Clarence Colliery - EPBC Referral 2024/09856

Preliminary Documentation

Prepared for Centennial Coal Company Pty Ltd

June 2026

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Centennial Coal Company Pty Ltd

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June 2026

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Approved by

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[redacted]

2 June 2026

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Executive Summary

Clarence Colliery Pty Ltd (Clarence), a subsidiary of Centennial Coal Company Pty Ltd (Centennial), owns and operates Clarence Colliery, an existing underground coal mine (initially approved in 1976) extracting from the Katoomba Seam.

Clarence Colliery is approximately 10 kilometres (km) east of Lithgow in New South Wales (NSW), in an area of extensive historical underground coal mining dating back to the 1880s and is east of the Centennial Springvale underground coal mine.

Centennial has been appointed as manager of operations at the Clarence Colliery on behalf of the Clarence Joint Venture, which comprises Coalex Pty Ltd (66%), Clarence Coal Investments Pty Ltd (29%) and Centennial Clarence Pty Ltd (5%) (collectively, Clarence JV), all of which are subsidiaries of Centennial. Partial extraction has been used at Clarence Colliery as a method of secondary extraction mining, primarily to control the amount of subsidence resulting from secondary coal extraction since around 1999.

On 11 April 2024, Centennial submitted an *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral for the secondary extraction (partial extraction) of coal from 918 and 920 Panels. On 18 July 2024, the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) determined that the extraction, and associated activities, are a controlled action (2024-09856).

On 31 August 2024 the Minister delegate requested a preliminary documentation assessment to support the 2024/09856 referral. The information required for the preliminary documentation assessment is included in Appendix A.

This preliminary documentation has been prepared in support of the environmental approvals application under the EPBC Act for the secondary extraction of the 918 Panel using partial extraction mining methods at Clarence Colliery (the proposed Action).

Centennial engaged with Commonwealth and State and government agencies on the application for the proposed secondary extraction of 918 and 920 Panels. Given stakeholder feedback received during this engagement, Centennial has subsequently deferred and removed the proposed mining of 920 Panel from the Extraction Plan and reduced the 918 Panel second workings footprint to avoid mining beneath key natural features.

On 20 October 2025, Centennial wrote to the Minister seeking a variation to the proposed action from that described in the original 2024/09856 referral. Centennial proposed removing the mining of 920 Panel from the controlled action. The variation to the proposed Action was approved by the delegate of the Minister on 14 November 2025. Therefore, the proposed Action, as varied, consists of only secondary extraction of 918 Panel.

Centennial proposes to carry out low impact underground mining, specifically, secondary extraction of the 918 Panel using the panel and pillar partial extraction using shortwall mining technique, as proposed in the 2024/09856 referral.

This preliminary documentation evaluates the potential impacts of the proposed Action on Matters of National Environmental Significance (MNES) under the controlling provisions of the EPBC Act, specifically:

- listed threatened species and ecological communities (sections 18 and 18A)
- a water resource, in relation to a large coal mining development (sections 24D and 24E).

Based on the outcomes of the subsidence, groundwater, surface water and geomorphological and assessments, the proposed Action is not expected to result in significant impacts on MNES. In particular, the assessments conclude that the proposed Action will not:

- cause a significant long term reduction in the size, extent or viability of the Temperate Highland Peat Swamps on Sandstone (THPSS) ecological community

- significantly fragment or modify habitat critical to the survival of THPSS or any EPBC listed species
- significantly affect groundwater dependent ecological processes that support THPSS
- significantly disrupt hydrological regimes through changes to groundwater availability, surface water flows or peat moisture conditions
- increase the risk of extinction of any listed species or ecological community
- materially alter the quantity, quality or availability of groundwater or surface water affecting aquifers, streams, swamps or associated ecosystems
- compromise the integrity of the Mount York Claystone aquitard separating shallow groundwater systems from deeper mine workings
- result in sustained groundwater depressurisation of the Burralow Formation or Banks Wall Sandstone
- increase zero flow days or low flow conditions in Pine Creek, Paddys Creek, Nine Mile Creek or Bungleboori Creek, or
- contribute to significant cumulative hydrological impacts when considered alongside historical and approved mining activities.

Accordingly, the proposed Action is not likely to have a significant impact on EPBC listed threatened species or ecological communities for the purposes of sections 18 and 18A of the EPBC Act, nor a significant impact on a water resource for the purposes of sections 24D and 24E of the EPBC Act.

TABLE OF CONTENTS

Executive Summary **ES.1**

1 Introduction **1**

1.1 Overview 1

1.2 Clarence Colliery approval background 1

1.3 Structure and content 4

1.4 Preparation of the preliminary documentation 5

2 Description of the action **6**

2.1 Variation to the controlled action 6

2.2 Mine planning and design 11

3 Preliminary documentation requirements **15**

3.1 Subsidence and height of fracturing 15

3.2 Groundwater 21

3.3 Water resources 28

3.4 Listed species and ecological communities 35

3.5 Summary of impacts 41

3.6 Impacts to Matters of National Environmental Significance 44

3.7 Ecologically sustainable development 45

3.8 Economic and social matters 47

3.9 Preliminary general content, format and style 49

4 References **51**

Appendices

Appendix A	Preliminary documentation requirements
Appendix B	Clarence Colliery – 918 Panel Subsidence Predictions and Impact Assessment Report (MSEC 2026)
Appendix C	Geotechnical, Subsidence and Caving Assessment for 918 Panel (SCT 2026)
Appendix D	Extraction Plan for 918 Panel: Groundwater Assessment (JBS&G 2026a)
Appendix E	Groundwater Correlation Assessment - Clarence Groundwater Monitoring Network (EMM 2026)
Appendix F	918 Panel Subsidence Monitoring Program Clarence Colliery (Centennial 2026b)
Appendix G	918 Panel Extraction Plan (Centennial 2026a)
Appendix H	918 Panel Watercourse Stability and Geomorphological Assessment (GHD 2026a)

Appendix I Referral documentation for Clarence Colliery – Secondary Extraction of the 918 and 920 Panels using Partial Extraction Methods (EPBC 2024/09856)

Tables

Table 1.1 Persons involved in the preparation of the preliminary documentation 5
Table 2.1 Variation changes 7
Table 3.1 Information required – subsidence and height of fracturing effects 16
Table 3.2 Information required – groundwater effects 23
Table 3.3 Information required – impacts on water resources 29
Table 3.4 Information required – comments from the Office of Water Science on the trigger action response plans and monitoring network 36
Table 3.5 Evaluation of ecologically sustainable development principles 46
Table 3.6 Stakeholder engagement undertaken since referral 48
Table 3.7 Community and Aboriginal stakeholder engagement undertaken since referral 49
Table 3.8 Preliminary documentation 49

Figures

Figure 1.1 Clarence Colliery regional location 2
Figure 1.2 Clarence Colliery 918 Panel site context 3
Figure 2.1 Clarence Colliery 2025/09856 referral – comparison of original to variation 9
Figure 2.2 Clarence Colliery 2025/09856 referral variation – natural and built features 10
Figure 2.3 Clarence Colliery partial extraction methods schematic 12

1 Introduction

On 11 April 2024, Centennial Coal Company Pty Limited (Centennial) submitted an *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) for the secondary extraction (partial extraction) of coal from 918 and 920 Panels of Clarence Colliery. On 18 July 2024, DCCEEW determined that the extraction, and associated activities, are a controlled action (2024/09856) under the following controlling provisions:

- Listed threatened species and communities (sections 18 and 18A), including potentially significant impacts on Temperate Highland Peat Swamps on Sandstone (THPSS) ecological community
- A water resource, in relation to unconventional gas development and large coal mining development (sections 24D and 24E).

It was determined that the project will be assessed by preliminary documentation.

Subsequently, Centennial removed 920 Panel from the proposed Action based on feedback from Commonwealth and State governments. Centennial sought a variation to remove 920 Panel from the proposed Action via a letter to the Commonwealth Minister for the Environment and Water (the Minister), dated 20 October 2025. The variation was approved by the Minister on 14 November 2025.

This preliminary documentation has been prepared to support the application under the EPBC Act for the secondary extraction of the 918 Panel at Clarence Colliery using panel and pillar partial extraction (PPPE) using shortwall mining technique (the proposed Action).

1.1 Overview

Clarence Colliery Pty Ltd (Clarence), a subsidiary of Centennial Coal Company Pty Ltd (Centennial), owns and operates Clarence Colliery, an underground coal mine extracting from the Katoomba Seam. Clarance Colliery was initially approved in 1976.

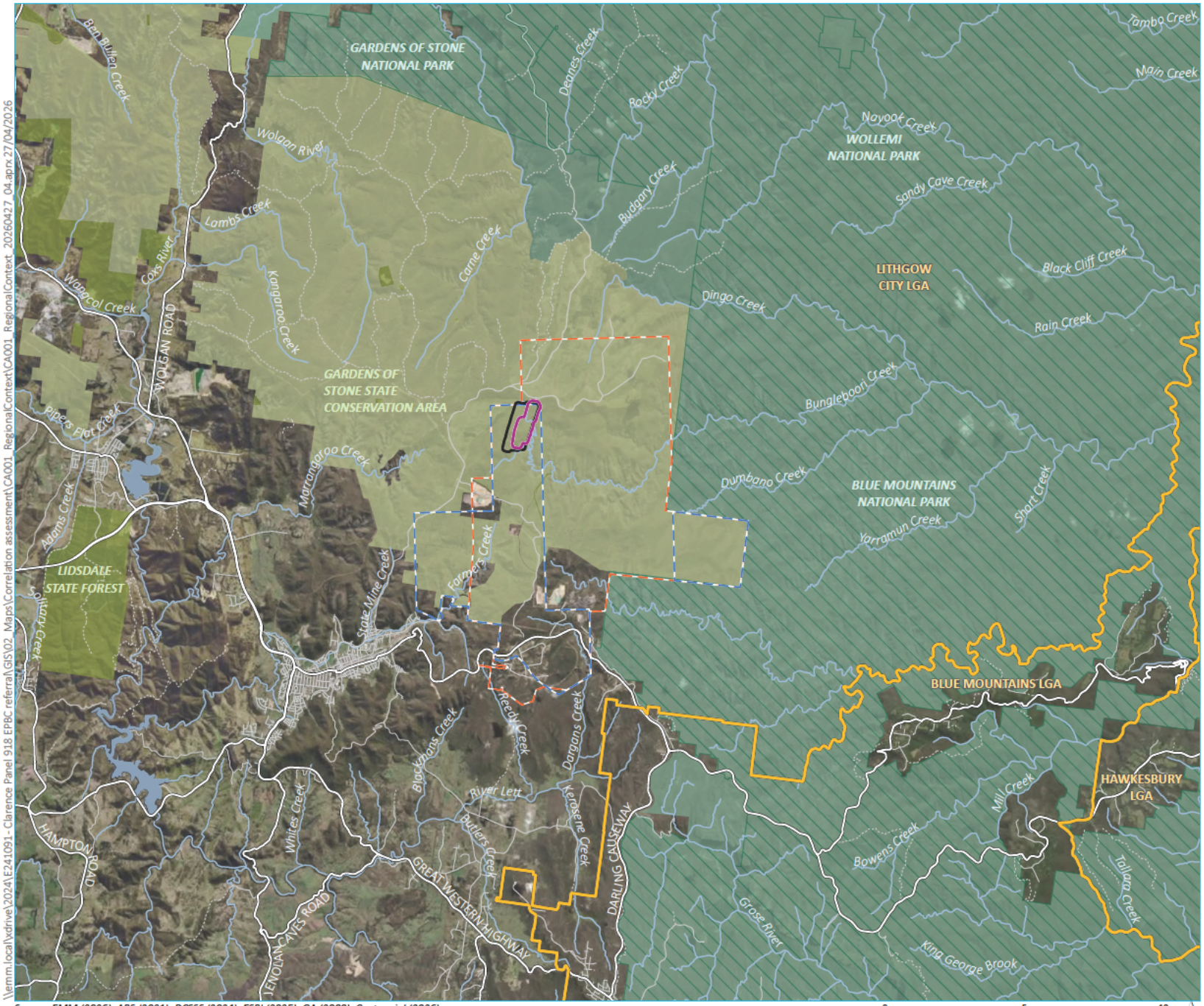
Clarence Colliery is approximately 10 kilometres (km) east of Lithgow in New South Wales (NSW), in an area of extensive historical underground coal mining dating back to the 1880s. The colliery is east of the Centennial Springvale underground coal mine (Figure 1.1), which is referred to as Springvale Mine.

Centennial has been appointed as manager of operations at Clarence Colliery on behalf of the Clarence Joint Venture, which comprises Coalex Pty Ltd (66%), Clarence Coal Investments Pty Ltd (29%) and Centennial Clarence Pty Ltd (5%) (collectively, Clarence JV), all of which are subsidiaries of Centennial. Partial extraction has been used at Clarence Colliery as a method of secondary extraction mining, primarily to control the amount of subsidence resulting from coal extraction.

1.2 Clarence Colliery approval background

1.2.1 Historical mining context

Underground mining in the Lithgow locality and Clarence Colliery extends back over 150 years, with the Valley of Clywdd and Eskbank mine operating from 1847, Oakey Park mine operating from 1888 to 1941 and State mine operating from 1919. Historical bord and pillar mining typically achieved around 85% coal extraction leading to subsidence fracturing. The historical mines and their proximity to the 918 Panel are shown in Figure 1.2.



KEY

- Proposed Action Area
- Original Action Area
- Clarence Colliery Holdings
- DA504-00 Mining Areas

Existing environment

- Major road
- Minor road
- Vehicular track
- Named watercourse
- Named waterbody
- Local Government Area
- National Park
- State Forest
- State Conservation Area
- Greater Blue Mountains World Heritage Area

INSET KEY

- Major road
- National Park
- State forest
- State Conservation Area

Source: EMM (2026); ABS (2021); DCSSS (2024); ESRI (2025); GA (2009); Centennial (2026)

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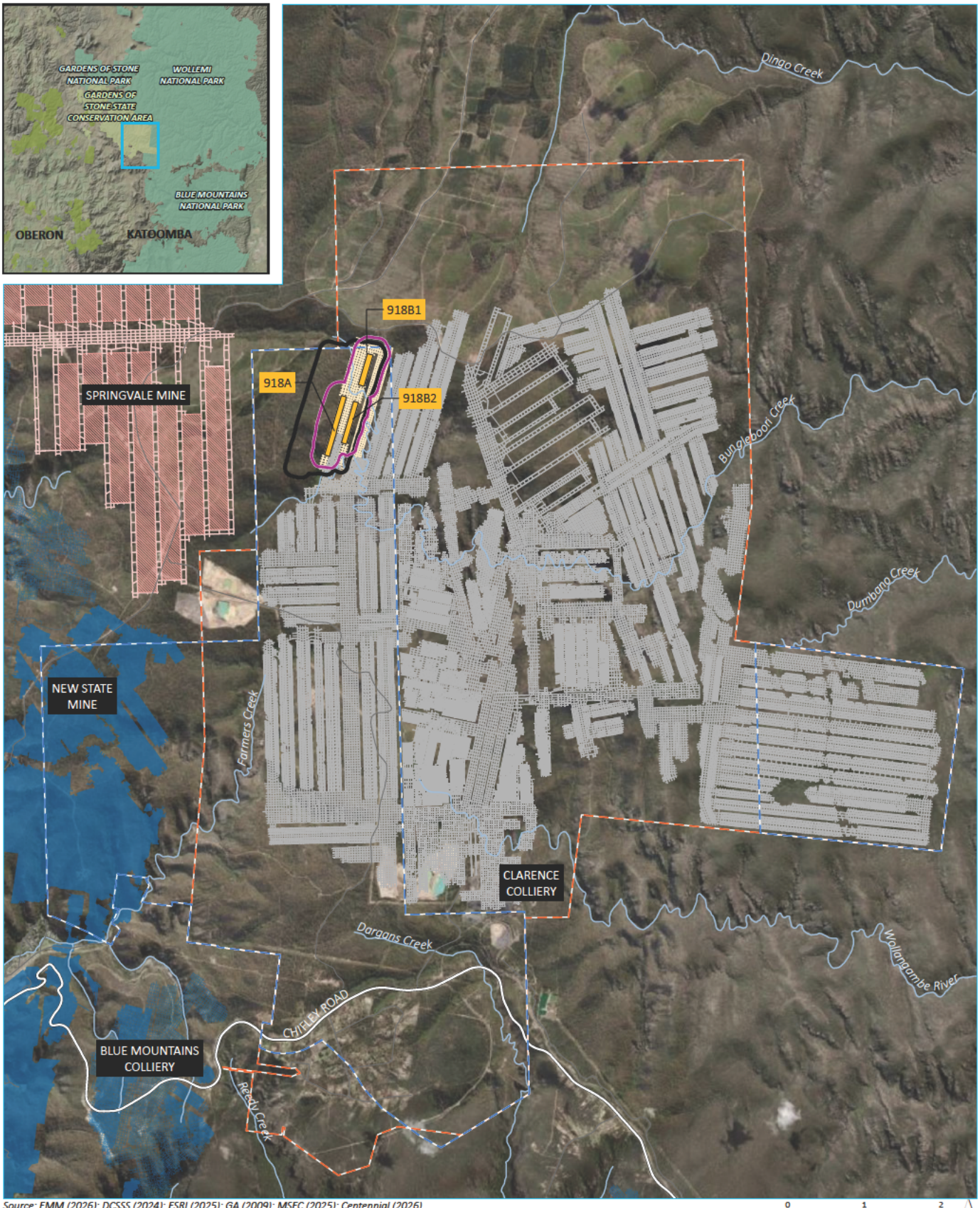
Clarence Colliery Regional Location

Clarence Colliery
Figure 1.1

EMM
creating opportunities



Source: EMM (2026); DCSSS (2024); ESRI (2025); GA (2009); MSEC (2025); Centennial (2026)

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KEY

- Proposed Action Area
- Original Action Area
- DA504-00 Mining Areas
- Clarence Colliery Holdings
- Existing Springvale workings
- Adjacent mine workings
- Existing Clarence Colliery workings
- Proposed 918 Panel first workings
- Revised 918 Panel second workings/disturbance footprint

Existing environment

- Major road
- Minor road
- Named watercourse

INSET KEY

- National Park
- State Forest
- State Conservation Area

Clarence Colliery 918 Panel
Site context

Clarence Colliery
Figure 1.2

EMM
creating opportunities

Springvale Mine is west of Clarence Colliery and is also owned and operated by Centennial. Springvale Mine commenced operations in 1995 and currently extracts coal using first workings and longwall mining techniques. The proximity of mining at Springvale Mine to Clarence Colliery is also shown on Figure 1.2.

