Management Plan Guidelines. Commonwealth of Australia, Canberra.

Comport, S.S., S.J. Ward and W.J. Foley (1996). Home ranges, time budgets and food-tree use in a high-density tropical population of Greater Gliders, *Petauroides volans minor (Pseudocheiridae: Marsupialia*). Wildlife Research 23, 401-419.

Connor DJ Tunstall BR (1981) A Hydrological Study of a Subtropical Semiarid Forest of *Acacia harpophylla* F. Muell. Ex Benth. (Brigalow), Australian Journal of Botany 29(3) 311 - 320

Connor DJ Tunstall BR (1968) Tissue water relations for Brigalow and Mulga. Australian Journal of Botany 16, 487-490

Costelloe J.F. (2016) Water use strategies of a dominant riparian tree species (*Eucalyptus coolabah*) in dryland rivers. Proceedings of the 11th International Symposium on Ecohydraulics, Melbourne, Australia

Costelloe, J. F., Payne, E., Woodrow, I. E., Irvine, E. C., Western, A. W., & Leaney, F. W. (2008). Water sources accessed by arid zone riparian trees in highly saline environments, Australia. Oecologia, 156(1), 43-52.

Crowther, M.S., D. Lunney, L. Lemon, E. Stalenberg, R. Wheeler, G. Madani, K.A. Ross and M. Ellis (2013). Climate-mediated habitat selection in an arboreal foliovore. Ecography 37, 336-343.

Department of Agriculture, Water and the Environment (DAWE) (2020a). Species profile and threats database (*Phascolarctos cinereus* - Koala). Department of the Environment, Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Department of Agriculture, Water and the Environment (DAWE) (2020b). Species profile and threats database (*Furina dunmalli* — Dunmall's Snake). Department of the Environment, Canberra. Available from: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Department of Science, Information Technology, Innovation and the Arts (DSITIA). (2015) Guideline for the Environmental Assessment of Subterranean Aquatic Fauna. Retrieved from: https://www.publications.qld.gov.au/dataset/subterranean-aquatic-fauna/resource/ba880910-5117-433a-b90d-2c131874a8e6

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) (2011) EPBC Act - Draft Referral guidelines for the nationally listed Brigalow Belt reptiles. Accessed online: http://www.environment.gov.au/resource/epbc-act-draft-referral-guidelines-nationally-listed-brigalow-belt-reptiles.

Doody, T. M., Hancock, P. J., & Pritchard, J. L. (2019). Information Guidelines Explanatory Note: Assessing groundwater-dependent ecosystems.

Doody, T. M. (2018). CSIRO: The water needs of floodplain trees, Murray Darling Basin Feature, Issue 243.

Doody, T., Colloff, M., Davies, M., Koul, V., Benyon, R., Nagler, P., (2015). Quantifying water requirements of riparian river red gum (*Eucalyptus camaldulensis*) in the Murray–Darling Basin, Australia – implications for the management of environmental flows. Ecohydrology, 8(8): 1471-1487.

Eamus, D., & Froend, R. (2006). Groundwater-dependent ecosystems: the where, what and why of GDEs. Australian Journal of Botany, 54(2), 91-96.

Environmental Protection Authority (2003). Guidance for the Assessment of Environmental Factors (in accordance with the Environmental Protection Act 1986). Consideration of subterranean fauna in groundwater and caves during impact assessment in Western Australia, No. 54, December 2003.

Eyre, T.J., Kelly, A.L, Neldner, V.J., Wilson, B.A., Ferguson, D.J., Laidlaw, M.J. and Franks, A.J. (2015). BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2. Queensland Herbarium, Department of Science, Information Technology, Innovation and Arts, Brisbane.

Fensham, R. J., & Fairfax, R. J. (2007). Drought-related tree death of savanna eucalypts: species susceptibility, soil conditions and root architecture. Journal of Vegetation Science, 18(1), 71-80.

Gill, H. S., & Abrol, I. P. (1991). Salt affected soils, their afforestation and its ameliorating influence. International Tree Crops Journal, 6(4), 239-260.

Grant, B.L. (2021). Gardening Know How: Eucalyptus Tree Watering: Information On Irrigation Eucalyptus Trees. Site accessed 21 April 2021, https://www.gardeningknowhow.com/ornamental/trees/eucalyptus/eucalyptus-tree-watering.htm

Hose, G. C., Sreekanth, J., Barron, O., & Pollino, C. (2015). Stygofauna in Australian groundwater systems: Extent of knowledge. Report to Australian Coal Association Research Program. Macquarie University and CSIRO.

Hoy, N. T., Gale, M. J., & Walsh, K. B. (1994). Revegetation of a scalded saline discharge zone in central Queensland. 1. Selection of tree species and evaluation of an establishment technique. Australian Journal of Experimental Agriculture, 34(6), 765-776.

hydrogeologist.com.au (2020). Groundwater progress report Fairhill Coal Project, prepared for Futura Resources.

Kath J., Reardon-Smith K., Le Brocque A.F., Dyer F.J., Dafny E., Fritz L., Batterham M. (2014) Groundwater decline and tree change in floodplain landscapes: Identifying non-linear threshold responses in canopy condition. Global Ecology and Conservation 2: 148-160

Kearney, M.R., B.A. Wintle and W.P. Porter (2010). Correlative and mechanistic models of species distribution provide congruent forecasts under climate change. Conservation Letters 3, 203-213.

Kehl, J.A. and A. Borsboom (1984). Home ranges, den use and activity patterns in the Greater Glider *Petauroides volans*. In: Possums and Gliders (eds. A.P. Smith and I.D. Hume) pp. 229-236. Surrey Beatty: Sydney.

Lawler, I.R., W.J. Foley, B.M. Eschler, D.M. Pass and K. Handasyde (1998). Intraspecific variation in Eucalyptus secondary metabolites determines food intake by folivorous marsupials. Oecologia 116, 160-169.

Lindenmayer, D.B., M.L. Pope and R.B. Cunningham (2004). Patch use by the greater glider (*Petauroides volans*) in a fragmented forest ecosystem. II. Characteristics of den trees and preliminary data on den-use patterns. Wildlife Research 31, 569-577.

Mensforth, L. J., Thorburn, P. J., Tyerman, S. D., & Walker, G. R. (1994). Sources of water used by riparian Eucalyptus camaldulensis overlying highly saline groundwater. Oecologia, 100(1-2), 21-28.

Moore, B.D. and W.J. Foley (2000). A review of feeding and diet selection in koalas (*Phascolarctos cinereus*). Australian Journal of Zoology. 48, 317-333.

Moore, B.D., W.J. Foley, I.R. Wallis, A. Cowling and K.A. Handasyde (2005). Eucalyptus foliar chemistry explains selective feeding by koalas. Biology Letters 1, 64-67.

Munks, S.A., R. Corkrey and W.J. Foley (1996). Characteristics of arboreal marsupial habitat in the semi-arid woodlands of northern Queensland. Wildlife Research 23, 185-195.

NRC. (2018). Overburden and potential coal reject characterisation report. Report prepared for Fairhill Coking Coal Pty Ltd. November 2018.

Phillips, B. (1990). Koalas. The little Australians we'd all hate to lose. Canberra, ACT: Australian Government Publishing Service.

Rice, K. J., Matzner, S. L., Byer, W., & Brown, J. R. (2004). Patterns of tree dieback in Queensland, Australia: the importance of drought stress and the role of resistance to cavitation. Oecologia, 139(2), 190-198.

SLR Consulting Australia (SLR). (2019a). Fairhill Coal Project – Underground water impact report. Prepared for Fairhill Coking Coal Pty Ltd. May 2019.

SLR Consulting Australia (SLR) (2019b). Fairhill Coal Project – Soil and Land Suitability Assessment. Prepared for Fairhill Coking Coal Pty Ltd. May 2019.

Specht, R.L. (1970), 'Vegetation', in G.W. Leeper (ed.), The Australian Environment, 4th edition. CSIRO and Melbourne University Press, pp. 44–67.

Subterranean Ecology (2010) Washpool Coal Mine Project Stygofauna Pilot Survey.

Sullivan, B.J., G.S. Baxter and A.T. Lisle (2003). Low-density koala (*Phascolarctos cinereus*) populations in the mulga lands of south-west Queensland. III. Broad-scale patterns of habitat use. Wildlife Research 30, 583-591.

Sun, D., & Dickinson, G. (1993). Responses to salt stress of 16 Eucalyptus species, *Grevillea robusta, Lophostemon confertus* and *Pinus caribea var. hondurensis*. Forest Ecology and Management, 60(1-2), 1-14.

Threatened Species Scientific Committee (TSSC) (2012). Listing advice for P*hascolarctos cinereus* (Koala). Available from:

http://www.environment.gov.au/biodiversity/threatened/species/pubs/197-listing-advice.pdf. In effect under the EPBC Act from 02-May-2012.

Threatened Species Scientific Committee (TSSC). (2016) Conservation Advice Petauroides volans greater glider. Canberra: Department of the Environment. Accessed online: http://www.environment.gov.au/biodiversity/threatened/species/pubs/254-conservation-advice-20160525.pdf

Tomlinson, M., & Boulton, A. (2008). Subsurface groundwater dependent ecosystems: a review of their biodiversity, ecological processes and ecosystem services.

Wen, L., Ling, J., Saintilan, N., & Rogers, K. (2009). An investigation of the hydrological requirements of River Red Gum (*Eucalyptus camaldulensis*) Forest, using Classification and Regression Tree modelling. Ecohydrology: Ecosystems, Land and Water Process Interactions, Ecohydrogeomorphology, 2(2), 143-155.

Appendices

Appendix A Fairhill Coal Project EA (BRID0071)

Permit

Environmental Protection Act 1994

Environmental authority BRID0071

This environmental authority is issued by the administering authority under Chapter 5 of the Environmental Protection Act 1994.

Environmental authority number: BRID0071

Environmental authority takes effect on 19 December 2024.

The anniversary date of this environmental authority is 24 November each year.

Environmental authority holder(s)

Name(s)	Registered address
Fairhill Coking Coal Pty Ltd	Level 28, 88 Phillip Street, SYDNEY NSW 2000

Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)
Environmental Protection Regulation 2019, Schedule 3, 13: Mining black coal	ML700043
Environmental Protection Regulation 2019, Ancillary 60 - Waste disposal 1: Operating a facility for disposing of, in a year, the following quantity of waste mentioned in subsection (1)(a)(ii): less than 50,000t	ML700043

Additional information for applicants

Environmentally relevant activities

The description of any environmentally relevant activity (ERA) for which an environmental authority (EA) is issued is a restatement of the ERA as defined by legislation at the time the EA is issued. Where there is any inconsistency between that description of an ERA and the conditions stated by an EA as to the scale, intensity or manner of carrying out an ERA, the conditions prevail to the extent of the inconsistency.

An EA authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the EA specifically authorises environmental harm.

A person carrying out an ERA must also be a registered suitable operator under the *Environmental Protection Act 1994* (EP Act).

Contaminated land

It is a requirement of the EP Act that an owner or occupier of land give written notice to the administering authority if they become aware of the following:

- the presence of, or happening of an event involving, a hazardous contaminant on the land that is causing, or is reasonably likely to cause, serious or material environmental harm (notice must be given within 24 hours); or
- if the land is contaminated land – a change in the condition of the land that is causing, or is reasonably likely to cause, serious or material environmental harm (notice must be given within 24 hours); or
- a notifiable activity (as defined in Schedule 3) having been carried out, or is being carried out, on the land (notice must be given within 20 business days).

For further information, including the form for giving written notice, refer to the Queensland Government website www.qld.gov.au, using the search term 'duty to notify'.

Take effect

Please note that, in accordance with section 200 of the EP Act, an EA has effect:

a) if the authority is for a prescribed ERA and it states that it takes effect on the day nominated by the holder of the authority in a written notice given to the administering authority – on the nominated day; or

b) if the authority states a day or an event for it to take effect – on the stated day or when the stated event happens; or

c) otherwise – on the day the authority is issued.

However, if the EA is authorising an activity that requires an additional authorisation (a relevant tenure for a resource activity, a development permit under the *Planning Act 2016* or an SDA Approval under the *State Development and Public Works Organisation Act 1971*), this EA will not take effect until the additional authorisation has taken effect.

If this EA takes effect when the additional authorisation takes effect, you must provide the administering authority written notice within 5 business days of receiving notification of the related additional authorisation taking effect.

The anniversary day of this environmental authority is the same day each year as the effective date. The payment of the annual fee will be due each year on this day. An annual return will be due each year on 01 April.

If you have incorrectly claimed that an additional authorisation is not required, carrying out the ERA without the additional authorisation is not legal and could result in your prosecution for providing false or misleading information or operating without a valid environmental authority.

	14 January 2025
Signature	Date

Cate Puschmann
Department of the Environment, Tourism, Science and Innovation
Delegate of the administering authority
Environmental Protection Act 1994

Enquiries:
Business Centre Coal
Department of the Environment, Tourism, Science and Innovation
Phone: (07) 4987 9320
Email: CRMining@des.qld.gov.au

Obligations under the *Environmental Protection Act 1994*

In addition to the requirements found in the conditions of this environmental authority, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. For example, the holder must comply with the following provisions of the Act:

- general environmental duty (section 319)
- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443)

Other permits required

This permit only provides an approval under the *Environmental Protection Act 1994*. In order to lawfully operate you may also require permits / approvals from your local government authority, other business units within the department and other State Government agencies prior to commencing any activity at the site. For example, this may include permits / approvals with your local Council (for planning approval), the Department of Transport and Main Roads (to access State controlled roads), the Department of Natural Resources and Mines, Manufacturing, and Regional and Rural Development (to clear vegetation), and the Department of Primary Industries (to clear marine plants or to obtain a quarry material allocation).

