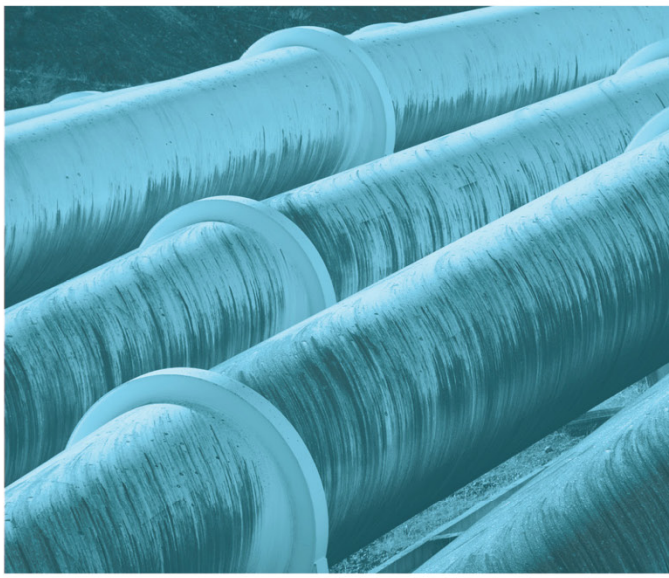



Clarence Colliery and Charbon Colliery

Modification report for modifications to DA 504-00 and SSD 08_0211

Prepared for Centennial Coal Company Limited
September 2020

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Client

Centennial Coal Company Limited

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1 September 2020

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1 September 2020

Executive Summary

Charbon Colliery (Charbon) is an underground and open cut coal mine owned and operated by Charbon Coal Pty Limited (Charbon Coal), a joint venture between Centennial Coal Company Limited (Centennial) and SK Networks Resources Australia Pty Ltd. Charbon is approximately 87 kilometres (km) north-west of Lithgow and 3 km south of Kandos in the Western Coalfields of New South Wales (NSW).

Charbon was approved as a Major Project under the now repealed Section 75J Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 7 September 2010 (PA 08_0211). PA 08_0211 has since been declared a State significant development (SSD) under Clause 6 of Schedule 2 of NSW Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017.

In 2015, mining operations ceased following the depletion of Charbon's approved coal reserves. Since the cessation of mining, Charbon Coal has been progressively rehabilitating the site. Charbon Coal undertakes rehabilitation and mine closure activities at the site pursuant to SSD 08_0211.

It is proposed to use coarse coal reject (CCR) material from Centennial's Clarence Colliery (Clarence) to enhance rehabilitation at Charbon. As nominated in Charbon's *Mining Operations Plan* (MOP), Charbon Coal proposes to import CCR from Clarence by train to backfill historical mining areas requiring rehabilitation. The transfer of CCR from Clarence to Charbon will assist Charbon Coal to better develop a final landform that is representative of existing landforms within and adjacent to site.

Charbon Coal is seeking to modify SSD 08_0211, pursuant to Section 4.55(2) of the EP&A Act, to allow for the transfer of CCR from Clarence to Charbon and the use of this material on-site during rehabilitation activities.

To facilitate the transfer of CCR from Clarence to Charbon, Centennial is also seeking to modify Clarence's development consent (DA 504-00), pursuant to Section 4.55(2) of the EP&A Act, to allow for the exportation of CCR from Clarence to Charbon by rail.

The NSW Department of Planning, Industry and Environment (DPIE) and key stakeholders have been consulted regarding the proposed modifications to assist in identifying all of the relevant issues to be assessed. Due to the inter-related scope of the proposed modifications, DPIE confirmed that their preference is for these applications to be assessed concurrently based on a consolidated modification report (MR) that addresses the impacts of both modifications. This MR and supporting technical assessments examine the potential impacts from the proposed modifications and propose mitigation measures, where required, to minimise potential impacts.

The proposed modifications have been designed to avoid and minimise adverse biophysical, social and economic impacts. Appropriate management measures have been identified to mitigate any residual impacts from the proposed modifications. These management measures will ensure the importation and use of Clarence CCR on-site at Charbon will have minimal additional environmental impacts compared to the use of on-site material alone.

The proposed modifications are considered to be consistent with the relevant objects of the EP&A Act and will not change the nature of the developments originally approved. All aspects relating to environmental management will continue in accordance with DA 504-00 and EPL 726 (Clarence), SSD 08_0211 and EPL 528 (Charbon), various approved plans and other elements of the consents.

The proposed modifications are of minimal environmental impact and both Charbon and Clarence will remain substantially the same developments for which consent was originally granted. As such it is considered the modifications can be approved pursuant to Section 4.55(2) of the EP&A Act.

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1 Introduction

1.1 Overview

1.1.1 Existing consents

i Charbon Colliery

Charbon Colliery (Charbon) is an underground and open cut coal mine owned and operated by Charbon Coal Pty Limited (Charbon Coal), a joint venture between Centennial Coal Company Limited (Centennial) and SK Networks Resources Australia Pty Ltd. Charbon is approximately 87 kilometres (km) north-west of Lithgow and 3 km south of Kandos in the Western Coalfields of New South Wales (NSW) within the Mid-Western Regional local government area (LGA) (Figure 1.1).

Charbon was approved as a Major Project under the now repealed Section 75J Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 7 September 2010 (PA 08_0211). PA 08_0211 has since been declared a State significant development (SSD) under Clause 6 of Schedule 2 of NSW Environmental Planning and Assessment (Savings, Transitional and Other Provisions) Regulation 2017.

Charbon has been in operation since the 1920s and has been owned and operated by Charbon Coal since 1994. In 2015, mining operations ceased following the depletion of Charbon's approved coal reserves. Since the cessation of mining, Charbon Coal has been progressively rehabilitating the site.

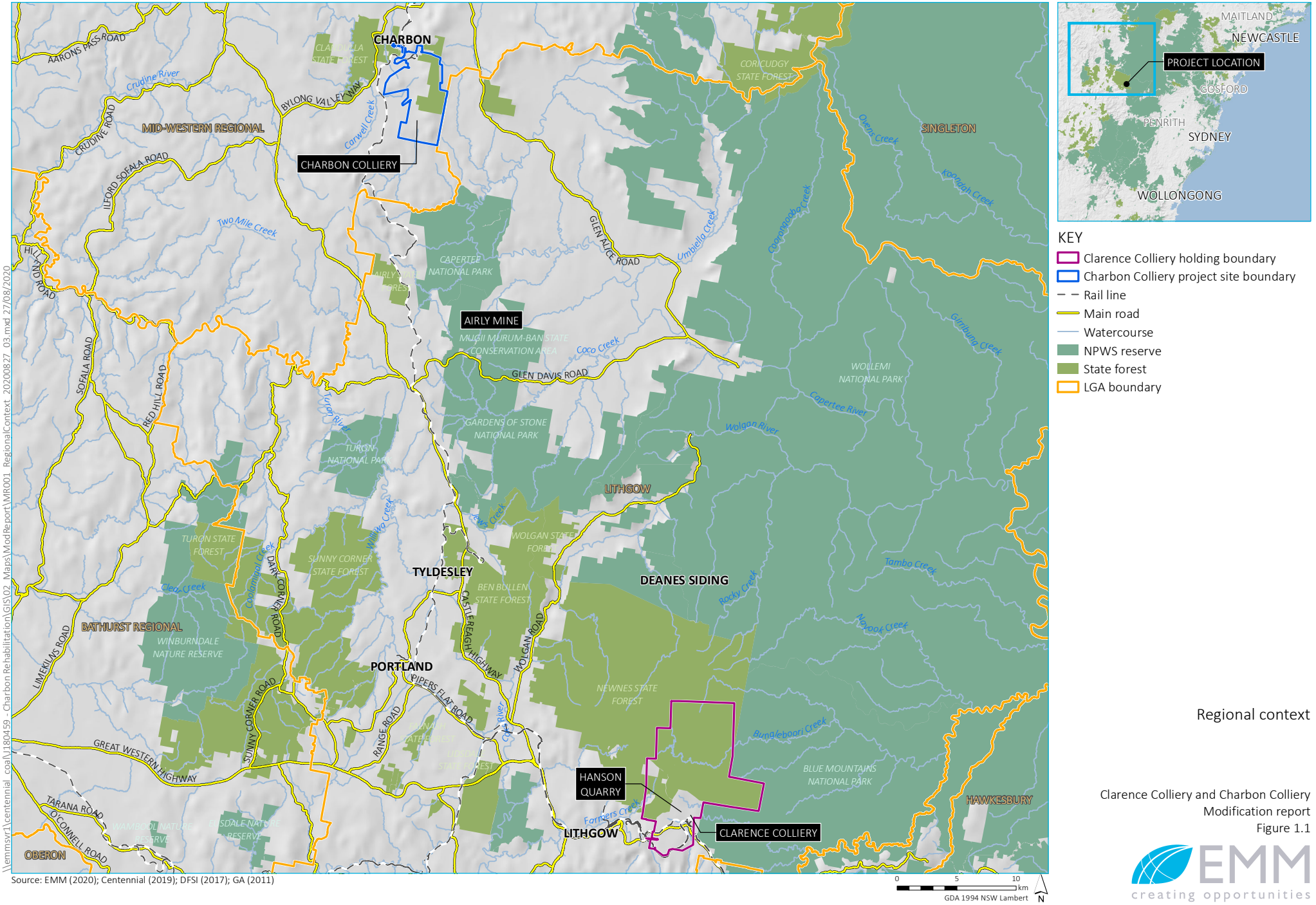
During open cut operations at Charbon, overburden was stockpiled out-of-pit, contrary to the *Environmental Assessment – Continued Operation of the Charbon Colliery* (Corkery 2009). To allow for the rehabilitation of these areas, the NSW Department of Planning and Environment (now NSW Department of Planning, Industry and Environment (DPIE)) issued Charbon Coal a Development Control Order (DCO) on 12 June 2019 to undertake rehabilitation works on all existing areas of disturbance and to allow transfer of out-of-pit stockpiles back into Charbon's open cut voids.

ii Clarence Colliery

Clarence Colliery (Clarence) is an underground coal mining operation utilising bord and pillar mining and partial extraction techniques. It is in the Western Coalfields of NSW, approximately 10 km east of Lithgow in the Lithgow LGA (Figure 1.1). Clarence has been in operation since the 1980s and is currently owned by Centennial and SK Networks Resources Australia Pty Ltd as participants in the Clarence Colliery Joint Venture. Centennial has been appointed as the management entity for the Clarence Colliery Joint Venture.

Clarence operates under three separate development consents:

- an interim development consent issued in 1976 by Blaxland Shire Council (now Lithgow City Council) for the construction of surface facilities (IRM.GE.76);
- a development consent issued in 1994 by Lithgow City Council for the extension of underground coal mining, surface reject emplacement areas (REAs) and water management and ancillary structures (174/93); and
- development consent issued in 2005 (DA 504-00) by the NSW Department of Infrastructure, Planning and Natural Resources (now DPIE) to expand site operations into Mining Lease (ML) 1583.



\\emmsvr1\centennial_coal\J180459 - Charbon Rehabilitation\GIS\02_Maps\ModReport\MR001_RegionalContext_20200827_03.mxd 27/08/2020

Source: EMM (2020); Centennial (2019); DFSI (2017); GA (2011)

Regional context

Clarence Colliery and Charbon Colliery
Modification report
Figure 1.1

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1.1.2 Modification overview

Charbon Coal undertakes rehabilitation and mine closure activities at Charbon pursuant to SSD 08_0211. While mining is permitted to continue until 31 August 2025, only rehabilitation and mine closure activities are currently being undertaken and these activities are approved to continue beyond 31 August 2025.

As nominated in Charbon's *Mining Operations Plan* (MOP) (Centennial 2019a), Charbon Coal proposes to import coarse coal reject (CCR) material from Clarence by train to backfill historical mining areas requiring rehabilitation. The combined use of Charbon overburden and Clarence CCR will allow Charbon Coal to be more selective when using material already available on-site and will assist Charbon Coal to better develop a final landform that is representative of existing landforms within and adjacent to the site. Charbon Coal is seeking to modify SSD 08_0211, pursuant to Section 4.55(2) of the EP&A Act, to allow for the transfer of CCR from Clarence to Charbon and the use of this material on-site during rehabilitation activities. At the same time, if approved, the proposed modification would authorise:

- the importation of CCR from Clarence to Charbon by rail;
- use of CCR for ongoing rehabilitation at Charbon; and
- an extension of the time permitted to undertake water transfers between Charbon and Airly Mine (Airly).

To facilitate the transfer of CCR from Clarence to Charbon, Centennial is seeking to modify DA 504-00, pursuant to Section 4.55(2) of the EP&A Act, to allow for the exportation of CCR from Clarence to Charbon by rail. If approved, the proposed modification would authorise:

- extraction of CCR from REA6;
- transfer of CCR from REA6 and Clarence's production stream to the existing train load out (TLO);
- loading of CCR into train-based containers via the existing TLO; and
- export of CCR off-site to Charbon via rail.

It is not proposed to change the approved life of mining operations, the approved extraction rate (3 million tonnes per annum (Mtpa)), coal handling and preparation, or rail or road dispatch of coal at Clarence. No new infrastructure or upgrades to existing infrastructure at Clarence is required to facilitate the proposed modifications.

No revisions to the project site boundary (SSD 08_0211) for Charbon are required as part of the proposed modification. It is not proposed to modify the approved life of mining operations.

EMM Consulting Pty Limited (EMM) has been engaged by Centennial and Charbon Coal to prepare this modification report (MR) to accompany the applications to modify DA 504-00 and SSD 08_0211.

Due to the inter-related scope of the proposed modifications, DPIE confirmed that their preference is for these applications to be assessed concurrently based on a consolidated MR that addresses the impacts of both modifications (this report). This MR assesses the impacts of the proposed modifications and proposes mitigation measures, where required, to minimise potential impacts.

1.2 Proponent

Centennial is a wholly owned subsidiary of Banpu Public Company Limited (Banpu).

Centennial is the proponent for the modification to DA 504-00. The relevant address is:

Centennial Coal Company Limited
Level 18, 1 Market Street
Sydney NSW 2000

Charbon Coal is the proponent for the modification to SSD 08_0211. The relevant address is:

Charbon Coal Pty Limited
Level 18, 1 Market Street
Sydney NSW 2000

1.3 Background

1.3.1 Clarence

Clarence is an underground mining operation utilising bord and pillar mining techniques using partial extraction. It targets the Katoomba Seam of the Illawarra Coal Measures and is approved to extract 3 Mtpa of run-of-mine (ROM) coal for supply to both domestic and export markets. Clarence has approval to transport coal via rail 24 hours per day, seven days per week. Some coal is also dispatched by road.

Clarence has the facilities on-site to wash ROM coal in order to maximise coal quality. A by-product of the washing process is CCR, which is emplaced in six REAs at Clarence's pit top, including:

- REA1, REA2 and REA4, which are rehabilitated but not closed;
- REA3, which is in care and maintenance;
- REA5, which is being constructed within the Clarence rail loop; and
- REA6, which is operational.

Clarence's operations are described in detail in Section 3.1.

DA 504-00 has been modified on five occasions (see Section 3.1.2).

1.3.2 Charbon

Mining at Charbon ceased in August 2015 and there is no further mining planned within the project site boundary. With the exception of the transfer of water to Airly, all activities currently occurring on-site relate to the decommissioning, rehabilitation and closure of Charbon.

Charbon's operations are described in detail in Section 3.2.

SSD 08_0211 has been modified once to allow for the transfer of up to 170 megalitres per year (ML/year) of water to Airly via train. This water is required to meet the current water deficit at Airly and enables Airly to mine at approved levels.

1.4 Related operations

1.4.1 Airly Mine

Airly is an existing underground coal mine owned and operated by Centennial Airly Pty Limited (Centennial Airly) approximately 5 km north-east of the village of Capertree within the Lithgow LGA (Figure 1.1).