The groundwater context for Clarence Colliery reflects the extensive historical mining in the area resulting in a highly modified groundwater regime, with extensive historical depressurisation and recovery.

1.2.2 NSW State approval background

Clarence Colliery operates under three main NSW development consents:

- IRM.GE.76 issued in 1976 by Blaxland Shire Council (now Lithgow City Council) for the construction of surface facilities and mining operations
- DA 174/93 issued in 1994 by Lithgow City Council for the extension of underground mining operations and other surface activities
- DA 504-00 issued in 2005 by the then Minister of Infrastructure, Planning and Natural Resources (now the Department of Planning, Housing and Infrastructure (DPHI)) to extend operations into Mining Lease (ML) 1583.

Under DA 504-00 (shown on Figure 1.2), Clarence Colliery is approved to extract 3 million tonnes per annum (Mtpa) of coal through underground partial extraction mining, until 31 December 2026. Centennial is seeking approval of Modification 11 to DA 504-00 to allow continued mining operations for 5 years to 31 December 2031. The modification application was submitted to DPHI on 30 January 2026 for public exhibition, assessment and determination.

DA 504-00 stipulates the subsidence criteria that must not be exceeded for partial extraction:

- 100 mm vertical subsidence
- 3 mm/m of tilt
- 2 mm/m of horizontal strain (compressive and tensile).

1.2.3 EPBC Act approval background

Centennial has previously lodged two referrals for coal extraction at Clarence Colliery using the first workings and partial pillar extraction technique:

- EPBC 2009/4882 – expansion of mining into the 700 Area by partial extraction mining (bord and pillar), the referred action was deemed not to be a controlled action.
- EPBC 2012/6446 – expansion of mining using partial pillar extraction (bord and pillar), the referred action was deemed not to be a controlled action provided it was undertaken in the manner set out in the referral decision.

1.3 Structure and content

On 31 August 2024, DCCEEW issued a request for information (RFI) for preliminary documentation for Secondary Extraction of the 918 and 920 panels.

This preliminary documentation and supporting technical reports respond to this RFI to further assess the likely impacts on Matters of National Environmental Significance (MNES). Having varied the Action to remove 920 Panel, it addresses the RFI matters pertinent to 918 Panel.

Centennial has prepared a 918 Panel Extraction Plan in accordance with NSW State Government requirements. The 918 Panel Extraction Plan is included as an appendix to the preliminary documentation as a number of the technical assessments in the plan provide information relevant to the preliminary documentation.

1.4 Preparation of the preliminary documentation

The purpose of the preliminary documentation is to enable stakeholders and the Minister to understand the environmental consequences of the proposed development on protected matters, including MNES. This preliminary documentation has been prepared in accordance with the general content, format and style framework (Appendix A).

This preliminary documentation has been prepared by the persons listed in Table 1.1.

Table 1.1 Persons involved in the preparation of the preliminary documentation

Name	Position	Qualification
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

2 Description of the action

The proposed Action is the secondary extraction of coal from the 918 Panel, using PPPE using shortwall equipment.

No other changes to the approved mining operations at Clarence Colliery were sought as part of the referral variation and no vegetation clearing is proposed.

2.1 Variation to the controlled action

2.1.1 Overview

The proposed Action has been developed and revised using an iterative design process since project inception in 2019 to balance economic outcomes for the proposed Action and reduce impacts on MNES. The avoid-minimise-mitigate-offset hierarchy was adopted:

- avoid land disturbance through the design of the proposed Action components, particularly focusing on the protection of areas of high conservation value
- protect cultural heritage values
- avoid and minimise direct and indirect impacts on the Gardens of Stone State Conservation Area (SCA)
- application of an adaptive management approach, including Trigger Action Response Plans (TARPs) to respond to monitoring results.

In July 2024, DCCEEW determined that the extraction of 918 and 920 Panels, and associated activities, are a controlled action (2024/09856). The controlled action decision raised concerns regarding uncertainty associated with the mining technique (PPPE using shortwall). In response, the risk of impacts to MNES and has been significantly reduced by avoiding direct mining beneath most THPSS and third order streams, and by reducing proposed Action area and disturbance footprint. It should be noted that no vegetation clearing is proposed and the disturbance footprint corresponds to the revised second workings areas on Figure 2.1 and Figure 2.2.

In November 2025, the controlled action was varied to remove 920 Panel and parts of 918 Panel. The design changes are illustrated in Figure 2.1 and Figure 2.2.

2.1.2 Action revisions

The original 2024/09856 referral included secondary extraction of four sub panels (918A, 918B, 920A, 920B) equating to 48.62 hectares (ha) of secondary extraction (disturbance footprint). Within the proposed Action area were the following surface features:

- 5.43 ha of THPSS, including Lower Nine Mile Shrub and Hanging Swamps and Paddys Creek Shrub and Paddys Creek Hanging Swamps
- three archaeological sites including two isolated artefacts/finds (quartz flakes considered to be of low archaeological significance and high cultural significance) and one modified scarred tree (considered to be of high archaeological significance and very high cultural significance)
- 25 steep slope features comprising seven cliffs, ten minor cliffs and eight pagodas.

Centennial has redesigned the proposed Action to reduce the likelihood of natural feature impacts primarily based on the results of additional subsidence and groundwater modelling results and stakeholder consultation.

The revised proposed Action:

- reduces the proposed Action area and disturbance footprint area
- removes 920A and 920B subpanel second workings
- removes second workings (PPPE shortwall) directly beneath the majority of THPSS communities (Lower Nine Mile Shrub and Hanging swamps and Paddys Creek Shrub swamp) except for 0.01 ha beneath Paddys Creek Hanging swamp
- removes 918 Panel second workings directly beneath third order stream sections of Bungleboori Creek
- removes 918 Panel second workings directly beneath third order stream sections of Paddys Creek
- removes 918 Panel second workings directly beneath one Aboriginal site
- removes 918 Panel second workings directly beneath one cliff
- reduces 918A and 918B2 subpanel widths from 85 metres (m) to 75 m
- reduces 918B1 subpanel width from 85 m to 83 m
- removes 1.02 million tonnes (Mt) of second workings run-of-mine (ROM) coal extraction.

The original 2024/09856 referral was estimated to commence on 1 May 2024 and finish on 1 October 2025. The revised proposed Action is estimated to commence in December 2026 and finish in November 2027. The rate, start date and finish dates of extraction in each subpanel are subject to mining conditions encountered and life of mine plan scheduling changes which is reflected in the estimated start and finish dates in Table 2.1.

The design changes are summarised in Table 2.1.

Table 2.1 Variation changes

Aspect	Original 2024/09856 referral	Variation	Difference (Reduction[1]/increase/nil)
Person/organisation proposing action	Clarence Colliery Pty Ltd	No change	Nil
Industry type	Mining	No change	Nil
Jurisdiction	NSW	No change	Nil
Location	Clarence Colliery Road, Clarence NSW 2790	No change	Nil
Estimated start date of proposed action	1/5/2024	1/12/2026	Additional 2.4 years due to delays in gaining statutory approvals
Estimated finish date of proposed action	31/12/2026	31/12/2031	Additional 5 years to allow for possible operational delays
Mining method and technique	Underground coal mining – partial extraction - PPPE (shortwall)	No change	Nil

Aspect	Original 2024/09856 referral	Variation	Difference (Reduction[1]/increase/nil)
Second workings panels	918A, 918B, 920A, 920B	918A, 918B1, 918B2	Removal of 920A and 920B subpanels. Splitting of 918B subpanel into 918B1 and 918B2
PPPE shortwall design – subpanel void width	918A: 85 m 918B: 85 m 920A: 85 m 920B: 85 m	918A: 75 m 918B1: 83 m 918B2: 75 m	2 m to 10 m reduction in void widths
Second workings – tonnes to be extracted	1.37 Mt	0.35 Mt	1.02 Mt reduction (74.5%)
Proposed Action area	144.90 ha	87.50 ha	57.40 ha reduction (39.6%)
Disturbance footprint[2]	48.62 ha	12.64 ha	35.98 ha reduction (74.0%)
THPSS within the proposed Action area	5.43 ha	2.26 ha	3.21 ha reduction (58.4%)
THPSS within the disturbance footprint	2.15 ha	0.01 ha	2.14 ha reduction (99.5%)
Archaeological sites within the Action area	3 sites	3 sites	Nil
Archaeological sites within the disturbance footprint	1 site	1 site	Nil
Cliff and pagoda features within the Action area	25 (7 cliffs, 10 minor cliffs and 8 pagodas)	15 (5 cliffs, 7 minor cliffs and 3 pagodas)	Reduction of 10 features (40%)
Cliff and pagoda features within the disturbance footprint	1 (1 cliffs, 0 minor cliffs and 0 pagodas)	0 (0 cliffs, 0 minor cliffs and 0 pagodas)	Reduction to no features (100%)

Notes: 1. Percentage reduction = (original – varied)/original x 100.

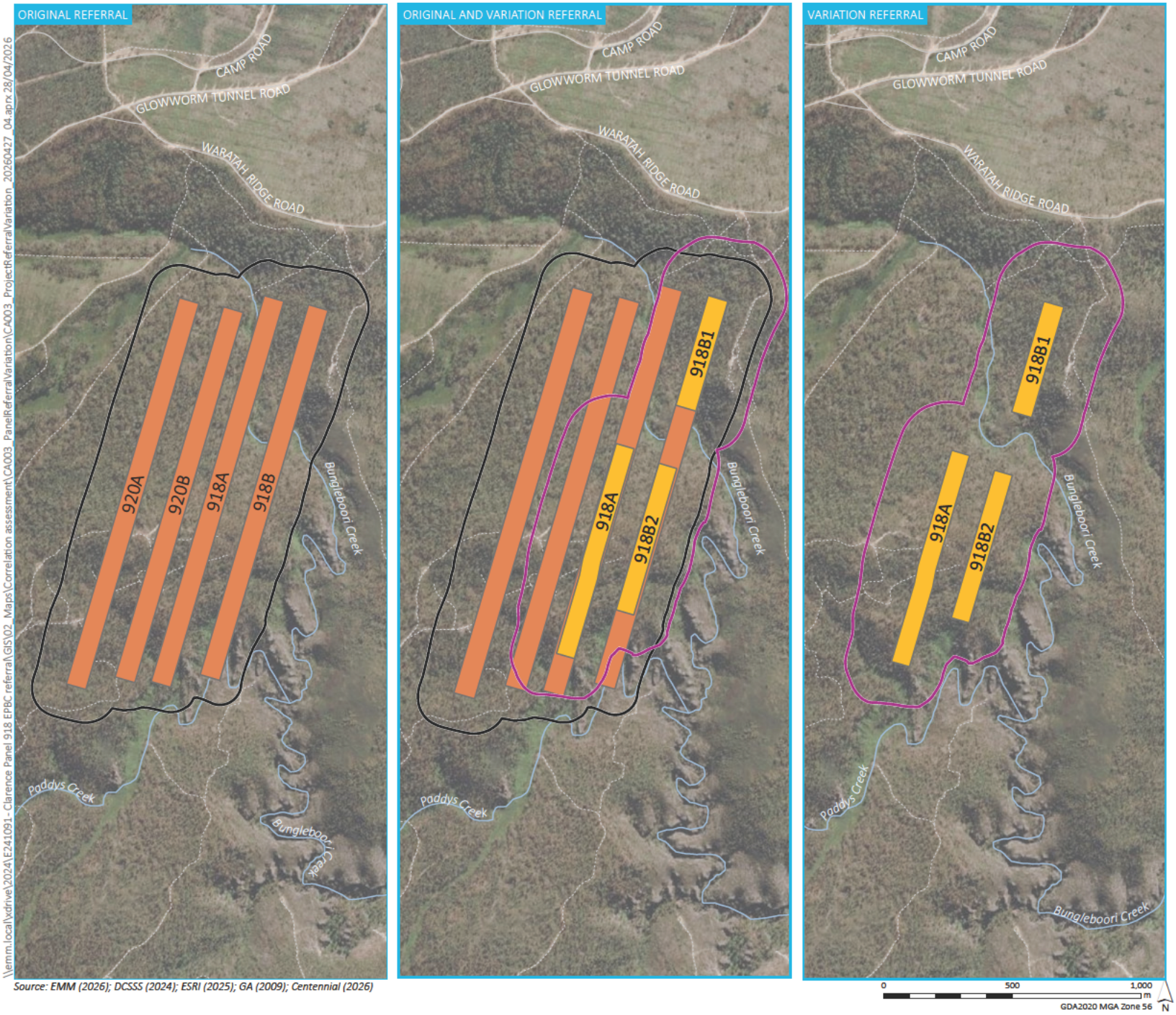
2. Disturbance footprint corresponds to the second workings areas. No vegetation clearing is proposed.

The surface extent of the varied action (the 'proposed Action area') is defined based on the angle of draw (the angle at which subsidence spreads out towards the limit of subsidence at the surface) and the subsidence depth. The proposed Action area is defined by the greater of the 35° angle of draw and the predicted 20 mm subsidence contour. The predicted 20 mm subsidence contour is generally located inside the 35° angle of draw, with the exception of a small section in the south-eastern corner near the bend on Paddys Creek (Appendix B).

The proposed Action Area is 87.5 ha. The disturbance footprint (the areas within the Action area which may be directly impacted or indirectly impacted by the second workings) is 12.64 ha.

No vegetation clearing is proposed as part of the proposed Action.

Overall, the revised mine plan has resulted in a reduction of the proposed Action area by approximately 57.4 ha compared to the proposed Action area identified in the original 2024/09856 referral.