Obligations under the *Mining and Quarrying Safety and Health Act 1999*

If you are operating a quarry, other than a sand and gravel quarry where there is no crushing capability, you will be required to comply with the *Mining and Quarrying Safety and Health Act 1999*. For more information on your obligations under this legislation contact Mine Safety and Health at www.resources.qld.gov.au, or phone 13 QGOV (13 74 68) or your local Mines Inspectorate Office.

Development Approval

This permit is not a development approval under the *Planning Act 2016*. The conditions of this environmental authority are separate, and in addition to, any conditions that may be on the development approval. If a copy of this environmental authority is attached to a development approval, it is for information only, and may not be current. Please contact the Department of the Environment, Tourism, Science and Innovation to ensure that you have the most current version of the environmental authority relating to this site.

Conditions of environmental authority

The environmentally relevant activity(ies) conducted at the location as described above must be conducted in accordance with the following site-specific conditions of approval.

This environmental authority consists of the following Schedules and Appendices:

Schedule A	General
Schedule B	Air
Schedule C	Surface Water
Schedule D	Groundwater
Schedule E	Acoustic
Schedule F	Land
Schedule G	Waste
Schedule H	Rehabilitation
Schedule I	Prescribed Environmental Matters
Appendix A	Rehabilitation Completion Criteria
Figure 1	Authorised Disturbance Areas
Figure 2	Mine Affected Water Release and Water Monitoring Points

Schedule A: General	
Condition number	**Condition**
A1	This environmental authority authorises environmental harm referred to in the conditions. Where there is no condition or this environmental authority is silent on a matter, the lack of a condition or silence does not authorise environmental harm.
A2	**Schedule H: Rehabilitation** Conditions of this environmental authority continue to apply in the event that this environmental authority is suspended.
A3	**Prevent and /or minimise likelihood of environmental harm** In carrying out the environmentally relevant activities, the holder must take all reasonable and practicable measures to prevent the likelihood of environmental harm being caused.
A4	The holder is approved for up to **one point seven (1.7) million tonnes per annum** (mtpa) of ROM Coal.
A5	**Authorised Disturbance** Surface disturbance by mining activities is only authorised within areas marked "Authorised Surface Disturbance" in **Figure 1 - Authorised Disturbance Areas** and must not exceed the disturbance limits specified for each domain in **Table A1 – Authorised disturbance areas.**

Table A1 – Authorised disturbance areas

Authorised disturbance	Closure domain	Domain description	Maximum disturbance limits (ha)
Sub-surface disturbance	Domain 1	Open cut depressions (including in-pit dumping)	311.01
Surface disturbance	Domain 2	Overburden dump	53.57
	Domain 3	On lease tracks and haul roads	16.07
	Domain 4	Water storage infrastructure (to be retained)	2.07
	Domain 5	Mine infrastructure (Site office, ROM pad, Workshop buildings) and Water storage infrastructure – to be decommissioned	82.46
Limited disturbance	Domain 6	Limited disturbance	554.34
Total			1,019.52

A6	Sub-surface disturbance by mining activities is only authorised within areas marked as "Authorised Sub-Surface Disturbance" in **Figure 1 - Authorised Disturbance Areas** and must not exceed the disturbance limit for domain 1 specified in **Table A1 – Authorised disturbance areas.**

A7	Disturbance by mining activities within areas marked as "Limited Disturbance Authorised" in **Figure 1 - Authorised Disturbance Areas** must not exceed the disturbance limit for domain 6 as specified in **Table A1 – Authorised disturbance areas, and**: (a) is only authorised to the extent reasonably necessary for the construction and installation of the environmental monitoring equipment, and associated access tracks; and (b) must not result in significant residual impact to prescribed environmental matters. Note: A significant residual impact must take cumulative impacts, including historical impacts into consideration.
A8	**Maintenance of measures, plant and equipment** The holder must: (a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority; (b) maintain such measures, plant and equipment in a proper and efficient condition; (c) operate such measures, plant and equipment in a proper and efficient manner; and (d) ensure all instruments and devices used for the measurement or monitoring of any parameter under any condition of this environmental authority are properly calibrated.
A9	**Monitoring** All monitoring records or reports required by this environmental authority must be kept until surrender of this environmental authority.
A10	Monitoring and determinations required under any condition of this environmental authority must be conducted by an appropriately qualified person.
A11	**Management Plans and Reports** Management plans and reports required under any condition of this environmental authority must be developed by an appropriately qualified person.
A12	Upon request from the administering authority, copies of monitoring results, records, registers, management plans, reports, and spatial information required by the conditions of this environmental authority must be made available and provided to the administering authority within **fourteen (14) days**.
A13	Within **thirty (30) days** of receiving comments from the administering authority for a management plan or report required under any condition of this environmental authority, the holder must update the management plan or report to address the comment(s).
A14	**Notification of emergencies, incidents and exceptions** The holder must notify the administering authority in writing within **twenty-four (24) hours** after becoming aware of any emergency; or incident that results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this environmental authority.
A15	Within **fourteen (14) days** following the notification in accordance with condition **A14,** further written advice must be provided to the administering authority, including the following: (a) results and interpretation of any samples taken and analysed; (b) outcomes of actions taken at the time to prevent or minimise unlawful environmental harm; and (c) proposed actions to prevent a recurrence of the emergency or incident.

A16	Any further monitoring results related to information provided in accordance with condition **A15** must be provided to the administering authority within **five (5) days** after they are received by the holder.
A17	**Complaints** The holder must record in a register all complaints received about the mining activities.
A18	The register required by condition **A17** must include: (a) complainant details: (i) name; (ii) address; (iii) contact number; (b) time and date of complaint; (c) the complainant's observations (statement, photo and/ or video); (d) reasons for the complaint; (e) investigations undertaken by the holder; (f) conclusions formed by the holder; (g) actions taken to resolve the complaint by the holder; (h) any abatement measures implemented by the holder; and (i) person responsible for resolving the complaint.
A19	When requested by the administering authority, the holder must investigate any complaint of nuisance or environmental harm that is neither frivolous nor vexatious in the opinion of the authorised person, , by: (a) undertaking monitoring specified by the administering authority; (b) undertaking the monitoring in the timeframe nominated by the administering authority; (c) completing an analysis and interpretation of the monitoring results; and (d) Implement abatement measures within a reasonable timeframe nominated by the administering authority so that the environmental harm or nuisance to which the complaint relates ceases.
A20	The results of the investigation undertaken in accordance with condition **A19** must be provided to the administering authority within **thirty (30) days** of completion of the monitoring timeframe in accordance with condition **A19(b)**.
A21	**Third-party reporting** The holder must: (a) obtain from an appropriately qualified independent third party auditor, a report on compliance with the conditions of this environmental authority within **one (1) year** of the commencement of mining activities; and (b) obtain further such reports at regular intervals, not exceeding two (2) years, from the completion of the report required by condition **A22**(a).
A22	Within **ninety (90) days** of completing the third party report in accordance with condition **A22**, the holder must provide the report to the administering authority.

A23	The report required by Condition **A21** must be certified by the appropriately qualified independent third party auditor, detail any non-compliance issues that were found (if no non-compliance issues were found this should be stated in the report), and If non-compliance issues were found the report it must also state: (a) actions taken by the holder to ensure compliance with this environmental authority; and (b) actions taken to prevent a recurrence of the non-compliance(s).
A24	**Risk management** The holder must: (a) Prior to commencing mining activities, develop a risk management system that mirrors the content requirement of the Standard for Risk Management (ISO31000:2009), or an Australian standard for risk management, to the extent relevant to environmental management; and (b) Implement the risk management system, required by condition **A24(a),** for the duration of the mining activities.
A25	Where a condition of this environmental authority requires compliance with a standard, policy or guideline published externally to this environmental authority and the standard is amended or changed subsequent to the issue of this environmental authority, the holder must: (a) comply with the amended or changed standard, policy or guideline within **two (2) years** of the amendment or change being made, unless a different period is specified in the amended standard or relevant legislation, the time specified in that condition; and (b) until compliance with the amended or changed standard, policy or guideline is achieved, continue to remain in compliance with the corresponding provision that was current immediately prior to the relevant amendment or change.
A26	At least **fourteen (14) days** prior to the commencement of the mining activities, the holder must notify the administering authority in writing of the commencement date of the mining activities.

Schedule B: Air	
Condition number	**Condition**
B1	**Air Quality** The holder must ensure that dust deposition and particulate matter emissions generated by the mining activities are measures and do not cause exceedances of the following limits at any sensitive or commercial place: (a) Dust deposition of 120 milligrams per square metre per day, averaged over one month, in accordance with the most recent version of Australian Standard AS3580.10.1 Methods for sampling and analysis of ambient air—Determination of particulate matter—Deposited matter – Gravimetric method. (b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM10) suspended in the atmosphere of 50 micrograms per cubic metre over a 24-hour averaging time, monitored in accordance with the most recent version of either: 1. Australian Standard AS3580.9.6 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM10 high volume sampler with size-selective inlet – Gravimetric method, or 2. Australian Standard AS3580.9.9 Methods for sampling and analysis of ambient air Determination of suspended particulate matter—PM10 low volume sampler—Gravimetric method. (c) A concentration of particulate matter with an aerodynamic diameter of less than 2.5 micrometres (PM2.5) suspended in the atmosphere of 25 micrograms per cubic metre over a 24-hour averaging time, when monitored in accordance with the most recent version of AS/NZS3580.9.10 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM2.5 low volume sampler—Gravimetric method. A concentration of particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a one year averaging time, when monitored in accordance with the most recent version of AS/NZS3580.9.3:2003 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—Total suspended particulate matter (TSP)—High volume sampler gravimetric method.
B2	An Air Quality Management Plan must: (a) be developed prior to commencing mining activities; and (b) be implemented for the duration of mining activities.

B3	The Air Quality Management Plan required by condition **B2** must: (a) develop and implement air quality monitoring network to measure air quality parameters nominated in condition **B1**; (b) provide for the effective management of actual and potential environmental impacts to air resulting from the mining activities; (c) identify all sources of air emissions that may occur as a result of the mining activity; (d) identify all potential sensitive places and commercial places that may be affected by air emissions from the mining activities; (e) identify the adverse meteorological conditions likely to produce elevated levels of air emissions at any sensitive place or commercial place, due to the mining activities; (f) detail the collection of air quality and meteorological data in accordance with the administering authority's Air Quality Sampling Manual; (g) detail the protocols for regular maintenance of plant and equipment to minimise the potential for fugitive dust emissions; (h) describe the procedures that will be used to manage dust emissions. Procedures must include measures committed to in the site-specific environmental authority application, or equivalent measures that achieve the same level of dust and particulate matter deposition. (i) include a preventative management system for air emissions; (j) include a Trigger Action Response Program; (k) include a biennial review of the plan to determine the adequacy and effectiveness in avoiding and minimising air emissions and dust at a sensitive place or commercial place; and (l) describe the procedures to be undertaken if exceedance of the levels in condition **B1** are detected.

Schedule C: Surface Water

Condition number	Condition
C1	Contaminants that will, or have the potential to cause environmental harm must not be released directly or indirectly to any waters as a result of activities authorised under this environmental authority, except as permitted under the conditions of this environmental authority.
C2	The release of mine affected water to waters must only occur from the release points specified in **Table C1 - Mine affected water release points, sources and receiving waters** as depicted in **Figure 2 - Mine affected water release and water monitoring points**.

Table C1 - Mine affected water release points, sources and receiving waters

Release point (RP)	Longitude (GDA94)	Latitude (GDA94)	Mine affected water source and location	Monitoring point	Receiving waters description
RP 1	148.6470261	-23.22802603	Waste rock dump and pit	RP 1	Cooroora Creek
RP 2	148.6402952	-23.2401523	Waste rock dump and pit	RP 2	Sandy Creek
RP 3	148.6340502	-23.24493137	Waste rock dump and pit	RP 3	Sandy Creek

C3	The release of mine affected water to waters from the release points at the locations specified in **Table C1 - Mine affected water release points, sources and receiving** must not exceed the release limits specified in **Table C2 - Mine affected water release limits.**
C4	Notwithstanding condition C**2** of this environmental authority, the release of mine affected water to waters from **RP1, RP2** and **RP3** is not permitted until the environmental authority is amended to include: (a) a release limit in **Table C2 - Mine affected water release limits** for Turbidity; and (b) a Maximum Permitted Release Rate in **Table C4 - Mine affected water release during flow events.**

Table C2 - Mine affected water release limits

Quality characteristic	Release limits	Monitoring frequency
Electrical conductivity (µS/cm)	Release limits specified in **Table C4 - Mine affected water release during flow events** for variable flow criteria	Daily during a release and within 2 hours of commencing the release
Dissolved Oxygen (%sat)	85 - 110	
pH (pH units)	6.5 - 8.5	
Turbidity (NTU)	TBD	

Notes: Turbidity must be determined once statistically valid number of surface water samples have been collected.