Water is currently transferred from Charbon's existing surface water dams via rail to Airly in accordance with the relevant conditions of SSD 08_0211 and Airly's development consent (SSD-5581). Under SSD-5581, this activity is approved until 31 January 2037.

Charbon Coal propose to continue to pump water to load trains at Charbon and transport up to 170 ML/year to Airly by rail, in accordance with SSD 08_0211 and SSD-5581.

1.5 Objectives

The objective of the proposed modifications is to better achieve Charbon's rehabilitation objectives.

This MR has been prepared to support the applications to modify DA 504-00 and SSD 08_0211.

Additional details regarding the modifications is provided in Chapter 4.

1.6 Justification

The rehabilitation objectives at Charbon are to progressively rehabilitate disturbed areas to:

- create a stable post-mining landform that is consistent with the final landform presented in the EA (Corkery 2009) and surrounding areas;
- restore ecosystem function, including maintaining, or establishing self-sustaining native ecosystems;
- maintain the diversity of local flora;
- maintain and enhance habitat of native fauna;
- minimise the risk of erosion; and
- ensure there is no safety hazard beyond that existing prior to mining.

Stockpiled Charbon overburden is currently used for all rehabilitation activities at Charbon. The overburden is used to fill mine voids and to reconstruct hillsides so that the final landform will meet rehabilitation objectives. This is approved under SSD 08_0211 and is described in the MOP (Centennial 2019a).

Centennial has identified an opportunity to import Clarence CCR to use as fill at Charbon. The use of both Charbon overburden and Clarence CCR would enhance rehabilitation outcomes as the CCR has better properties for fill and landform construction, while the Charbon overburden has better properties for use in the upper fill layers and for capping (Table 1.1). The use of Clarence CCR will allow the available Charbon overburden to be used more selectively.

Table 1.1 Comparison of Charbon overburden and Clarence CCR

Use	Charbon overburden	Clarence CCR

Table 1.1 Comparison of Charbon overburden and Clarence CCR

Use	Charbon overburden	Clarence CCR
Fill	Charbon overburden consists of fine-grained materials that do not provide the construction material qualities of Clarence CCR.	Clarence CCR is coarser than Charbon overburden and offers improved drainage, greater structural strength and better compaction characteristics. The use of CCR will facilitate the construction of a more stable final landform than one constructed using only Charbon overburden.
Upper layers of fill and capping (about 2.5 m of benign material above 0.5 m of Southern Open Cut resistant overburden cladding)	The fine-grained Charbon overburden provides a beneficial growth medium for the establishment of self-sustaining native ecosystems. It also has better water holding capacity, which encourages plant growth. The fine-grained Charbon overburden has lower permeability than Clarence CCR, reducing the water infiltration to Clarence CCR. Charbon overburden is well-suited for capping.	Clarence CCR is a less suitable growth medium.
Material handling	The clay mineralogy of Charbon overburden contributes to lower soil strengths that can be problematic during earthworks in wet weather.	Clarence CCR is easier to transport than Charbon overburden and can be readily loaded and unloaded.

The combined use of both materials will provide an improved final landform compared to the landform that will be achieved under the current SSD 08_0211 and the MOPs. When compared with previously assessed and currently approved mining activities at Charbon, the proposed modification involves:

- a smaller vehicle fleet;
- fewer heavy vehicle movements; and
- fewer train movements.

Consequently, the potential for adverse amenity impacts (eg noise and dust) to be experienced at sensitive receptors surrounding Charbon will be less than currently approved.

1.7 Alternatives

Clarence and Charbon have rail loops that allow the export and import of material. The use of the existing rail network for CCR transport will avoid impacts on the local and regional road network associated with alternative transport methods (ie road transport).

Alternative sources of fill material have been considered but no feasible alternatives have been identified that avoid road haulage.

The 'do nothing' alternative would forego the identified opportunity to improve rehabilitation outcomes at Charbon.

1.8 Report contents

This MR describes Clarence and Charbon and their surrounds, existing operations at both mines, details of the proposed modifications, legislative framework, stakeholder consultation and provides an environmental

assessment and justification of the proposed modifications. This MR is accompanied and supported by the following technical assessments:

- Clarence:
  - a noise and vibration impact assessment (NVIA) prepared by EMM (Appendix A);
  - an air quality impact assessment (AQIA) prepared by EMM (Appendix B);
  - a socio-economic impacts analysis prepared by AIGIS Group (Appendix C); and
  - a greenhouse gas (GHG) emissions assessment prepared by EMM (Appendix D).
- Charbon:
  - an NVIA prepared by EMM (Appendix E);
  - an AQIA prepared by EMM (Appendix F);
  - a geochemistry assessment prepared by EMM (Appendix G);
  - a water resources assessment prepared by EMM (Appendix H);
  - a level crossing impact assessment prepared by EMM (Appendix I);
  - a biodiversity development assessment report (BDAR) waiver prepared by RPS Australia East Pty Ltd (RPS) (Appendix J); and
  - a GHG emissions assessment prepared by EMM (Appendix K).

2 Site description

2.1 Clarence Colliery

2.1.1 Site location

Clarence is in the Western Coalfield of NSW, approximately 10 km east of Lithgow in the Lithgow LGA (Figure 1.1). It is bordered by the Blue Mountains National Park to the east and Newnes State Forest to the north and west. The residential areas of Newnes Junction and Clarence Village are 900 metres (m) south-east and 1.5 km south-west of Clarence, respectively (Figure 2.1).

A number of extractive industries are in close proximity, including the Hanson Quarry to the west and the disused Rocla Quarry to the south-east (Figure 2.1). The proposed Newnes Kaolin Project is also to the south (Figure 2.1).

A spur rail line connects Clarence's surface facilities to the Main Western Rail Line (Figure 2.1). Road access to Clarence is directly from Clarence Colliery Road.

2.1.2 Land use and ownership

Land uses surrounding Clarence include extractive industries, rural residential dwellings, conservation and forestry.

The surface facilities at Clarence are on Crown and free-hold land north of Chifley Road (a continuation of Bells Line of Road) and the Main Western Rail Line (Figure 2.2).

2.1.3 Land zones

The land within Clarence's holding boundary is zoned RU3 (Forestry) and E3 (Environmental Management) under the Lithgow Local Environmental Plan 2014 (Lithgow LEP) (Figure 2.3).

2.1.4 Main Western rail line

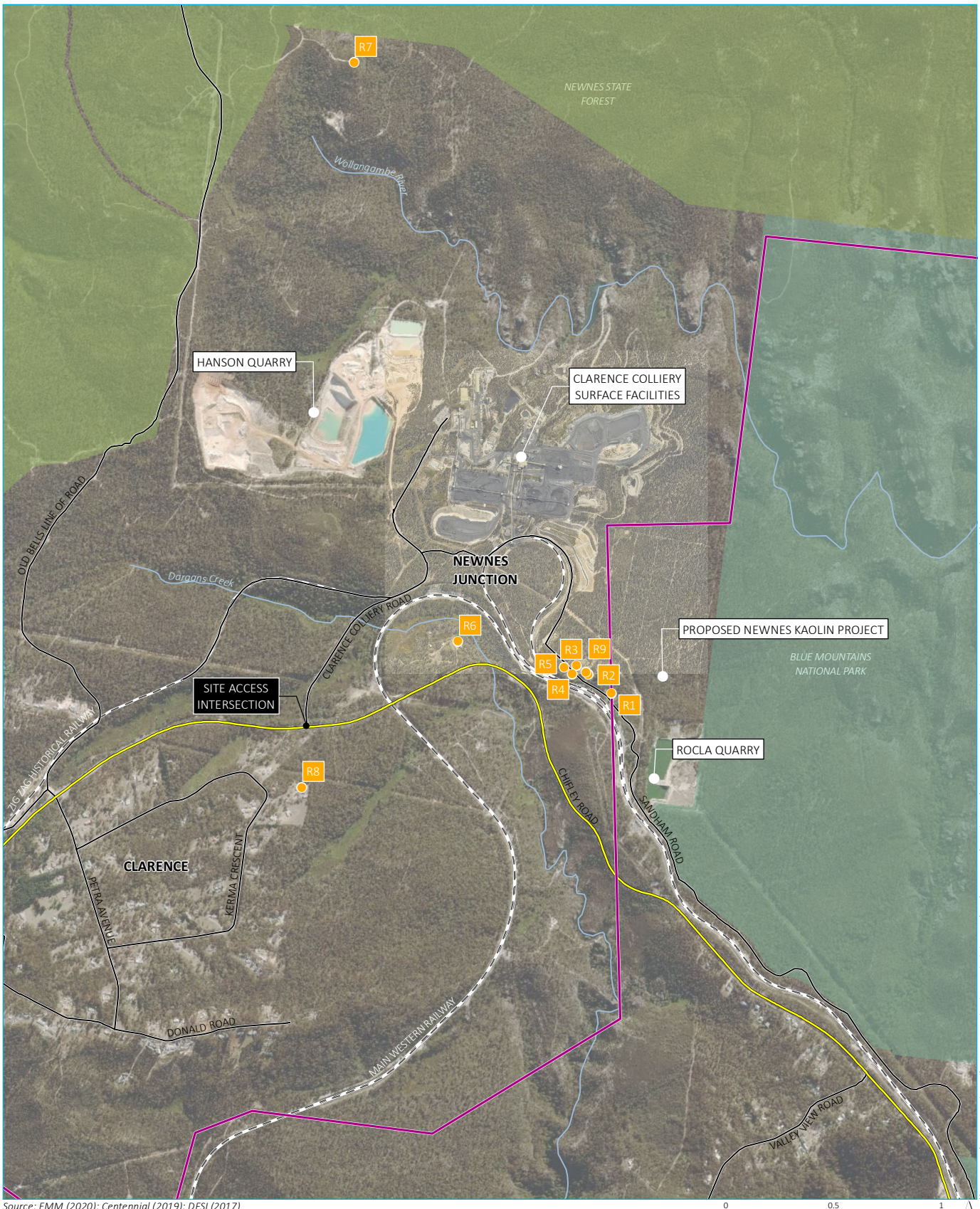
A spur rail line connects Clarence's surface facilities to the Main Western rail line. Clarence has approval to transport coal via rail 24 hours per day, seven days per week.

The Main Western rail line is a major rail line in NSW connecting Sydney to the Blue Mountains, Central West, North-West Slopes and Far West regions. Goods traffic continues along the Main Western rail line as far west as Nyngan. Passenger services operate daily between Sydney and Dubbo and commuter trains also travel between Sydney and Lithgow via the Blue Mountains line.

Existing daily train movements on the Main Western rail line between are summarised in Table 8.9.

2.1.5 Sensitive receptors

There are six sensitive receivers within 1 km of Clarence's surface facilities (Figure 2.1). The residential areas of Newnes Junction and Clarence Village are approximately 900 m south and 1.5 km south-west of Clarence, respectively (Figure 2.1).



\\emmsvr1\centennial_coal\180459 - Charbon Rehabilitation\GIS\02_Maps\ModReport\MR002_LocalContextClarence_20200827_04.mxd 27/08/2020

Source: EMM (2020); Centennial (2019); DFSI (2017)

0 0.5 1 km

GDA 1994 MGA Zone 56

N

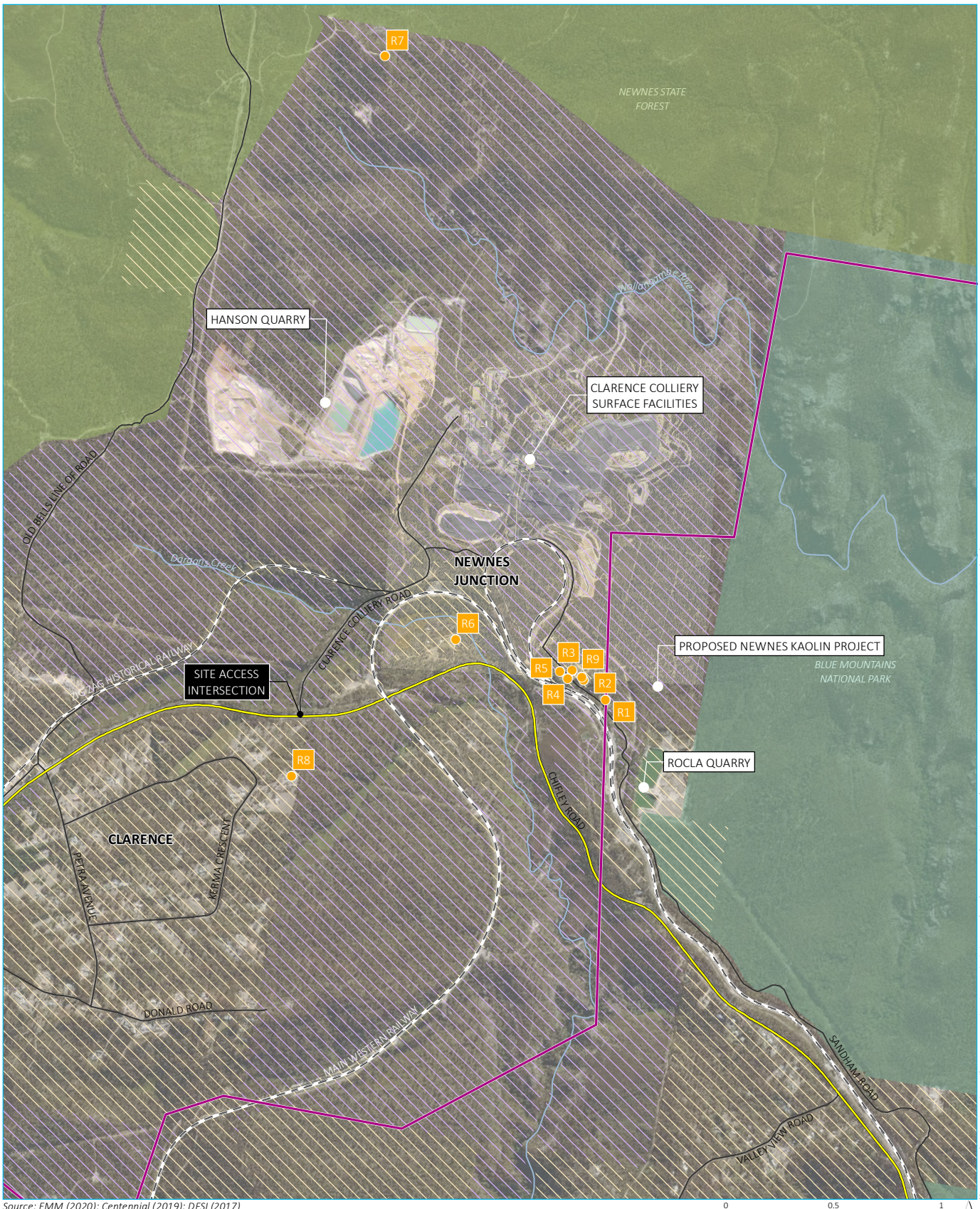
KEY

- Clarence Colliery holding boundary
- Assessment location
- Rail line
- Main road
- Local road
- Watercourse
- NPWS reserve
- State forest

Local context - Clarence Colliery

Clarence Colliery and Charbon Colliery
Modification report
Figure 2.1

EMM
creating opportunities



\\emmsvr1\centennial_coal\180459 - Charbon Rehabilitation\GIS\02_Maps\ModReport\MR003_LandOwnership_20200827 4_04.mxd 27/08/2020

Source: EMM (2020); Centennial (2019); DFSI (2017)

0 0.5 1 km

GDA 1994 NSW Lambert

N

KEY

- Clarence Colliery holding boundary
- Sensitive receiver
- Rail line
- Main road
- Local road
- Watercourse
- NPWS reserve
- State forest