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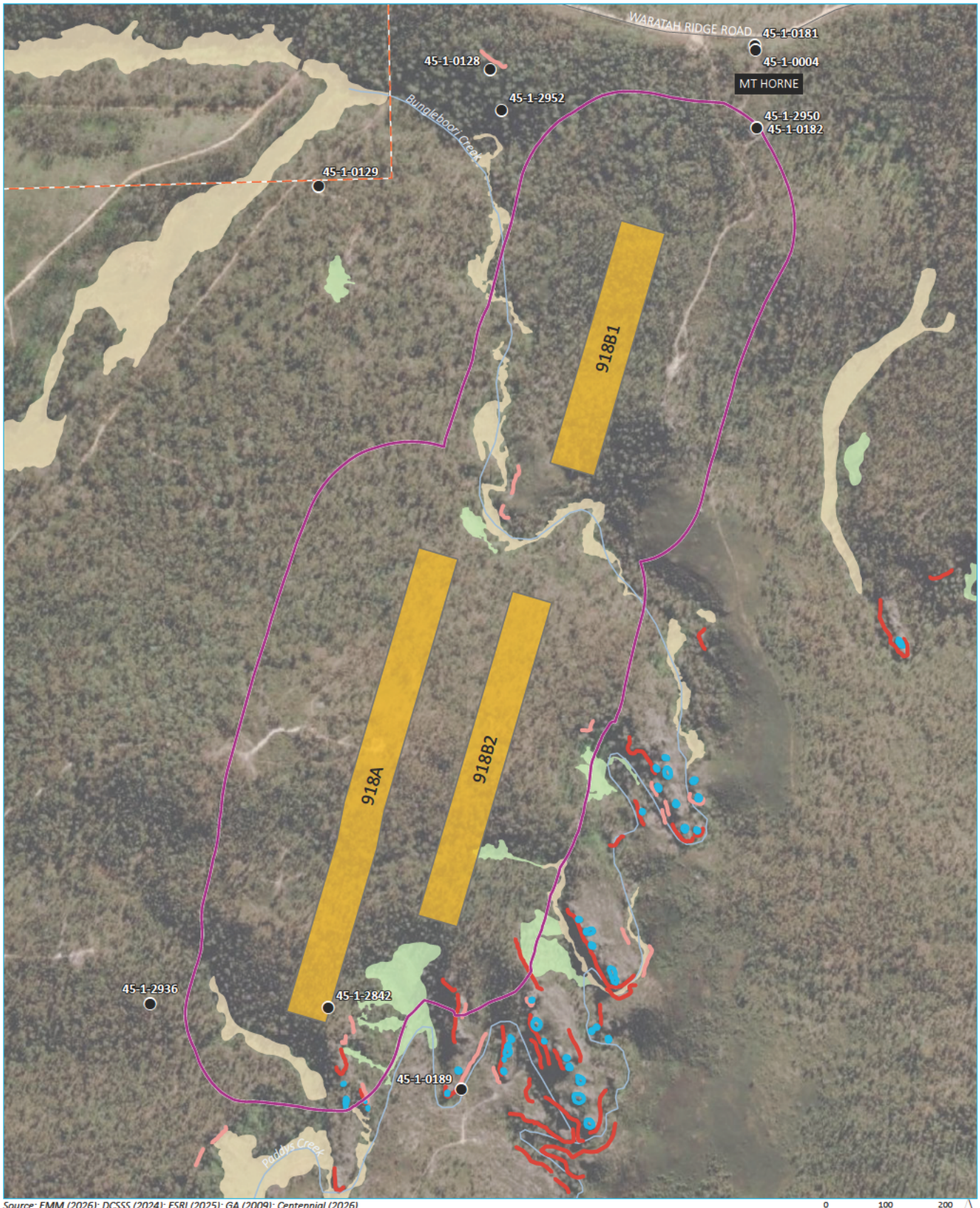
Source: EMM (2026); DCSSS (2024); ESRI (2025); GA (2009); Centennial (2026)

Clarence Colliery 2025/09856
Referral Original Referral and Referral Variation Comparison

Clarence Colliery
Figure 2.1

EMM
creating opportunities



Source: EMM (2026); DCSSS (2024); ESRI (2025); GA (2009); Centennial (2026)

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KEY

- Proposed Action Area
- Revised 918 Panel second workings/disturbance footprint
- DA 504-00 consent boundary
- Aboriginal heritage site

Existing environment

- Minor road
- Named watercourse

Cliff mapping

- Cliff
- Minor cliff
- Pagoda

Swamp

- Hanging
- Shrub

Clarence Colliery
2025/09856 Referral Variation – Natural and Built Features

Clarence Colliery
Figure 2.2

EMM
creating opportunities

2.2 Mine planning and design

2.2.1 Strategic design

Since 1998, the Clarence Colliery design strategy to protect THPSS has involved:

- maintaining the integrity of the Mount York Claystone (MYC) aquitard such that the shallow groundwater system associated with the Burralow Formation is unaffected by mining
- limiting vertical subsidence and tilts, such that surface/near-surface water flow is unaffected
- creating stable remnant coal pillars to support the overlying strata
- avoiding surface cracking by maintaining tensile and compressive strains of <2 mm/m consistent with government guidelines (DoE 2014).

The proposed partial extraction of 918 Panel continues this strategy to avoid impacts to THPSS.

Paddys Creek Shrub Swamp, Paddys Creek Hanging Swamp, Lower Nine Mile Shrub and Hanging Swamp are THPSS groundwater dependent ecosystems within the proposed Action area. The proposed Action area is characterised by outcropping of the Burralow Formation, the Banks Walls Sandstone and Quaternary soils, alluvium and colluvium including peat accumulations. McHugh (2013) observed that outcropping of the Burralow Formation, with interbedded sedimentary sequences and claystone aquitards (with seven major aquitards referred to as YS1 to YS6), perform a vital function in the presence and persistence of shrub and hanging swamps on the Newnes Plateau. The MYC aquitard generally lies 110–120 m above the coal seam and the overlying Burralow Formation aquitards generally lie 175–210 m above the coal seam.

Additional consultation and mine design amendments were conducted throughout the development of the 918 Panel Extraction Plan and resulted in a proposed mine design that actively avoids partial extraction second workings beneath Pine Swamp, Nine Mile Swamp, Paddys Creek Swamp and Lower Nine Mile Swamp.

2.2.2 Mining methods

The PPPE using shortwall mining technique is a partial extraction mining method. The coal resource recovery for 918 Panel is 52%. The remaining coal is being retained in situ to support the overlying strata to provide regional support to the overburden, minimising surface subsidence.

The PPPE using shortwall mining technique proposed differs slightly from the PPPE method previously referred (EPBC 2012/6446 and EPBC 2009/4882). Both mining techniques employ partial extraction mining methods, and both mining techniques are predicted to result in ≤100 mm of subsidence. However, the two techniques have different design layouts as shown in Figure 2.3. The proposed PPPE mining methodology also requires the use of additional equipment not previously used for partial pillar extraction, being hydraulic supports.

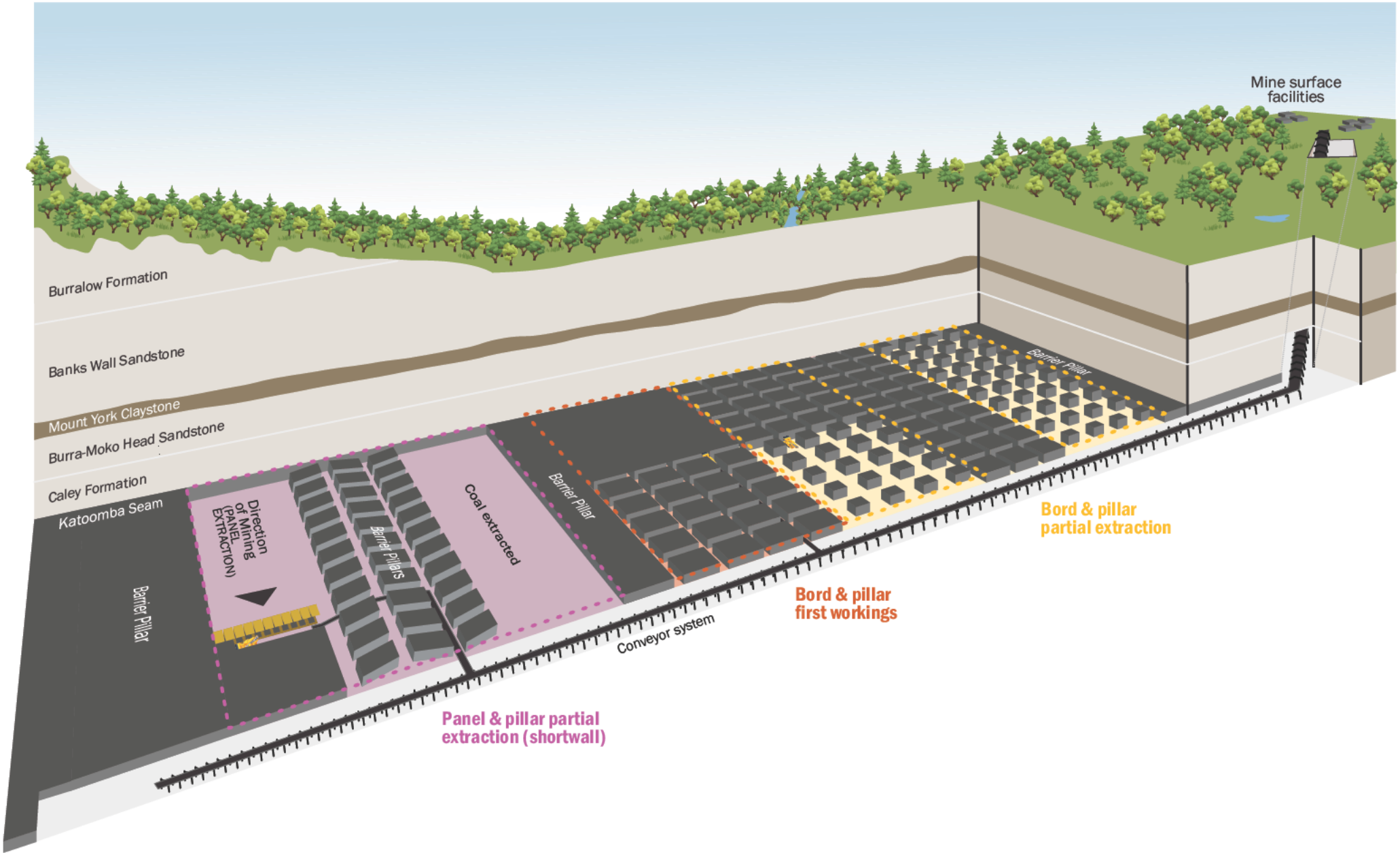

Figure 2.3 Clarence Colliery partial extraction methods schematic

i Panel and Pillar Partial Extraction (using Shortwall) mining method

Panel and Pillar Partial Extraction (using Shortwall) mining is a variation on bord and pillar mining, which uses a continuous miner to extract coal from the shortwall face. Shortwall mining has previously been used in Australia in the 1960s to 1980s and internationally but is not currently in use in Australia.

In the 918 Panel mining layout secondary extraction of coal is planned from either side of the 918 Panel first workings, four heading, spine pillar panel (spine panel). In the 918 Panel layout the shortwall panels would be separated from the adjacent 900 and 919 panels by barrier pillars.

The continuous miner is operated remotely by a miner driver. Shortwall mining uses hydraulic supports to protect personnel so that they are not walking under unsupported roof when accessing the coal face or the continuous miner. The supports are advanced behind the continuous miner during the extraction of coal. The length of the shortwall face is determined by the number of installed hydraulic supports at the start of each extraction panel and the final cut length of the continuous miner at the final support.

For the proposed Clarence shortwall, panel development (or first workings) is to be bord and pillar first workings using a continuous miner/s to develop a four heading layout. It is noted for clarity, that first workings do not form part of the proposed Action.

The shortwall mining system allows secondary extraction on advance and retreat. This means that as the spine pillar panel is developed, a shortwall can be established adjacent to either side of the spine pillar panel and advanced as a parallel process to development of the spine pillar panel. Following completion of the spine pillar panel and the advancing shortwall panel, a retreating shortwall panel may be established on the other side of the first workings panel.

ii PPPE using shortwall mining technique at Clarence Colliery

The mined coal seam thickness at Clarence has historically ranged between 2.5 m–4 m. The mined seam thickness in the 918 second workings ranges between 1.9–2.3 m thick. It is proposed to use the shortwall mining technique at Clarence due to thinning of the coal seam in the remaining mining areas.

The PPPE mining method is illustrated in Figure 2.3.

PPPE using shortwall mining technique provides improved safety for underground miners and improved efficiency:

- Operator safety: the shortwall system has been designed for remote operation of extraction (lifting) operations, with operators generally positioned in the access roadways which would be driven at a height of 2.5 m, rather than on the shortwall face, which would extract only the 1.7–2.5 m coal seam and have hydraulic shields present which would further reduce clearance.

- Mine subsidence and environmental outcomes: the mine design for the 918 second workings is based on similar void widths to existing Clarence double sided lifting operations, with larger spine and barrier pillars and a thinner extraction section. Subsidence assessments have been conducted using empirical and numerical methods and indicate that the 100 mm subsidence limit would not be exceeded.

- Low seam extraction efficiency and economic recovery of coal resource: the shortwall mining technique improves the efficiency and economic viability of mining operations by reducing roadway development required to access mining reserves and improving the development to extraction ratio.

The PPPE mining technique would be conducted according to detailed mine designs, developed to achieve the partial extraction subsidence criteria stipulated within DA 504-00:

- 100 mm vertical subsidence

- 3 mm/m of tilt
- 2 mm/m of horizontal strain (compressive and tensile).

3 Preliminary documentation requirements

Centennial engaged technical specialists to prepare subsidence, geotechnical and environmental assessments for each of the relevant disciplines to assess the proposed Action and to address the DCCEEW RFI. These reports are referenced in the following sections of this report and are included in the appendices.

The responses in the sections below follow the structure of the RFI.

3.1 Subsidence and height of fracturing

3.1.1 Subsidence and height of fracturing effects

Although DCCEEW acknowledged the comprehensiveness of the referral documentation, DCCEEW noted that there is the possibility of underprediction of subsidence and height of fracturing effects including:

- shortwall panel extraction has not previously been undertaken and, therefore, there is no monitoring data to support the conclusion reached
- previous subsidence movements from panel extraction nearby have not been adequately assessed
- uncertainty analyses for some parameters were not sufficiently conservative to support the conclusion of negligible effects
- previous modelling undertaken to predict likely subsidence effects has underestimated the subsidence that actually occurred (e.g. Airly; and Clarence 906, 908 and 910 Panels).

DCCEEW sought clarification and further information on cumulative effects and the conservativeness of model assumptions to support the conclusion that the proposed mine design would not result in significant impacts to water resources and, by extension, groundwater dependent ecosystems.

3.1.2 Subsidence and height of fracturing assessments

Technical assessments which consider subsidence impacts and height of fracturing have been updated in consideration of the varied action (including reduced disturbance footprint and proposed Action area) and to address the RFI:

- *Clarence Colliery – 918 Panel Subsidence Predictions and Impact Assessment Report* (Mine Subsidence Engineering Consultants (MSEC) 2026). This report is included as Appendix B of this document.
- *Geotechnical, Subsidence and Caving Assessment for 918 Panel* (Strata Control Technology (SCT) 2026). This report is included as Appendix C of this document.

3.1.3 Request for information responses

RFI requirements relating to subsidence predictions and height of fracturing and where they are addressed in the preliminary documentation are shown in Table 3.1.

Table 3.1 Information required – subsidence and height of fracturing effects

RFI ID	Information required	Reference to preliminary documentation response
1.1	**Spatial pattern of subsidence effects** The spatial pattern of subsidence effects as shown by the contours in Figure 11 of the MSEC report shows that the 80 mm maximum subsidence contour occurs as two distinct areas. If the subsidence monitoring line is located outside areas where maximum subsidence is predicted, it may not be sensitive enough to the subsidence risk to inform the trigger action response plan.	As detailed in Section 2.1 and shown on Figure 2.2 of this report, the mine plan has been revised to accommodate feedback received from the DPHI and DCCEEW on the original 2024/09856 referral. The 918 Panel application significantly reduces the area which would be subject to subsidence. The predicted subsidence contours have been revised to reflect the new mine plan. The convention subsidence survey lines 900H and 900F are sufficient for measuring maximum subsidence. Global navigation satellite stets (GNSS) units are also proposed to be placed along the spine pillar, between 918A and 918B2 subpanels, where maximum subsidence is predicted to occur (Section 7.1 of Appendix B). A figure showing the planned subsidence monitoring network is provided in Drawing No. MSEC1493-14 (Appendix B of this report).
	The department requests further explanation for the modelled spatial pattern of subsidence from panels 918/920 and the spatial uncertainty, having regard to mapping of depth of cover, thickness of geological layers, thickness of Katoomba seam, other factors that might be influencing the pattern.	SCT has developed a rock failure and subsidence numerical model based on the site-specific geotechnical characteristics of the 918 Panel layout and overburden (Appendix C). The numerical model has been validated for Clarence Colliery primarily on observations during the extraction of 910 to 906 Panels. The 918 Panel rock failure and subsidence model has been set conservatively with a smaller central spine pillar size than for the majority of 918 Panel (Section 7.2 of Appendix C). The central spine pillar in the mine plan has a pillar width of 26 m, while a 21 m pillar width was modelled for the central pillar. Given the subcritical nature of the mining geometry (i.e., narrow extraction face), the cumulative surface subsidence is largely driven by pillar compression. Pillar compression is largely a function of average abutment load, which is reduced with a wider pillar. As such, the model presents subsidence based on a greater average abutment load, given the smaller pillar, and the model is therefore considered more conservative than the design spine pillar width. The subsidence profiles were developed to reasonably match the shape of SCT's predicted subsidence profiles at depths of cover of 180 m and 280 m. The subsidence profiles were also designed conservatively to achieve an angle of draw of 35 degrees. The Incremental Profile Method (IPM) model adjusts the profiles within the Action area based on actual depths of cover and seam thickness, interpolating between the two profiles at 180 m and 280 m (Section 3.7 of Appendix B).
	The department requests that Figure 11 in the MSEC report is updated to show the uncertainty bounds (if possible) and the location of the subsidence monitoring line(s).	It is not possible to show uncertainty bounds for each of the predicted subsidence contours in Drawings Nos. MSEC1493-11 to 1493-13 (Appendix B). However, a discussion on reliability of the predictions is provided in Section 4.3 of Appendix B. The location of subsidence monitoring lines is shown on MSEC1493-14 (Appendix B).