C5	The release of mine affected water, to internal water management infrastructure installed and operated in accordance with a water management plan that complies with condition **C31** to **C33** inclusive is permitted.
C6	The release of mine affected water to waters in accordance with condition **C2,** must be monitored for each quality characteristic and at the frequency specified in **Table C2 - Mine affected water release limits** and **Table C3 - Release contaminant trigger investigation levels.**

Table C3 - Release contaminant trigger investigation levels

Quality characteristic	Trigger Level (µg/L)	Comment on trigger level	Monitoring frequency
Aluminium	55	For aquatic ecosystem protection, based on SMD guideline.	Within 2 hours of commencing the release and thereafter daily during release
Arsenic	13	For aquatic ecosystem protection, based on SMD guideline.	
Cadmium	0.2	For aquatic ecosystem protection, based on SMD guideline.	
Chromium	1	For aquatic ecosystem protection, based on SMD guideline.	
Copper	2	For aquatic ecosystem protection, based on LOR for ICPMS.	
Iron	300	For aquatic ecosystem protection, based on low reliability guideline.	
Lead	4	For aquatic ecosystem protection, based on SMD guideline.	
Mercury	0.2	For aquatic ecosystem protection, based on LOR for CV FIMS.	
Nickel	11	For aquatic ecosystem protection, based on SMD guideline.	
Zinc	8	For aquatic ecosystem protection, based on SMD guideline.	
Boron	370	For aquatic ecosystem protection, based on SMD guideline.	
Cobalt	90	For aquatic ecosystem protection, based on low reliability guideline.	
Manganese	1,900	For aquatic ecosystem protection, based on SMD guideline.	
Molybdenum	34	For aquatic ecosystem protection, based on low reliability guideline.	
Selenium	10	For aquatic ecosystem protection, based on LOR for ICPMS.	
Silver	1	For aquatic ecosystem protection, based on LOR for ICPMS.	
Uranium	1	For aquatic ecosystem protection, based on LOR for ICPMS.	
Vanadium	10	For aquatic ecosystem protection, based on LOR for ICPMS.	
Ammonia	900	For aquatic ecosystem protection, based on SMD guideline.	
Nitrate	1,100	For aquatic ecosystem protection, based on ambient Qld WQ Guidelines (2006) for TotalN.	
Petroleum hydrocarbons (C6-C9)	20		
Petroleum hydrocarbons (C10-C36)	100		
Fluoride (total)	2,000	Protection of livestock and short term irrigation guideline.	

Notes:

1. All metals and metalloids must be measured as total (unfiltered) and dissolved (filtered). Trigger levels for metal/metalloids apply if dissolved results exceed trigger. 2. The quality characteristics required to be monitored as per **Table C3 - Release contaminant trigger investigation levels** can be reviewed once the results of two years monitoring data is available, or if sufficient data is available to adequately demonstrate negligible environmental risk, and it may be determined that a reduced monitoring frequency is appropriate or that certain quality characteristics can be removed from **Table C3 - Release contaminant trigger investigation levels** by amendment. 3. SMD—slightly moderately disturbed level of protection, guideline refers ANZECC & ARMCANZ (2000). 4. LOR—typical reporting for method stated. ICPMS/CV FIMS—analytical method required to achieve LOR.	
C7	If quality characteristics of the release exceed any of the trigger levels specified in **Table C3 - Release contaminant trigger investigation levels** during a release event, the holder must compare the downstream results in the receiving waters to the trigger values specified in **Table C3 - Release contaminant trigger investigation levels** and: 1. where the trigger values are not exceeded then no action is to be taken; or 2. where the downstream results exceed the trigger values specified **Table C3 - Release contaminant trigger investigation levels** for any quality characteristic, compare the results of the downstream site to the data from background monitoring sites and; (a) if the result is less than the background monitoring site data, then no action is to be taken; or (b) if the result is greater than the background monitoring site data, complete an investigation into the potential for environmental harm and provide a written report to the administering authority outlining: (i) details of the investigations carried out; (ii) actions taken to prevent environmental harm; and (iii) proposed actions to prevent a recurrence of the exceedance. Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with **C7 2(b)** of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.
C8	If an exceedance in accordance with condition **C7 2(b)** is identified, the holder must notify the administering authority within **twenty-four (24) hours** of receiving the result.
C9	The report required by condition **C7 2(b)** must be provided to the administering authority within **fourteen (14) days** following the notification under condition conditions **C8.**
C10	**Mine Affected Water Release Events** The holder must ensure that 2 stream flow gauging stations are installed, operated and maintained to determine and record stream flows at the locations and flow recording frequency specified in **Table C4 - Mine affected water release during flow events** and **Figure 2 - Mine affected water release and water monitoring points.**
C11	Notwithstanding any other condition of this environmental authority, the release of mine affected water to waters in accordance with condition **C2** must only take place during periods of natural flow events in accordance with the receiving water flow criteria for discharge specified in **Table C4 - Mine affected water release during flow events** for the release points specified in **Table C1 - Mine affected water release points, sources and receiving waters**.

C12	The release of mine affected water to waters in accordance with condition **C2** must not exceed the electrical conductivity and sulphate release limits or the maximum release rate (for all combined release point flows) for each receiving water flow criteria for discharge specified in **Table C4 - Mine affected water release during flow events** when measured at the monitoring points specified in **Table C1 - Mine affected water release points, sources and receiving waters**.

Table C4 - Mine affected water release during flow events

Receiving Waters	Release Point (RP)	Gauging Station	Longitude (GDA94)	Latitude (GDA94)	Receiving Water Flow recording frequency	Receiving Water Flow criteria for discharge (m^3/s)	Maximum Permitted Release Rate Dilution (Ratio of MAW to Natural Flow)	Electrical Conductivity Release limits
Coorooora Creek	RP 1	Gauging Station 1	148.646529	-23.227336°	Continuous (minimum of 1 data point every 1 hour)	>0.1 (m^3/s)	TBD	Electrical conductivity (µS/cm): 1,470
Sandy Creek	RP 2 RP 3	Gauging Station 2	148.63336	-23.245302	Continuous (minimum of 1 data point every 1 hour)	>0.1 (m^3/s)	TBD	Electrical conductivity (µS/cm): 1,470

Notes: Maximum Permitted Release Rate must be determined once statistically valid number of surface water flow events have been monitored and mixing ratios determined.

C13	The daily quantity of mine affected water released from each release point must be measured and recorded.
C14	Releases to water must be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or cause a material build-up of sediment in such waters.

C15	**Notification of release event** The holder must notify the administering authority via WaTERS within **twenty-four (24) hours** after commencing a release of mine affected water to the receiving environment. Notification must include the submission of written advice to the administering authority of the following information: (a) release commencement date and time; (b) details regarding the compliance of the release with the conditions of Schedule: Water (Surface Water) of this environmental authority (that is, contaminant limits, natural flow, discharge volume); (c) release point(s); (d) release rate; (e) release salinity; and (f) receiving water including the natural flow rate.
C16	The holder must notify the administering authority via WaTERS as soon as practicable and no later than **twenty-four (24) hours** after cessation of a release event notified under condition **C15**. The release cessation notification must include the submission of written advice to the administering authority of the following information: (a) release cessation date and time; (b) receiving water(s) including the natural flow rate; and (c) volume of water released. NOTE: Successive or intermittent releases occurring within **twenty-four (24) hours** of the cessation of any individual release can be considered part of a single release event and do not require individual notification for the purpose of compliance with conditions **C15**, **C16,** and **C17**, provided the relevant details of the release are included within the notification provided in accordance with conditions **C15**, **C16,** and **C17.**
C17	Within **twenty-eight (28) days** of notification under condition **C15**, the holder must provide the administrating authority via WaTERS the following information in writing: (a) confirmation of: (i) the release commencement date and time; (ii) the release cessation date and time; (iii) receiving water(s) including the natural flow rate; and (iv) volume of water released; (b) all in-situ and laboratory water quality monitoring results; (c) details regarding the compliance of the release with the conditions of Schedule E: Water (Surface Water) of this environmental authority (i.e. contamination limits, natural flow, discharge volume); (d) whether the release of water resulted in any impacts to the receiving environment; and (e) any other matter(s) pertinent to the water release event.
C18	**Notification of release event exceedance** If the release limits defined in **Table C2 - Mine affected water release limits** are exceeded, the holder must notify the administering authority within **twenty-four (24) hours** of receiving the results.

C19	Within **twenty-eight (28) days** of notification under condition **C18**, the holder must provide the administrating authority via WaTERS the following information in writing: (a) the reason for the release; (b) the location of the release; (c) the total volume of the release and which (if any) part of this volume was non-compliant; (d) the total duration of the release and which (if any) part of this period was non-compliant; (e) all water quality monitoring results (including all laboratory analyses); (f) identification of any environmental harm as a result of the non-compliance; (g) all calculations; and (h) any other matters pertinent to the water release event.
C20	**Receiving Environment Monitoring and Contaminant Trigger Levels** The quality of the receiving waters must be monitored at the locations specified in **Table C6 - Receiving water upstream background sites and downstream monitoring points** for each quality characteristic and at the monitoring frequency stated in **Table C5 - Receiving waters contaminant trigger levels** and **Table C3 - Release contaminant trigger investigation levels**.

Table C5 - Receiving waters contaminant trigger levels.

Quality characteristic	Release limits	Monitoring frequency
pH (pH units)	6.5 (lower trigger) 8.5 (upper trigger)	Within 6 hours of a release of MAW or first flow. Subsequent monitoring must be conducted daily during the flow.
EC (µS/cm)	base flow: 310 [A] high flow: 210 [A]	
Turbidity (NTU)	<10% increase from upstream	
Nitrate (mg NO_3-N /L)	0.7	Within 12 hours of a release of MAW or first flow. Subsequent monitoring must be conducted weekly during the flow.
Ammonia (mg/L)	0.9	
Aluminium (mg/L)	0.055	
Arsenic (AsV) (mg/L)	0.013	
Barium (mg/L)	TBD	
Boron (mg/L)	0.37	
Cadmium (mg/L)	0.0002	
Chromium (CrVI)(mg/L)	0.001	
Cobalt (mg/L)	0.0028	
Copper (mg/L)	0.0014	
Lead (mg/L)	0.0034	
Manganese (mg/L)	1.9	
Mercury (inorganic) (mg/L)	0.00006 [C]	
Nickel (mg/L)	0.011	
Selenium (total; mg/L)	0.005 [C]	
Uranium (mg/L)	0.005[B]	
Vanadium (mg/L)	0.005[B]	
Zinc (mg/L)	0.008	
Total BTEX (µg/L)	3[B]	
Total Xylenes (µg/L)	1.5[B]	
TRH (C6-C10) (µg/L)	50[B]	
Sulfate (mg/L)	250	
TSS (mg/L)	110[A]	

Default ANZECC & ARMCANZ (2000) Freshwater Aquatic ecosystems trigger value for 95% species protection used with exception of the following:

[A] Water quality objectives to protect aquatic ecosystem environmental values under baseflow for Mackenzie River.

[B] Limit of reporting.

[C] Se and Hg is 99% due to potential for bioaccumulation.

Table C6 – Receiving water upstream background sites and downstream monitoring points

Monitoring points	Receiving waters location description	Longitude (GDA94)	Latitude (GDA94)
Upstream background monitoring points			
FHWC1	Sandy Creek	148.6105691	-23.24356644
FHCC1	Cooroora Creek	148.6295721	-23.21337062
Downstream monitoring points			
FHWC2	Sandy Creek	148.6269213	-23.24778681
FHWC3	Sandy Creek	148.6372826	-23.24313674
FHCC2	Cooroora Creek	148.6454464	-23.22350922
FHCC3	Cooroora Creek	148.6508437	-23.233876

Notes:

The data from background monitoring points must not be used where they are affected by releases from other mines.

C21	If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in **Table C5 - Receiving waters contaminant trigger levels** and **Table C3 - Release contaminant trigger investigation levels** during a release event the holder must compare the downstream results to the upstream results in the receiving waters and: (a) where the downstream result is the same or a lower value than the upstream value for the quality characteristic then no action is to be taken; or (b) where the downstream results exceed the upstream results complete an investigation into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining: (i) details of the investigations carried out; and (ii) actions taken to prevent environmental harm.
C22	**Receiving Environmental Monitoring Program** The holder must develop and implement a Receiving Environment Monitoring Program (REMP). For the purposes of the REMP, the receiving environment is the waters of Cooroora Creek and Sandy Creek Catchment and connected or surrounding waterways within **ten (10) km** downstream of the release points (**RP1, RP2** and **RP3)**. The REMP must: (a) be developed prior to commencing mining activities; (b) be implemented for the duration of the mining activities; and (c) encompass any sensitive receiving waters or environmental values downstream of the mine that will potentially be affected by an authorised release of mine affected water.
C23	The REMP required by condition **C22** must:

	(a) identify and describe any adverse impacts to surface water environmental values quality and flows due to the activities authorised under this environmental authority; (b) Monitor the effects of the activities authorised under this environmental authority on the receiving environment periodically (under natural flow conditions) and while mine affected water is being discharged from the mine; (c) Meet the requirements of the administering authority 'Guideline- Receiving environment monitoring program guideline (ESR/2016/2399); (d) assess the condition or state of receiving waters, including upstream conditions, spatially within the REMP area, considering background water quality characteristics based on accurate and reliable monitoring data that takes into consideration temporal variation (e.g. seasonality); (e) be designed to facilitate assessment against water quality objectives for the relevant environmental values that need to be protected ((i.e. as scheduled pursuant to the Environmental Protection (Water and Wetland Biodiversity) Policy 2019); (f) include monitoring from background reference sites (e.g. upstream or background) and downstream sites from the release (as a minimum, the locations specified in **Table C6 - Receiving water upstream background sites and downstream monitoring points**; (g) Specify the frequency and timing of sampling required in order to reliably assess ambient conditions and to provide sufficient data to derive site specific background reference values in accordance with the Queensland Water Quality Guidelines 2009. This should include monitoring during periods of natural flow irrespective of mine or other discharges; (h) include monitoring and assessment of dissolved oxygen saturation, temperature and all water quality parameters listed in **Table C2 - Mine affected water release limits** and **Table C3 - Release Contaminant Trigger Investigation Levels**; (i) include, where appropriate, monitoring of metals/metalloids in sediments (in accordance with ANZECC & ARMCANZ 2000, BATLEY and/or the most recent version of AS5667.1 Guidance on Sampling of Bottom Sediments); (j) include, where appropriate, monitoring of macroinvertebrates in accordance with the AusRivas methodology; (k) apply procedures and/or guidelines from ANZG 2018 and other relevant guideline documents; (l) describe sampling and analysis methods and quality assurance and control; and (m) incorporate stream flow and hydrological information in the interpretations of water quality and biological data.
C24	A report outlining the findings of the REMP, including all monitoring results and interpretations in accordance with condition **C22** and **C23** must be prepared annually and submitted to the administering authority by no later than the 31 May each year. The report must include an assessment of background reference water quality, the condition of downstream water quality compared against water quality objectives, and the suitability of current discharge limits to protect downstream environmental values.
C25	**Water reuse** Mine affected water may be piped or trucked or transferred by some other means that does not contravene the conditions of this environmental authority and deposited into artificial water storage structures, such as farm dams or tanks, for the purpose of supply to: (a) any operation licensed for ERA13 (mining black coal); (b) properties owned by the environmental authority holder; or (c) a third party.