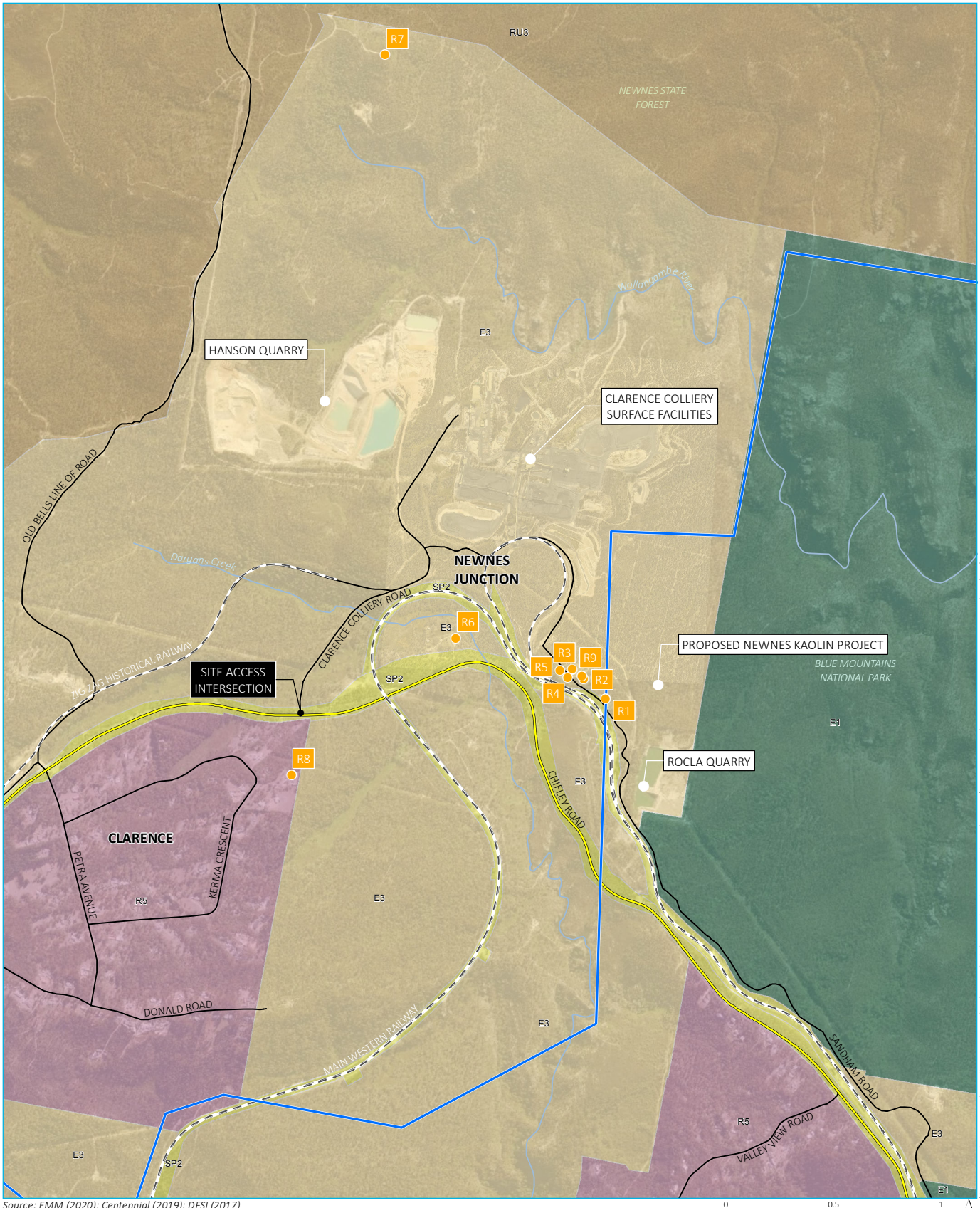
Land owner

- Crown
- Freehold

Land ownership - Clarence Colliery

Clarence Colliery and Charbon Colliery
Modification report
Figure 2.2

EMM
creating opportunities



Source: EMM (2020); Centennial (2019); DFSI (2017)

0 0.5 1 km

GDA 1994 NSW Lambert

N

\\emmsvr1\centennial_coal\180459 - Charbon Rehabilitation\GIS\02_Maps\ModReport\MR004_LandUseZone_20200827_04.mxd 27/08/2020

KEY

- Clarence Colliery holding boundary
- Sensitive receiver
- Rail line
- Main road
- Local road
- Watercourse

Land use zoning (Lithgow LEP)

- E1 National Parks and Nature Reserves
- E3 Environmental Management
- R5 Large Lot Residential
- RU3 Forestry
- SP2 Infrastructure

Land zones - Clarence Colliery

Clarence Colliery and Charbon Colliery
Modification report
Figure 2.3

EMM
creating opportunities

2.1.6 Environmental setting

i Geology, topography and soils

Clarence mines the Katoomba Seam of the Illawarra Coal Measures in the Western Coalfield. The overburden lithology at Clarence is characterised by competent interbedded sandstones, shales and fine to medium grained massive sandstones tending to basal conglomerates (GHD 2013).

The area surrounding Clarence is characterised by elevated terrain, with elevations ranging from approximately 920 metres Australian Height Datum (mAHD) to 1,160 mAHD within approximately 10 km of Clarence.

The soil landscape is categorised as either the Newnes Plateau or the Medlow Bath soil landscape (GHD 2013). The Newnes Plateau soil landscape consists of shallow sands and lithosols (GHD 2013a). The Medlow Bath soil landscape consists of moderately deep earthy sands and yellow earths (GHD 2013a).

ii Water resources and hydrology

a Groundwater

As reported in Clarence's *Water Management Plan* (WMP), there are three broad groundwater systems in the region surrounding Clarence:

- a perched groundwater system consisting of a discontinuous, near-surface system generally independent of the regional groundwater system;
- a shallow groundwater system in the Narrabeen Group, largely in the Banks Wall Sandstone; and
- a deep groundwater system that exists in the strata below the Mount York Claystone, including the Burra-Moko Head Sandstone, which has occasional water-bearing zones, and the Illawarra Coal Measures.

b Surface water

Clarence is within the greater Hawkesbury-Nepean Catchment and covers three adjacent catchments for the Wollangambe River, Wolgan River and upper Coxs River. Surface water systems within the holding boundary include: Wollangambe River; Bungleboori Creek; Dumbano Creek; Dingo Creek; Carne Creek; Farmers Creek; Dargans Creek; and Reedy Creek.

iii Climate

The Lithgow (Cooerwull) Bureau of Meteorology (BoM) weather station is 9.5 km south-west of Clarence. Clarence experiences a temperate climate as classified by the Koppen climate classification system. This consists of warm summers and cold winters. The average rainfall at the Lithgow weather station is 784 millimetres (mm) per year (from 1878–2018) with an annual low of 470 mm (in 1940) and annual high of 1,206 mm (in 1956). The average annual temperature is 18.6°C (2006–2018).

2.2 Charbon Colliery

2.2.1 Site location

Charbon is in the Western Coalfield of NSW, approximately 87 km north-west of Lithgow and 3 km south of Kandos in the Mid-Western Regional LGA (Figure 1.1). The project site is about 8 km long, from north to south, and about 4 km wide, from east to west. There is bushland, Charbon Lime Works and the village of Charbon to the north, bushland (Kandos State Forest) and escarpment (Great Dividing Range) to the east and bushland and agricultural land to the south and west. The closest suburbs are Charbon, approximately 1.5 km north-west of the rail loop (at the north end of the project site), and Clandulla, approximately 2.7 km south-west of the rail loop.

A private rail loop connects Charbon's surface facilities to the Wallerawang-Gwabegar rail line (Figure 2.4). Road access to Charbon is from Bylong Valley Way via Cooper Drive, Charbon Road and a private access road for employees, visitors and contractors.

2.2.2 Land use and ownership

Land uses surrounding Charbon include rural residences, agriculture, industry (eg Charbon lime plant and Cement Australia plant) transport infrastructure and commercial forestry.

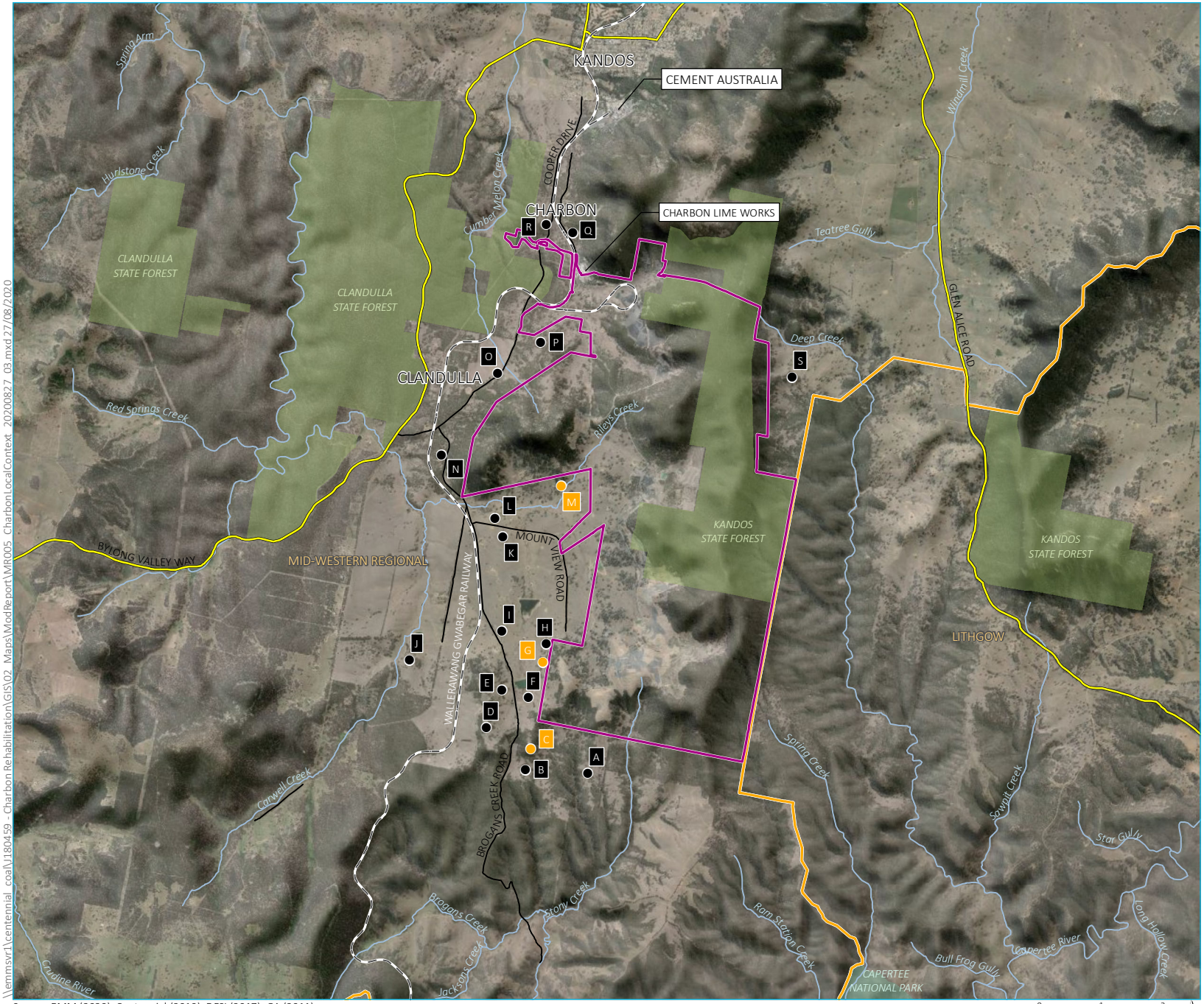
The majority of land within the project site boundary is owned by Centennial. Forestry Corporation of NSW (Forestry NSW) owns Kandos State Forest and Clandulla State Forest, both of which are partially within the project site boundary (Figure 2.5). There are small private landholdings within the southern and western portions of the project site boundary and several small areas of Crown land (mostly Crown road reserves) and NSW Government land.

2.2.3 Land zones

The land with Charbon's project site boundary is zoned RU1 (Primary Production) and SP2 (Rail Infrastructure Facilities) under the Mid-Western Regional Local Environmental Plan 2012 (Mid-Western Regional LEP) (Figure 2.6).

2.2.4 Sensitive receptors

There are a number of non-mine owned residences in the area surrounding the project site boundary (Figure 2.4). The closest non-mine owned residence is Residence H, approximately 80 m from the project site boundary. The closest non-mine owned residence to the rail loop and proposed rail unloading activities is Residence P, approximately 1,500 m south-west of the rail loop.



KEY

- Charbon Colliery project site boundary
- Sensitive receiver
- Centennial-owned property
- Rail line
- Watercourse
- NPWS reserve
- State forest
- LGA boundary

Source: EMM (2020); Centennial (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 NSW Lambert

N

Local context - Charbon Colliery

Charbon Colliery Modification 2
Modification report
Figure 2.4

EMM
creating opportunities

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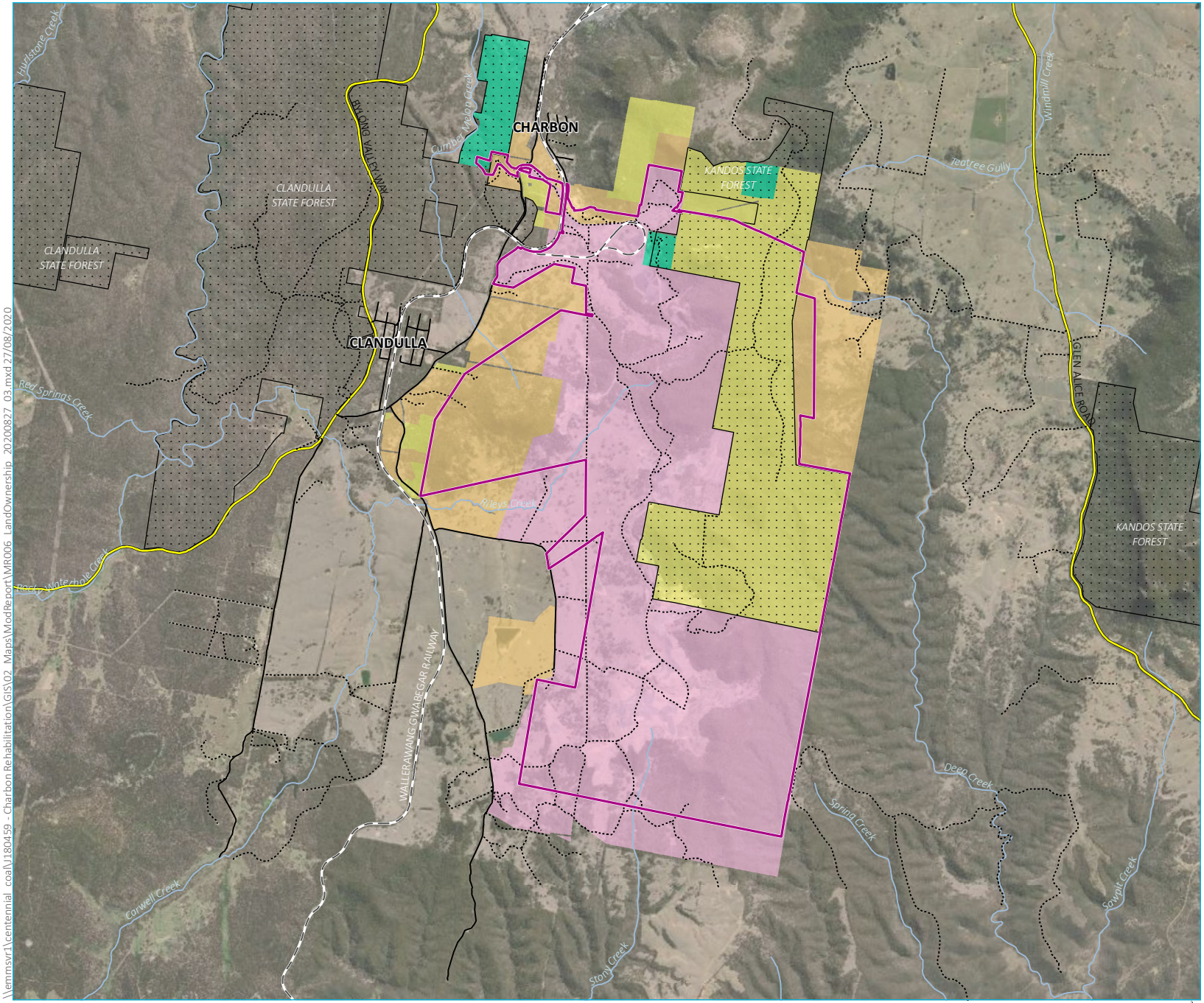