RFI ID	Information required	Reference to preliminary documentation response
	The referral provides some examples of observed v predicted subsidence from panels 906-910. If available, the department requests a map of observed v. predicted subsidence for panels 906-910 that provide a 2-dimensional validation of the numerical modelling prediction method.	The original subsidence contours for Panels 906 to 910 are not available. Figure 18 and 19 in Appendix 1 (*SCT numerical modelling subsidence assessment for the 900 Area at Clarence Colliery CLR5844*) of Appendix C shows the observed 2D subsidence profile of 906, 908 and 910 Panels.
1.2	**Effect of Caley Formation on maximum subsidence and height of fracturing** While the information provided in the referral generally supports a conclusion that the Mount York Claystone will not be compromised by the PPPE method, the UNSW modelling showed that maximum subsidence is sensitive to the thickness of the Caley Formation (CF). In decreasing the CF thickness from 57 m to 49 m, the maximum subsidence estimate increased from 79 mm to 87 mm. Bore hole logs in the proposed extraction area indicate that the Caley Formation is around ~40 m in some areas (40.2 m at CLRP 43 and 42.9 m at CLRP 42). The department requests further testing of the sensitivity of Caley Formation thickness and total Caley Formation-Burra-Moko Head thickness to understand the effect that Caley Formation thickness has on the height of fracturing. As a minimum, thicknesses of 30 m and 40 m should be considered (using appropriate thicknesses (60 – 70 m) of the Burra-Moko Head Formation).	The rock failure model in the SCT report (Appendix C) is based on the lithology of borehole CLRP27, located adjacent to 918B1 subpanel, where the thickness of the Caley Formation is 14 m. Borehole CLRP41, located within 918A subpanel, has a thickness of Caley Formation of 12 m. The height of caving in the SCT model ranges 60–90 m above the mining horizon, with a consistent Caley Formation thickness. The height of caving in the SCT model is not restricted to the Caley formation and therefore not controlled by the thickness of the Caley Formation. This is discussed in Section 9.2.4 of Appendix C. Additionally, the Western Coalfield is generally uniform in the depositional environment leading to consistent local overburden thickness. Given the subcritical nature of the subpanels, the maximum subsidence is primarily controlled by compression of the strata in the pillar system, with the subsidence from caving a lessor component. The compression of strata is related to all lithologies within the stress bulb above and below the mining horizon, not just the Caley Formation. SCT's experience is that using 1 m detail in lithology changes through the strata based on a representative borehole provides reasonable subsidence predictions. This is discussed in Section 9.2.4 of Appendix C.

RFI ID	Information required	Reference to preliminary documentation response
1.3	**Depth of cover** Depth of cover is a key factor in determining subsidence related movements. Depth of cover varies across the site and is shallowest beneath 918B near Paddys Creek. Different depths of cover have been used in the analyses, some of which have not been clearly justified. Values reported include: 1. 175-315 m (Referral, p. 17) 2. 175-295 m (Extraction Plan – Main report, p. 20) 3. 280 m for beam analysis (Strata2 report, e-page 13) 4. 250 m for calculating width to height ratios and whether these are subcritical (GW report, p. 133) 5. 220-285 m in the groundwater modelling (GW report, p. 226) The department requests clarification for the different ranges used and implications for modelling results and confirmation that depth of cover parameters are appropriately conservative for predicting subsidence related movements.	Given the mine plan changes, i.e. removal of the 920 Panel, reduction in 918 sub-panel widths and lengths, change from 26.5 degree Angle of Draw to 35 degrees Angle of Draw and 20mm subsidence contour for the proposed Action area, the depths of cover range have changed. The supporting assessments have been updated to reflect the minimum and maximum depths of cover: • MSEC (Appendix B) Section 1.3: 174–329 m • SCT (Appendix C) Table 1: 174–329 m • JBS&G (Appendix D) Section 4.15.3 and Figure 4.52c: 174–329 m • Centennial Extraction Plan (Appendix G) Main report, Section 1.2: 174–329 m.
1.4	**Factors that could be causing underprediction of subsidence** Several factors have previously been observed at Clarence Colliery to affect total vertical subsidence including floor strength (Strata2 2023, e-page 11), high density of geological structures (Strata2 2023, e-page 12), roof deformation (Strata2 2023, e-pages 13-14) and flooding of workings (Strata2 2023, e-page 27). These factors are said to be unlikely to affect the project site but justifications for these assumptions are not clear. If some of these mechanisms were to occur, then vertical subsidence could exceed 100 mm. The SCT report (s4.3.1) reports a maximum subsidence of 131 mm at panels 906-910, possibly due to flooded workings, additional subsidence effects from 906, some geological anomaly. The Strata2 report considers eventual flooding of workings can add 15-20 mm of additional subsidence to subsidence predictions (although it considers this effect is captured in the empirical model). The UNSW modelling does not appear to consider effects on subsidence of flooded workings.	It is important to note that the subsidence modelling undertaken by Strata2 and UNSW is related to the 918 and 920 Panel application and is no longer relevant to the action. Centennial engaged SCT to model and assess the geotechnical, subsidence and caving of the 918 Panel. The SCT model is a different rock failure model than previously used in the original 2024/09856 referral. The SCT model has history of success in representing not only longwall extraction, but more relevant validated examples for miniwall and partial extraction at Airly Mine and Clarence Colliery. <u>Floor and roof strength</u> The roof strata in the 918 Panel consists of strong (approximately 80 megapascal (MPa)) sandstone or siltstone. The immediate floor strata in the 918 Panel consists of 2 m of competent interbedded sandstone, mudstone and claystone. The roof and floor lithology is not anticipated to negatively impact the long-term stability of the pillars. The floor strata below the intermediate floor consists of the Middle River Seam which inherently has a low strength due to the lithology of coal. Therefore, it is unlikely that the floor could have a lower average strength than is modelled in the rock failure model, adding a layer of conservatism. Any change in floor lithology is likely to be a stronger and or stiffer lithology that would help reduced subsidence due to strata compression. Roof and floor strength is discussed in Section 9.2.5.1 of Appendix C. <u>Geological anomalies</u> Mapped and projected faults in the vicinity of the 918 Panel are shown on Figure 13 of Appendix C. Given the minor nature of the faults, oblique orientation to the pillar ribs and the strain hardening pillar geometries, the majority of the pillars are considered to have minimal impact to pillar stability from the faults (Section 7.3 of Appendix C). This is due to

RFI ID	Information required	Reference to preliminary documentation response
	The department seeks further information on the factors that might be leading to under-prediction, including but not limited to: • flooding • floor and roof strength • geological anomalies. Information on how they have been accounted for in estimating maximum subsidence for panels 918/920 is also sought (e.g. is flooding inevitable? what effect will it have? can it be managed?). In addition, the department requests clarification as to whether there have been changes to the modelling approaches in their application to 918/920 that improve on the approaches that previously led to underprediction.	the panel geometry being sub-critical with subsidence behaviour being primarily driven by pillar compression, so faults are not anticipated to increase the subsidence for this mechanism (Section 9.2.5.3 of Appendix C). Flooding and management SCT investigated historical surveyed subsidence at Clarence Mine to determine if flooding workings influences subsidence over time (Section 9.2.5.2 of Appendix C). In summary, SCT found that once post steady state subsidence is achieved post extraction, acceleration may occur some years afterwards. Although post steady state acceleration of subsidence has been observed to approximately correlate with panel flooding, post steady state acceleration is also observed to occur without flooding. SCT (Section 9.2.5.2 of (Appendix C) suggest "that the post steady state acceleration for subsidence is due to ongoing remnant pillar failure, which could be accelerated by the introduction of water due to flooding. Therefore, the primary cause of the long term subsidence is related to the failure of remnant pillars or stooks, rather than flooding itself." SCT (Section 9.2.5.2 of (Appendix C) concludes "the nature of secondary extraction of the three 918 subpanels is such that there will be no remnant pillars. Therefore, eventual flooding of the workings in and around the 918 Panel is not anticipated to materially increase the subsidence due to the mine approach having no remnant pillars or stooks and the spine and barrier pillars having substantial factors of safety." No management of flooded workings is required given the 918 Panel and pillar design. Subsidence modelling uncertainty analysis Similar uncertainty concerns related to floor and roof strength and total subsidence to those stated in the Commonwealth DCCEEW RFI were raised by the NSW Independent Expert Advisory Panel for Mining (IEAPM). Centennial and SCT consulted with the IEAPM on several occasions during the development of the 918 Panel Extraction Plan. Subsequently, SCT undertook a subsidence uncertainty modelling exercise to address these concerns (Section 9.2.3 of Appendix C). The revised subsidence modelling produced maximum subsidence predictions which were less than the original 918 Panel SCT subsidence predictions. It was therefore recommended that the original subsidence outcomes produced by SCT were retained on ongoing assessment as the more conservative outcomes of the modelling assessment.

RFI ID	Information required	Reference to preliminary documentation response
1.5	**Cumulative subsidence effects from nearby extraction** The department is concerned that the cumulative effects on subsidence from extraction of nearby panels was not adequately addressed in the assessments of subsidence effects, and notes: • UNSW model predicts vertical subsidence >100 mm for panels 908/910 when the adjoining panel 906 is included in the analysis. • The SCT reports observed subsidence of 133 mm at panels 906 – 910, which is thought could be in part to additional subsidence effects from extraction of panel 906. SCT recommends further assessment to determine potential increase in subsidence from any adjacent secondary extraction panels. • Hebblewhite states that the impact of extraction of 906 panel on the 918/920 panel layout is outside the scope of the current project and is not considered as part of the review. The department requests further information to demonstrate that there will not be cumulative effects on subsidence and height of fracturing at panels 918 and 920 from extraction that has already occurred at nearby panels (and potentially from future panels). This could include modelling, angle of draw analyses, barrier panel width analyses, monitoring of tensile and compressive forces in other extraction areas or other sources information that can be used to show whether panels 918/920 are isolated from nearby subsidence effects or likely to be affected by them.	Refer to the response provided for RFI ID 1.4 above regarding the new approach to subsidence modelling for the 918 Panel assessment. The geotechnical, subsidence and caving assessment developed by SCT (Appendix C) has been updated to incorporate the revised mine plan for the 918 Panel only. This reduces the disturbance footprint by 74% (Table 2.1). The barrier pillar width analysis included in Section 5.2.2 of Appendix 1 (Appendix C). Section 9.3 of Appendix C concludes “given the >70 m barrier pillar widths between the 900 Panel and the 906 and 918B2 Panels, together with the small magnitude of subsidence anticipated for the 900s Panel, it is anticipated that the cumulative subsidence effects between the three panels result in minor subsidence increases over the 900s panel and the barriers and not impacts the 918 Panel maximum subsidence.” Cumulative subsidence is addressed in Section 9.3 of Appendix C. SCT state “the spine pillar system between 918A and 918B panels and the adjacent barrier pillar to the 900 Panel are large enough in width to maintain separation between the caved zones of each extracted panel. i.e. fracturing of the strata above the pillars was not modelled to occur, maintaining isolated caved zones in adjacent panels. As such, there is not anticipated to be an increase in caving height due to extraction of adjacent panels.”

3.2 Groundwater

3.2.1 Groundwater effects

DCCEEW acknowledges that the groundwater modelling report provides considerable detail on the model set-up and parameterisation, and that it was assessed by independent reviewers as constructed and implemented in accordance with *Australian Groundwater Modelling Guidelines* (Barnett *et al.* 2012).

DCCEEW sought and received advice on the referral from the Department's Office of Water Science (OWS) and Geoscience Australia, who provide comments as delegate for the Commonwealth Minister for Resources.

OWS noted that the groundwater model is highly complex, which makes clear communication of model functions and assumptions challenging. OWS acknowledged the considerable effort that has gone into representing goafing and fracturing characteristics for different mining approaches in the model to and the characterisation of lineaments and their potential reactivation but were concerned that the level of model complexity may not be justified by the data available to constrain model parameters through calibration, nor for the scale of the model for assessing impacts to individual swamps.

OWS considered that more discussion was needed about the sensitivity of the model to its parameters, which parameters were appropriate to calibrate the interdependency of parameters to increase confidence in the model predictions, and the model's capability to predict near surface changes in water tables.

Geoscience Australia raised concerns about the implementation of subsidence and fracturing assumptions and that the representation of Mining Method 3 may be too tightly constrained in its portrayal and testing of geological, hydrogeological and numerical groundwater simulation assumptions, and that it may underpredict impacts to groundwater dependent ecosystems. Geoscience Australia was unable to verify the conclusion that there would be no significant impacts to water resources.

DCCEEW concurred that it is difficult to conclude that the proposed Action will have a negligible impact on water resources and dependent ecosystems and species. Further information was sought through the RFI on the effects on groundwater for a broader (more conservative) range of subsidence and height of fracturing effects.

3.2.2 Groundwater assessment

The JBS&G *Extraction Plan for 918 Panel: Groundwater Assessment* (provided as Appendix D) assesses impacts to groundwater. It has been updated to address the revised proposed Action and to address the RFI.

The groundwater model incorporates the varied and complex mining history in the Western Coalfield in respect to mining techniques, extraction ratios, goafing/non-goafing behaviour and subsidence outcomes and categorises the variables into six categories called Model Mining Methods. Model Mining Method used in Appendix D defined as follows, and illustrated in Figure 1.3 of Appendix D:

- Model Mining Method 1 – development (non-goafing)
- Model Mining Method 2 – extraction (partial extraction, principally single-sided pillar lifting; non-goafing)
- Model Mining Method 3 – extraction (PPPE and double-sided pillar lifting with extraction ratios between 55% and 65%; limited goafing)
- Model Mining Method 4 – extraction (total pillar extraction with extraction ratios greater than 80%; full goafing)
- Model Mining Method 5 – extraction (longwall extraction, with extraction ratios greater than 85%; full goafing)

- Model Mining Method 6 – extraction (backfilling of open cut).

Appendix D has been independently peer-reviewed in accordance with the Australian Groundwater Modelling Guidelines. The peer review (provided in Appendix 7 of the 918 Panel Extraction Plan (Appendix G)) was undertaken by Alyssa Baron and James Dowdeswell of GHD Pty Ltd. They concluded that the groundwater model supporting the Clarence 918 Panel Extraction Plan is fit-for-purpose to address the modelling objectives set out in the report (GHD 2026c).

3.2.3 Groundwater correlation assessment

EMM prepared the *Groundwater Correlation Assessment – Clarence Groundwater Monitoring Network* (EMM 2026), a statistical correlation assessment (provided in Appendix E) of Clarence groundwater monitoring network data to address Geoscience Australia concerns that there is no evidence to support claims that no impacts have occurred to THPSS or the shallow aquifer caused by the partial extraction mining method. The correlation assessment considers mining impacts on groundwater levels, with consideration of rainfall data.

3.2.4 Request for information responses

RFI requirements regarding groundwater effects and where they are addressed in the preliminary documentation are shown in Table 3.2.