C26	The volume, pH and electrical conductivity of water transferred or given as per Condition **C25** must be monitored and recorded and given in accordance with a written agreement (the third party agreement). The third party agreement must: (a) include a commitment from the person utilising the mine affected water to use it in such a way as to prevent environmental harm or public health incidents and specifically make the persons aware of the General Environmental Duty (GED) under section 319 of the *Environmental Protection Act 1994*, environmental sustainability of the water disposal and protection of environmental values of waters; and (b) be signed by both parties to the agreement.
C27	**Annual water monitoring reporting** The following information must be recorded in relation to all water monitoring required under the conditions of this environmental authority and submitted to the administering authority in the specified format with each annual return: (a) the date on which the sample was taken; (b) the time at which the sample was taken; (c) the monitoring point at which the sample was taken; (d) the measured or estimated daily quantity of mine affected water released from all release points; (e) the release flow rate at the time of sampling for each release point; (f) the results of all monitoring and details of any exceedances of the conditions of this environmental authority; and (g) water quality monitoring data where required by the environmental authority (release, receiving environment, REMP, water storages, sewage treatment plants and groundwater) must be provided to the administering authority in the specified electronic format via WaTERS.
C28	**Water Management Plan** A Water Management Plan must: (a) be developed prior to commencing mining activities; and (b) implemented for the duration of mining activities.

C29	The Water Management Plan required by condition **C28** must include: (a) provide for effective management of actual and potential environmental impacts resulting from water management associated with the mining activity carried out under this environmental authority; and (b) be developed in accordance with administering authority's guideline *Preparation of Water Management Plans for Mining Activities (EM324)* and include: (i) a study of the source of contaminants; (ii) a water balance model for the site; (iii) an updated flood model for the site; (iv) a water management system for the site; (v) measures to manage and prevent saline drainage; (vi) measures to manage and prevent acid rock drainage; (vii) contingency procedures for emergencies; and (viii) a program for monitoring and review of the effectiveness of the water management plan.
C30	An annual review of the Water Management Plan must be undertaken by an appropriately qualified person, be completed by 30 November each calendar year, and be submitted with the next annual return.
C31	The annual review of the water management plan must assess the adequacy of the plan, ensure actual and potential environmental impacts are managed and identify any necessary amendments to the plan.
C32	**Stormwater and water sediment controls** An Erosion and Sediment Control Plan must be developed by an appropriately qualified person prior to commencing mining activities, and implemented for the duration of mining activities to: (a) minimise erosion and the release of sediment to receiving waters; and (b) minimise contamination of stormwater.
C33	The Erosion and Sediment Control Plan must demonstrate how erosion and sediment control measures adequately minimise the release of sediment to receiving waters and must include at least the following: (a) assessment of all catchment areas; (b) assessment of soil types, including sodic dispersive soils; (c) specify design criteria for erosion and sediment control structures; (d) provide the location and description of all erosion and sediment control structures; (e) provide an audit schedule to ensure erosion and sediment control structures are being maintained.
C34	Stormwater, other than mine affected water, is permitted to be released to waters from: (a) erosion and sediment control structures that are installed and operated in accordance with the Erosion and Sediment Control Plan required by condition **C32**; and (b) water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with conditions **C28** to **C31**, for the purpose of ensuring water does not become mine affected water.

C35	**All Dams** The consequence category of any dam must be assessed by a suitably qualified and experienced person: (a) prior to the construction of the dam; and (b) at regular intervals not exceeding **two (2) years**, from the completion of the assessment required by condition **C35(a)**.
C36	The holder must only construct a dam of low consequence category.

Schedule D: Groundwater	
Condition number	**Condition**
D1	The holder must not release contaminants to groundwater.
D2	**Groundwater dependent ecosystems** The biocondition and extent of groundwater dependent ecosystems associated with the alluvium aquifer of Cooroora Creek and Sandy Creek must remain unchanged. *Note: The biocondition must be determined by the methodology in BioCondition: a condition assessment framework for terrestrial biodiversity in Queensland: assessment manual. T.J. Eyre et. al. Version 2.2 (2015 or later versions).*
D3	The groundwater quality characteristics identified in **Table D2 - Groundwater quality triggers and limits** and standing water levels must be monitored by an appropriately qualified person at the locations and frequency specified in **Table D1 - Groundwater monitoring locations and frequency and** as depicted in **Figure 2 – Mine affected water release and water monitoring points**.

Table D1 – Groundwater monitoring locations and frequency

Monitoring Bores	Location		Surface RL (m)	Screened interval (mBGL)	Aquifer	Monitoring Frequency
	Longitude (GDA94)	Latitude (GDA94)				
Interpretation Bores						
FHMB07	148.6378685	-23.2040189	167.3	37-48	Sandstone, mudstone/coal (Fairhill)	Monthly
Compliance Bores (Water Quality & Water Levels)						
FHMB01	148.6496123	-23.2325322	151	10 - 20	Alluvium (Quaternary)	Monthly
FHMB02	148.6214938	-23.2087581	153.4	8 - 18.5	Coal/siltstone (Fairhill)	Monthly
FHMB03	148.6370413	-23.2355354	158.9	12 - 20	Sandstone/siltstone (Fairhill)	Monthly
FHMB04	148.6159283	-23.2146583	168.3	18 - 29.5	Tuffaceous siltstone (Fairhill)	Monthly
FHMB05	148.6086543	-23.2406059	165.2	7.5 - 23.5	Coal/tuff (Fairhill)	Monthly
FHMB06	148.5998478	-23.2527789	179.8	11 - 41	Sandstone, mudstone/coal (Fairhill)	Monthly
FHMB08	148.6316266	-23.2421586	153.3	2.8 - 11	Permian Sediments (Sandy Creek)	Monthly

FHMB09 (New)	148.6408149	-23.2221619	151.3	2.8 – 12.1	Permian Sediments (Cooroora Creek)	Monthly
FHMB010A	148.5848781	-23.2428885	TBC	TBC	Nested/Adjacent: Alluvium & Permian (Fairhill) – Sandy Creek	Monthly
FHMB010B	148.5848489	-23.2428978	TBC	TBC	Nested/Adjacent: Alluvium & Permian (Fairhill) – Sandy Creek	Monthly
FHMB011A	148.6135283	-23.1992966	TBC	TBC	Nested/Adjacent: Alluvium & Permian (Fairhill) – Cooroora Creek	Monthly
FHMB011B	148.6135457	-23.1993125	TBC	TBC	Nested/Adjacent: Alluvium & Permian (Fairhill) – Cooroora Creek	Monthly
FHMB012 (New)	148.6187144	-23.2474692	158.3	2.8 - 9	Tertiary Sediments (Sandy Creek)	Monthly
FH002	148.6139012	-23.2421085	162.4	7 - 55	Permian (Fairhill)	Monthly

1. *RL must be measured to the nearest 5cm from the top of the bore casing.*
2. *Where monitoring is no longer possible because of the removal of a bore as a direct result of the mining activity, the impact on the monitoring network must be evaluated and replacement bore(s) constructed, where required, to complete the network.*

D4	Prior to 01 February 2026, the environmental authority must be amended to include: (a) The TBC's for Monitoring bores FHMB010A, FHMB010B, FHMB011A and FHMB11B; and (b) Updates to **Table D1 - Groundwater monitoring locations and frequency** for TBC's that are locations.
D5	Monitoring bores FHMB010A, FHMB010B, FHMB011A and FHMB11B must be installed and monitored in accordance with **Condition D3** prior to 01 January 2026.
D6	Groundwater quality measured from any compliance bore specified in **Table D1 - Groundwater monitoring locations and frequency** must not exceed: (a) Trigger Value (Limit A) for any quality characteristic specified in **Table D2 – Groundwater quality triggers and limits** on any five (5) consecutive sampling occasions for the same characteristic; or (b) Contaminate Limit (Limit B) for any quality characteristic specified in **Table D2 – Groundwater quality triggers and limits** on any three (3) consecutive sampling occasions. Note: Consecutive sampling occasions means any number of sampling results obtained sequentially.

Table 2 – Groundwater quality triggers and limits

Groundwater quality parameter	Bore	Limit A	Limit B
Drawdown	B02, B03, B04, B05, B06	> 2m	> 2m
	B01, FHMB010, FHMB011, New 1	> 0.6 m	> 0.6 m
	FHMB09	> 0.5m	> 0.5m
pH (pH Units)[3]	All bores		7.1 – 8.1
Electrical Conductivity (µS/cm) [3]	B01		47,000
	B02, B03, B04, B05, B06	24,000	24,300
Major ions (Na, Ca, Mg, K, Cl, HCO_3, CO_3)	All bores	For interpretation only	
Total Hardness (as CaCO3)	All bores	For interpretation only	
Aluminium (mg/L)[3]	B01	0.194	0.207
	B02, B03, B04, B05, B06	0.055	0.08
Ammonia (mg/L as N)[3]	All bores	1	1.6
Arsenic (mg/L)[3]	B01, B02, B04, B05		0.013
	B03, B06	0.03	0.04
Boron (mg/L)[3]	All bores	0.6	0.7
Cadmium (mg/L)[1]	All bores		0.0002
Chromium (mg/L)[1]	All bores		0.001
Cobalt (mg/L)[3]	B02, B03, B04, B05, B06	0.002	0.005
	B01	0.017	0.018
Copper (mg/L)[2]	All bores	0.003	0.004
Iron (mg/L)[3]	All bores	3	5
Lead (mg/L)[1]	All bores		0.0034
Manganese (mg/L)[3]	B02, B03, B04, B05, B06	0.6	1
	B01	9	9.7
Mercury (mg/L)	All bores		0.0006
Nickel (mg/L)[3]	All bores		0.011
Selenium (mg/L)[1]	All bores	0.005	0.011
Sulphur as Sulfate SO_4 (mg/L)[3]	B02, B03, B04, B05, B06	430	450
	B01	2,380	2.400
Uranium (mg/L) [3]	All bores	0.01	0.013
Vanadium (mg/L)[3]	All bores		0.006

Zinc (mg/L)[2]	All bores	0.06	0.008

Notes:

[1] Default ANZECC & ARMCANZ (2000) Freshwater Aquatic ecosystems trigger value for 95% species protection used with the exception of Se which is 99% due to potential for bioaccumulation

[2] Fitzroy Groundwater zone 34, 80th percentile, deep bores.

[3] Site-specific triggers.

D7	**Quality Exceedance** If an exceedance is detected in accordance with condition **D6**, the holder must notify the administering authority via WaTERS within **24 hours** of receiving analysis results**.**
D8	Within **fourteen (14) days** of the notification given under condition **D7**; an investigation into the cause of the exceedance by an appropriately qualified person must be commenced, and include: (a) an investigation of the potential for environmental harm; and (b) the actions taken or to be taken to ensure compliance with condition **D1** of this environmental authority.
D9	The exceedance investigation under condition **D8** must be completed and submitted to the administering authority via WaTERS within **three (3) months** of notifying the administering authority under condition **D7**.
D10	Where an investigation completed under condition **D8** identifies the potential for environmental harm, an action plan to mitigate potential environmental harm must be developed by an appropriately qualified person and implemented within **one (1) month** of the completion of the investigation under condition **D8**.
D11	**Standing Water Level Exceedance** If the standing water level of underground water measured at any compliance bore specified in **Table D1 - Groundwater monitoring locations and frequency** exceeds the drawdown of the trigger drawdown levels specified for the relevant bore in **Table D2 – Groundwater quality triggers and limits**: (a) the administering authority must be notified via WaTERS within **twenty four (24) hours**; and (b) an investigation into the cause of the exceedance must be conducted within **ten (10) business days**; and (c) if the activities are identified as a potential cause or contributor to the drawdown, take immediate action to ensure compliance with the conditions of this authority.
D12	If a resource activity is identified as a potential cause or contributor to drawdown in excess of 2m, the EA holder must enter a make good agreement with the bore owner of any bore located within the affected area of an aquifer.
D13	**Groundwater Monitoring Program** A Groundwater Monitoring Program must: (a) be developed prior to commencing mining activities; and (b) be Implemented for the duration of mining activities.