KEY

- Charbon Colliery project site boundary
- Rail line
- Main road
- Local road
- Vehicular track
- Watercourse
- State forest

Land ownership

- Centennial
- Freehold
- Crown
- NSW Government

Source: EMM (2020);Centennial (2019); DFSI (2017); GA (2011)

0 1 2 km

GDA 1994 NSW Lambert

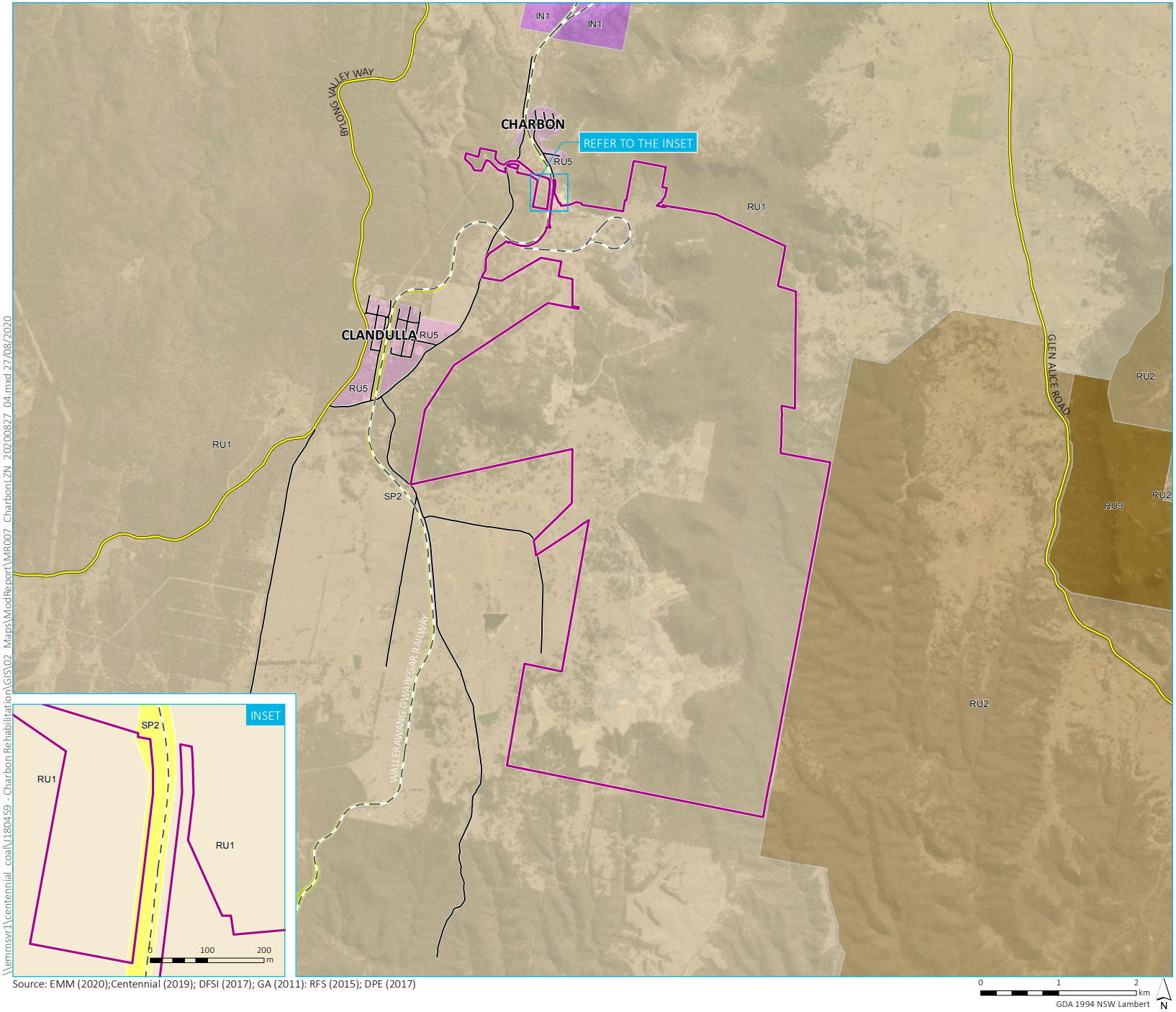
N

\\emmsvr1\centennial coal\J180459 - Charbon Rehabilitation\GIS\02 Maps\ModReport\MR006 LandOwnership 20200827 03.mxd 27/08/2020

Land ownership - Charbon Colliery

Clarence Colliery and Charbon Colliery
Modification report
Figure 2.5

EMM
creating opportunities



KEY

- Charbon Colliery project site boundary
- Rail line
- Main road
- Local road

Land use zoning (Mid-Western Regional LEP)

- IN1 General Industrial
- RU1 Primary Production
- RU2 Rural Landscape
- RU3 Forestry
- RU5 Village
- SP2 Infrastructure

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Source: EMM (2020);Centennial (2019); DFSI (2017); GA (2011): RFS (2015); DPE (2017)

Land zones - Charbon Colliery

Clarence Colliery and Charbon Colliery
Modification report
Figure 2.6

EMM
creating opportunities

2.2.5 Wallerawang-Gwabegar rail line

Charbon's existing rail loop is connected to the Wallerawang-Gwabegar Rail Line, which is not operated to a fixed timetable. During mining, an average of eight coal trains per week were dispatched from Charbon on the Wallerawang-Gwabegar Rail Line.

Charbon is currently approved to operate eight train movements in the day period (7 am–10 pm) and two train movements in the night period (10 pm–7 am). Since the completion of mining, rail transport has been used infrequently for importation of materials to Charbon's pit top for rehabilitation activities.

As noted previously, Charbon Coal has approval to transfer up to 170 ML/year of water to Airly via train. One water-laden train per day (ie two rail movements) is permitted to travel from Charbon to Airly. Water pumping infrastructure on-site at Charbon's pit top is utilised to fill the train with water.

Train movements on this section of the line are discussed in Section 8.5.2 and correspond to approximately four train movements daily (two in each direction) between Wallerawang and Airly and approximately two train movements daily (one in each direction) between Airly and Charbon.

2.2.6 Environmental setting

i Geology, topography and soils

Charbon is in the northern extent of the Western Coalfields of NSW. During operations, Charbon mined the Irondale and Lithgow Seams of the Permian aged Illawarra Coal Measures.

The eastern section of the site is dominated by a ridgeline associated with the Great Dividing Range. Within this range are two dominant peaks, one immediately east of the coal handling and preparation plant (CHPP) (Church Mountain) with an elevation of 1,022 mAHD and a taller peak further north (Baldy Peak) with an elevation of 1,071 mAHD. The western section of the site is dominated by Haystack Mountain, with an elevation of 984 mAHD. The undulating valley floor between the eastern and western peaks ranges in elevation from 680 mAHD to 770 mAHD.

Soils at Charbon generally consist of red and yellow podzolic soils and bleached loams (GSSE 2009):

- Red podzolics on-site generally consist of brown to reddish brown sandy loam topsoils that are weak in structure, overlying light to medium reddish brown clays that are angular blocky and moderate to strong in structure.
- Yellow podzolics also feature throughout the site. They consist of hard setting weakly structured brown loams to sandy loams. The subsoils generally display yellowish brown or yellowish orange medium to heavy clays and are moderately structured with coarse angular blocky rough faced pods.
- Smaller portions of the site contain bleached loams which belong to the Three Sisters soil landscape unit. Topsoils generally display dark brown sandy to fine loams. Bright yellowish-brown sandy clay loams which are weakly structured are present in the subsoils.

ii Water resources and hydrology

a Groundwater

Local groundwater sources in the vicinity of the site are generally low-yielding and predominantly within weathered and/or fractured sandstone and coal seams that occur within Haystack Mountain and the Great Dividing Range (GHD 2019).

The alluvium in the vicinity of Charbon forms an unconfined shallow aquifer (GHD 2019). The alluvial sediments are associated with valley floor drainage lines and are of limited extent within the project site (GeoTerra 2009).

The coal seams within the project site boundary form unconfined, free draining, unsaturated aquifers (GeoTerra 2009). Underground workings at Charbon have been generally dry workings with minimal groundwater inflow. No significant groundwater systems have been intersected by open cut mining operations at Charbon (GeoTerra 2009). Groundwater seepage is generally not observable from these dry workings, except after significant rainfall events where ephemeral perched seeps may produce short periods of low water flow.

The regional groundwater system is typically at least 30 m deep beneath the underground workings, within the Shoalhaven Group and the underlying metamorphic rocks. The regional groundwater aquifer in the vicinity of the site is confined and typically saturated. The regional aquifer is recharged from rainfall infiltration and seepage from local drainage sites. It is unlikely that the regional groundwater system is hydraulically connected to coal seam groundwater (GeoTerra 2009).

b Surface water

The majority of the site is in the Cudgegong River Catchment, which consists of scattered intermittent watercourses and creeks draining agricultural land. The Cudgegong River flows to Lake Windamere, both of which form part of the Macquarie-Bogan River Catchment of central NSW. A small portion of the southern and eastern part of the site is in the Capertee River Catchment, which is part of the Hawksbury-Nepean Catchment.

The site extends into four local catchments:

- Reedy Creek – Reedy Creek catchment is the northernmost catchment and contains the disused CHPP and coal stockpiles, CHPP dams, pit top services area and the rail loop. Reedy Creek flows into Reedy Creek Dam, which provided process water to the CHPP. Overflows from the dam enter Cumber Melon Creek which drains into the Cudgegong River (Macquarie-Bogan River Catchment).
- Rileys Creek – Rileys Creek catchment is south of the Reedy Creek catchment and drains former open cut and underground mining areas. This catchment contains numerous farm dams that contain local minor flows. Rileys Creek drains into Carwell Creek to the west, which drains into Lake Windamere without entering Reedy Creek or the Cudgegong River (Macquarie-Bogan River Catchment).
- Stony Creek – Stony Creek drains portions of open cut mining areas to the south of the site. Stony Creek drains into Ulumbra Creek, which flows south-east into the Capertee River (Hawkesbury-Nepean River Catchment).
- Deep Creek – Deep Creek catchment overlies part of the closed underground workings on the eastern side of the site. No runoff from disturbed areas flows to Deep Creek (Hawkesbury-Nepean River Catchment).

iii Climate

The Nullo Mountain BoM weather station is approximately 30 km north-east of Charbon. The average rainfall is at the Nullo Mountain weather station is 700 mm per year (from 1889–2018) with an annual low of 318 mm (in 1982) and an annual high of 1,537 mm (in 1950). The average annual maximum temperature is 16.7°C with an average annual minimum temperature of 8.1°C (1991–2018).

3 Existing operations

3.1 Clarence Colliery

3.1.1 Overview of operations

Clarence has approval to extract 3 Mtpa of ROM coal for supply to both domestic and export markets. Coal is extracted from the Katoomba Seam of the Illawarra Coal Measures using bord and pillar and partial extraction methods. ROM coal is beneficiated (washed) on-site prior to despatch. Clarence is approved to operate 24 hours per day, seven days per week and currently employs up to 400 full-time equivalent (FTE) personnel. Key surface infrastructure at Clarence is identified on Figure 3.1.

Clarence's development consents (Section 3.1.1) allow for the following activities:

- construction and operation of pit top facilities including:
  - mine administration and bath house buildings;
  - store and workshop buildings;
  - water treatment plant;
  - rail loop and load out facilities;
  - conveyor systems to transfer coal from the underground mine to the pit top facilities including the load out on the rail loop;
  - ROM stockpile area;
  - ventilation facilities (including a downcast ventilation shaft on Newnes Plateau);
  - washed coal stockpile area;
  - CHPP;
  - various water management structures including storage and leachate dams and irrigation areas; and
  - sewage treatment plant;
- underground mining from the Katoomba and Lithgow Seams using bord and pillar techniques;
- construction and operation of REAs 1–6 and associated water management infrastructure;
- extraction of up to 3 Mtpa of ROM coal;
- transport of up to 300,000 tpa of beneficiated coal by road (subject to conditions – Section 3.1.5); and
- transport up to 3 Mtpa of coal via rail, which can take place 24 hours per day, seven days per week.

Source: EMM (2020); Centennial (2019); DFSI (2017); GA (2011)

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KEY

- Clarence Colliery holding boundary
- Clarence Colliery surface facilities
- Assessment location
- Rail line
- Main road
- Local road
- Watercourse/drainage line
- Waterbody

Existing surface facilities at Clarence Colliery

Clarence Colliery and Charbon Colliery Modification report

Figure 3.1

EMM creating opportunities

3.1.2 Existing approvals and licences

i Development consents

Clarence operates under three development consents:

- An interim development consent (IRM.GE.76) issued in 1976 by Blaxland Shire Council (now Lithgow City Council) for the construction of surface facilities, underground mining and associated works (predominantly within CCL 705). This consent has been modified on two occasions to:
  - enable the construction of REAs; and
  - enable decommissioning works associated with REA3.
- A development consent (174/93) issued in 1994 by Lithgow City Council for the extension of underground coal mining, surface REAs and water management and ancillary structures. This consent has been modified once to enable changes to some construction aspects of REA5.
- Development consent (DA 504-00) issued in 2005 by the NSW Department of Infrastructure, Planning and Natural Resources (now DPIE) to expand site operations into ML 1583. This consent has been modified on five occasions to:
  - increase the mine's workforce;
  - construct and operate REA6 and an effluent irrigation area;
  - change the road haulage route;
  - temporarily increase road haulage; and
  - further increase the mine's workforce.

ii Environment protection licence

Clarence operates under Environment Protection Licence (EPL) 726.

iii Mining authorities

Clarence holds multiple mining leases issued under the NSW *Mining Act 1992* (Mining Act). The bulk of the underground mining operations and Clarence's surface facilities occur within CCL 705, while underground mining activities also occur within ML 1353, ML 1354 and ML 1583. A small proportion of the existing surface facilities are within ML 1721.

iv Mining operations plan

The MOP (Centennial 2019b) outlines the proposed operations at Clarence (as approved by the mine's development consents) and has been prepared for the five-year period from 1 January 2018 to 31 October 2022.

3.1.3 Approved mining operations

A partial-pillar extraction system is implemented at Clarence, which has been designed such that remnant pillars that remain within and between panels are long-term stable. Subsidence analysis results have proven this method of extraction results in extremely low levels of subsidence. Unlike full extraction mining, partial extraction minimises subsidence through leaving a proportion of the resource in-situ. This provides support to the overlying strata, minimising the breakage and falling of the overburden and maintains the integrity of overlying aquifers. All mining activities are undertaken in accordance with an approved subsidence management plan (SMP).

3.1.4 Materials handling and processing

Coal from the underground operations is brought to the surface via the main ROM conveyor which is south of the administration building. Coal is then run through a rotary breaker and crusher to reduce the size of the coal to ≤50 mm where it is conveyed to the ROM coal stockpiles.

An understack coal reclaim system can either direct coal directly to the train loading bin or on to the CHPP for processing.

Material from the ROM coal stockpiles is fed into the CHPP where it is washed and then either sent to the washed coal stockpile or the product coal stockpile. During the washing of the coal, fines material (less than 0.05 mm) is collected and run through a thickener and into belt filter presses which compress the slurry into cakes which are stored on-site to be blended with product coal for sale. Some unwashed ROM coal is exported from the site for sale.