Table 3.2 Information required – groundwater effects

RFI ID	Information required	Reference to preliminary documentation response
2.1	**Key parameters in the groundwater model** The department requests a summary of key model parameters, the main sources of uncertainty and how uncertainty is handled, and the implications for the assessment of applying a regional scale model to local-scale assessment. This means providing a clearer understanding of which parameters the model is most sensitive to, how they are represented in the model (fixed, calibrated), justifications for parameter choices – in particular range of subsidence and height of fracture values considered in the model.	A detailed regional 3D groundwater model was required to assess the groundwater impacts of 918 Panel due to the complex, three dimensional interaction of depressurisation of adjacent operations as well as within operations. The groundwater model extent was also set to incorporate the influence of the Wolgan Valley to the northwest of Clarence Colliery and the Colo River to the north and east of Clarence Colliery (represented by regional throughflow via general head boundary conditions). Based on the drawdown plots presented in Appendix H of JBS&G (2026a) (Appendix D), the model extent was appropriate. The groundwater model was prepared in accordance with the *Information Guideline Explanatory Note - Uncertainty analysis for groundwater modelling* (IESC 2023). Of the approaches to managing uncertainty listed in IESC (2023), "ensemble methods" are the most sophisticated and consider, simultaneously, the uncertainty in all model parameters. As presented in Section 4.11 of the of the Groundwater Assessment (GA) (Appendix D), the height of depressurisation (H_{A2}) was updated to include parameter uncertainty. The 'sensitivity' of model parameters is described in Section 4.13 of the GA (Appendix D) and Appendix D of JBS&G (2023). Section 4.11 of the GA (Appendix D) describes the model parameters of the calibration approach with supporting data in Appendices E, F and K of the GA. Section 4.13 of GA (Appendix D) presents the sensitivity analysis and approach to predictive uncertainty analysis, with supporting data in Appendix G of the GA. Appendix G of the GA (Appendix D) presents plots of relative uncertainty variance reduction of parameters; a statistical measure related to the sensitivity of model history-matching performance to parameters. Larger values mean that the model performance (i.e. measurement objective function) is more sensitive to the assigned parameter value, and that the history-matching process has reduced the uncertainty of that parameter. Smaller values mean that the assigned parameter value has a small influence on model performance, and the history-matching process has not reduced the uncertainty of that parameter. Prediction simulations incorporate parameter uncertainty (stochastic simulations). Where a particular parameter is not particularly informed by the history-matching process, the range of values that parameter can take in stochastic simulations is large. Several types of parameters have consistently large values of variance reduction: • General-Head Boundary (GHB) stage and conductance • stacked drain hydraulic conductivity • recharge • fracturing height • time-varying materials (TVM) properties.

RFI ID	Information required	Reference to preliminary documentation response
		Additionally, pilot point parameters have small subsets with large variance reduction. These are associated with spatial locations where these parameters are sensitive. Pilot point parameters are spatially correlated through the use of covariance matrices. Measurement uncertainty is handled through the use of measurement noise, and model history-matching, which serves to reduce the uncertainty of parameters where indicated by measurements. Where parameters cannot be constrained by measurement data, the uncertainty remains high. All parameters have been developed consistent with the conceptualisation. Fracturing height and TVM properties show large variance reduction, suggesting that the measurement dataset contains sufficient information to constrain these parameters. Section 4.16 of the GA (Appendix D) presents a scenario analysis to confirm the dependence of 'mine design parameters' on model predictions (stochastic).
2.2	**Representation of fracturing in the groundwater model** The Tammetta equation appears to form the basis of implementation of continuous fracturing in the groundwater model (JBS&G 2023, p. 54) but this approach results in some of the smallest estimates of the height of continuous fracturing (see Paragraph 2biii). Figure 4.31b (JBS&G 2023, p. 135) indicates that continuous fracturing is implemented to a height of approximately 30 m above the Katoomba Seam. The department requests a more fulsome assessment of the effect of fracturing height on mine water inflows and groundwater levels in the outcropping aquifers (Burralow and Banks Wall) using the more conservative estimates from the geotechnical reports, including cumulative effects and considering the scenario that continuous fracturing breaches the Mount York Claystone. While the latter scenario may be very low likelihood, it will provide an indication of the risks associated with the aquitard being breached.	The relationship developed by Tammetta (2013) is based on regression analysis of observed height of complete drainage. Due to the panel width, mined seam height and cover depth for 918 Panel, the resultant value of Height of Fracturing 'Zone A' is small. This is presented in detail in the response to RFI ID 1.1 and RFI ID 1.5. The effect of fracturing height on hydraulic properties in the groundwater model is presented in Section 4.11 of Appendix D. The groundwater model was subject to calibration, including consideration of the subsidence model (refer Section 4.11 of Appendix D). Simultaneous fit to observed mine dewatering rates at three different sites, pre- and post-mining packer tests, and the extensive network of groundwater level monitoring demonstrates applicability of the approach adopted. The minimum resultant hydraulic conductivity methodology was not applied to extraction of 918 Panel as the PPPE method is a low subsidence method (refer Section 3.5.3 of Appendix D). Potential fracturing of the Mount York Claystone is discussed in response to RFI ID 2.4.2 in Table 3.3.

RFI ID	Information required	Reference to preliminary documentation response
	OWS noted that the stacked drains, which are used to implement continuous fracturing, are turned off within 3-6 months of subsidence occurring (JBS&G 2023, p. 55) and that a ramp function may be used to represent changes to hydraulic properties in the long-term (JBS&G 2023, p. 60). Further discussion is needed on how connected fracturing is represented over time in the groundwater model.	Continuous fracturing is an assumption based on observation of complete drainage. Stacked drains are used to represent the initial effect of subsidence-induced change to hydraulic properties (observed depressurisation) (Section 4.10.2.6 of Appendix D). These are active for a single stress period (3 months) for initial depressurisation. The TVM package is used to assign hydraulic properties to subsidence zones following initial depressurisation and remain active in perpetuity. The effect of the mining method on the height of fracturing is illustrated by comparing the results for Longwall 1 at Clarence, which has a large mined height, large panel width and large cover depth, with the results for the 918 Panel: • Figure 4.54a of Appendix D presents the ramp function above Longwall 1. Due to the width of longwalls, mined height and cover depth, the top of height of fracturing (Zone A, H_{A2}) above Longwall 1 almost meets ground surface, as shown in Figure 4.54a. • Figure 4.56a of Appendix D presents the ramp function above Panel 918A at Clarence. The height of the top of height of fracturing (Zone A) for 918 Panel (Figure 4.56a) is significantly less than that for Longwall 1 (Figure 4.54a). Summarising, use of Model Mining Method = 3 in a different context (large mined height, large panel width and large cover depth) to that proposed to be used to extract 918 Panel, would result in a much higher estimate of the height of fracturing (H_{A2}). Calibration of the groundwater model to observed mine dewatering rate and observed groundwater elevations – including depth versus pressure profiles, confirm the use of stacked drains, followed by replacement by high hydraulic conductivities (via the TVM package), the magnitude of which depends on mine design (high subsidence methods, compared to low subsidence methods) – is an acceptable representation of observed behaviour.
2.2	**Width of extraction panels** The groundwater model specifies the extraction panel width for 918 and 920 based on scaling another mining method. This results in an extraction panel width that is smaller than the 85 m in the design. The department requests: • a more fulsome assessment of the effect of extraction panel width on groundwater levels in the outcropping aquifers (Burralow and Banks Wall), including for panels of 85 m width and also wider panels to demonstrate the sensitivity of the model to this parameter. • justification for use of narrower widths than will be undertaken.	The amendment to panel width for Model Mining Method = 3 for 918 Panel has been removed from Appendix D. Section 1.2 of Appendix D now states: "Void width (unsupported span) is 75m for Sub Panel 918A and Sub Panel 918B2 (southern, two sub panels) and is 83 m for Sub Panel 918B1 (northern, single sub panel)." These match the proposed panel widths. As presented in Section 4.10.1 of Appendix D, the adjustment factor was based on Pilot Points (spatial distribution, inclusive of covariance matrices) and the value of adjustment factor to H_{A2} was relevant to Model Mining Method = 3, 4 and 5. As presented in the response to RFI 2.2 above, the combination of stacked drains and subsidence-induced change to hydraulic properties is demonstrated, through calibration, to be an appropriate representation of the effect of extraction on the deep groundwater system in the Western Coalfield. To consider the implication of uncertainty in 'mine design' parameters, Section 4.16 of Appendix D presents a Scenario Analysis where all parameters not related to 'mine design' were fixed and only mine design aspects were allowed to vary. Model simulations incorporating predictive uncertainty were then prepared and are presented in Appendix H of JBS&G 2026a) (Appendix D).

RFI ID	Information required	Reference to preliminary documentation response
2.3	**Depth of cover** See 1.3 above. The department requests clarification for the depth of cover ranges assumed in the model, the implications for modelling results and confirmation that depth of cover parameters are appropriately conservative for predicting groundwater effects.	The depth of cover is dictated by the geological model that was incorporated into the groundwater model (Section 4.7.1 of Appendix D). As presented in the response to RFI 1.3 in Table 3.1, the cover depth with respect to the Extraction Plan for 918 Panel is 174 to 329 m. Notwithstanding that the cover depth is generally static, uncertainty in the height of fracturing (H_{A2}) was incorporated in the uncertainty analysis (refer to response to RFI 2.2), of which depth of cover was one parameter. Further, as presented in the response to RFI ID 1.3 in Table 3.1, the sensitivity of Cover Depth (d) to the estimate of H_{A2} is relatively small (exponent in Tammetta's (2013) equation is 0.2). This is due to the more significant influence of panel width (exponent is 1.0) and mined height (exponent is 1.4) on the calculated H_{A2}. The mine design for 918 Panel is the controlling factor for H_{A2}, with small mining height, medium panel width and large cover depth (described in Section 4.11.1 of Appendix D).
2.4	**Storage parameters** The groundwater modeller notes issues with MODFLOW-USG numerical engine prevent changes to the storage parameters (e.g., JBS&G 2023, p. 64). The department requests discussion of implications of this for mine inflows and drawdown of water tables in the Burralow and Banks Wall Sandstone formations.	The updated groundwater modelling (Appendix D), allows storage properties to vary as part of history-matching. These were incorporated into the predictive modelling. Changes in storage (represented by void space, where the mining method was such that the roof of workings was assumed not to collapse) has implications on predicted mine inflow rates but did not have much effect on the modelled change in groundwater elevation in the Banks Wall Sandstone and Burralow Formation (Section 4.15.4.3 of Appendix D).
2.5	**Representation of hydraulic conductivity** Plots showing hydraulic conductivity in selected stress periods and various model layers (JBS&G 2023, Appendix C) show limited variation between original values and post-mining when continuous fracturing would be expected to be present (increasing hydraulic conductivity). Further discussion of how parameters are varying over time is required to determine if the groundwater model adequately simulates the conceptualised impact pathways.	PPPE is a low subsidence mining method and hence the effect on the overlying strata is significantly smaller than would be the case for a high subsidence mining method such as the longwall mining method. Subsidence-induced and subsequent fracturing changes to hydraulic properties is discussed in Section 4.11 of Appendix D, based on the use of stacked drains and the TVM package which represent variance over time. Outputs are presented in Section 4.15.5.4 of Appendix D. Calibration of observed dewatering rates, groundwater elevations and depth versus pressure profiles indicate that the representation of the effect of extraction on the groundwater system is appropriately represented.
2.6	**Groundwater drawdown predictions** The figures of change in groundwater elevation (4.51a and 4.51b in JBS&G 2023) do not use contour intervals aligned with the impact classes defined in Table NM-A4 (p xii of JBS&G 2023) and that the impact classification does not include drawdowns of 1-2 m.	The error identified by DCCEEW is acknowledged. The impact categorisation of "small" in Table NM-A4 should have been "0.5 to 2 m decline", not "0.5 to 1 m decline". A similar mistake was in Table NM-A3. Both of these have been corrected in the updated GA (Appendix D).

RFI ID	Information required	Reference to preliminary documentation response
	The department requests that the impact classification is updated. Having regard to the conclusions from the sensitivity testing of model parameters, that updated maps of change in drawdown elevations are provided that: • use contours consistent with the impact classification and provide the extent of drawdown to at least the 0.2 m contour and show water table lowering • show 10, 50 and 90th percentiles (as required) at 1, 2, 5 and 10 years from commencement of extraction (longer if changes are still propagating through the system) for the uppermost water table of each of: – Burralow Formation – Banks Wall Sandstone With the relevant creeks and swamps identified in the maps for each formation	The surface geology in the model (layer of the highest active node) is presented in Figure 3.4c of Appendix D. The Burralow Formation is not continuous across 918 Panel for model layer descriptions and layer-by-layer model boundary conditions, inclusive of extent of active nodes (Section 4.7.1 and Appendix C of the GA (Appendix D)). There are multiple water tables that can form, facilitated by use of variably saturated flow in the Burralow Formation and in other model layers, as consistent with the conceptual model presented in Section 3.5.3 of Appendix D. The highest active node is considered to host the uppermost water table and is a composite of modelled groundwater elevation from relevant layers (whichever happens to be the highest active one). Development and extraction of the 918 Panel will be implemented temporally, not all at one time. Time-series hydrographs are presented in Section 4.15.5.8 of Appendix D, accompanied by the model geometry log (nearest model node). Hydrographs from 2020 to 2049 are presented on the series of figures in Section 4.15.5.8 of Appendix D. Predicted drawdown in the Burralow Formation and the Banks Wall Sandstone are included in this series of figures. Stochastic simulations presented in Section 4.15.5.8 of Appendix D reflect the range of model output (namely the ranked 10^{th} to 90^{th} values of changes in groundwater elevations; which were determined separately). The range (10^{th} to 90^{th} percentile) is an 'envelope' of the uncertainty in the values of model parameters insofar as they affect model output. Given the above, the 50^{th} percentile model output is not presented in Appendix D with respect to change to groundwater elevation, essentially because the 10^{th}, 50^{th} and 90^{th} ranked values are not probabilities. i.e. each model output is equally likely, and the range between the 10^{th} and the 90^{th} model output, in a sense, reflects the 'error band'. A contour interval of 0.1 m was used for the highest active node (uppermost water table), given those nodes host the environmental receptors (groundwater dependent ecosystems and watercourses). A contour interval of 0.5 m was retained for the lower hydrogeologic units, since the impact threshold for these units with respect to a potentially affected surrounding groundwater user is 2 m.

3.3 Water resources

3.3.1 Water resources effects

DCCEEW determined there was insufficient information in the groundwater assessment about the water requirements of creeks and swamps in the proposed extraction area against which to evaluate the model results and requested further information on the creeks and swamps in the vicinity of the proposed extraction area. Results suggested groundwater elevations could increase in some swamps which requires further explanation. Further clarification of impacts on streamflow and swamps was sought, having regard to their water requirements, using appropriate metrics and maps. It was requested that when reporting changes in percentage terms, that details of how the percentage change was calculated are included – including what the percentage is a percentage of, rationale for metric used, what period of record, how representative of (climate/flow) conditions it is.

DCCEEW noted that the presentation of results in the groundwater report was not always clear, colours hard to distinguish, labels that don't identify formations, results not presented using the defined impact threshold scales, etc).

DCCEEW noted that the assessment of impact on water resources should be undertaken in accordance with the *Significant Impact Guidelines 1.3: Coal seam gas and large coal mining developments - impacts on water resources – DCCEEW* (DCCEEW 2022).

3.3.2 Additional water assessments

In addition to the assessments noted in Sections 3.2.2 and 3.2.3, Centennial has engaged specialist assessments since the original 2024/09856 referral application to assess impacts to water resources and MNES:

- *Extraction Plan for 918 Panel: Surface Water Assessment* (JBS&G 2026b). This report is included in Appendix 8 of the 918 Panel Extraction Plan, which is provided as Appendix G of this document.
- *918 Panel Watercourse Stability and Geomorphological Assessment* (GHD 2026a). This report is provided as Appendix H of this document.

3.3.3 Request for information responses

RFI requirements regarding impacts on water resources and where they are addressed in the preliminary documentation are shown in Table 3.3.