D14	The Groundwater Monitoring Program required by condition **D13** must: (a) identify potential sources of contamination to groundwater from the activities authorised under this environmental authority; (b) identify the environmental values that need to be protected; (c) ensure that all potential groundwater impacts due to the activity are identified, monitored and mitigated; (d) document the sampling and monitoring methodology; (e) ensure that adequate groundwater monitoring and data analysis is undertaken to achieve the following objectives: a. detect any impacts to groundwater levels due to the activity; b. detect any impacts to groundwater quality due to the activity; c. determine compliance with condition **D1**; d. determine trends in groundwater quality; (f) include an appropriate quality assurance and quality control program; (g) a numerical groundwater model; (h) include a conceptual groundwater model; and (i) include an annual review process to identify improvements to the program.
D15	The holder must: (a) have the Groundwater Monitoring Program reviewed by an independent and appropriately qualified third party to determine if the Groundwater Monitoring Program meets the requirements in condition **D14** within **one (1) year** of commencement of mining activities; and (b) complete such reviews at regular intervals, not exceeding **one (1) year**, from the completion of the report required by condition **D15(a)**; and (c) submit the peer review reports via WaTERS at the same time as each annual return.
D16	**Annual Monitoring Report** The holder must complete an Annual Monitoring Report and submit the report to the administering authority via WaTERS at the same time as each annual return.
D17	The Annual Monitoring Report required by condition D**16** must include (a) the standing water level in the compliance bores; (b) any changes in water quality in the compliance bores; (c) maps showing the actual water level drawdown contours caused by the take of underground water for each aquifer; (d) details of any review undertaken of the numerical groundwater model since the previous Annual Monitoring Report; (e) an assessment of any differences between the actual water level impact and the impact predicted for the same period in the most current numerical groundwater model; (f) details of any bores which are predicted by the most current numerical groundwater model to be located in the affected area; and (g) raw data within useable electronic format.

D18	**Numerical Groundwater Model** An appropriately qualified person, must review the numerical underground water model within two years from the commencement of the activities authorised under this EA and at least 5 years thereafter. The review and revised model must include: (a) information about a revised numerical underground water model based on transient calibration; (b) incorporation of measured mine dewatering volumes and underground water monitoring data; (c) any revised hydrogeological conceptualisation and assumptions of the model, including: (i) any revised geological interpretation; (ii) any revised hydrogeological parameters or assumptions on recharge; and (iii) any assumptions of outflows from springs and other water users; (d) an update of predicted impacts including: (i) any revised predicted impacts on springs and watercourses dependent on underground water flow, and other users, including any changes to the affected area; (ii) any revised predicted underground water inflows into mine workings during mining operations and post closure; (iii) maps showing the revised prediction of the total water level impact from the commencement of underground extraction to post closure; (iv) maps showing the difference between these predicted water level impacts and the water level impacts as predicted at the time of application for this environmental authority; (v) sensitivity analysis; and (e) an evaluation of the accuracy of the predicted impacts from the model. The first review undertaken within two years of commencement of take must also include a peer review.
D19	Monitoring and sampling of groundwater quality and standing water levels must be carried out in accordance with written procedures and must address the requirements of the latest version of the following documents: (a) for groundwater and aquatic environments, the Queensland Government's Monitoring and Sampling Manual 2009 – Environmental Protection (Water and Wetland Biodiversity) Policy 2019; and (b) for groundwater, Groundwater Sampling and Analysis – A Field Guide (2009:27 GeoCat#6890.1) and Australian Standard AS/NZS 5667.11:1998 Water Quality – Sampling – Guidance on sampling of groundwaters.
D20	The construction, maintenance and decommissioning of groundwater monitoring bores must be undertaken in a manner that: (a) prevents contaminants entering the groundwater; (b) ensures the integrity of the bores to obtain representative groundwater samples from the target aquifer; and (c) maintains the hydrogeological environment within the aquifer.
D21	A bore drill log must be kept for all groundwater monitoring bores that includes:

	(a) bore identification reference and geographic coordinate location; (b) specific construction information including but not limited to depth of bore, depth and length of casing, depth and length of screening and bore sealing details; (c) standing groundwater level and water quality parameters including physical parameters and results of laboratory analysis for the possible trigger parameters; (d) lithological data and stratigraphic interpretation by an appropriately qualified person to identify important features associated with groundwater monitoring; and (e) target aquifer formation of the bore.

Schedule E: Acoustic	
Condition number	**Condition**
E1	**Noise** Noise generated by the mining activities must not exceed the limits identified in **Table E1 – Noise Limits** at any sensitive place or commercial place**.**

Table E1 - Noise Limits.

Noise level dB(A) measured as	Monday to Saturday			Sundays and public holidays		
	7am – 6pm	6pm – 9pm	9pm – 7am	7am – 6pm	6pm – 9pm	9pm – 7am
	Noise measured at a sensitive place					
$L_{Aeq, adj, 15mins}$	35	35	30	35	35	30
Max $_{LpA,15mins}$			47			47
	Noise measured at a commercial place					
$L_{Aeq, adj, 15mins}$	40	40	35	40	40	35

E2	Noise monitoring must be conducted in accordance with the administering authority's Noise Measurement Manual and noise measurements must ensure: (a) source noise levels are expressed as component noise levels for the purposes of comparison with noise limits defined within **Table E1 - Noise Limits**; (b) all noise monitoring devices are calibrated in accordance with AS IEC 61672.1-2004; and (c) that monitoring locations are relevant to the matter under investigation.
E3	**Blasting** Blasting must not cause the limits in **Table E2 - Airblast overpressure and vibration limits** to be exceeded at any sensitive place or commercial place.

Table E2 - Airblast overpressure and vibration limits

Parameter	**Airblast overpressure measured at a sensitive place or commercial place**		
	Monday to Friday	**Monday to Friday**	**Saturday, Sunday and Public Holidays**
	9am to 4pm	**4pm to 9am**	**Anytime**
Airblast overpressure (dB (Linear) Peak)	115dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time	No Blasting to occur	
Ground vibration peak particle velocity (mm/second)	5mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time	No Blasting to occur	

E4	The holder must develop and implement a blast monitoring program that is consistent with AS2187.2-2006 Explosives – Storage and use.
E5	Blast monitoring must be conducted in accordance with the blast monitoring program required by condition E**4**.

Schedule F: Land	
Condition number	**Condition**
F1	**Preventing contaminant release to land** Contaminants must not be released to land unless otherwise authorised by a condition of this environmental authority.
F2	**Storage and handling of chemicals and flammable or combustible liquids** All chemicals and flammable or combustible liquids must be stored and handled in accordance with the latest edition of AS1940—The storage and handling of flammable and combustible liquids. Where no relevant Australian Standard exists, store such materials within an effective on-site containment system.
F3	**Topsoil Management Plan** A Topsoil Management Plan must: (a) be developed prior to commencing mining activities; and (b) be implemented for the duration of mining activities.

Schedule G: Waste	
Condition number	**Condition**
G1	**Waste disposal** Unless otherwise specified in the conditions of this environmental authority, waste, other than any spoil, tyres, or vegetation removed as part of the mining activity or permitted by another condition of the environmental authority, must not be disposed of within the mining leases.
G2	**Disposal of Tyres** Scrap tyres resulting from the mining activities authorised under this environmental authority may be disposed in spoil emplacements within the mining leases listed on this environmental authority.
G3	A record must be kept of the number, volume, and location for all scrap tyres disposed.
G4	**Waste management** A Waste Management Plan must be: (a) developed prior to commencing mining activities; and (b) implemented for the duration of mining activities.
G5	The Waste Management Plan required by condition **C4** must include: (a) a description of the mining activities that may generate waste; (b) waste management control strategies, including: (i) the types and amounts of wastes generated by the mining activities; (ii) segregation of the wastes; (iii) storage of the wastes; (iv) transport of the wastes; and (v) monitoring and reporting matters concerning the wastes; (c) how the waste will be managed in accordance with the waste and resource management hierarchy; (d) the hazardous characteristics of the wastes generated; (e) procedures for addressing accidents, spills and other incidents; (f) the criteria on which the performance of the waste management program will be assessed; and (g) staff training.

Schedule H: Rehabilitation	
Condition number	**Condition**
H1	A Rehabilitation Management Plan must: (a) be developed prior to commencing mining activities; and (b) implemented for the duration of mining activities.
H2	The Rehabilitation Management Plan required by condition **H1**, must address all relevant requirements within this environmental authority, and at a minimum include the following items: (a) detail how all land disturbed by the mining activities will be rehabilitated to ensure that it is; (i) safe for humans and wildlife; (ii) non-polluting; (iii) stable; (iv) able to sustain an agreed post mining land use; and (b) specify mining material characteristics for specific rehabilitation strategies; (c) final completion criteria for all domains, which aligns with **Appendix A - Rehabilitation Completion Criteria;** (d) provide a schematic representation of final landform inclusive of; (i) drainage design and features; (ii) slope designs; (iii) cover design; (iv) erosion controls proposed on reshaped land; and (e) detail the progressive rehabilitation strategy to be implemented, which aligns with **Table H1 – Progressive Rehabilitation Requirements**; (f) map and tabulate the rehabilitation requirements applied to all mine domains with respect to rehabilitation goals, rehabilitation objectives, indicators and completion criteria; (g) details of how the final land uses will align with local planning scheme requirements; (h) identify a minimum of six reference sites and six rehabilitation sites to be used to develop rehabilitation acceptance criteria to allow valid comparison of self-sustaining rehabilitation vegetation communities to local reference sites; (i) a plan to demonstrate how the Landscape Function Analysis (LFA) reference sites must be established within the first year of commencement of the mining activities to provide suitable baseline reference for progressive rehabilitation; (j) a process to adequately strip, stockpile, and maintain any topsoil disturbed by the mining activities, to ensure its volume, and physical and chemical characteristics are maintained in a way that will not constrain the achievement of the defined rehabilitation completion criteria;

<table>
<tr><td></td><td>(k) a compliance table that directs any reader of the plan to the relevant section/s which address all the relevant rehabilitation requirements of this environmental authority;
(l) describe a program for monitoring and review of the effectiveness of the Rehabilitation Management Plan; and
(m) management actions to be implemented for when rehabilitation objectives are not progressing towards meeting the completion criteria.</td></tr>
<tr><td>H3</td><td>Land disturbed by mining activities must be progressively rehabilitated in accordance with the Rehabilitation Management Plan required by condition H1.</td></tr>
<tr><td>H4</td><td>Rehabilitation activities carried out in accordance with Table H1 - Progressive Rehabilitation Requirements must achieve the completion criteria as stated in Appendix A - Rehabilitation Completion Criteria.</td></tr>
<tr><td>H5</td><td>Table H1 - Progressive Rehabilitation Requirements.
<table>
<tr><th>Year</th><th>Progressive Rehabilitation
(Minimum percentage (%) of disturbed area)</th></tr>
<tr><td>Year 1[1]</td><td>0</td></tr>
<tr><td>Year 2</td><td>2</td></tr>
<tr><td>Year 3</td><td>5</td></tr>
<tr><td>Year 4</td><td>10</td></tr>
<tr><td>Year 5</td><td>15</td></tr>
<tr><td>Year 6</td><td>25</td></tr>
<tr><td>Year 7</td><td>40</td></tr>
<tr><td>Year 8</td><td>50</td></tr>
<tr><td>Year 9</td><td>100</td></tr>
</table>
Notes
[1] Means one (1) year from the commencement of mining activities.</td></tr>
<tr><td>H6</td><td>By 1 March each calendar year immediately following commencement of mining, the holder must provide to the administering authority a rehabilitation progress report for the project. The report must include an analysis of the following
(a) for the relevant Reporting Period – the actual amount of rehabilitation completed for that period; and
(b) for the immediately preceding Reporting Period, if applicable – the estimated amount of rehabilitation to be completed in that period.</td></tr>
</table>

Schedule I: Prescribed Environmental Matters	
Condition number	**Condition**
I1	Significant residual impacts to prescribed environmental matters are not authorised under this environmental authority or the *Environmental Offsets Act 2014*.
I2	Records demonstrating that each impact to a prescribed environmental matter will not result in a significant residual impact to that matter must be: (a) completed by an appropriately qualified person; and (b) kept for the life of the environmental authority.

Definitions

Key terms and/or phrases used in this document are defined in this section. Where a term is not defined, the definition in the *Environmental Protection Act 1994*, its regulations or environmental protection policies must be used. If a word remains undefined it has its ordinary meaning.

'acid mine drainage' means any contaminated discharge emanating from a mining activity formed through a series of chemical and biological reactions, when geological strata is disturbed and exposed to oxygen and moisture.

'acid rock drainage' means any contaminated discharge emanating from a mining activity formed through a series of chemical and biological reactions, when geological strata is disturbed and exposed to oxygen and moisture.

'administering authority' is the agency or department that administers the environmental authority provisions under the *Environmental Protection Act 1994*.

'airblast overpressure' means energy transmitted from the blast site within the atmosphere in the form of pressure waves. The maximum excess pressure in this wave, above ambient pressure is the peak airblast overpressure measured in decibels linear (dBL).

'appropriately qualified person' means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods or literature.

'assessed' or '**assessment'** by a suitably qualified and experienced person in relation to a consequence assessment of a dam, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit of the assessment:

(a) exactly what has been assessed and the precise nature of that determination;

(b) the relevant legislative, regulatory and technical criteria on which the assessment has been based;

(c) the relevant data and facts on which the assessment has been based, the source of that material, and

(d) the efforts made to obtain all relevant data and facts; and

(e) the reasoning on which the assessment has been based using the relevant data and facts, and

(f) the relevant criteria

'associated works' in relation to a dam, means:

(a) operations of any kind and all things constructed, erected or installed for that dam; and

(b) any land used for those operations.