Coal which is sent to the washed coal stockpile is not sorted by size. The washed coal stockpile covers approximately 4 ha and has the capacity to store 300,000 t of coal. Coal from the washed coal stockpile is collected via an underground reclaim system and transported to the train loading bin adjacent to the train loader on the rail loop.

Coal for the product coal stockpile is run through a screening plant which separates it into three size fractions (<15 mm, 15–25 mm and 25–50 mm). The product coal stockpile covers approximately 2 ha. Coal from the product coal stockpile can be loaded onto semi-trailers and truck-and-trailer units with a front-end loader. All loading and haulage at Clarence's pit top is within the product coal stockpile area and dedicated haul roads within the pit top.

CCR material not suitable for sale is currently placed in REA6.

3.1.5 Coal transport

Coal is exported from Clarence by train and truck. Both ROM coal and beneficiated coal is transported by rail, using the Main Western rail line to Port Kembla or Newcastle for overseas markets.

Only washed and sized coal is transported to domestic markets via road haulage. Clarence is approved to transport up to 200,000 tpa by road to domestic markets, with a maximum of 100,000 tpa transported to the west, and the remainder to the east for the life of the mine. Trucking of coal only takes place on weekdays between 6.00 am and 10.00 pm.

Until 31 December 2020, Clarence is approved to transport up to 300,000 tpa by road to domestic markets, with a maximum of 200,000 tpa transported to Mount Piper Power Station (MPPS) or locations north of Sydney or eastern NSW using approved haulage routes.

3.1.6 Reject emplacement

There are six REAs at Clarence's pit top (Section 1.3.1). Reject emplacement activities can occur 24 hours per day, 7 days per week.

Reject material from the CHPP is currently transferred to the active area within REA6 using 40-t dump trucks. These dump trucks allow direct tipping of the reject materials into the REA. The emplacement stockpile within the REA is raised in designated lifts with stabilising berms. The construction of the lifts and berms and compaction of the reject material within the REA is undertaken using a bulldozer and front-end loader or excavator.

Rehabilitation of the REAs is progressive and is undertaken in accordance with the MOP (Centennial 2019b).

3.1.7 Water management

The water management system at Clarence is comprised of clean, dirty, coal contact and leachate water. Sources of water at the mine include rainfall, catchment runoff and groundwater inflow to the underground mine workings. The primary water demands are for:

- underground operations;
- the CHPP;
- surface dust suppression;
- machinery washdown;
- maintaining water levels within the firefighting storage; and
- staff amenities.

Surface water runoff from areas where there is no coal storage, transportation, handling or processing or any disturbance is considered to be clean water, as it is unlikely to be contaminated with coal fines or sediment. Runoff is diverted around dirty water and coal-contact catchments to avoid mixing with clean water runoff.

Clean water runoff is typically from natural and impervious catchments such as areas of vegetation, rehabilitation, sealed roads and sealed car parks.

Dirty water is runoff from disturbed areas and areas likely to contain suspended sediment, oils, grease and hydrocarbons. This typically includes workshop and fuel storage areas.

Coal-contact water is runoff from catchments where coal storage, transportation, handling or processing occurs. Coal-contact water is managed within the dirty water management systems.

Leachate water includes any water associated with the operational REAs either at the surface or as exfiltration into the water management system.

3.1.8 Waste management

The major general waste streams from Clarence are water; packaging material (including plastic, paper, cardboard and wood); waste oil; oil filters; oil drums; scrap metal; hoses; bottles (plastic and glass); sewage effluent; and general putrescible rubbish.

General waste is disposed to landfill by licensed waste contractors. Recyclable materials are recycled whenever possible at the site. Oil drums and filters are recycled and other waste metals are removed from site by a metal

recycling company. Waste oil collected in the workshop is stored in an underground collection sump before being removed off-site by a licensed contractor for recycling.

Sewage and grey water from the bathhouse and offices at the pit top is treated on-site by a sewage treatment facility. Underground sewage is contained by activated biological toilets.

All potentially hazardous material at Clarence is stored and/or bunded appropriately in accordance with relevant standards. Hazardous materials that need to be disposed of are stored within an allocated area prior to being removed by a licensed hazardous waste contractor.

Where possible, all quantities of waste or recyclable material is quantified and recorded for benchmarking and continuous improvement purposes as well as reporting in accordance with the National Greenhouse and Energy Reporting Scheme and National Pollution Inventory.

3.1.9 Environmental management

Clarence has an environmental management strategy (EMS) developed in accordance with Centennial's EMS Framework and is generally consistent with the elements of ISO 14001. This EMS provides a framework to ensure the effective management of environmental issues and compliance with regulatory requirements for all activities and areas managed by Centennial. It also provides a means for continuous improvements in environmental performance.

As part of the EMS, a comprehensive set of environmental management plans have been developed and implemented at the mine. The implementation of these plans and integration of the EMS Framework is a strong focus at the mine and demonstrates environmental due diligence. These plans are reviewed and updated, as necessary, to reflect operational changes and incorporate additional/amended requirements.

The environmental management plans are backed by an environmental monitoring network. Monitoring results are reported monthly on Centennial's website and in Clarence's annual review documents.

3.2 Charbon Colliery

3.2.1 Overview of operations

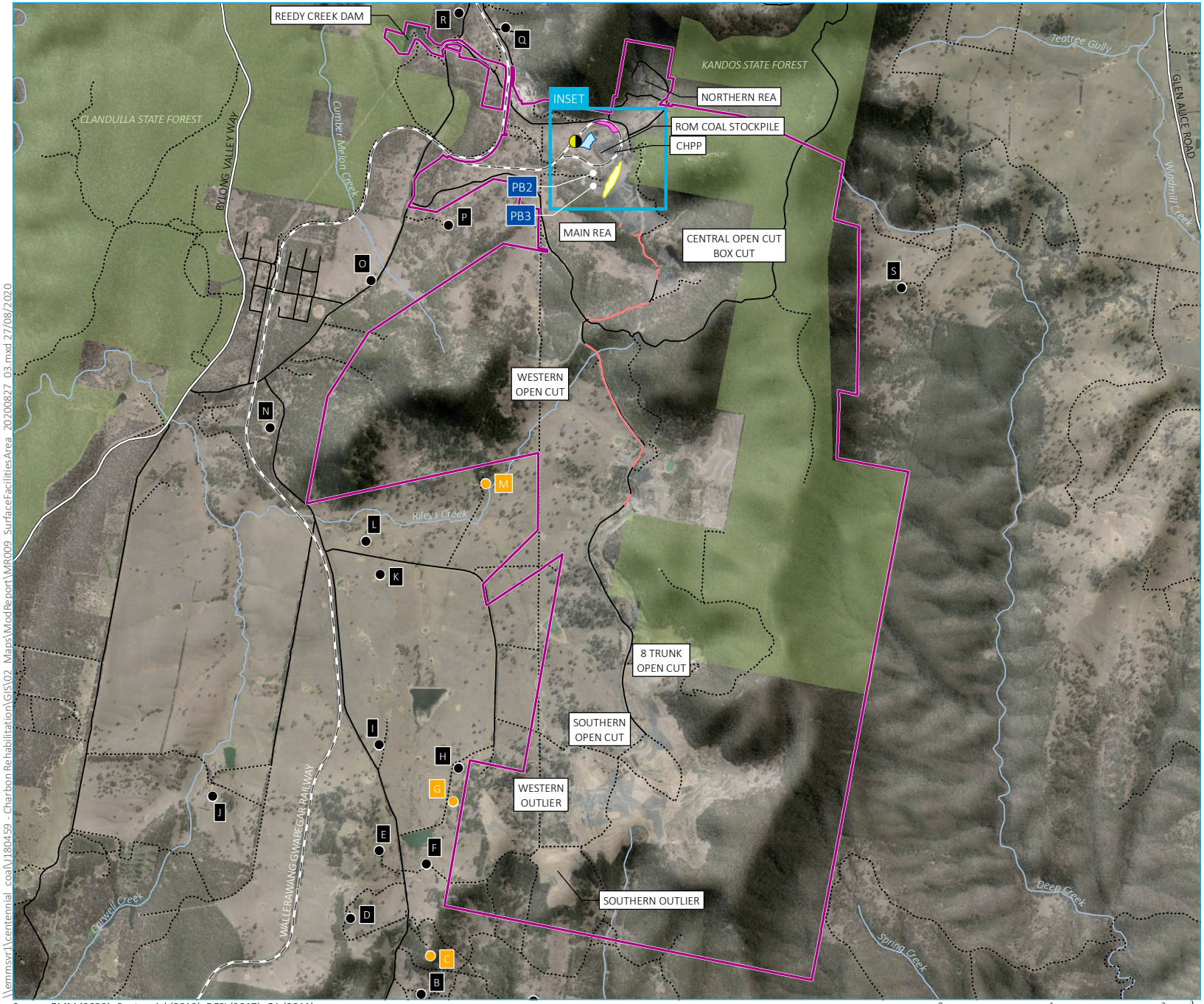
Mining at Charbon ceased in August 2015 and no further mining is planned within the project site boundary. With the exception of the transfer of water to Airly, all activities currently occurring on-site relate to the decommissioning, rehabilitation and closure of Charbon.

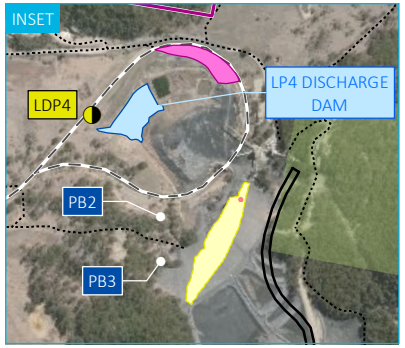
Previous mining areas and existing infrastructure at Charbon is identified on Figure 3.2.

The following activities are approved under SSD 08_0211:

- mining until 31 August 2025 with rehabilitation continuing beyond that date;
- mining of approximately 5.4 Mt of coal comprising:
  - open cut mining at 700,000 tpa in the Western and Western Outliers, Southern Open Cut Extension and 8 Trunk, Central and Western Open Cuts;
  - underground mining at 900,000 tpa in the Western Underground;
  - maximum quantity of coal mined annually not exceeding 1.5 Mtpa over 15 years;
- transfer of coal from the mining areas to the CHPP using underground conveyors and haulage trucks on internal haul roads;
- beneficiation of a maximum of 1.5 Mtpa of ROM coal per year in the CHPP to generate product coal;
- transportation of coal off-site, including:
  - 250,000 tpa of ROM and product coal to domestic customers by public road;
  - 20,000 tpa of product coal to Charbon Lime Works by private road;
  - 1.5 Mtpa of ROM and product coal by rail to domestic and overseas markets;
- train loading and dispatch 24 hours per day, 7 days per week;
- vehicular access to Charbon from Bylong Valley Way via Cooper Drive, Charbon Road and a private access road;
- the construction and operation of the following infrastructure at Charbon's pit top area:
  - surface water management structures;
  - CHPP and associated conveyors;
  - product and ROM coal stockpile areas;
  - REAs (including the Main REA and Northern REA);
  - rail loop and coal loading facility;

  - administration buildings and workshops;
  - ancillary roadways, powerlines and pipelines;
- management of waste rock within in-pit waste rock emplacement areas;
- management of coarse and fine reject materials in REAs;
- movement of existing overburden and rock emplacements as required to facilitate rehabilitation activities;
- storage and removal of waste, which is managed by a licensed waste/recycling contractor as appropriate;
- decommissioning and removal of all infrastructure from within the project site boundary (with the exception of some connecting roads and access tracks, which will be maintained for land management and bushfire hazard reduction/firefighting equipment, as well as, some dams and water management structure), including:
  - disconnecting and terminating services including power, water, data and telephone;
  - sealing all surface entries, adits, shafts and drifts in accordance with regulatory requirements;
  - identifying and removing (or remediating in situ) all hazardous and contaminated materials;
  - demolishing and removing all fixed plant and buildings from the site in accordance with the approved waste management strategy (WMS);
  - removing all mobile equipment from the site; and
  - breaking up and removing or reusing all concrete footings, pads and pavements.





KEY

- Charbon Colliery project site boundary
- Surface water storage
- Sensitive receiver
- Centennial-owned property
- Licensed Discharge Point (LDP)
- Rail line
- Main road
- Local road
- Vehicular track
- Watercourse
- State forest

Proposed modification elements

- Hardstand
- Link road
- Haul road widening

Source: EMM (2020); Centennial (2019); DFSI (2017); GA (2011)

\\emmsvr1\centennial coal\J180459 - Charbon Rehabilitation\GIS\02 Maps\ModReport\MR009 SurfaceFacilitiesArea 20200827 03.mxd 27/08/2020

Mine layout at Charbon Colliery

Clarence Colliery and Charbon Colliery
Modification report
Figure 3.2

EMM
creating opportunities

3.2.2 Existing approvals and licences

i Development consent

Charbon commenced operations in the 1920s. It supplied coal to the nearby, now closed, Charbon and Kandos cement works. In 1985, a rail loop and CHPP were installed to allow the export of beneficiated (washed) coal from Charbon. Since mining commenced, Charbon has been operated under a number of consents. A summary of the existing development consents and planning approvals for Charbon is provided in Table 3.1.

Table 3.1 Summary of existing approvals for Charbon Colliery

Issuing authority	Approval number	Approval date	Expiry date	Approved activities
NSW Department of Planning (now DPIE)	-	21 March 1985	-	CHPP, rail loop, product coal loading facilities and modifications to the pit top.
	32/92 33/92	24 June 1993	-	Construction and operation of mine entry, infrastructure, fine reject and tailings disposal system, and expansion of underground mining.
Rylstone Shire Council (now Mid-Western Regional Council)	94/95	21 December 1995	-	Third Entry Open Cut.
	94/95	25 June 2002	-	Modification for open cut mining north of Third Entry.
	1999/65	29 June 1999	Lapsed 29 June 2004	Mt View Access Road.
NSW Department of Infrastructure, Planning and Natural Resources (now DPIE)	122-3-2003	19 December 2003	January 2016	Southern Open Cut including Areas 3 and 4.
Planning Assessment Commission of NSW (now Independent Planning Commission or IPC)	08_0211	7 September 2010	Mining until 31 August 2025, all other activities permitted until the site has been properly rehabilitated.	The Charbon Coal Project, including: • continuing mining operations at the existing underground mine and Southern Open Cut; • extending mining operations by open cut and underground methods; • processing up to 1.5 Mtpa of ROM coal at the existing CHPP; • transporting product coal by road and rail to local and regional markets; and • rehabilitating the site.
DPIE	08_0211	30 July 2019	-	Modification to allow transfer of water to Airly using rail transport.

ii Development control order

As noted in Section 1.1.1, during open cut operations at Charbon, overburden was stockpiled out-of-pit, contrary to the *Environmental Assessment – Continued Operation of the Charbon Colliery* (Corkery 2009). To allow for the rehabilitation of these areas, the NSW Department of Planning and Environment (now DPIE) issued Charbon Coal a DCO on 12 June 2019 to undertake rehabilitation works on all existing areas of disturbance and to allow transfer of out-of-pit stockpiles back into Charbon's open cut voids.

iii Environment protection licence

Charbon operates under EPL 528.

iv Mining authorities

The mining authorities that Charbon operates within are listed in Table 3.2.