Table 3.3 Information required – impacts on water resources

RFI ID	Information required	Reference to preliminary documentation response
2.4.1	**Impact assessment – streamflow** To the extent that the information is available, the department requests: a) Characterisation of Paddys Ck, Pine Ck, Nine Mile Ck and Bungleboori Ck – Stream order, geological formation, groundwater connection, flow regime	The Surface Water Assessment (SWA) for 918 Panel is provided in Appendix 8 of the 918 Panel Extraction Plan (Appendix G). Figure 3.7 of the SWA shows the stream order Paddys Creek, Pine Creek, Nine Mile Creek and Bungleboori Creek. Figure 3.7 of the SWA presents the surface geology based on highest active layer in the numerical groundwater model. The THPSS are groundwater dependent ecosystems and are 'gaining streams' with respect to groundwater connection. Swamp groundwater connection and typical flow regime conditions are described in Section 3.7 of Appendix H. There are no hydraulic structures in the vicinity of 918 Panel, hence the flow regimes in the creeks are normal (normal depth) and are not subcritical or supercritical. Further characterisation of the watercourses above the 918 Panel, including groundwater connection and flow regime observations, is presented in Sections 5 and 7.1 of the Geomorphological Assessment (Appendix H).
	b) Information on low flow characteristics – e.g. flow duration curves, flow rating curves (i.e. information that shows the role of groundwater in sustaining flow and how it fluctuates over time)	Streamflow measurements along creeks with THPSS are manual measurements using pygmy current meters due to the shallow depth of flow in the creeks and the small magnitude of flow. As hydraulic structures are not present, flow rating curves (water level vs flow) and flow duration curves (showing how often percentile flows are exceeded) cannot be developed. Rather, Section 4.3 of the SWA includes a hydrological model developed for the Western Coalfield on the GoldSIM modelling platform, based on the Australian Water Balance Model (AWBM) (Boughton 2010). The hydrological model, referred to as the Regional Surface Water Flow and Quality Mode, includes groundwater contribution to surface water (obtained from numerical groundwater model) as well as consideration of changes to catchment surfaces due to subsidence. Section 4.3.5. of the SWA details the modelling approach used to predict surface water impacts induced by the extraction of 918 Panel. Section 5 of Appendix H summarises that the watercourses within the Action area are largely either bedrock-controlled or stable channels flowing within good-condition swamps. The bedrock-controlled channels flow within steep-sided gorges and appear to be predominantly fed by groundwater from the upstream swamps and Burralow Formation aquitard springs. Further information regarding groundwater fluctuation is included Section 3 of Appendix H.

RFI ID	Information required	Reference to preliminary documentation response
	c) Interpret and make conclusions about the impacts on streamflow a. Summarise impacts of proposed action on zero flow days (number, duration of dry spells) and low flow days (where low flow is 10th percentile flow for flow days) – compare pre- and post- extraction FDCs	Section 4.3.5.4 of the SWA presents the modelling predictions from 918 Panel extraction on zero flow days and low flow days for Bungleboori Creek catchment including: • Pine Swamp • Paddys Creek Swamp • Bungleboori Creek • Paddys Creek Tributary. Section 4.3.6 of the SWA provides analysis of the modelling results which indicate there will be negligible changes (<2%) to streamflow in Pine Swamp, Paddys Creek Swamp and Bungleboori Creek. For the short-term period (January 2030 to December 2032), results indicate that the Paddys Creek Tributary will have a small increase (+2 to +5%) in daily surface water flows for low-flows, and a medium decrease (-5 to -15%) in daily surface water flows for median flows. Modelling indicates that, in a short time period, the changes will ameliorate to be negligible (<2%) in daily surface water flows for low flow, and a negligible increase in daily surface water flows for median flows. Analysis of modelling results indicates that there will be a negligible change with respect to cumulative days and average (geomean) flow for dry periods for Pine Swamp, Paddys Creek Swamp, Bungleboori Creek and Paddys Creek Tributary. Section 4.3.6 of the SWA concludes that the impact of changes to modelled streamflow in each of the catchments due to the extraction of 918 Panel is considered to be insignificant.

RFI ID	Information required	Reference to preliminary documentation response
2.4.2	**Impact assessment – swamps** To the extent that the information is available, the department requests: d) Characterisation of Paddys Ck, Pine Ck, Nine Mile Ck shrub and hanging swamps – Stream order, geological formation, groundwater connection, flow regime, peat development, resilience to periods of drying – include conceptual model of swamps figure	Swamps within the proposed Action area are characterised in Sections 3, Section 4 and Appendix B of the geomorphological assessment (Appendix H). Stream order Refer to response to RFI 2.4.1. Geological formation Swamp geological formation is described in Section 3.4 of Appendix H. Groundwater connection and flow regime Swamp groundwater connection and typical flow regime conditions are described in Section 3.7 of Appendix H. Peat development Swamp peat development is described in Section 3.4.1 of Appendix H. Resilience to periods of drying Swamp resilience to periods of drying is discussed in Sections 3.4.1 and 3.4.2 of Appendix H. Conceptual model of swamps figure A conceptual hydrogeological model of the swamps is provided in Figure 3.1 of Appendix H.
	e) Summarise swamp monitoring data (map with monitoring locations, length of record, frequency of records) and comment on representativeness of data. Include (if possible): – flow rating curve (flow depth v flow rate) – flow (water depth) duration curves	Swamp monitoring data is summarised in Section 3.7 of Appendix H. Maps and figures showing swamp monitoring locations are provided in Appendix A of Appendix H. Refer to response to RFI ID 2.4.1 regarding flow measurements.
	f) Interpret and make conclusions about the impacts on swamps a. Provide maps of water table lowering for 10, 50 and 90th percentiles (as required) at 1, 2, 5 and 10 years from commencement of extraction, using drawdown contours of 0.1, 0.2, 0.5, 1, 2, 3 m for uppermost water table of each of: i. Burralow Formation ii. Banks Wall Sandstone	GA Refer to response to RFI ID 2.6 for details and explanation on water table lowering at percentiles and drawdown contours used in the GA. A contour interval of 0.1 m was used for the highest active node (uppermost water table). The MYC is a regional aquitard, up to 20 m in thickness, that has been conceptualised to separate the shallow and deep aquifers; the deep groundwater system includes the Katoomba and Lithgow Coal seams. The MYC comprises a sequence of sandstone, shale and claystone that form a semi-permeable layer which limits connectivity between the shallow and deep aquifers, acting as a confining layer. The Burralow Formation and Banks Wall Sandstone are above the MYC. These formations discharge to THPSS, supported by shallow Quaternary sediments and peat formations.

RFI ID	Information required	Reference to preliminary documentation response
	Highlight the relevant swamps for each formation	As detailed in Section 2.2.1, maintaining the integrity of the MYC aquitard such that the shallow/upper groundwater system is unaffected by mining is a key design constraint used to avoid impacts to THPSS. The GA (Appendix D) concludes that the impact to THPSS from development and extraction of 918 Panel will be insignificant because of the geotechnical context of 918 Panel (small mining height, medium panel width and large cover depth) leading to minimal disruption to the MYC. <u>Groundwater Correlation Assessment</u> The Groundwater Correlation Assessment (EMM 2026) (Appendix E) analysed groundwater level responses across swamp, standpipe and piezometers in hydrogeological units above the MYC in the Clarence groundwater monitoring network. Results show mostly strong positive correlations with rainfall (cumulative deviation from the mean monthly rainfall), indicating that groundwater level trends are primarily climate driven. Instances of inverse correlations are associated with delayed recharge processes or periods of limited monitoring data. Table 6.1 of Appendix E presents the Spearman correlation assessment of the swamp monitoring sites. Results indicated there is no evidence of mining impact in the monitored swamps. <u>Watercourse Stability and Geomorphological Assessment</u> GHD conducted a baseline geomorphological condition assessment of watercourses and swamps above the proposed 918 Panel in the Watercourse Stability and Geomorphological Assessment (GHD 2026a) (Appendix H). The findings of the assessment are as follows (Section 7.1 of Appendix H): • Swamp condition was assessed using a condition assessment developed by Fryirs *et al.* (2016). The narrow, elongate swamps running through bedrock gorges have good condition channelised fill morphology, with a well-defined, stable creek channel, with sections of intact swamp, where flow trickles through the vegetation. Larger swamps in the Action area appear to be on the threshold of intact/channelised fill morphology. Major extrinsic change (e.g., bushfire) can cause a transition from an intact morphology with dispersed flow, to a channelised fill morphology with well-defined channels through the swamp. In addition, the larger swamps can show variability of morphology, with sections of intact swamp and sections of channelised fill. Groundwater data from upper and lower Paddys Creek Swamp (piezometers PSE1 and PSE2) (Section 7.1 of Appendix H) indicates fluctuating water tables and rapid response to rainfall events, typical of channelised fill swamps. Hanging swamps perched above Bungleboori and Paddys Creek gorges were assessed to be good condition intact swamps. • Drought, bushfire and prolonged rainfall, occurring separately or together, have caused variable impacts on the landscape elements of the study area. The swamp systems typically rebound more rapidly than the surrounding woodland areas, due to the presence of groundwater. Following the recent sequence of drought, major bushfire and then prolonged/intense rainfall, the majority of swamps have now completely recovered. In contrast, adjacent woodland still shows major fire damage, with partial recovery of mid and understorey vegetation. There are swamp areas which show impacts from the recent events. Upper Paddys Creek Swamp has fire-damaged areas with associated erosion. A track leading to the Pine Hanging Swamp has resulted in erosion of the lower swamp.

RFI ID	Information required	Reference to preliminary documentation response
		Section 5 of the geomorphological assessment (Appendix H) concludes "GHDs baseline geomorphological condition assessment has identified that, although the swamps in the study area are sensitive to external change, the predicted ground impacts are not anticipated to adversely impact these features." It should be noted that the study area is the same as the proposed Action area in this context. Biodiversity Management Plan The Biodiversity Management Plan which is included in Volume 2 of Appendix G considers potential impacts to swamps from an ecological perspective. Section 3.3.2.1 of the Biodiversity Management Plan states: "JBS&G (2026b) modelled the predicted reduction of flow, water level and water quality on GDEs within the vicinity of 918 Panel. The report states "Modelling indicates that there will be insignificant change to surface water flow in the Pine Swamp, Paddys Creek Swamp, Bungleboori Creek and Paddys Creek Tributary catchments, due to the implementation of the Extraction Plan for 918 Panel. Modelling indicates there will be insignificant change to water quality (salinity) in the Pine Swamp, Paddys Creek Swamp, Bungleboori Creek and Paddys Creek Tributary catchments, due to implementation of Extraction Plan for 918 Panel. RPS has considered the potential for changes to tilt (0.05% change), surface water flows (insignificant change) and salinity (insignificant change) to impact the THPSS located within the 918 Panel extraction plan area. Based on the MSEC and JBS&G findings, it is unlikely that ecological impacts to THPSS would result from the extraction of 918 Panel. This is supported by evidence that Newnes Plateau Shrub Swamps have been undermined by partial extraction operations at Clarence since 1998, including (but not limited to) parts of Paddys Creek East Swamp, Pagoda Swamp, Happy Valley and Happy Valley Upper Swamps and a small hanging swamp above 908 Panel to the east of the EP Area. To date, there is no evidence of mining-related damage to these features above areas that have been subject to partial extraction mining activities at Clarence Colliery (Centennial Clarence 2025)." Additionally, Table 6.1 of Appendix E presents the Spearman correlation assessment of the swamp monitoring sites at Clarence Colliery. Results indicated there is no evidence of mining impact in the monitored swamps.

RFI ID	Information required	Reference to preliminary documentation response
	g) Summarise impacts of proposed action on zero flow days (number, duration, frequency of dry spells) and low flow days (where low flow is 10th percentile flow for flow days)	The SWA (provided in Appendix 8 of the *918 Panel Extraction Plan* (Appendix G of this document)) adopted a conservative approach to assessing the surface water impacts that would result from the extraction of 918 Panel. A dry period is considered to be the same as a low-flow period, whereby the streamflow is lower than the 10% threshold over the selected time period, calculated from the Approved Case (i.e. no extraction in the 918 Panel). It is noted that the use of recession curves in the AWBM will prevent streamflow from ever reaching zero (Section 4.3.5.4 of the SWA). Section 4.3.5.4 of the SWA provides the detailed predictions and analysis of results on zero flow and low flow days due to the proposed Action. Section 4.36 the SWA provides a summary of the model predictions which include: • Negligible changes (less than 2%) to streamflow in Pine/Nine Mile Swamp, Paddys Creek Swamp and Bungleboori Creek. • In the short-term, the Paddys Creek Tributary will have a small increase (+2 to +5%) in daily surface water flows for low-flows, and a medium decrease (-5 to -15%) in daily surface water flows for median flows. Modelling indicates that in the short time, the changes will ameliorate to be negligible change (less than 2%) in daily surface water flows for low flow, and a negligible increase in daily surface water flows for median flows. • A negligible change with respect to cumulative days and average (geomean) flow for dry periods for Pine/Nine Mile Swamp, Paddys Creek Swamp, Bungleboori Creek and Paddys Creek Tributary.
	h) Discuss level of confidence in results.	The extensive calibration of the Regional Surface Water Flow and Quality Model is described in Section 4.3.4 of the SWA. All numerical models have limitations, however, comparison of the difference between Approved Case (i.e. no extraction in the 918 Panel) and Proposed Case (extraction of the 918 Panel) indicate that development and extraction of 918 Panel will lead to an insignificant change in modelled streamflow and cumulative days in dry periods.

3.4 Listed species and ecological communities

3.4.1 Impacts on listed species and ecological communities

DCCEEW indicated it is not seeking further information on the potential impacts to EPBC-listed species and ecological communities based on assumed presence, and because the information sought in relation to subsidence, fracturing and groundwater effects and impacts to streams and swamps will clarify the risk to these MNES.

3.4.2 Avoidance, mitigation, management and monitoring

DCCEEW supported Centennial's approach of the extraction management plan and associated sub-management plans, including Trigger Action Response Plans (TARPs). However, DCCEEW notes that as drafted, the proposed TARP actions mostly initiate additional monitoring; review and updating of modelling; and consideration of remediation approaches but do not clearly commit to implementing actions to prevent further impact or remediate existing impacts.

DCCEEW requested that in finalising the extraction plan and associated TARPs, concerns raised by the OWS in relation to those plans and the monitoring locations are considered and addressed with a view to providing the best possible safety net for protecting MNES. To this end, DCCEEW requested further information through the preliminary documentation and/or through the proposed and final decision stage, that demonstrates that appropriate triggers, responses and actions are specified to avoid significant impacts to swamps, streams and associated biota, including:

- details on monitoring locations for control and potentially affected sites (what is being monitored, frequency of measurement, accuracy and reliability of measurements, distance to extraction panels)
- (related to above) assessment of the sensitivity of the monitoring locations to effects of mining panels 918/920 (e.g. lag time between extraction and propagation of groundwater depressurisation effects by depth and monitoring location)
- how climate signals in monitoring data will be differentiated from mining effects
- other relevant information to demonstrate that the monitoring network has been designed to provide the earliest possible warning of possible mining induced impacts
- appropriate subsidence, height of fracturing and groundwater triggers
- strong and precautionary commitments to stop mining, revise the extraction footprint and/or undertake other actions designed to contain the risk of significant impacts.

3.4.3 Monitoring and trigger action response plans

The *918 Panel Subsidence Monitoring Program Clarence Colliery* (Centennial 2026b) including the TARPs has been updated in consideration of the revised proposed Action and to address the RFI. The updated Monitoring Program is provided in Appendix F.

3.4.4 Request for information responses

Further RFI requirements requested by OWS on the TARP approach and monitoring and where they are addressed in the preliminary documentation are provided in Table 3.4.