'authority' means this environmental authority.

'background', with reference to the water schedule means the average of samples taken prior to the commencement of mining from the same waterway that the current sample has been taken.

'blasting' means the use of explosive materials to fracture:

(a) rock, coal and other minerals for later recovery; or

(b) structural components or other items to facilitate removal from a site or for reuse.

'chemical' means:

(a) an agricultural chemical product or veterinary chemical product within the meaning of the Agricultural and *Veterinary Chemicals Code Act 1994* (Commonwealth);

(b) a dangerous good under the *Australian Code for the Transport of Dangerous Goods by Road and Rail approved by the Australian Transport Council*;

(c) a lead hazardous substance within the meaning of the *Workplace Health and Safety Regulation 1997*;

(d) a drug or poison in the *Standard for the Uniform Scheduling of Drugs and Poisons* prepared by the Australian Health Ministers' Advisory Council and published by the Commonwealth; or

(e) any substance used as, or intended for use as:

(i) a pesticide, insecticide, fungicide, herbicide, rodenticide, nematocide, miticide, fumigant or related product;

(ii) a surface active agent, including, for example, soap or related detergent;

(iii) a paint solvent, pigment, dye, printing ink, industrial polish, adhesive, sealant, food additive, bleach, sanitiser, disinfectant, or biocide;

(iv) a fertiliser for agricultural, horticultural or garden use;

(v) a substance used for, or intended for use for mineral processing or treatment of metal, pulp and paper, textile, timber, water or wastewater; or

(vi) manufacture of plastic or synthetic rubber.

'commercial place' means a workplace used as an office or for business or commercial purposes, which is not part of the mining activity and does not include employees' accommodation or public roads.

'completion criteria' means the measures by which actions implemented are deemed to be complete. The acceptance criteria indicate the success of the decommissioning and rehabilitation outcomes or remediation of areas which have been significantly been disturbed by the mining activities. Acceptance criteria may include information regarding:

- stability of final land forms in terms of settlement, erosion, weathering, pondage and drainage;
- control of geochemical and contaminant transport processes;
- quality of runoff waters and potential impact on receiving environment;
- vegetation establishment, survival and succession;
- vegetation productivity, sustained growth and structure development;
- fauna colonisation and habitat development;
- ecosystem processes such as soil development and nutrient cycling, and the recolonisation of specific fauna groups such as collembola, mites and termites which are involved in these processes;
- microbiological studies including recolonisation by mycorrhizal fungi, microbial biomass and respiration;
- effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development;
- resilience of vegetation to disease, insect attack, drought and fire; and
- vegetation water use and effects on ground water levels and catchment yields.

'consecutive sampling occasion' means consecutive sequential '**sampling occasions'** regardless of frequency.

'consequence' in relation to a structure as defined, means the potential for environmental harm resulting from the collapse or failure of the structure to perform its primary purpose of containing, diverting or controlling flowable substances.

'consequence category' means a category, either low, significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the *Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933).*

'CSIRO' means Commonwealth Scientific and Industrial Research Organisation.

'dam' means a land-based structure or a void that contains, diverts or controls flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and **associated works.**

'**disturbance'** of land includes:

(a) compacting, removing, covering, exposing or stockpiling of earth;

(b) removal or destruction of vegetation or topsoil or both to an extent where the land has been made susceptible to erosion;

(c) carrying out mining within a watercourse, waterway, wetland or lake;

(d) the submersion of areas by hazardous contaminant storage and dam/structure walls;

(e) temporary infrastructure, including any infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after the mining activity has ceased; or

(f) releasing of contaminants into the soil, or underlying geological strata.

However, the following areas are not included when calculating areas of 'disturbance':

(a) areas off lease (e.g. roads or tracks which provide access to the mining lease);

(b) areas previously disturbed which have achieved the rehabilitation outcomes;

(c) by agreement with the administering authority, areas previously disturbed which have not achieved the rehabilitation objective(s) due to circumstances beyond the control of the mine operator (such as climatic conditions);

(d) areas under permanent infrastructure. Permanent infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be left by agreement with the landowner; or

(e) disturbance that pre-existed the grant of the tenure.

'EC' means electrical conductivity.

'**environmental authority'** has the same meaning as given in the *Environmental Protection Act 1994.*

'**environmental offset'** has the meaning in section 7 of the *Environmental Offsets Act 2014*.

'EP Act' means the *Environmental Protection Act 1994.*

'holder' has the same meaning as given in the *Environmental Protection Act 1994.*

'infrastructure' means water storage dams, levees, roads and tracks, buildings and other structures built for the purpose of the mining activity.

'$L_{A\ eq,\ adj,\ 15\ mins}$' means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a **fifteen (15) minute** period has the same mean square sound pressure of a sound that varies with time.

'land' in the 'land schedule' of this document means land excluding waters and the atmosphere, that is, the term has a different meaning from the term as defined in the *Environmental Protection Act 1994*. For the purposes of the *Acts Interpretation Act 1954*, it is expressly noted that the term 'land' in this environmental authority relates to physical land and not to interests in land.

'land use' –means the selected post mining use of the land, which is planned to occur after the cessation of mining operations.

'LFA' means Landscape Function Analysis developed by Tonyway and Hindley (2004), as known an Ecosystem Function Analysis as CSIRO's principal method for mine rehabilitation assessment within the arid zone.

'licensed place' means the mining activities carried out on mining lease (ML) 700028 and ML 700029.

'low consequence dam' means any dam that is not a high or significant consequence category as assessed using the Manual for assessing consequence categories and hydraulic performance of structures (ESR/2016/1933).

'm' means metres.

'matters of state environmental significance or MSES' has the meaning in schedule 2 of the Environmental Offsets Regulation 2014.

'**Max LpA'** means the maximum A-weighted sound pressure level measured using Fast response.

'maximum extent of impact' means the total, cumulative, residual extent and duration of impact to a prescribed environmental matter that will occur over a project's life after all reasonable avoidance and reasonable on-site mitigation measures have been, or will be, undertaken.

'measures' includes any measures to prevent or minimise environmental impacts of the mining activity such as bunds, silt fences, diversion drains, capping, and containment systems.

'mine affected water':

(a) means the following types of water:

(i) pit water, tailings dam water, processing plant water;

(ii) water contaminated by a mining activity which would have been an environmentally relevant activity under Schedule 2 of the Environmental Protection Regulation 2019 if it had not formed part of the mining activity;

(iii) rainfall runoff which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated, excluding rainfall runoff discharging through release points associated with erosion and sediment control structures that have been installed in accordance with the standards and requirements of an Erosion and Sediment Control Plan to manage such runoff, provided that this water has not been mixed with pit water, tailings dam water, processing plant water or workshop water;

(iv) groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated;

(v) groundwater from the mine's dewatering activities; or

(vi) a mix of mine affected water (under any of paragraphs i)-v) and other water.

(b) does not include surface water runoff which, to the extent that it has been in contact with areas disturbed by mining activities that have not yet been completely rehabilitated, has only been in contact with:

(i) land that has been rehabilitated to a stable landform and either capped or revegetated in accordance with the acceptance criteria set out in the environmental authority but only still awaiting maintenance and monitoring of the rehabilitation over a specified period of time to demonstrate rehabilitation success, or

(ii) land that has partially been rehabilitated and monitoring demonstrates the relevant part of the landform with which the water has been in contact does not cause environmental harm to waters or groundwater, for example:

(a) areas that are been capped and have monitoring data demonstrating hazardous material adequately contained with the site; and

(b) evidence provided through monitoring that the relevant surface water would have met the water quality parameters for mine affected water release limits in this environmental authority, if those parameters had been applicable to the surface water runoff, or

(iii) both.

'mining activities' means the activities:

(a) all environmentally relevant activities authorised under this environmental authority.

'**mining lease'** has the same meaning as given in the *Mineral Resources Act 1989*

'**ML'** has the same meaning as '**mining lease**'

'minimise' is to reduce to the smallest possible amount or degree.

'NATA' means National Association of Testing Authorities, Australia.

'natural flow' means the flow of water through waters caused by nature.

'non-polluting' means having no adverse impacts upon the receiving environment.

'peak particle velocity (ppv)' means a measure of ground vibration magnitude which is the maximum rate of change of ground displacement with time, usually measured in millimetres/second (mm/s).

'prescribed environmental matters' has the meaning in section 10 of the *Environmental Offsets Act 2014*, limited to the matters of State environmental significant listed in schedule 2 of the Environmental Offsets Regulation 2014.

'progressive rehabilitation' means '**rehabilitation'** undertaken progressively or a staged approach to rehabilitation as mining operations are ongoing.

'project' means the Fairhill Coal Project (FHCP) assigned mining lease (ML) 700043.

'**project area'** means the designated areas within **Figure 1 - (Authorised Disturbance Areas).**

'protected area' means – a protected area under the:

(a) *Nature Conservation Act 1992*;

(b) a marine park under the *Marine Parks Act 1992*, or

(c) a World Heritage Area.

'receiving environment' in relation to an activity that causes or may cause environmental harm, means the part of the environment to which the harm is, or may be, caused. The receiving environment includes (but is not limited to):

(a) a watercourse;

(b) groundwater; or

(c) an area of land that is not specified in conditions **A6** to **A8** of this environmental authority.

The term does not include land that is specified in conditions **A6** to **A8** of this environmental authority.

'receiving waters' means the waters into which this environmental authority authorises releases of mine affected water.

'reference site (or analogue site)' may reflect the original location, adjacent area or another area where rehabilitation success has been completed for a similar biodiversity. Details of the reference site may be as photographs, computer generated images and vegetation models etc.

'referral dam' has the meaning given by section 341 of the *Water Supply (Safety and Reliability) Act 2008*.

'rehabilitation' the process of reshaping and revegetating land to restore it to a safe, stable, non-polluting landform.

'release event' means a surface water discharge from mine affected water storages or contaminated areas on the licensed place.

'representative' means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

'**reporting period'** means a calendar year.

'resampling event' means the resampling that is required to take place within **fourteen (14) days** of receipt of the results.

'RL' means reduced level, relative to mean sea level as distinct from depths to water.

'**ROM'** means run of mine of black coal.

'saline drainage' The movement of waters, contaminated with salts, as a result of the mining activity.

'sampling occasion' means the collection of a sample undertaken in accordance with the sampling frequency specified, and where an exceedance is recorded the '**sampling occasion'** together with the '**resampling event'**.

'self-sustaining' means an area of land which has been rehabilitated and has maintained the required acceptance criteria without human intervention for a period nominated by the administering authority.

'sensitive place' means:

(a) a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises, or

(b) a motel, hotel or hostel, or

(c) an educational institution, or

(d) a medical centre or hospital, or

(e) a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 1992* or a World Heritage Area, or

(f) a public park or gardens.

Note: The definition of 'sensitive place' and 'commercial place' is based on Schedule 1 of EPP Noise. That is, a sensitive place is inside or outside on a dwelling, library and educational institution, childcare or kindergarten, school or playground, hospital, surgery or other medical institution, commercial & retail activity, protected area or an area identified under a conservation plan under *Nature Conservation Act 1992* as a critical habitat or an area of major interest, marine park under *Marine Parks Act 2004*, park or garden that is outside of the mining lease and open to the public for the use other than for sport or organised entertainment. A commercial place is inside or outside a commercial or retail activity.

A mining camp (i.e., accommodation and ancillary facilities for mine employees or contractors or both, associated with the mine the subject of the environmental authority) is not a sensitive place for that mine or mining project, whether or not the mining camp is located within a mining tenement that is part of the mining project the subject of the environmental authority. For example, the mining camp might be located on neighbouring land owned or leased by the same company as one of the holders of the environmental authority for the mining project, or a related company. Accommodation for mine employees or contractors is a sensitive place if the land is held by a mining company or related company, and if occupation is restricted to the employees, contractors and their families for the particular mine or mines which are held by the same company or a related company.

For example, a township (occupied by the mine employees, contractors and their families for multiple mines that are held by different companies) would be a sensitive place, even if part or all of the township is constructed on land owned by one or more of the companies.

'significant residual impact' has the meaning in section 8 *Environmental Offsets Act 2014*.

'stable' in relation to land, means land form dimensions are or will be stable within tolerable limits now and in the foreseeable future. Stability includes consideration of geotechnical stability, settlement and consolidation allowances, bearing capacity (trafficability), erosion resistance and geochemical stability with respect to seepage, leachate and related contaminant generation.

'sub-surface disturbance' means the excavation below natural ground level including the removal of overburden and coal, and does not mean excavation associated with water management structures, or other infrastructure.

'suitably qualified and experienced person' means a person who is a Registered Professional Engineer of Queensland under the provisions of the *Professional Engineers Act 2002*, who has an **appropriate level of expertise** in the structures, geomechanics, hydrology, hydraulics and environmental impact of watercourse diversions.

An ***appropriate level of expertise*** includes:

- demonstrable competency, experience and expertise in:
  - investigation, design or construction of watercourses diversions;
  - operation and maintenance of watercourse diversions;
  - geomechanics with particular emphasis on channel equilibrium, geology and geochemistry;
  - hydrology with particular reference to flooding, estimation of extreme storms, water management or meteorology;
  - hydraulics with particular reference to sediment transport and deposition and erosion control;
  - hydrogeology with particular reference to seepage and groundwater;

  - solute transport processes and monitoring thereof; or
- sufficient knowledge and experience to certify that where the **suitably qualified and experienced person** has relied on advice and information provided by other **persons with relevant expertise***:
  - they consider it reasonable to rely on that advice and information; and
  - the expert providing the advice and information has knowledge, competency, suitable experience and demonstrated expertise in the matters related to watercourse diversions.