Table 3.2 Existing mining tenements – Charbon Colliery

Reference	Title	Grant date	Expiry date
CCL 732	Consolidated Coal Lease 732	1 December 1989	2 December 2025
ML 1318	Mining Lease 1318	29 June 1993	29 June 2026
ML 1384	Mining Lease 1384	19 January 1996	18 January 2038
ML 1501	Mining Lease 1501	21 December 2001	20 December 2022
ML 1524	Mining Lease 1524	28 October 2002	27 October 2023
ML 1545	Mining Lease 1545	19 January 2004	9 January 2025
ML 1647	Mining Lease 1647	17 December 2010	17 December 2031
ML 1663	Mining Lease 1663	9 January 2012	9 January 2033
MPL 270	Mining Purposes Lease 270	29 April 1991	29 January 2026
MPL 499	Mining Purposes Lease 499	28 May 1925	28 May 2026
MPL 505	Mining Purposes Lease 505	11 August 1925	11 August 2026
MPL 526	Mining Purposes Lease 526	14 December 1925	14 December 2024
MPL 670	Mining Purposes Lease 670	26 March 1930	26 March 2024
MPL 964	Mining Purposes Lease 964	20 November 1939	20 November 2023

v Mining operations plan

Charbon has now entered the closure and rehabilitation phase and rehabilitation works are undertaken in accordance with two approved MOPs. The MOPs have been prepared in accordance with *ESG3: Mining Operations Plan (MOP) Guidelines* (ESU – Mineral Resources 2013).

The first MOP (the S 240 MOP) (Centennial 2015) addresses 43 ha of ML 1647 and ML 1545 in the south of the site. The S 240 MOP was prepared to satisfy a notice issued under Section 240 of the Mining Act and relates to rehabilitation of Charbon on privately-owned land.

The second MOP (Centennial Coal 2019a) addresses the remaining rehabilitation areas at the site and was prepared to satisfy the relevant requirements of the *Landscape Management Plan*, *Rehabilitation and Offsets Management Plan* and *Mine Closure Plan* as required by Schedule 4, Conditions 6–8 of SSD 08_0211.

3.2.3 Approved mining operations

Open cut and underground mining and coal beneficiation (washing) was undertaken at Charbon until 2015. Underground mining was completed on 7 March 2014 and open cut mining ceased on 14 August 2015.

3.2.4 Materials handling and processing

There is no mining, product coal handling or processing currently undertaken on-site.

3.2.5 Coal transport

During mining, transportation of coal off-site included:

- up to 250,000 tpa of ROM and product coal to domestic customers by public road;
- up to 20,000 tpa of product coal to Charbon Lime Works by private road; and
- 1.5 Mtpa of ROM and product coal by rail to domestic and overseas markets.

Charbon's existing rail loop is connected to the Wallerawang-Gwabegar Rail Line, which is not operated to a fixed timetable. During mining, an average of eight coal trains (ie sixteen train movements) per week were dispatched from Charbon on the Wallerawang-Gwabegar Rail Line. Charbon is currently approved to operate eight train movements in the day period (7 am–10 pm) and two train movements in the night period (10 pm–7 am).

Since the completion of mining, rail transport has been used infrequently for importation of materials for rehabilitation activities. In addition, one water-laden train per day (ie two rail movements) is permitted to travel from Charbon to Airly.

3.2.6 Reject emplacement

SSD 08_0211 allows management of waste rock (overburden and interburden in open cut mining areas) and reject material management. All waste rock management is undertaken in accordance with the approved MOPs. Movement of existing overburden and rock emplacements is undertaken as required to facilitate rehabilitation activities.

3.2.7 Water management

Surface water and groundwater at Charbon is managed in accordance with the WMP. GHD prepared a surface water assessment for Charbon as part of a modification to SSD 08_0211 (GHD 2019). The assessment discusses in detail the hydrology of the site. A summary of the existing surface water and groundwater management systems is provided below.

i Underground water system

Inputs into the underground water system at Charbon consist of surface infiltration and seepage from the Third Entry Evaporation Dam. No groundwater is extracted from the underground workings or open cut pits.

Charbon Coal holds Water Access Licence (WAL) 27890 that permits extraction of up to 30 ML/year from two production bores. Historically, groundwater from the production bores was used to supplement the surface water supply system for use in the Southern Open Cut, underground workings and CHPP. Following the cessation of mining operations in 2015, the two production bores are no longer in use.

ii Surface water management

During mining, the surface water management system (Figure 2.8 of Appendix H), comprising both clean and dirty water systems, relied on demands from the CHPP and underground mining operations. The system is complex and has progressively developed over the life of Charbon (including since the cessation of mining and commencement of rehabilitation).

a Clean water system

Surface water runoff from areas where there is no coal storage, transportation, handling or processing or any disturbance is considered to be clean water, as it is unlikely to be contaminated with coal fines or sediment. Most clean water is diverted away from disturbed areas and does not enter the dirty water management system. The major clean water diversions are around the Main REA, pit top and open cut areas. As rehabilitation progresses, clean water management will also increase.

The Reedy Creek Dam captures clean water from Charbon. The dam has a capacity of 220 ML. This dam receives surface water runoff as well as discharges from LDP4, LDP5 and LDP6. Water from the dam can be pumped to the CHPP Dams 1, 2 and 3 or the Header Tank and was historically used to supplement the water supply to the CHPP and other water demands of Charbon when mining operations were occurring. No extraction of water has occurred from the Reedy Creek Dam since 2015 (ie when mining operations ceased).

b Dirty water system

Dirty water is runoff from disturbed areas and is likely to contain suspended sediment, oils, grease, hydrocarbons or coal. To prevent dirty water from entering the areas of clean water runoff and natural waterways, a number of dirty water control structures are in place and dirty water is generally directed into various sediment dams for treatment through settling prior to discharge through LDPs.

Water catchments within the project site boundary are described in Section 2.2.6. The CHPP, ROM coal stockpiles, mine washery dams, pit top services area, coal loading infrastructure, rail loop and previous open cut areas are in the Reedy Creek catchment.

Water for rehabilitation activities is sourced from on-site storages, specifically LDP2 and LDP3 Discharge Dams. Water for rehabilitation is not sourced from LDP4 or the dams associated with the CHPP.

iii Water transfers to Airly

Water transferred by rail to Airly is sourced from a combination of existing on-site storages as follows:

- runoff into CHPP dams that report to CHPP Dam 3;
- runoff/seepage into LDP4 Dam, which is then delivered into CHPP Dam 3 via a pipeline and pump; and
- runoff into Reedy Creek Dam, which is then delivered into CHPP Dam 3 via a pump station and pipeline.

Water from LDP4 Dam is sourced preferentially over sourcing transfer water from Reedy Creek Dam. This ensures that discharges from LDP4 Dam and flows to Reedy Creek Dam are minimised.

A pipeline connects CHPP Dam 3 to an above ground multi-outlet water manifold adjacent to the rail loop. Water from CHPP Dam 3 is transferred along the pipeline, via the water manifold and through a series of flexible hoses into containers on rail wagons.

3.2.8 Waste management

With the cessation of mining, no production waste (ie reject materials from ROM coal beneficiation) is generated at Charbon. Non-production wastes generated at Charbon are summarised in Table 3.3.

Table 3.3 Existing waste management – Charbon Colliery

Waste type	Storage	Removal
General waste (including food scraps)	Covered bins located within and adjacent to crib rooms, offices, workshops and other areas as required. These are regularly emptied into large, centrally-located, covered bins.	Collected on a regular basis by a licensed waste contractor and disposed of at a suitably licensed waste disposal facility.
Waste oils and greases	Bunded storage containers within workshop areas and transferred to a centrally-located, bunded waste oil tank.	Collected by a licensed waste contractor and recycled as required.
Scrap steel/metal	Stored in designated scrap metal bins or specified areas adjacent to workshops.	Collected by a scrap metal recycler as required.
General recyclables	Covered bins located within and adjacent to crib rooms, offices, workshops and other areas as required. These are regularly emptied into large, centrally-located covered recycling bins.	Collected by a licensed recycling contractor as required.
Sewerage and non-production wastewater	Treated within on-site facilities and used for irrigating vegetated areas on-site.	Not applicable.

As Charbon is not connected to a municipal water supply, drinking water is supplied by bottled water. Water for showers in the bathhouse and toilets is supplied by harvested water from the rooftops of the administration building. Wastewater from the bathhouse and toilets is treated at the wastewater collection system and then applied to the sewage irrigation area via LDP1.

3.2.9 Rehabilitation and final landform

Charbon is in the closure and rehabilitation phase and rehabilitation works are being undertaken in accordance with two approved MOPs. Charbon Coal's rehabilitation goal for disturbed areas within the project site boundary is to provide a low maintenance, geotechnically stable and safe landform that is commensurate with the surrounding area (Section 1.6).

Initially effort has focused on areas within the Southern Open Cut mining area to mitigate and manage the sediment load being generated and transported off-site. These works are largely complete.

Consistent with the approved MOPs, Charbon Coal will return disturbed areas within the project site boundary to a native forest ecosystem commensurate with the surrounding native forested areas and pre-mining conditions.

At the completion of rehabilitation, some manmade water bodies and drainage structures will be maintained to manage surface water flows and provide water resources for native fauna. Charbon Coal intends to retain some access roads and/or tracks to allow ongoing access to manage the final landform. These roads and/or tracks will also serve as fire breaks and assist with bushfire management.

3.2.10 Environmental management

Charbon has an EMS developed in accordance with Centennial's EMS Framework and is generally consistent with the elements of ISO 14001. This EMS provides a framework to ensure the effective management of environmental issues and compliance with regulatory requirements for all activities and areas managed by Charbon Coal. It also provides a means for continuous improvements in environmental performance.

As part of the EMS, a comprehensive set of environmental management plans have been developed and implemented at Charbon. The implementation of these plans and integration of the EMS Framework is a strong focus at Charbon and demonstrates environmental due diligence. These plans are reviewed and updated, as necessary, to reflect operational changes and incorporate additional/amended requirements.

The environmental management plans are backed by an environmental monitoring network. Monitoring results are reported monthly on Charbon Coal's website and in Charbon's annual review documents.

4 Proposed modification

The importation of CCR from Clarence will contribute to the successful rehabilitation of Charbon, enabling Charbon Coal to develop an improved final landform that is representative of existing landforms within and adjacent to the site.

4.1 Clarence Colliery

4.1.1 Overview

It is proposed to modify DA 504-00 to allow for:

- extraction of CCR from REA6;
- transfer of CCR from REA6 and Clarence's production stream to the existing TLO;
- loading of CCR into train-based containers via the existing TLO; and
- export of CCR off-site to Charbon via rail.

A comparison between approved operations and the proposed modification is provided in Table 4.1.

Table 4.1 Comparison of existing operations and the proposed modification - Clarence

Aspect	Approved operations	Modification
Mine life	Under DA 504-00, mining operations are permitted to 31 December 2026.	No change.
Holding boundary	As shown in Figure 5.6 of Appendix 2 to DA 504-00.	No change.
Hours of operation	Clarence is approved to operate 24 hours per day, 7 days per week.	No change.
Employment	Up to 400 full-time equivalent (FTE) personnel.	No change.
Train access	Trains access the rail loop from the Main Western Rail Line.	No change.
Rail movements	Clarence has approval to transport up to 3 Mtpa of coal via rail, which can take place 24 hours per day, 7 days per week.	As part of the proposed modification, one CCR-laden train will be used per day (ie two rail movements) to transport CCR from Clarence to Charbon.

Table 4.1 Comparison of existing operations and the proposed modification - Clarence

Aspect	Approved operations	Modification
Surface infrastructure	Clarence's pit top facilities include: • mine administration, bath house, store and workshop buildings; • water treatment plant; • rail loop and load out facilities; • conveyor systems to transfer coal from the underground mine to the pit top facilities; • ROM coal and washed coal stockpile areas; • ventilation facilities; • CHPP; • REAs 16; and • water management structures.	No change.
Site access	Vehicle access is from Chifley Road via Clarence Colliery Road and a private access road for employees, visitors and contractors.	No change.
Coal extraction, handling and processing	Coal is extracted from the Katoomba Seam of the Illawarra Coal Measures using bord and pillar and partial extraction methods. ROM coal is beneficiated (washed), sized and sorted on-site prior to despatch.	No change.
Coal transport	Coal is transported from Clarence to off-site locations either by rail or by trucks. Both ROM coal and beneficiated coal is transported by rail, using the Main Western rail line. Only washed and sized coal is transported to domestic markets via road haulage. Trucking of coal takes place on weekdays only between 6.00 am and 10.00 pm.	No change.
Rejects management	There are six REAs at Clarence's pit top, including: • REA1, REA2 and REA4, which are rehabilitated but not closed under the High Risk Activity (HRA) notification process; • REA3, which is in care and maintenance; • REA5, which is currently being constructed within the rail loop; and • REA6, which is operational.	CCR from REA6 will be extracted and loaded into train-based containers via the existing TLO for transfer to Charbon. CCR from Clarence's production stream will also be loaded into train-based containers via the existing TLO (as required).
Water management	In accordance with the approved WMP.	No change.
Waste management	Management systems in place for the various non-production waste streams, including general waste, maintenance consumables, waste oils and grease and sewage.	No change.
Rehabilitation and final landform	In accordance with the approved MOP.	No change.
Environmental management	Clarence's EMS provides a framework under which environmental matters are managed.	Clarence's management plans will be reviewed and updated, as necessary, to reflect operational changes and incorporate additional/amended requirements.

4.1.2 Construction activities

No construction activities are required on-site at Clarence to facilitate the proposed modification. No additional plant, equipment or fixed infrastructure is required.

4.1.3 Material handling

An excavator currently operating on-site at the REA3 complex will be used (as required) to excavate CCR from REA6. Excavated material will be loaded into trucks that will be used to transfer this material to Clarence's product stockpile area. From the stockpile, CCR will be transferred via Clarence's existing reclaim system and TLO to containers on trains. The containers will not have a roof allowing them to be loaded directly from the TLO and will have a rear opening to assist with the discharge of material on-site at Charbon.

CCR from Clarence's production stream will also be transferred from the CHPP to the product stockpile area before it is transferred via the existing reclaim system and TLO onto containers on trains.

Excavation and stockpiling of CCR will occur between 7 am and 6 pm. Train loading activities will occur 24 hours, 7 days per week, as for coal loading currently approved under DA 504-00.

The geochemical properties of Clarence CCR will be assessed as it is being excavated (ie CCR from REA6) or as it is generated from Clarence's CHPP. This may be conducted at Clarence and may include rapid turn-around laboratory analysis. Active management of Clarence CCR will reduce the acid and metalliferous drainage (AMD) risk to the receiving environment at Charbon and is described in Section 8.3 of this MR and Appendix G.

No changes to the approved status of REAs 1, 2, 3, 4 or 5 are proposed as part of this modification.

4.1.4 Proposed rail movements

As part of the proposed modification, one CCR-laden train will be used per day (ie two rail movements) to transport CCR from Clarence to Charbon. It is anticipated that trains will consist of 2 locomotives and approximately 30 wagons. Each train will carry 2 containers per wagon, providing a total of 60 containers per train. Containers are able to hold 25 t of CCR. Therefore, each train will have the ability to transport up to approximately 1,500 t of CCR.

Over a period of five years, it is anticipated that up to 1.5 Mt of CCR will be transported from Clarence to Charbon with an average annual transfer of between 300,000 t and 350,000 t.

4.1.5 Conditions of consent

No specific conditions in DA 504-00 need to be modified.

Centennial is seeking to modify the list of definitions in DA 504-00 to include reference to this MR.

4.2 Charbon Colliery

4.2.1 Overview

It is proposed to modify SSD 08_0211 to allow for:

- the construction of:
  - a 3,000 square metre (m^2) hardstand pad adjacent to Charbon's existing rail loop (Figure 3.2);
  - a link road between the hardstand and Charbon's existing haul roads (Figure 3.2);
  - a 11-kV transmission line to Charbon's existing pump shed;
- widening of Charbon's existing haul roads in some areas to ensure a minimum width of 8.8 m is maintained;
- importation of CCR from Clarence to Charbon by rail (one loaded train per day);
- unloading of CCR containers at Charbon's rail loop;
- transfer of CCR containers to the active rehabilitation areas or temporary storage on the hardstand pad;
- use of CCR during rehabilitation activities at Charbon; and
- extension to the approved water transfer activities from Charbon to Airly from 31 August 2025 to 31 January 2037 to align with Airly's development consent (SSD-5581).