Table 3.4 Information required – comments from the Office of Water Science on the trigger action response plans and monitoring network

RFI ID	Information required	Reference to preliminary documentation response
5.1	**Subsidence and height of fracturing** • Monitoring line 900H only provides partial coverage of the 918 panel and almost no coverage of the 920 panel in the northern area of predicted maximum subsidence. GNSS subsidence monitoring does not appear to be planned in this area of predicted maximum subsidence (Figure 4, p. 17 of Subsidence Monitoring Program).	920 Panel has been removed from the application and is therefore no longer relevant. Subsidence monitoring line 900H has been extended over the 918 Panel. Figure 3 of *918 Panel Subsidence Monitoring Program Clarence Colliery* (SMP) (Centennial 2026b) (Appendix F) shows the extent of the 900H monitoring line and Figure 2 of the SMP shows that the survey line is situated in the area above 918B1 Panel which is predicted to experience maximum subsidence. Figure 3 of Appendix F shows that the GNSS unit 900_G31 is located directly over 918AB1 Panel in the area that is predicted to experience maximum vertical subsidence.
	• Monitoring line 900F does not appear to align with the southern area of predicted subsidence maximums and no GNSS monitoring appears to be planned for the southern area of predicted maximum subsidence. If no monitoring occurs in the areas of predicted maximum subsidence then it is less likely that maximum subsidence levels will be identified and that the TARP will be initiated or mine layouts altered.	Subsidence monitoring line 900F has been installed and is proposed to be monitored as part of the 918A and 918B2 subpanel extraction. Crossline 900F traverses both 918A and 918B2 subpanels at the points where maximum subsidence is predicted to occur for each panel. Figure 3 of the SMP (Appendix F) shows that the existing GNSS units 900_G3A, proposed 900_28 and proposed 900_29 are located directly over the 918A subpanel in the area that is predicted to experience maximum vertical subsidence. Figure 3 of the SMP Appendix F shows that the proposed GNSS units 900_35 and 900_36 are located directly over 918B2 subpanel in the area that is predicted to experience maximum vertical subsidence.
	• A surface extensometer is planned for CLRP41 to confirm that the height of continuous fracturing does not extend above the Mt York Claystone (Centennial 2024c, p. 21). It does not appear to be located in the area of predicted maximum vertical subsidence and may not capture the maximum height to which continuous fracturing occurs.	Figure 3 of the SMP shows the location of CLRP41 which is in the centreline of 918A Panel. Figure 2 shows that the area of maximum predicted subsidence within the deeper 280 m depth of cover modelling scenario (Section 9.2 of Appendix C) is skewed towards the chain pillars as SCT predicted pilar compression as the primary contributor to subsidence. CLRP41 is located in the area where maximum vertical caving is predicted to occur.
	• The proposed TARP (SMP, App. 3) actions mostly initiate additional monitoring, review and updating of modelling, engagement with independent experts and consideration of remediation approaches. Even when subsidence > 100 mm is observed, the TARP does not commit to altering the mine layout, only considering the option (e.g. SMP, p. 35 and App. 3). – the TARP allows for the mine layout and design parameters to be exceeded rather than committing to a specific layout (see the TARP for the aspect 'Underground Mining Control', SMP, App. 3).	An Adaptive Management and Staged Implantation approach has been added to Section 9.4 of the SMP (Appendix F) which addresses the concerns raised regarding lack of commitment in the previous TARPs. <u>Adaptive Management Strategy</u> The Adaptive Management Strategy includes the following three steps: 1. Implementation of a detailed monitoring program to measure and record mining-induced ground movements and impacts on natural and built features during and after mining. 2. A review of relevant observations at appropriate stages, when: a) mining of each sub-panel has progressed a sufficient distance such that the majority of mining-induced movements have occurred; and

RFI ID	Information required	Reference to preliminary documentation response
	– the process to review data, update modelling and change the mine layout in the TARP (SMP, App. 3) is lengthy with changes likely only possible for the 920 panel given the proposed frequency of data analysis. – when subsidence triggers are exceeded, proposed actions in the TARP will allow mining to continue, even when a red trigger is exceeded (i.e. subsidence of >100 mm). This will result in further subsidence above the current state approved limits. – mining will also continue if the extensometer data indicate that continuous fracturing through the entire Mt York Claystone has occurred (red trigger status). In this scenario impacts to the overlying THPSS are more likely to occur and be more severe. An adaptive management strategy would be agreed, however remediation of impacted swamps is extremely difficult, if at all possible. The TARP proposes updates to the current modelling. SCT has highlighted that the current modelling may not be able to predict the onset of non-elastic strata compression (SCT 2023, p. 18) or make accurate subsidence predictions once nonelastic strata compression commences. The peer reviewer also noted this (Hebblewhite 2023a, p. 20). The TARP should include an analysis of all monitoring data associated with subsidence, especially pillar monitoring data, by a suitable expert so that potential non-elastic strata compression can be identified and new modelling undertaken that is able to simulate this behaviour if needed.	b) there remains sufficient time to adjust the mine plan for future sub-panels without resulting in delays to mine production if required; and/or c) monitoring results exceed the TARPs. 3. A decision on whether to adjust the mine plan for future sub-panels to further reduce the potential for exceeding the conditions of approval of the development consent. <u>Staged Implementation</u> The 918 Extraction Plan would be undertaken in stages, with the extraction of the 918A sub-panel and the 918B1 sub-panel followed by a hold point prior to the extraction of the 918B2 sub-panel. The proposed sequence of second workings under the Extraction Plan and anticipated start and completion dates are summarised in the table below. The rate, start date and finish dates of extraction in each panel are subject to mining conditions encountered and life of mine plan scheduling changes. **Panel** / **Start date** / **Finish date** 918A / December 2026 / March 2027 918B1 / June 2027 / July 2027 918B2 / July 2027 / August 2027 After completion of mining of 918A sub-panel, and stabilisation of subsidence, an 918A End of Sub-panel Report will be prepared by a suitably qualified and experienced person and will incorporate environmental and subsidence monitoring data to validate subsidence performance predictions and confirm compliance status within the applicable consent conditions. The 918A end of sub-panel report will provide a defined compliance and adaptive management hold point and inform whether any refinement to the adjacent 918B2 sub-panel design, e.g. reduction of void width or length, is required prior to 918B2 approval determination and extraction commencement. The 918A end of sub-panels report will be submitted to the DPHI for assessment and determination. <u>Updated TARPs</u> To monitor and manage compliance with the performance measures stipulated in DA504-00, Clarence has established performance indicators for each feature within the corresponding management plans (included as attachments to Volume 2 of Appendix G): • 918 Panel Water Management Plan • 918 Panel Land Management Plan • 918 Panel Biodiversity Management Plan • 918 Panel Heritage Management Plan

RFI ID	Information required	Reference to preliminary documentation response

- 918 Panel Built Features Management Plan
- 918 Panel Public Safety Management Plan
- 918 Panel Subsidence Monitoring Program.

Escalating triggers and levels of investigation, via TARPs, have also been established in accordance with the trigger values which are shown in Table 6.5 of the 918 Panel Extraction Plan (Appendix G).

Table 6.5: Performance Indicators & TARP Risk Management Scenarios

Performance Indicator	General Description	Action / Response
Level 1: Condition Green	**Operations within predictions, and within approved impacts.**	Continued operations and monitoring as normal.
Level 2: Condition Amber	**Operations within approved impacts but potentially exceed / exceed predictions.**	Review and investigation processes are engaged, with adaptive management as required.
Level 3: Condition Red	**Operations exceed approved impact.** *The approved Performance Measures (criteria thresholds) of Development Consent (and any other relevant approvals) are listed in Condition Red.*	Adaptive Management measures are fully engaged as per the TARP and relevant sections of the Extraction Plan and the SMP.

The updated TARP includes a subsidence of trigger of 80 mm. A review will be initiated if monitoring, including continuous GNSS monitoring, shows this trigger is being exceeded. The TARP includes a number of actions to be considered, including conducting a review and making decisions in accordance with the Adaptive Management Strategy, and slowing or stopping partial extraction.

With the introduction of continuous GNSS monitoring, the process to review data is increased to weekly during mining, allowing for greater opportunities to update modelling and changing the mine layout.

Slowing or stopping secondary extraction is included when a red trigger is exceeded. A hard stop upon exceedance of a red trigger may result in unsafe underground conditions, depending on where the active face is located when a red trigger is exceeded. It is noted that a technical review will likely have already commenced when the amber trigger is exceeded, such that Centennial decision makers will already be well-informed and will have already made plans prior to exceedance of a red trigger. This applies to both subsidence monitoring and extensometer monitoring.

RFI ID	Information required	Reference to preliminary documentation response
5.2	**Groundwater** • Groundwater monitoring of potential impacts on swamps will only be undertaken at two locations in each of Lower Nine Mile and Paddys Creek swamps (4 in all) • Table 2.4 (GHD 2024, pp. 12-13) lacks details on the depth of monitoring at many of the listed monitoring bores, thus it is unclear that all 3 groundwater systems in the conceptualisation are being adequately monitored. The parameters being monitored at each site are also not clear.	In May 2025, i.e. after the 918 and 920 Panels Extraction Plan was submitted, additional standpipe piezometers have been installed (CSP34, CSP35, and CSP36). CSP34 is an additional bore at Bungleboori South East Swamp and CSP35 and CSP36 are new bores at Paddys Creek Hanging Swamp. These monitoring sites have been added to the *918 Panel Water Management Plan* (WMP) (GHD 2026b) (included in Volume 2 of the Extraction Plan for 918 Panel (Appendix G)). They will be monitored as part of the WMP implementation. Table 2.4 of the WMP has been updated to include monitoring depths for all groundwater bore monitoring sites. Locations of swamp surface water quality and flow monitoring are shown in Figure 2.1 and details are shown in Table 2.2 of the WMP. Monthly monitoring at the four locations includes: • Flow rate • Physicochemical (Temperature, pH, EC, DO, TSS, TDS, redox potential) • Total and dissolved metals (Mn, Fe).
	• No comparison of observed and predicted groundwater inflows is proposed in the monitoring plan. This could be undertaken to validate the groundwater model and as a trigger in the TARP. Also monitoring/triggers associated with inflows would be useful to meet the state requirement that there are no significant inflows to mine workings (GHD 2024, Table 4.5, p. 37).	Section 4.12.4.7 of the GA (Appendix D) has been amended to include the modelled and observed dewatering rates, including future predicted dewatering rates. Figure 4.41 of the GA (Appendix D) presents the modelled and observed dewatering rate (ML/d) and relative cumulative dewatering volume (ML) at Clarence Colliery and the fit to observed dewatering rate and relative cumulative volume is considered to be good. Greater inflows at Clarence Colliery are considered to be conservative. Table 4.5 of the WMP (Volume 2 of Appendix G) has been updated to include criteria 'groundwater inflows are within 20% of the predicted inflows' to validate (or otherwise) the modelled inflows. The TARP in the WMP has been updated to specify that groundwater inflow into the 918 Panel will be reviewed every three-months and at the end of each sub-panel.
	• How the groundwater level triggers were derived is not comprehensively explained. It is only stated that the triggers are based on "review of groundwater elevation observations, 135 years of climatic data and numerical groundwater model predictions." (GHD 2024, p. 35). The site-specific triggers provided range between 0.50 mbgl to 1.30 mbgl (GHD 2024, Table 4.2, p. 35). For CSP2/BSE2 and CSP5/PHS2 the trigger appears to correlate with the bottom of the monitoring bore meaning there is no way to determine how much the trigger is exceeded by once it is reached.	In Section 6.2.1 of the GA (Appendix D), JBS&G have undertaken a review of groundwater level observations and groundwater model outputs at identified locations to devise groundwater level trigger values that will be appropriate to monitoring groundwater levels. These were determined based on review of water level observation history, model outputs, including the range of stochastic model output, as well as consideration of potential future extended dry periods. The 918 Panel layout was designed to not extract beneath THPSS shrub and hanging swamps (with the exception of Paddys Creek Hanging Swamp which is located partly above the proposed 918B2 sub-panel) to mitigate risk of impacting the swamps. Table 6.1 of the Groundwater Correlation Assessment (Appendix E) presents the Spearman correlation assessment of the swamp monitoring sites across Clarence Colliery. Results indicated there is no evidence of mining impact on the monitored swamps due to partial extraction mining method at Clarence Colliery. The comment by OWS on confirmation of screened interval with respect to trigger value is acknowledged and was incorporated into the revised trigger levels presented in the WMP (Volume 2 of the Extraction Plan for 918 Panel (Appendix G).

RFI ID	Information required	Reference to preliminary documentation response
	• The plan proposes to compare groundwater model predictions with observed levels and inflows every 2 years (GHD, 2024, p. 38). Given the proposed 22-month life of this project, this means comparison will not occur during the active mining phase.	Section 5.1 and the TARP in the WMP (Volume 2 of the Extraction Plan for 918 Panel (Appendix G)) have been updated to specify that this review will be undertaken quarterly and at the end of each sub-panel.
5.3	**Creek and swamp monitoring** • The department notes that flow/water level monitoring is too short in duration and has too few readings to provide a good baseline for assessing the effects of extraction and therefore no stream flow triggers have not been specified. It is unclear how the state requirement of no reduction in surface water flows is to be assessed.	Numerical modelling carried out by JBS&G (Appendix D) predicts a negligible (less than 5%) change in groundwater contribution to surface water for both Bungleboori Creek and Paddys Creek (Section 2.2.3 of the WMP (Volume 2 of the Extraction Plan for 918 Panel (Appendix G)) and height of fracturing is not expected to extend above the MYC (Section 2.2.3.1 of the WMP) from the extraction of 918 Panel. Therefore, losses to surface water flows as a result of mining are not predicted (Section 4.1.2 of the WMP). Approximately 2 years of additional surface water flow and level monitoring has been undertaken since the original 2024/09856 referral was submitted, as detailed in Section 3.2.2 of the WMP. All streamflow monitoring locations have periods of low or no flow. The exception is Bungleboori Creek downstream site, where only two monitoring events have occurred. As periods of low or no flow occur naturally, no trigger values for streamflow are proposed. A review of water flow monitoring will be undertaken in the event that subsidence monitoring indicates that subsidence is greater than predicted. Under the Water TARP of the 918 Panel Extraction Plan, a review of recent monitoring results and any relevant operational data (e.g., operational activities, meteorological data) and identify any potentially contributing factors would be undertaken for the level one trigger of a reduction in flow compared with historical baseline results and reference sites (WMP Appendix D of the WMP (Volume 2 of the Extraction Plan for 918 Panel (Appendix G)).
	• The stream water quality monitoring generally is also very limited, but the WMP defines trigger values based on default guideline values from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018) to provide a species protection level of 99%. However, the department notes that the analytes monitored differ between sites and recommends that the same analytes are monitored at all locations to enable more meaningful assessments of changes over time.	The stream water quality monitoring has been extended so the same analytes are monitored at all locations (Section 2.1.1 of the WMP (included in Volume 2 of the Extraction Plan for 918 Panel (Appendix G)).

3.5 Summary of impacts

The proposed secondary extraction of the 918 Panel using PPPE shortwall mining (the proposed Action) is predicted to result in low-magnitude, localised and manageable impacts, with no significant impacts to MNES. Residual impacts are categorised as negligible or low.

Negligible Residual Impact

A negligible residual impact is an impact that:

- Is so small in magnitude, extent and duration that it is not detectably different from natural variability, background conditions or measurement uncertainty
- Results in no measurable or discernible change to environmental values, processes or receptors
- Does not compromise ecosystem function, integrity or resilience
- Requires no additional mitigation, management or offsetting.

Negligible impacts are considered insignificant for the purposes of the EPBC Act, even when considered cumulatively.

Low Residual Impact

A low residual impact is an impact that:

- Is small in magnitude, localised in extent and limited in duration
- May be detectable, but remains well below regulatory thresholds, guidelines or significance criteria
- Does not result in long-term or irreversible change to environmental values
- Does not reduce viability, condition or function of ecological, hydrological or cultural receptors
- Can be readily managed through standard mitigation measures, monitoring and adaptive management.

Low residual impacts are not considered significant under the EPBC Act, either individually or cumulatively.

Key residual environmental impacts of the proposed Action and their significance are summarised below.

3.5.1 Subsidence and ground movement

Key subsidence and ground movement impacts and their significance are:

- Predicted maximum vertical subsidence is ≤100 mm, with tilt ≤3 mm/m and horizontal strain ≤2 mm/m, consistent with DA 504-00 subsidence criteria.
- Subsidence is expected to be sub-critical and primarily driven by pillar compression, rather than extensive goaf formation.
- Revised mine design significantly reduces subsidence risk through:
  - removal of the 920 Panel

- reductions in panel widths (to 75–83 m)
- avoidance of second workings beneath key natural features.

- Subsidence impacts are expected to be localised above the 918A and 918B2 sub-panels, with no predicted exceedance of applicable criteria.
- An enhanced subsidence monitoring program (GNSS, survey lines and extensometers) and adaptive management framework will provide early warning and the ability to slow or stop mining if triggers are exceeded.

Residual impact: Low

3.5.2 Height of fracturing and MYC aquitard integrity

Key height of fracturing impacts and their significance are:

- Geotechnical modelling indicates that continuous fracturing will not extend to the MYC aquitard.
- The MYC is expected to remain intact, maintaining separation between shallow groundwater systems (supporting THPSS) and deeper mine workings.
- No fracturing is predicted to propagate into the Burralow Formation or Banks Wall Sandstone at a scale that would alter groundwater flow regimes.
- Extensometer monitoring is proposed to verify predicted height of fracturing during mining.