Persons with relevant expertise include:

- Geomorphologist: person who has demonstrated competency and relevant experience in stream geomorphology and watercourse diversions.
- Geotechnical expert: person who has demonstrated competency and relevant experience in geotechnical assessment of soil characteristics suitable for watercourse diversions.
- Vegetation expert: person who has demonstrated competency and relevant experience in the identification, role and function of vegetation with watercourses and adjoining floodplains, and has demonstrated competency and relevant experience in revegetation of watercourse diversions and adjoining floodplains.
- Groundwater expert: person who has demonstrated competency and relevant experience in groundwater systems.
- Surface water expert: person who has demonstrated competency and relevant experience in hydrology.
- Engineer: person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Persons Act 2002* or has similar qualifications under a respected professional registration association, and has demonstrated competency and relevant experience in design and construction of watercourse diversions.
- Soils expert: person who has demonstrated competency and relevant experience in soil classification including the physical, chemical and hydrologic analysis of soil.

'surface disturbance' means any disturbance, including excavation associated with water management structures or other infrastructure, other than sub-surface disturbance.

'the Act' means the *Environmental Protection Act 1994*.

'underground water' has the meaning given by schedule 4 of the *Water Act 200*0.

'waste' as defined in section 13 of the *Environmental Protection Act 1994*.

'waste and resource management hierarchy' has the meaning given by section 9 of the *Waste Reduction and Recycling Act 2011*.

'watercourse' has the same meaning given in the *Water Act 2000*.

'water quality' means the chemical, physical and biological condition of water.

'waters' includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), storm water channel, storm water drain, and groundwater and any part thereof.

'**WaTERS'** means the administering authority's Water Tracking and Electronic Reporting System (WaTERS) to submit surface and ground water monitoring and tracking data online, which can be accessed via following web link - www.business.qld.gov.au/industries/mining-energy-water/water/maps-data/submit-data.

'**year**" means a period of **twelve (12) months** beginning on 1 January.

'µS/cm' means micro siemens per centimetre.

Appendices

Appendix A - Rehabilitation Completion Criteria.

GOAL	OBJECTIVES	INDICATORS	COMPLETION CRITERIA
Domain 1 – Open Cut Depressions (including in-pit dumping)			
Safe for humans and animals.	The site is safe, structurally sound, and stable for humans and animals.	No exposed hazardous materials.	Coal seams are fully capped by at least two metres of competent and benign material. No evidence of spontaneous combustion post closure.
		No contaminated mine drainage.	Water quality in final depressions achieves stock water quality (ANZECC) demonstrated by surface water quality monitoring regime post closure. Monitoring of surface material quality has demonstrated that physical and chemical properties are safe and able to support the identified post closure land use. The area is not listed on the Contaminated Land Register and Environmental Management Register.
		Risk assessment documentation	Risk assessment documents potential risks and it is demonstrated that identified controls and mitigation measures have been successfully implemented post closure in accordance with relevant guidelines and Australian Standards such as ISO31000 Risk Management. Risk/s identified as per risk assessment must be low. Demonstrate that risk assessment documents risk and controls, and mitigation measures have been successfully implemented.
Stable	Low probability of subsidence, rock falls, slumping of slopes.	Geotechnically stable.	Slopes of the post mining landform are geotechnically stable as demonstrated by a geotechnical assessment conducted by a suitably qualified and experienced person. No slopes steeper than 25%. Slopes between 15% and 25% must consist of competent rock (as built design reports to demonstrate adequate cover and materials placement by a suitably qualified and experienced person). Vertical intervals between slope breaks are 10m so that the overall maximum length of slope will be approximately 40m. No evidence of slumping identified as per the geotechnical assessment conducted by a suitably qualified and experienced person.

GOAL	OBJECTIVES	INDICATORS	COMPLETION CRITERIA
	Landform design achieves appropriate erosion rates.	Rate of soil loss will be similar to sites in the general area surrounding the mine.	No evidence of the formation of erosion gullies and rill erosion. Benchmark erosion study completed by an appropriately qualified person, has been conducted and compares sediment run-off rates from the post closure landform versus the sediment run-off rates in undisturbed regions. The erosion rates on the post closure landform are similar to rates of reference sites.
	Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion. Ground cover of at least 90% compared to the reference sites.
Non-polluting	Water quality solute concentrations met. Low risk of contamination. No mine drainage issues. Mine affected water contained on site. Current and future groundwater quality values will be maintained at acceptable levels for downstream users.	Final depressions that collect water have no risk to fauna (i.e. meet stock drinking water contaminant limits at all monitoring locations).	Water quality of surface water runoff does not exceed limits outlined in Environmental Protection (Water) Policy 2009; Mackenzie River Sub-basin Environmental Values and Water Quality Objectives. Groundwater quality does not exceed limits outlined in Environmental Protection (Water) Policy 2009; Mackenzie River Sub-basin Environmental Values and Water Quality Objectives. Evidence that no significant decline in groundwater quality has occurred relative to historic (background) groundwater quality.
	Hazardous and toxic materials are not buried within the mine area unless encapsulated.	A life of mine hazardous materials register indicating the volumes.	An audit of the hazardous materials register has been conducted to identify the location, use and disposal of potentially hazardous materials during the life of the mine.

GOAL	OBJECTIVES	INDICATORS	COMPLETION CRITERIA
Able to sustain an agreed post-mining land use (Grazing area)	Agreed vegetation cover to achieve species richness and density comparable to surrounding grazing areas	Ecosystem functioning indicators water level and quality (dissolved oxygen, pH, temperature, salinity and nutrients (nitrogen and phosphorus) Habitat indicators: width, continuity, extent of shading and species composition.	Final Depressions are located outside of the AEP 1% flood zone. Landscape Function Analysis (LFA) monitoring demonstrates that vegetation cover, types and densities are comparable to relevant rehabilitation monitoring reference sites. Soil characteristics demonstrate acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the Australian Soil and Land Survey Handbook and capable of sustaining the identified post closure land use. Final landform demonstrates the ability to sustain grazing as the identified post closure land use. Landform suitable for grazing activities and provides suitable access to water for stock and able to sustain pre-mining grazing capacity. Certification by an appropriately qualified person, that the vegetation type and density of species in rehabilitated areas are suited to the soil composition, slope, aspect, climate and agreed post mining land use. Certification by an appropriately qualified person, that species in rehabilitated areas show evidence of flowering, viable seed setting, germination and emergence, and will continue to do so. Certification by an appropriately qualified person that the vegetation in rehabilitated areas includes the presence of species suitable and complimentary to the post-mining land use, and are at a density and composition comparable to reference sites.
		Regenerative capacity and resilience of the pastures	Pasture productivity recovers following natural and man-made events (e.g. grazing, fire, slashing, and drought).
	Weed infestation less than pre-mining conditions.	Weed and pest species absence.	Evidence that weed and pest species management is occurring where appropriate. The presence of weeds and pest species is no greater than the prevalence on the reference sites.
Domain 2 - Overburden Dump			
Safe for humans and animals	The site is safe, structurally sound, and stable for humans and animals	No exposed hazardous material.	Potential hazardous materials have been identified during mine life and removed or selected capping material has been applied with cover thickness appropriate to the contaminant as determined by appropriately qualified person.
		Risk Assessment documentation.	Risk assessment documents potential risks and it is demonstrated that identified controls and mitigation measures have been successfully implemented post closure in accordance with relevant guidelines and Australian Standards such as ISO31000 Risk Management.

GOAL	OBJECTIVES	INDICATORS	COMPLETION CRITERIA
			Risk/s identified as per risk assessment must be low. Demonstrate that risk assessment documents risk and controls, and mitigation measures have been successfully implemented.
Stable	Low probability of subsidence, rock falls, slopes slippage and inert material loss. No long-term erosion and geotechnical stability. Landform is capable of similar land use capabilities/suitable prior to disturbance. Self-sustaining vegetation cover	Structural and geotechnical adequacy No major erosion. No hanging material which carries a moderate risk of rock fall.	No slumping or gullying >0.5m within 5 years post closure. No slopes greater than 25%. Final landform demonstrates the ability to sustain grazing.
	Landform design achieves appropriate erosion rates.	Rate of soil loss will be similar to sites in the general area surrounding the mine.	No evidence of the formation of erosion gullies and rill erosion. Benchmark erosion study completed by an appropriately qualified person, has been conducted and compares sediment run-off rates from the post closure landform versus the sediment run-off rates in undisturbed regions. The erosion rates on post closure landform are similar to rates of reference sites.
	Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the site's characteristics including soil type, topography and climate. Ground cover of at least 90% compared to the reference sites.
Non-polluting	Water quality solute concentrations met. Low risk of contamination.	Overburden Spoil Dump water runoff have no risk to receiving environment (i.e. meet stock drinking water	Water quality of surface water runoff does not exceed limits outlined in Environmental Protection (Water) Policy 2009; Mackenzie River Sub-basin Environmental Values and Water Quality Objectives. Groundwater quality does not exceed limits outlined in Environmental Protection (Water) Policy 2009; Mackenzie River Sub-basin Environmental Values and Water Quality Objectives.

GOAL	OBJECTIVES	INDICATORS	COMPLETION CRITERIA
	No mine drainage issues. Mine affected water contained on site. Current and future groundwater quality values will be maintained at acceptable levels for downstream users.	contaminant limits at all monitoring locations).	Evidence that no significant decline in groundwater quality has occurred relative to historic (background) groundwater quality.
	Hazardous and toxic materials are not buried within the mine area unless encapsulated.	A life of mine hazardous materials register indicating the volumes	An audit of the hazardous materials register has been conducted to identify the location, use and disposal of potentially hazardous materials during the life of the mine.
Able to sustain an agreed post-mining land use (Low-density grazing area).	Agreed vegetation cover to achieve species richness and density comparable to surrounding grazing areas.	Ecosystem functioning indicators water level and quality (dissolved oxygen, pH, temperature, salinity and nutrients (nitrogen and phosphorus). Habitat indicators: width, continuity, extent of shading and species composition.	LFA monitoring demonstrates that vegetation cover, types and densities are comparable to relevant rehabilitation monitoring reference sites. Soil characteristics demonstrate acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the Australian Soil and Land Survey Handbook and capable of sustaining the identified post closure land use. Final landform demonstrates the ability to sustain grazing as the identified post closure land use. Landform suitable for grazing activities and provides suitable access to water for stock and able to sustain pre-mining grazing capacity. Certification by an appropriately qualified person, that the vegetation type and density of species in rehabilitated areas are suited to the soil composition, slope, aspect, climate and agreed post mining land use. Certification by an appropriately qualified person, that species in rehabilitated areas show evidence of flowering, viable seed setting, germination and emergence, and will continue to do so. Certification by an appropriately qualified person that the vegetation in rehabilitated areas includes the presence of species suitable and complimentary to the post-mining land use and are at a density and composition comparable to reference sites.

GOAL	OBJECTIVES	INDICATORS	COMPLETION CRITERIA
		Regenerative capacity and resilience of the pastures	Pasture productivity recovers following natural and man-made events (e.g. grazing, slashing, fire, and drought).
	Weed infestation less than pre-mining conditions.	Weed and pest species absence.	Evidence that weed and pest species management is occurring where appropriate. The presence of weeds and pest species is no greater than the prevalence on the reference sites.
Domain 4 - Water storage Infrastructure (to be retained)			
Safe for humans and animals	The site is safe, structurally sound, and stable for humans and animals	Risk Assessment documentation	Risk assessment documents potential risks and it is demonstrated that identified controls and mitigation measures have been successfully implemented post closure in accordance with relevant guidelines and Australian Standards such as ISO31000 Risk Management. Risk/s identified as per risk assessment must be low. Demonstrate that risk assessment documents risk and controls, and mitigation measures have been successfully implemented.
Stable	Water Storage is fit for purpose. No long-term erosion and geotechnical. instability.	Structurally and geotechnically stable and hydraulic adequacy. No major erosion.	Final structure is fit for purpose as demonstrated by a suitably qualified and experienced person. Spillway must have adequate capacity to safely manage a 1:100 year flood event. No evidence of the formation of erosion gullies and rill erosion. Benchmark erosion study completed by an appropriately qualified person, has been conducted and compares sediment run-off rates from the post closure landform versus the sediment run-off rates in undisturbed regions. The erosion rates on post-closure landform are similar to rates of reference sites.
Non-polluting	Acid mine drainage will not cause serious environmental harm. Water quality solute concentrations met. No mine drainage issues. Mine affected water contained on site.	Stock drinking water limits are met.	Water quality is within the ANZECC stock watering quality criteria as demonstrated by surface water quality monitoring regime post closure. No acid mine drainage or discharges. Surface water quality does not exceed limits outlined in Environmental Protection (Water) Policy 2009; Mackenzie River Sub-basin Environmental Values and Water Quality Objectives. Sediments/sludge removed from the structure.