No revisions to the project site boundary (SSD 08_0211) for Charbon are required as part of the proposed modification. It is not proposed to modify the approved life of mining operations.

A comparison between approved operations and the proposed modification is provided in Table 4.2.

Table 4.2 Comparison of existing operations and the proposed modification - Charbon

Aspect	Approved operations	Modification
Mine life	Mining operations to be undertaken until 31 August 2025. Rehabilitation to be undertaken after this expiry date.	Extension to the approved water transfer activities from Charbon to Airly to 31 January 2037 to align with Airly's development consent (SSD-5581).
Project site boundary	As shown in Figure 2 of Appendix 2 to SSD 08_0211.	No change.
Hours of operation	Charbon's operating hours are defined in Table 3 of Condition 3 of Schedule 3 of SSD 08_0211. Train loading and dispatch activities are approved 24 hours per day, 7 days per week.	No change.
Employment	Charbon has approval to employ up to 143 FTE personnel during mining operations. Since the cessation of mining, up to 30 FTE personnel have been employed.	No change.

Table 4.2 Comparison of existing operations and the proposed modification - Charbon

Aspect	Approved operations	Modification
Train access	Trains enter Charbon's private rail loop from the Gwabegar to Wallerawang Line.	No change.
Rail movements	Up to eight trains in the day period and up to two trains in the night period. One water laden train per day can also be dispatched.	No change to approved limits (one CCR-laden train will be used per day (ie two rail movements) to transport CCR from Clarence to Charbon). Up to 1.5 Mt of CCR will be transported from Clarence to Charbon with an average annual transfer of between 300,000 t and 350,000 t.
Surface infrastructure	Existing surface infrastructure includes: • CHPP and associated conveyors; • dirty and clean water management systems in addition to provision of potable and waste water services; • rail loop and coal loading facility; • administration buildings and workshops; • ancillary roadways, powerlines and pipelines; • Main REA and Northern REA; • product and ROM coal stockpiles; and • haul roads.	Construction and use of: • a hardstand within the rail loop; • powerline poles and an additional 11 kV transmission line; and • link road. Haul road widening.
Site access	Vehicle access from Bylong Valley Way via Cooper Drive, Charbon Road and a private access road for employees, visitors and contractors.	No change.
Rejects management	SSD 08_0211 allows management of waste rock (overburden and interburden in open cut mining areas) and reject material management. No reject generated at Charbon as mining and coal processing has ceased.	On arrival at Charbon, containers with CCR will be unloaded and transported by truck to the areas being rehabilitated for use during rehabilitation.
Water management	In accordance with the approved WMP.	Additional groundwater monitoring bores will be installed down gradient of CCR emplacement areas and upgradient of receptors.
Waste management	Management systems in place for waste streams, including general waste, maintenance consumables, waste oils and grease and sewage.	No change.
Rehabilitation and final landform	Progressive rehabilitation and life of mine rehabilitation in accordance with the approved MOPs.	CCR from Clarence will be used in rehabilitation activities at Charbon including the Central Open Cut Box Cut, Western Open Cut and 8 Trunk Open Cut (Figure 3.2).

4.2.2 Construction activities

Construction activities to be undertaken as part of the proposed modification include:

- A 3,000 m^2 hardstand pad adjacent to Charbon's existing rail loop (Figure 3.2). During unloading activities, a forklift and other machinery will be operated on this hardstand. Containers used to transport CCR to

Charbon may also be stored on this hardstand. Some minor vegetation clearance will be required to construct the proposed hardstand.

- A link road between the hardstand pad and Charbon's existing haul roads (Figure 3.2). The link road will be constructed within the existing disturbance footprint for Charbon's Main REA complex.

- Powerline poles and an additional 11-kV transmission line from close to Charbon's access road to the existing pump shed. The transmission line will replace an existing powerline to the pump station that will need to be rerouted away from the hardstand pad.

Widening of Charbon's existing haul roads will also be undertaken in some areas to ensure a minimum width of 8.8 m is maintained (Figure 3.2).

The majority of plant, materials and equipment required to complete these activities is available on-site. Additional materials may be delivered to site via the local road network.

The construction areas have been extensively disturbed as part of previous mining activities on-site (including construction of surface water dams, water loading infrastructure and Charbon's rail loader).

It is anticipated that the construction activities will be completed within approximately eight weeks.

All construction activities will be undertaken during standard daytime construction hours in accordance with the *Interim Construction Noise Guideline* (ICNG) (DECC 2009). Construction works will be restricted to:

- Monday to Friday: 7 am–6 pm;

- Saturday: 8 am–1 pm; and

- no work on Sundays and public holidays.

No additional employees will be required during construction.

4.2.3 Proposed rail movements

As part of the proposed modification, one CCR-laden train per day (ie two rail movements) will transport CCR from Clarence to Charbon. In addition, one water-laden train per day (ie two rail movements) will continue to travel from Charbon to Airly.

Train movements (for both CCR and water transport) will only occur on the rail loop at Charbon between 7 am and 6 pm to avoid noise impacting neighbouring residents outside of these times.

4.2.4 Material handling

On arrival at Charbon, containers with CCR will be transferred from the train to trucks and transported to the areas being rehabilitated for use during the construction of the final landform.

To transfer the containers from the train to trucks, a forklift and other machinery will be operated on the hardstand pad. Containers used to transport CCR to Charbon may also be stored on this hardstand.

A grader and water truck will be used to maintain the haul roads used to transport CCR from the proposed hardstand to the rehabilitation areas.

4.2.5 Rehabilitation and final landform

CCR from Clarence will be used as fill during ongoing rehabilitation of the Central Open Cut Box Cut, Western Open Cut and 8 Trunk Open Cut (Figure 3.2). Clarence CCR will be treated as potentially acid forming (PAF) material with the capacity to generate AMD.

A deep multi-layer moderate hydraulic conductivity cover will be developed on the sloping landforms with store-and-release characteristics, that will allow plant establishment and growth, while minimising deep-drainage (potential AMD seepage) and mitigating upward migration of soluble salts.

The deep multi-layer cover will be 3-m-thick and will consist of a 2.5 m benign overburden layer (average thickness) followed by approximately 0.5 m of Southern Open Cut resistant overburden cladding. This cover will be adopted at areas to be rehabilitated with Clarence CCR (Centennial 2020).

This cover will limit infiltration of water (and upward migration of salinity) into and from Clarence CCR emplaced at Charbon. Charbon's rehabilitation plans have provisions for field trials of the cover system and the development and continuation of surface and groundwater quality monitoring.

The rehabilitation design and management of Clarence CCR is discussed in Section 8.3 and Appendix G.

No changes to the approved final landform are required as part of the proposed modification.

4.2.6 Water transfers to Airly

It is proposed to continue to operate pumping infrastructure to load trains with water at Charbon to enable Charbon Coal to continue to transport up to 170 ML/year of water to Airly by rail.

Charbon Coal requests an extension to the approved water transfer activities from Charbon to Airly to 31 January 2037 to align with Airly's development consent (SSD-5581).

4.2.7 Conditions of consent

Charbon Coal is seeking to modify:

- Condition 5 of Schedule 2 of SSD 08_0211 to extend water transfer activities from Charbon to Airly to 31 January 2037 to align with Airly's development consent (SSD-5581).
- Appendix 2 to include the proposed hardstand and link road.
- The list of definitions in SSD 08_0211 to include reference to this MR.

No changes to the DCO (Section 3.2.2) are required as part of the proposed modification. Clarence CCR will not be used in the rehabilitation of out-of-pit areas.

Charbon's MOP (Centennial 2019a) will be updated to reflect the changes proposed as part of this modification.

5 Legislation and policy

5.1 Introduction

This chapter describes the relevant Commonwealth and State legislation and regulatory framework under which the proposed modifications will be assessed and determined.

5.2 Commonwealth legislation

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the Commonwealth Department of Agriculture, Water and the Environment (DAWE). It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places defined as 'matters of national environmental significance' (MNES). If it is likely that there will be significant impacts to MNES, DAWE can deem that a project is a 'controlled action', requiring approval under the EPBC Act.

Charbon is a controlled action under the EPBC Act. The approval, EPBC 2010/5498, was granted on 19 November 2010 and has effect till 2025. The approval permitted:

- the clearing of approximately 42 ha of native vegetation including 13.3 ha of White Box-Yellow Box-Blakely's Red Gum and derived grasslands;
- the clearing of approximately 47 ha of cleared land; and
- the removal of no more than 40 individual *Eucalyptus macrorhyncha* subsp. *cannonii*.

As a result of the proposed modification to SSD 08_0211, approximately 0.04 ha of native vegetation will be cleared (Table 8.11 and Appendix J). This includes some scattered trees; however, these trees are not hollow-bearing and do not form part of an endangered ecological community (EEC). Further, no threatened species or ecological communities or their habitat has been identified in the proposed disturbance area. The proposed modification to SSD 08_0211 will not impact the ecological value of the land within the project site boundary or its immediate surrounds.

Clarence is not considered a controlled action and no areas of native vegetation will be cleared for the proposed modification to DA 504-00.

Ecological and heritage impacts are discussed further in Table 7.10 (Clarence) and Table 8.11 (Charbon). The proposed modifications will not significantly change previously assessed and approved impacts on biodiversity, Aboriginal cultural heritage or historic heritage. Disturbance activities will remain within the currently assessed and approved footprints at both Clarence and Charbon.

The proposed modifications are unlikely to have a significant impact on any MNES listed under the EPBC Act and consequently have not been referred to DAWE.

5.3 NSW State legislation

5.3.1 NSW Environmental Planning and Assessment Act 1979

i Section 4.55 (2) modification

Development consents may be modified under Section 4.55 of the EP&A Act provided that the development as modified will be substantially the same development as the development for which consent was originally granted.

a Clarence Colliery

Centennial is seeking to modify DA 504-00 pursuant to Section 4.55(2) of the EP&A Act to allow for the loading and transport of CCR from Clarence to Charbon via rail. Compliance of the proposed modification with the requirements of Section 4.55(2) is provided in Table 5.1.

Table 5.1 Comparison with Section 4.55(2) requirements (Clarence Colliery)

Section 4.55 (2) requirement	Comment
(a) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all), and	The proposed modification is substantially the same development for which consent was originally granted being an underground coal mine. Centennial has identified an opportunity to transport CCR from Clarence to use for fill at Charbon. This would be a beneficial use of CCR that would otherwise be waste placed into the approved REAs at Clarence. The proposed modification does not include an increase to the approved extraction rate of 3 Mtpa. No additional plant, equipment or supporting infrastructure is required to support the proposed modification.
(b) it has consulted with the relevant Minister, public authority or approval body (within the meaning of Division 4.8) in respect of a condition imposed as a requirement of a concurrence to the consent or in accordance with the general terms of an approval proposed to be granted by the approval body and that Minister, authority or body has not, within 21 days after being consulted, objected to the modification of that consent, and	Centennial has consulted with DPIE as part of the preparation of this MR. DPIE confirmed that the appropriate approval pathway for the modification is by way of Section 4.55(2) of the EP&A Act. Further information about this consultation is provided in Chapter 6.
(c) it has notified the application in accordance with: i. the regulations, if the regulations so require, or ii. a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a development consent, and	Clause 118 of the NSW Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) relates to the notification period associated with 4.55(2) modifications. Notice of the application must be published in a local newspaper by DPIE. DPIE must also cause notice of the proposed modification to be given to each person who made a submission in relation to the original development application. This MR will be placed on public exhibition by DPIE.
(d) it has considered any submissions made concerning the proposed modification within the period prescribed by the regulations or provided by the development control plan, as the case may be.	Any submissions made concerning the proposed modification will be reviewed by DPIE and forwarded to Centennial to consider and respond to (via a submissions report).

b Charbon Colliery

Charbon Coal is seeking to modify SSD 08_0211 pursuant to Section 4.55(2) of the EP&A Act to allow for the receipt of CCR from Clarence and the use of this material for rehabilitation activities. Compliance of the proposed modification with the requirements of Section 4.55(2) is provided in Table 5.2.

Table 5.2 Comparison with Section 4.55(2) requirements (Charbon Colliery)

Section 4.55 (2) requirement	Comment
(a) it is satisfied that the development to which the consent as modified relates is substantially the same development as the development for which consent was originally granted and before that consent as originally granted was modified (if at all), and	The proposed modification is substantially the same development for which consent was originally granted being an underground and open cut coal mine. Charbon Coal is committed to developing a final landform that is representative of existing landforms within and adjacent to the site. Ongoing rehabilitation at Charbon can be enhanced using a combination of Charbon overburden and Clarence CCR. The proposed areas for the additional construction activities have been extensively disturbed as part of previous mining activities on-site (including construction of surface water dams, water loading infrastructure and Charbon's rail loader). No changes to the project site boundary (Figure 3.2) are required as part of the proposed modification.
(b) it has consulted with the relevant Minister, public authority or approval body (within the meaning of Division 4.8) in respect of a condition imposed as a requirement of a concurrence to the consent or in accordance with the general terms of an approval proposed to be granted by the approval body and that Minister, authority or body has not, within 21 days after being consulted, objected to the modification of that consent, and	Charbon Coal has consulted with DPIE as part of the preparation of this MR. DPIE confirmed that the appropriate approval pathway for the modification is by way of Section 4.55(2) of the EP&A Act. Further information about this consultation is provided in Chapter 6.
(c) it has notified the application in accordance with: i. the regulations, if the regulations so require, or ii. a development control plan, if the consent authority is a council that has made a development control plan that requires the notification or advertising of applications for modification of a development consent, and	Clause 118 of the NSW Environmental Planning and Assessment Regulation 2000 (EP&A Regulation) relates to the notification period associated with 4.55(2) modifications. Notice of the application must be published in a local newspaper by DPIE. DPIE must also cause notice of the proposed modification to be given to each person who made a submission in relation to the original development application. This MR will be placed on public exhibition by DPIE.
(d) it has considered any submissions made concerning the proposed modification within the period prescribed by the regulations or provided by the development control plan, as the case may be.	Any submissions made concerning the proposed modification will be reviewed by DPIE and forwarded to Charbon Coal to consider and respond to (via a submissions report).

ii Matters for consideration

Modification applications under Section 4.55(2) of Division 4.9 are required to take into consideration the relevant matters referred to in Section 4.15 of the EP&A Act which include:

(a) the provisions of:

(i) any environmental planning instrument, and

(ii) any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved), and

(iii) any development control plan, and

(iiia) any planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4, and

(iv) the regulations (to the extent that they prescribe matters for the purposes of this paragraph), and

(v) (Repealed)

that apply to the land to which the development application relates,

(b) the likely impacts of that development, including environmental impacts on both the natural and built environment, and social and economic impacts in the locality,

(c) the suitability of the site for the development,

(d) any submissions made in accordance with this Act or the regulations,

(e) the public interest.

Matters a (i), (iii) and (iv) have been addressed in the following sections of this chapter. Matters (b) to (e) are addressed in Chapters 6, 7, 8 and 9.

5.3.2 NSW Environmental Planning and Assessment Regulation 2000

Clause 115 of the EP&A Regulation lists the information required in a development consent application under Section 4.55(2) of the EP&A Act. Table 5.3 provides an outline of where this information is provided. The proposed modifications are not considered designated development under the EP&A Regulation.

Table 5.3 EP&A Regulation Clause 115 information requirements

Clause 115 information requirement	Where addressed
(a) the name and address of application	Section 1.2 of this MR.
(b) a description of the development to be carried out under the consent (as previously modified)	Chapter 3 of this MR.
(c) the address, and formal particulars of title, of the land on which the development is to be carried out,	Section 2.1 and Appendix 1 of DA 504-00 (Clarence). Section 2.2 and Appendix 1 of SSD 08_0211 (Charbon).
(d) a description of the proposed modification to the development consent,	Chapter 4 of this MR.
(e) a statement that indicates either: i. that the modification is merely intended to correct a minor error, misdescription or miscalculation, or ii. that the modification is intended to have some other effect, as specified in the statement,	Section 4.1 of this MR (Clarence). Section 4.2 of this MR (Charbon).
(f) a description of the expected impacts of the modification,	Chapter 7 (Clarence).