Residual impact: Negligible

3.5.3 Groundwater

Key groundwater impacts and their significance are:

- Numerical groundwater modelling indicates:
  - negligible to very small drawdown (<0.5–1 m) in shallow aquifers above the MYC
  - no sustained depressurisation of groundwater-dependent ecosystems.
- Historical groundwater level responses in monitoring bores and swamps are dominated by climatic variability rather than mining influences, based on correlation analysis.
- Groundwater inflows to the mine are predicted to be low and manageable, with performance verified through monitoring and comparison with model predictions.
- An expanded groundwater monitoring network and refined TARPs are proposed to provide a conservative risk management framework.

Residual impact: Low to negligible

3.5.4 Surface water (streams)

Key groundwater impacts and their significance are:

- No direct vegetation clearing is proposed.
- Hydrological modelling predicts:
  - negligible changes (<2%) to streamflow volumes, zero-flow days and low-flow statistics for Pine Creek, Paddys Creek, Nine Mile Creek and Bungleboori Creek
  - short-term, minor and transient changes in a tributary of Paddys Creek that will rapidly ameliorate.
- Creek channels are predominantly bedrock-controlled or geomorphologically stable, reducing sensitivity to minor subsidence-related tilting.

Residual impact: Negligible

3.5.5 Temperate Highland Peat Swamps on Sandstone

Key THPSS impacts and their significance are:

- The revised mine plan avoids second workings beneath almost all THPSS, with only ~0.01 ha occurring beneath Paddys Creek Hanging Swamp.
- Groundwater modelling, correlation analysis, geomorphological assessment and ecological assessment all indicate no significant change to water availability, flow regime or condition of THPSS.
- Historical evidence shows THPSS above previous partial extraction areas at Clarence Colliery have not shown mining related impacts.
- Swamps will continue to be monitored – including groundwater levels, surface water levels and flows, geomorphology and ecological condition – with refined TARPs proposed to provide a conservative risk management framework.

Residual impact: Negligible

3.5.6 Biodiversity and listed species

Key biodiversity impacts and their significance are:

- No vegetation clearing or habitat removal is proposed.
- Potential indirect impacts (subsidence, groundwater change, altered surface water flow) are predicted to be negligible.
- Ecological modelling and field evidence indicate no significant impacts to EPBC-listed species or ecological communities, including THPSS.

Residual impact: Negligible

3.5.7 Aboriginal cultural heritage

Key Aboriginal cultural heritage impacts and their significance are:

- No direct impacts to Aboriginal heritage are predicted.
- Existing heritage management and monitoring measures will be maintained.

Residual impact: Negligible

3.5.8 Built features, land use and public safety

Key built features, land use and public safety impacts and their significance are:

- No adverse impacts to built features or recreational infrastructure are predicted.
- Public access areas will be managed through existing safety management systems.
- No change to current land uses within the Gardens of Stone State Conservation Area.

Residual impact: Negligible

3.6 Impacts to Matters of National Environmental Significance

This preliminary documentation has assessed the likely impacts of the proposed Action on MNES, having regard to the relevant controlling provisions of the EPBC Act:

- Listed threatened species and ecological communities (sections 18 and 18A)
- A water resource, in relation to a large coal mining development (sections 24D and 24E).

The assessment has been undertaken on the basis of the varied action, which excludes mining of the 920 Panel and incorporates substantial reductions to the 918 Panel extraction footprint.

3.6.1 Listed threatened species and ecological communities (sections 18 and 18A)

The proposed Action has been assessed for its potential to result in a significant impact on EPBC-listed species and ecological communities, including the Endangered THPSS ecological community.

Based on the findings of the subsidence, groundwater, surface water and geomorphological assessments, the proposed Action:

- will not lead to a significant long-term decrease in the size, extent or viability of THPSS
- will not significantly fragment or modify habitat critical to the survival of THPSS or any EPBC-listed species
- will not significantly affect groundwater-dependent ecological processes that sustain THPSS
- will not significantly disrupt hydrological regimes through altered groundwater availability, surface water flows, or peat moisture conditions
- will not significantly increase the risk of extinction of any listed species or ecological community.

The revised mine design avoids second workings beneath the vast majority of THPSS, with only a minor overlap (~0.01 ha) beneath Paddys Creek Hanging Swamp. All indirect impact pathways (subsidence, fracturing, groundwater change and altered surface water flow) are predicted to be negligible in magnitude and localised.

Enhanced monitoring, conservative trigger levels and a staged adaptive management framework provide a precautionary safeguard to ensure impacts remain below thresholds of significance.

The proposed Action is not likely to have a significant impact on EPBC-listed threatened species or ecological communities for the purposes of sections 18 and 18A of the EPBC Act.

3.6.2 Water resources – large coal mining development (sections 24D and 24E)

The proposed Action has been assessed in accordance with the *Significant Impact Guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources*.

The assessment demonstrates that the proposed Action:

- will not significantly alter the quantity, quality or availability of groundwater or surface water to a degree that would materially affect aquifers, streams, swamps or associated ecosystems
- will not significantly compromise the integrity of the MYC aquitard, which separates shallow groundwater systems from deeper mine workings
- will not result in significantly sustained groundwater depressurisation of the Burralow Formation or Banks Wall Sandstone
- will not cause a significant increase in zero-flow days or low-flow conditions in Pine Creek, Paddys Creek, Nine Mile Creek or Bungleboori Creek
- will not significantly increase cumulative hydrological impacts when considered in the context of historical and approved mining.

Predicted changes to groundwater levels and surface water flows are negligible to very small, temporary where present, and within modelled uncertainty and observed climatic variability. Mine inflows are predicted to remain low and manageable.

The groundwater and surface water monitoring framework, including groundwater level triggers, inflow validation, and adaptive mine design hold points, will ensure that any unanticipated effects would be detected early and managed to prevent escalation.

The proposed Action is not likely to have a significant impact on a water resource, for the purposes of sections 24D and 24E of the EPBC Act.

3.7 Ecologically sustainable development

DCCEEW requests a description of how the proposed action meets the principles of ecologically sustainable development (ESD) (as defined in section 3A of the EPBC Act):

- decision making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations
- if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation

- the principle of inter-generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations
- the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making
- improved valuation, pricing and incentive mechanisms for the production, delivery, distribution or consumption of goods and services – especially those that are derived from natural or social capital or from ecological services – should be promoted.

Table 3.5 below evaluates the ESD principles against the proposed Action.

Table 3.5 Evaluation of ecologically sustainable development principles

Principles	Evaluation against the proposed Action
Decision making	During preparation of the EPBC referral, the variation and this preliminary documentation, the potential short-term and long-term environmental, social, cultural and economic impacts of the proposed Action have been systematically assessed by Centennial and independent technical specialists. As documented in Tables 4.1 and 4.2, Centennial undertook consultation with Commonwealth and NSW Government agencies, community representatives and Aboriginal stakeholder groups. Submissions, advice and requests for further information were considered and addressed through iterative refinement of the proposed Action design and supporting assessments. The proposed Action was substantially modified in response to stakeholder and regulator feedback to avoid and minimise impacts to MNES, including reductions in the proposed Action area and avoidance of sensitive environmental and cultural features. As summarised in Section 3.5 and Section 3.6, the proposed Action will not result in significant impacts on MNES.
Precautionary principle	The proposed Action has been developed and assessed in accordance with the precautionary principle, with emphasis on avoiding and minimising risk to environmental values at the design stage. Precautionary measures incorporated into the proposed Action include: • removal of the 920 Panel from the proposed action • a substantial reduction in the proposed Action area and disturbance footprint • avoidance of secondary extraction beneath the majority of Temperate Highland Peat Swamps on Sandstone (THPSS), with only a minor area (~0.01 ha) underlying Paddys Creek Hanging Swamp • avoidance of secondary extraction beneath third-order stream sections of Bungleboori Creek • avoidance of secondary extraction beneath Aboriginal heritage sites and cliff features • reductions in sub-panel widths to limit subsidence magnitude. A comprehensive monitoring program and adaptive management framework, including conservative trigger levels and staged implementation, has been adopted to manage uncertainty and respond to any unanticipated effects. Clarence would monitor and report on environmental values within the proposed Action area and implement adaptive management procedures and measures as required by the following management plans (included as attachments to Volume 2 of Appendix G): • 918 Panel Water Management Plan • 918 Panel Land Management Plan • 918 Panel Biodiversity Management Plan • 918 Panel Heritage Management Plan • 918 Panel Built Features Management Plan • 918 Panel Public Safety Management Plan • 918 Panel Subsidence Monitoring Program. Based on the refined mining layout and assessment outcomes, the proposed Action does not pose a risk of serious or irreversible environmental damage, consistent with the precautionary principle.

Principles	Evaluation against the proposed Action
Inter-generational equity	The proposed Action is located within the Gardens of Stone State Conservation Area, an area with ecological and recreational values. The proposed Action design has been refined to minimise land disturbance and protect areas of higher conservation value, including groundwater-dependent swamps and watercourses. Subsidence-related impacts to natural features are predicted to be unlikely and negligible in magnitude, and within applicable regulatory criteria. An adaptive management and monitoring framework is in place to ensure that environmental values are maintained throughout the life of the proposed Action. These measures ensure that the health, diversity and productivity of the environment are maintained for the benefit of future generations, consistent with the principle of inter-generational equity.
Conservation of biological diversity and ecological integrity	The proposed Action is in an area with a long history of underground coal mining. Notwithstanding, the proposed Action has been designed and assessed with avoidance of impacts to biodiversity and ecological integrity as a primary consideration. Key measures include: • removal of the 920 Panel • a reduction of approximately 57.4 ha in the proposed Action area and 35.98 ha in the disturbance footprint • avoidance of secondary extraction beneath the majority of THPSS communities. Based on the findings of the ecological, hydrological, subsidence and groundwater assessments, the proposed Action will not compromise the viability or integrity of EPBC-listed ecological communities or associated ecological processes.
Improved valuation, pricing and incentive mechanisms	Centennial accepts the financial costs associated with all the measures required for the proposed Action to avoid, minimise, mitigate and manage potential environmental and social impacts.

3.8 Economic and social matters

DCCEEW notes that the preliminary documentation must address the economic and social impacts (both positive and negative) of the proposed action. The consideration of economic and social matters may include:

- details of any public consultation undertaken, and the outcomes (if additional to the referral information, noting that the draft preliminary documentation will be published for public consultation and must be addressed in finalising the preliminary documentation)
- details of any indigenous stakeholder consultation (if additional to referral information)
- projected economic costs and benefits of the project, including the basis for their estimation through cost/benefit analysis or similar studies
- any employment opportunities expected to be generated by the project at each phase of the proposed action
- any benefits to the local and wider community as a result of the proposed action.

3.8.1 Economic

In December 2025, Centennial engaged Gillespie Economics to undertake an economic impact assessment of the proposed extension to the Clarence Colliery's operations. The assessment examined the economic efficiency and local economic impacts of the proposal using Cost-Benefit Analysis and Local Effects Analysis (Gillespie Economics, 2026).

Gillespie Economics concluded that the proposal is economically justified and would deliver substantial net benefits to Australia and New South Wales. The analysis identified significant local benefits, including employment support, income generation and broader regional economic activity. Importantly, any residual environmental and social impacts were assessed as limited and not sufficient to outweigh the economic benefits of the proposal.

The proposed Action would secure employment for the existing workforce, of approximately 380 personnel for approximately 14 months. . Therefore, it is considered that the proposed Action is economically justified for the same reasons stated in (Gillespie Economics 2026).

The proposed Action would provide royalties to the NSW State of approximately $5.7 million[1].

3.8.2 Consultation

Centennial engages with government agencies, special interest groups, Aboriginal stakeholders and the broader community on an ongoing basis. Consultation associated with the original 2024/09856 referral, the proposed Action as varied and the 918 Panel Extraction Plan has been ongoing since the application was first lodged in 2021, with stakeholders kept informed as the proposal has evolved. A detailed consultation record is provided in Appendix 3 of the 918 Panel Extraction Plan (Appendix G). A summary of the consultation undertaken with Commonwealth DCCEEW for the proposed Action referral is summarised in Table 3.6.

Public consultation has included engagement with the Clarence Community Consultative Committee (CCC) and Western Region Registered Aboriginal Parties in relation to both the 918 Panel Extraction Plan and the EPBC referral. A summary of the consultation is provided in Table 3.7.

The 918 Panel Extraction Plan was submitted to NSW Government agencies on 26 February 2026 with consultation ongoing. An updated 918 Panel Extraction Plan (Appendix G) which addresses stakeholder feedback was resubmitted 24 April 2026.

Further public consultation will be undertaken during public exhibition of the referral.

Table 3.6 Stakeholder engagement undertaken since referral

Stakeholder	Consultation type	Date	Key matters raised/comments
Commonwealth Department of Climate Change, Environment, Energy and Water (DCCEEW)	Meeting and presentation	20/04/2023	• Project briefing
	Meeting and presentation	22/05/2023	• Project briefing and preliminary subsidence results
	Email	21/11/2023	• Provision of Groundwater model report and draft Water Management Plan
	Meeting and presentation	4/12/2023	• Detailed presentation on the groundwater model report
	Business Portal	28/2/2024	• Lodgement 918 and 920 Panel referral
	Letter	18/7/2024	• Notification of decision

[1] Royalty calculation is based on April 2026 thermal coal price in the export market which is subject to change. Actual saleable coal tonnages may result from changes in product specification requirements, yield and ROM tonnages mined.

Stakeholder	Consultation type	Date	Key matters raised/comments
	Letter	31/8/2024	• Request for further information
	Letter	20/10/2025	• Controlled Action variation application
	Letter	14/11/2025	• Notification Action has been varied.
	Meeting	26/03/2026	• Project briefing

Table 3.7 Community and Aboriginal stakeholder engagement undertaken since referral

Stakeholder	Consultation type	Date	Key matters raised/comments
CCC	June 2024, September 2024, December 2024, March 2025, June 2025, September 2025, December 2025, March 2026	Meeting and presentation	• Project update
Western Region Registered Aboriginal Parties (RAPs)	March 2024, September 2024, March 2025, October 2025, April 2026	Meeting and presentation	• Project update

Centennial will continue to consult with government agencies, special interest groups, Aboriginal stakeholders and the broader community regarding 918 Panel.

3.9 Preliminary general content, format and style

Appendix A of the statement of reasons (SOR) which was attached to the Minister's decision, provides an outline of the general content, formatting and style recommendations for the development of the preliminary documentation. This preliminary documentation has been prepared generally in accordance with this suggested framework (Table 3.8). The numbering of individual items shown in Table 3.8 has retained the same numbering as the SOR.

Table 3.8 Preliminary documentation

Content requirements		Where addressed
A1.1	Be a stand-alone document containing sufficient information to avoid the need to search out previous or supplementary reports.	This report
A1.2	Enable interested stakeholders and the Minister to easily understand the consequences of the project on matters of national environmental significance (MNES).	Section 3.5 and Section 3.6
A1.3	Be written so that any conclusions reached can be independently assessed. Include all key claims, findings, proposals and undertakings in the main document.	This report
A1.4	Refer to all relevant standards, policies and other guidance material published by the department. Any instances where published guidance is not followed must be justified. Where no Commonwealth standards exist, state government and industry standards may be useful.	Appendix B to Appendix H

Content requirements		Where addressed
A1.5	Include the names, roles and qualifications (where relevant) of all persons involved in preparing the preliminary documentation.	Section 1.4
A1.6	Include a copy of this request for information and a cross-reference table indicating where the information fulfilling this request is included in the preliminary documentation (e.g. Section 4.2.2 and Appendix A, Chapter 2.1).	Appendix A Chapter 3
A1.7	The preliminary documentation must state the following for all information provided: • the source and date of the information • how the reliability of the information was tested • the uncertainties (if any) in the information • the guidelines, plans, and/or policies considered.	This report Appendix B to Appendix H
A2. Format and style requirements		
A2.1	Be in a suitable format to be published in hardcopy (A4 or A3 size, with maps and diagrams in A4 or A3 size and in colour) and published in electronic format (e.g. MSWord or PDF) on the internet.	Compliant
A2.2	Include detailed technical information, studies or investigations necessary to support the information in the stand-alone document as appendices.	Compliant
A2.3	Be objective, clear, succinct, avoid technical jargon and, where appropriate, be supported by maps, plans, diagrams, data or other descriptive detail.	Compliant
A2.4	Reference all sources using the Harvard standard of referencing. Ensure that other supporting documents (e.g. academic studies, regulatory standards) are publicly accessible, with electronic links provided where possible.	Compliant
A2.5	Redact the contact details of departmental officers.	Compliant
A2.6	Not contain any commercial in confidence markings. If the preliminary documentation contains sensitive information, please discuss this with the assessment officer.	Compliant

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