GOAL	OBJECTIVES	INDICATORS	COMPLETION CRITERIA
	Low risk of contamination.	No seepage to groundwater.	Groundwater quality does not exceed limits outlined in Environmental Protection (Water) Policy 2009; Mackenzie River Sub-basin Environmental Values and Water Quality Objectives Evidence that no significant decline in groundwater quality has occurred relative to historic (background) groundwater quality.
Able to sustain an agreed post-mining land use.	Water quality in the dam is suitable for the post mining land uses.	Water quality Sediment Quality.	Water quality of surface water runoff does not exceed limits outlined in Environmental Protection (Water) Policy 2009; Mackenzie River Sub-basin Environmental Values and Water Quality Objectives. Sediment at the base of the dam complies with the levels outlined in the Draft Guidelines for the Assessment and Remediation of Contaminated Sites in Queensland or any later guideline.
	Post Mining landholder to retain infrastructure.	Legally binding agreement between entities.	Sign off by post mining landholder – asset transfer agreement; receiver of the structure is aware of risks. Water storage Infrastructure retained must not be a referral dam under the Water Supply (Safety and Reliability) Act 2008 Certification and condition report on all Water storage Infrastructure to be retained by post mining landholder.
Domain 3 and 5 - Mine infrastructure (Site office, ROM pad, and Workshop buildings), Access tracks and haul roads and Water storage Infrastructure – to be decommissioned			
Safe for humans and animals	The site is safe, structurally sound, and stable for humans and animals	Risk Assessment documentation.	Risk assessment documents potential risks and it is demonstrated that identified controls and mitigation measures have been successfully implemented post closure in accordance with relevant guidelines and Australian Standards such as ISO31000 Risk Management. Risk identified as per risk assessment must be moderate to low or additional mitigation measure implement. Demonstrate that risk assessment documents risk and controls, and mitigation measures have been successfully implemented
	Rehabilitation of exploration drill holes and groundwater monitoring bores.	All exploration drill holes and all monitoring bores established on the Mining Leases have been rehabilitated.	All exploration drill holes and monitoring bores have been rehabilitated in accordance with the applicable Australian Standard or guideline. All aquifers have been isolated where exploration drill holes or monitoring bores have intersected more than one water bearing strata, in accordance with the 'Minimum Construction Requirements for Water Bores in Australia' (Australian Government, February 2012) or latest edition.
Stable	Low probability of subsidence, rock falls, slumping or inert material loss	Structural and geo- technical adequacy.	Achieve geotechnically stable as demonstrated by a geotechnical assessment conducted by a suitably qualified and experienced person. Slopes of the post mining landform are similar to those pre mining topography.

GOAL	OBJECTIVES	INDICATORS	COMPLETION CRITERIA
	Landform design achieves appropriate erosion rates.	No major erosion. Rate of soil loss will be similar to sites in the general area surrounding the mine.	No evidence of the formation of erosion gullies and rill erosion. Benchmark erosion study completed by an appropriately qualified person, has been conducted and compares sediment run-off rates from the post closure landform versus the sediment run-off rates in undisturbed regions. The erosion rates on disturbed land are similar to rates of reference sites.
Non-polluting	Current and future groundwater quality values will be maintained at acceptable levels for downstream users	Surface water runoff from the rehabilitation areas meet water quality objectives.	Groundwater quality does not exceed limits outlined in Environmental Protection (Water) Policy 2009; Mackenzie River Sub-basin Environmental Values and Water Quality Objectives. Evidence that no significant decline in groundwater quality has occurred relative to historic (background) groundwater quality.
	Current and future surface water quality values will be maintained at acceptable levels for downstream users	Ecosystem functioning indicators water level and quality	Water quality of surface water runoff does not exceed limits outlined in Environmental Protection (Water) Policy 2009; Mackenzie River Sub-basin Environmental Values and Water Quality Objectives.
	Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented. Site is within agreed contaminant levels, suitable for the proposed post-mining land use being beef cattle grazing, and removed from Contaminated Land Register and/or Environmental Management Register.
Able to sustain an agreed post-mining land use of grazing	Agreed vegetation cover to achieve species richness and density comparable to surrounding grazing areas	Ecosystem functioning indicators water level and quality (dissolved oxygen, pH, temperature, salinity and nutrients (nitrogen and phosphorus) Habitat indicators: width, continuity, extent of shading and species composition	LFA monitoring demonstrates that vegetation cover, types and densities are comparable to relevant rehabilitation monitoring reference sites. Soil characteristics demonstrate acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the Australian Soil and Land Survey Handbook and capable of sustaining the identified post closure land use. Ground cover of at least 90% compared to the reference sites. Final landform demonstrates the ability to sustain grazing as the identified post closure land use. Landform suitable for stock and related stock management activities and able to sustain pre-mining grazing capacity.

GOAL	OBJECTIVES	INDICATORS	COMPLETION CRITERIA
			Certification by an appropriately qualified person, that the vegetation type and density of species in rehabilitated areas are suited to the soil composition, slope, aspect, climate and agreed post mining land use. Certification by an appropriately qualified person, that species in rehabilitated areas show evidence of flowering, viable seed setting, germination and emergence, and will continue to do so. Certification by an appropriately qualified person, which the vegetation in rehabilitated areas includes the presence of species suitable and complimentary to the post-mining land use, and are at a density and composition comparable to reference sites.
		Regenerative capacity and resilience of the pastures	Pasture productivity recovers following natural and man events (e.g. grazing, slashing, fire, and drought).
	Post Mining landholder to retain infrastructure and tracks	Legally binding agreement between entities	Sign off by post mining landholder – asset transfer agreement; receiver of the equipment or asset are aware of risks. Certification and condition report on all buildings to retain by post mining landholder.
	Weed infestation less than pre- mining conditions	Weed and pest species absence	Evidence that weed and pest species management is occurring where appropriate. The presence of weeds and pest species is no greater than the prevalence on the reference sites.

Figure 1 – Authorised Disturbance Areas

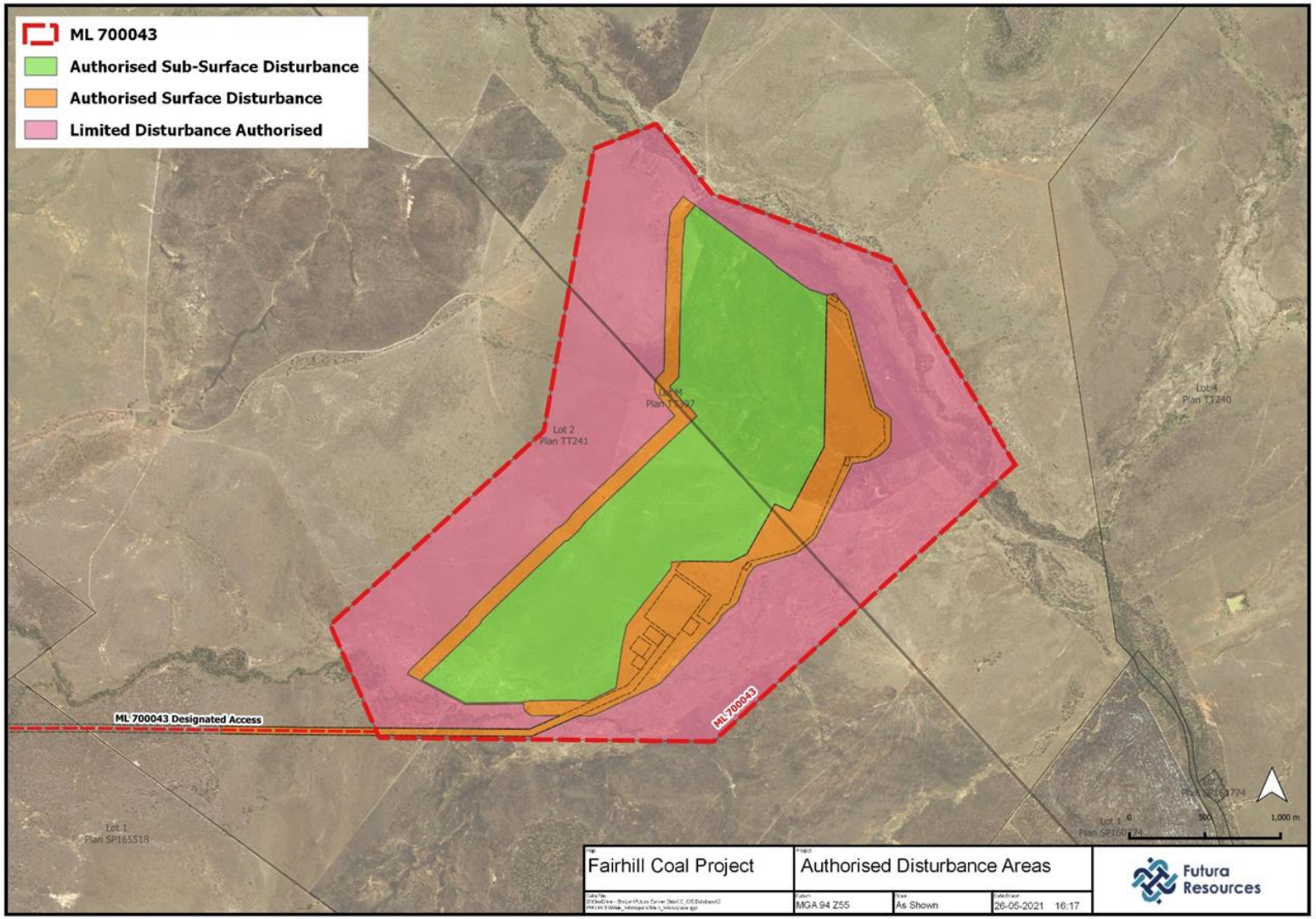
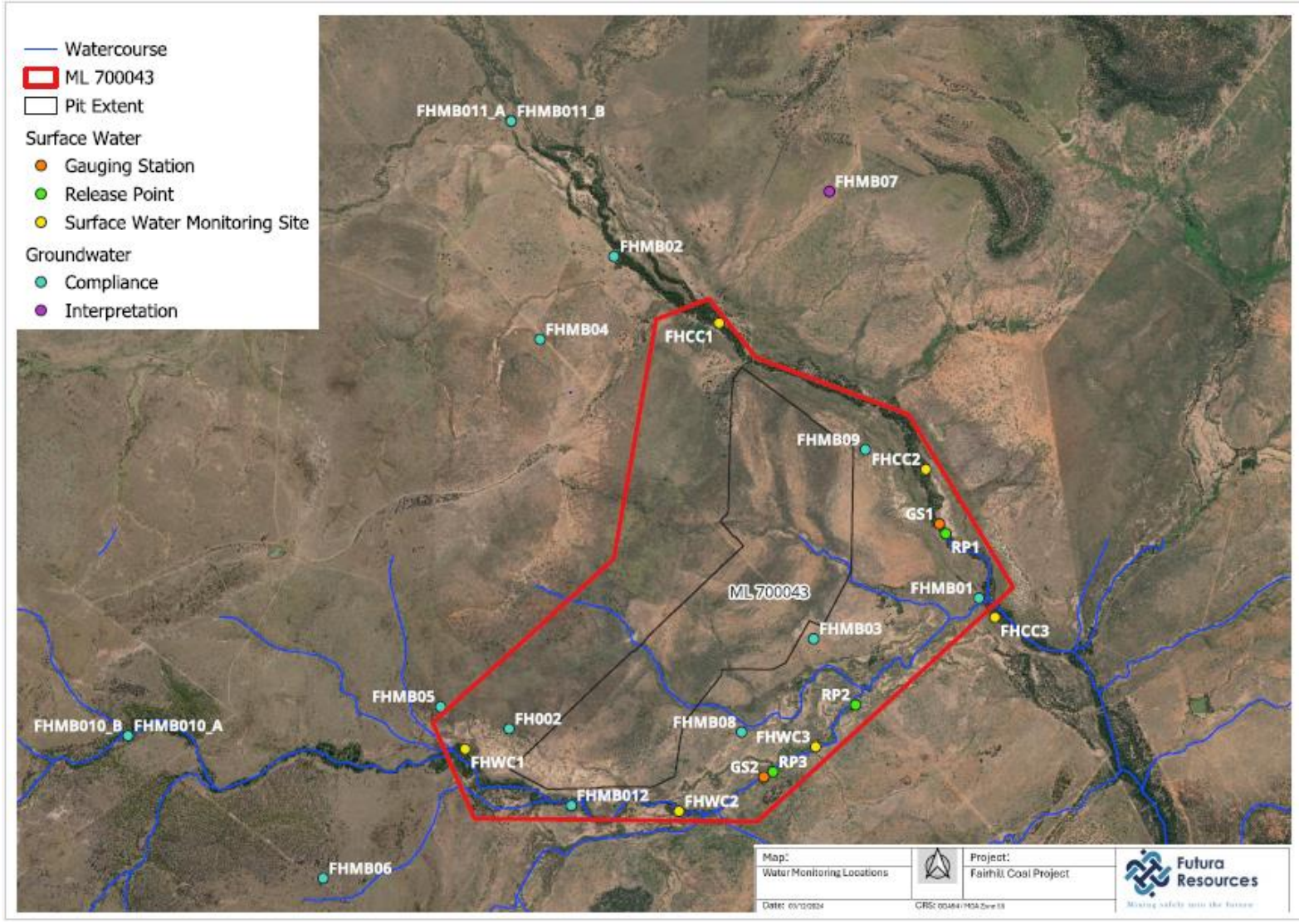


Figure 2 – Mine affected water release and water monitoring points



END OF ENVIRONMENTAL AUTHORITY

Appendix B BioCondition Benchmark for RE 11.3.25

Appendix B BioCondition benchmarks to be used when calculating BioCondition scores at impact and control sites

Attribute	Published Benchmark Value (v3.4)
Non-native plant cover	0
Tree species richness	4
Shrub species richness	4
Grass species richness	8
Forb/other species richness	13
Tree canopy height	23
Tree subcanopy height	11
Tree canopy cover	34
Tree subcanopy cover	12
Large tree threshold: eucalypt	53
Large tree threshold: non-eucalypt	26
Total number of large trees per ha: eucalypt	19
Total number of large trees per ha: non-eucalypt	13
Shrub canopy cover	7
Native perennial grass cover	35
Litter ground cover	21
Woody debris length per ha	473