Table 5.3 EP&A Regulation Clause 115 information requirements

Clause 115 information requirement	Where addressed
	Chapter 8 (Charbon).
(g) an undertaking to the effect that the development (as to be modified) will remain substantially the same as the development that was originally approved,	Table 5.1 (Clarence). Table 5.2 (Charbon).
(g1) in the case of an application that is accompanied by a biodiversity development assessment report, the reasonable steps taken to obtain the like-for-like biodiversity credits required to be retired under the report to offset the residual impacts on biodiversity values if different biodiversity credits are proposed to be used as offsets in accordance with the variation rules under the *Biodiversity Conservation Act 2016*,	The proposed modifications will not significantly change previously assessed and approved impacts on biodiversity. Disturbance activities will remain within the currently assessed and approved footprints at both Clarence and Charbon. The proposed areas for the additional construction activities at Charbon have been extensively disturbed as part of previous mining activities on-site (including construction of surface water dams, water loading infrastructure and Charbon's rail loader). RPS has prepared a BDAR waiver to support the proposed modification to SSD 08_0211 (Table 8.11 and Appendix J). The proposed modification to SSD 08_0211 will not impact the ecological value of the land within the project site boundary or its immediate surrounds.
(h) if the applicant is not the owner of the land, a statement signed by the owner of the land to the effect that the owner consents to the making of the application (except where the application for the consent the subject of the modification was made, or could have been made, without the consent of the owner),	Landowner's consent is not required for a development application for public notification development if the applicant instead gives notice of the application: • to the owner of the land in writing before the application is made; or • by publishing a notice no later than 14 days after the application is made in a newspaper circulating in the area in which the development is to be carried out.
(i) a statement as to whether the application is being made to the Court (under Section 4.55) or to the consent authority (under Section 4.56)	The proposed modification applications are not being made to the NSW Land and Environment Court.
and, if the consent authority so requires, must be in the form approved by that authority.	The form of this application is consistent with DPIE's requirements.

5.3.3 Other relevant NSW State legislation and planning instruments

An outline of other relevant NSW State legislation and planning instruments relevant to the proposed modifications to Clarence and Charbon is provided in Table 5.4 and Table 5.5, respectively.

Table 5.4 Other relevant NSW State legislation (Clarence Colliery)

NSW legislation	Comment
POEO Act	Clarence is a 'premise based scheduled activity' under Schedule 1 (10 Coal Works) and (28 Mining for Coal) of the POEO Act. Clarence operates under EPL 726, which is administered by the EPA under Sections 43(b) and 48 of the POEO Act. No changes to EPL 726 are proposed as part of this modification. The modification as outlined in Section 4.1 will operate under EPL 726. The POEO Act and NSW Protection of the Environment Operations (Waste) Regulation 2014 (Waste

Table 5.4 Other relevant NSW State legislation (Clarence Colliery)

NSW legislation	Comment
	Regulation) are the key legislative instruments for the regulation of waster in NSW. Both contain provisions for the management, storage, transport, processing, recovery and disposal of waste. The application of waste to land (as defined in the POEO Act) may trigger regulatory requirements, such as the need for an EPL and waste levy payments. In cases, the EPA provides regulatory exemptions to these requirements. The EPA issues resource recovery orders (orders) and resource recovery exemptions (exemptions) under the provisions of the Waste Regulation for specific wastes. An order and exemption can be used without EPA approval but, all conditions of the order and exemption must be met for the reuse of the resource recovery waste to be lawful. Development consent and permission from the owner and occupier of the place where the waste will be re-used is generally required. The Coal Washery Rejects (Coal Mine Void) Order 2014 applies to "waste resulting from washing coal (including substance such as coal fines, soil, sand and rock resulting from the process)". Clarence washes ROM coal to meet coal quality specifications. A by-product of the washing process is CCR. Therefore, Clarence CCR satisfies the definition of coal washery rejects in the order.
NSW *Water Act 1912* (Water Act)	The Water Act governs access, trading and allocation of licences associated with surface water and groundwater sources where a water sharing plan is not in place. The Water Act applies to groundwater interference, bore installation and extraction of groundwater. No additional licenses or allocations are required as a result of the proposed modification.
NSW *Water Management Act 2000* (WM Act)	The WM Act is intended to ensure that water resources are conserved and properly managed for sustainable use benefitting both present and future generations. Water sharing plans prepared in accordance with the WM Act include rules for protecting the environment and administrating water licencing and trading. Clarence does not require water use approvals under Section 89, water management approvals under Section 90 or a controlled activity approval under Section 91 of the WM Act.
NSW *Work Health and Safety (Mines and Petroleum Sites) Act 2013*	The NSW *Work Health and Safety (Mines and Petroleum Sites) Act 2013* aims to assist in securing and promoting the health, safety and welfare of people at work at coal operations. Centennial hold all necessary approvals under the Act and operations will continue to be regulated under the provisions of the Act.
NSW *Mining Act 1992*	Under Part 2 of the Mining SEPP, mining may be carried out with consent on land that is the subject of a ML under the Mining Act. No changes to Centennial's existing mining tenements are required as part of the proposed modification.

Table 5.5 Other relevant NSW State legislation (Charbon Colliery)

NSW legislation	Comment
POEO Act	Charbon is a 'premise based scheduled activity' under Schedule 1 (10 Coal Works) of the POEO Act. Charbon operates under EPL 528, which is administered by the EPA under Sections 43(b) and 48 of the POEO Act. Charbon operates under EPL 528, which authorises the mining of coal up to 500,000 tpa and coal works up to 2 Mtpa. No changes to EPL 528 are proposed as part of this modification. The modification as outlined in Section 4.2 will operate under EPL 528. The POEO Act and Waste Regulation are the key legislative instruments for the regulation of waster in NSW. Both contain provisions for the management, storage, transport, processing, recovery and disposal of waste. The application of waste to land (as defined in the POEO Act) may trigger regulatory requirements, such as the need for an EPL and waste levy payments. In cases, the EPA provides regulatory exemptions to these requirements. The EPA issues resource recovery orders (orders) and resource recovery exemptions (exemptions) under the provisions of the Waste Regulation for specific wastes. An order and exemption can be used without

Table 5.5 Other relevant NSW State legislation (Charbon Colliery)

NSW legislation	Comment
	EPA approval but, all conditions of the order and exemption must be met for the reuse of the resource recovery waste to be lawful. Development consent and permission from the owner and occupier of the place where the waste will be re-used is generally required. The Coal Washery Rejects (Coal Mine Void) Exemption 2014 applies to coal washery rejects that are, or are intended to be, applied to land as fill for coal mine voids. Clarence CCR will be used to fill historical open cut coal mining voids at Charbon and therefore the exemption is applicable to the proposed use of Clarence CCR in rehabilitation activities at Charbon. Charbon Coal will comply with the conditions of the Coal Washery Rejects (Coal Mine Void) Exemption 2014 as: • Clarence CCR will only be applied to land to fill the existing voids to the original ground level (ie pre-mining); • Charbon Coal will only apply Clarence CCR to land where it complies with SSD 08_0211 and the approved MOPs; and • Charbon Coal will apply Clarence CCR to land as fill for the existing voids within six months of its receipt.
WM Act	With respect to surface water sources, Charbon is within the Upper Cudgegong River water source, regulated by the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources*. With respect to groundwater sources, Charbon is within the Sydney Basin MDB groundwater source, regulated by the *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources*. Charbon's existing water access licences provide sufficient capacity for the ongoing transfer of water to Airly, as well as ongoing rehabilitation and closure activities.
NSW *Work Health and Safety (Mines and Petroleum Sites) Act 2013*	Charbon Coal hold all necessary approvals under this Act and operations will continue to be regulated under the provisions of the Act.
NSW *Mining Act 1992*	No changes to Charbon Coal's mining tenements are required as part of the proposed modification.
NSW *Biodiversity Conservation Act 2016* (BC Act)	The proposed areas for the additional construction activities at Charbon have been extensively disturbed as part of previous mining activities on-site (including construction of surface water dams, water loading infrastructure and Charbon's rail loader). As a result of the proposed modification, approximately 0.04 ha of native vegetation will be cleared (Table 8.11 and Appendix J). This includes some scattered trees; however, these trees are not hollow-bearing and do not form part of an EEC. The proposed modification will not significantly impact any threatened species, populations or ecological communities, and their habitats, listed under the BC Act.

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

The Mining SEPP aims to provide for the proper management and development of mineral, petroleum and extractive material resources for the social and economic welfare of NSW.

Sub-clause 7(1)(a) of the Mining SEPP states that development for the purpose of underground mining may be carried out on any land with development consent. In relation to any inconsistency between the Mining SEPP and an environmental planning instrument, sub-clause 5(3) provides that the Mining SEPP prevails to the extent of the inconsistency.

On this basis, any provision in the Lithgow LEP (Clarence) or Mid-Western Regional LEP (Charbon) that would otherwise operate to prohibit the proposed modifications has no effect. The proposed modifications are therefore permissible with development consent.

5.5 Local environmental plans

5.5.1 Lithgow Local Environmental Plan 2014

The land within Clarence's holding boundary is zoned RU3 (Forestry) and E3 (Environmental Management) under the Lithgow LEP (Figure 2.3).

5.5.2 Mid-Western Regional Local Environmental Plan 2012

The land with Charbon's project site boundary is zoned RU1 (Primary Production) and SP2 (Rail Infrastructure Facilities) under the Mid-Western Regional LEP (Figure 2.6).

6 Stakeholder consultation

6.1 Stakeholder engagement strategy

As part of the preparation of this MR, Centennial developed a stakeholder engagement strategy, which encourages initiating and maintaining open lines of communication with a wide range of stakeholders. The objectives of the strategy are to:

- identify stakeholders that may be affected by the proposed modifications;
- develop an understanding of any concerns stakeholders may have about the proposed modifications;
- ensure consistent and accurate messages are provided to all stakeholders;
- provide a means of recording feedback from stakeholders and subsequent responses from Centennial;
- ensure appropriate monitoring and reporting of community-initiated enquiries and complaints; and
- provide a mechanism to update stakeholders about the proposed modifications.

The strategy identifies the methods that will be utilised by Centennial to provide information to stakeholders on the proposed modifications (eg letters, Centennial's website and community consultative committees (CCCs)).

6.2 Government stakeholders

6.2.1 NSW Department of Planning, Industry and Environment

Centennial wrote to DPIE on 23 March 2020 to introduce the proposed modification to DA 504-00 and seek advice with regard to the assessment pathway and scope of this MR. DPIE responded on 7 April 2020 to confirm the assessment scope and nominated application under Section 4.55(2) of the EP&A Act as the appropriate approval pathway. A copy of this correspondence is provided in Appendix L. Feedback provided by DPIE and how this has been addressed is summarised in Table 6.1.

Table 6.1 Feedback from DPIE and how it has been addressed – Clarence Colliery

Matter raised	Response
DPIE confirmed that the appropriate approval pathway for the modification application would be under Section 4.55(2) of the EP&A Act.	The approval pathway for the modification is nominated and described in Section 5.3.1 of this MR.
DPIE requested that Centennial:	
• Identify the proposal's potential impacts on the rail network.	A level crossing impact assessment was prepared by EMM (Appendix I) for the proposed modification. The existing level of safety of all assessed level crossings is considered acceptable and no capacity constraints have been identified on the assessed sections of the rail network. In addition, the NVIA for Charbon (Appendix E) has considered potential rail noise impacts.

Table 6.1 Feedback from DPIE and how it has been addressed – Clarence Colliery

Matter raised	Response
• Provide details on how the proposal would affect the site's reject emplacement strategy and existing rehabilitation commitments based on the approved life of mine.	Over a period of five years, it is anticipated that up to 1.5 Mt of CCR will be transported from Clarence to Charbon with an average annual transfer of between 300,000 t and 350,000 t. This may delay the progression of reject emplacement from REA6 to REA5; however, Clarence's reject emplacement strategy and existing rehabilitation commitments will not change as a result of the proposed modifications. Rehabilitation will be undertaken in accordance with Clarence's MOP.
• Provide information on the suitability, including geochemical analysis, of the reject material proposed to be used for rehabilitation (from both REA6 and new reject waste from the washery) at the Charbon Mine site and the statutory context for transport of reject and disposal of waste material from Clarence Colliery to the Charbon Mine.	A geochemical characterisation study of REA6 CCR at Clarence assessed the potential geochemical risks associated with placement of REA6 CCR at Charbon. REA6 CCR was compared to waste rock and rejects from other emplacement facilities at both Clarence and Charbon to assess the suitability of REA6 CCR (and CCR from Clarence's production stream more generally) as backfill at Charbon. The results of this study are summarised in Section 8.3 and Appendix G. The statutory context for the transport and disposal of CCR is provided in Table 5.4 (transport from Clarence by Centennial) and Table 5.5 (receipt and ongoing use at Charbon by Charbon Coal).
• Consult with key stakeholders during the preparation of the MR, including the NSW Resources Regulator, EPA, Australian Rail Track Corporation, LCC and any affected landowners.	Chapter 6 of this MR. Note: No engagement has been undertaken with Australian Rail Track Corporation as they are not responsible for the relevant sections of the rail line between Clarence and Charbon. Engagement has been undertaken with John Holland Country Regional Network (JHCRN) (Section 6.4).

Centennial wrote to DPIE on 20 April 2020 to introduce the proposed modification to SSD 08_0211 and seek advice with regard to the assessment pathway and scope of this MR. DPIE responded on 29 April 2020 to confirm the assessment scope and nominated application under Section 4.55(2) of the EP&A Act as the appropriate approval pathway. A copy of this correspondence is provided in Appendix L. Feedback provided by DPIE and how this has been addressed is summarised in Table 6.2.

Table 6.2 Feedback from DPIE and how it has been addressed – Charbon Colliery

Matter raised	Response
DPIE confirmed that the appropriate approval pathway for the modification application would be under Section 4.55(2) of the EP&A Act.	The approval pathway for the modification is nominated and described in Section 5.3.1 of this MR.
DPIE requested that Centennial:	
• Provide detail on how the imported material will be managed to achieve the final landform and existing rehabilitation objectives/commitments required under the project approval, the approved Mining Operations Plan (Rehabilitation and Closure Mining Operations Plan Amendment C dated 25 September 2019) and the Development Control Order issued by the Department on 12 September 2019.	A geochemistry assessment (Section 8.3 and Appendix G) and water resources assessment (Section 8.4 and Appendix H) have been prepared by EMM for the proposed modification. The assessments recommend management measures that are required if Clarence CCR is to be used for rehabilitation at Charbon. Charbon's MOP (Centennial 2019a) will be updated to reflect the changes proposed as part of this modification. No changes to the approved final landform are required as part of the proposed modification. No changes to the DCO (Section 3.2.2) are required as part of the proposed modification. Clarence CCR will not be used in the rehabilitation of out-of-pit areas.

Table 6.2 Feedback from DPIE and how it has been addressed – Charbon Colliery

Matter raised	Response
• Identify the proposal's potential impacts on the rail network.	A level crossing impact assessment has been prepared by EMM (Section 8.5 and Appendix I). The NVIA for Charbon (Appendix E) considers potential rail noise impacts.
• Identify whether there would be any impacts on heritage values above that already approved for the development.	The proposed areas for the additional construction activities have been extensively disturbed. Potential impacts on heritage values have been considered in Table 8.11.
• Demonstrate that the coal reject material is suitable for rehabilitation, with consideration of statutory requirements for transport and disposal of coal reject waste, and potential for land and water pollution due to the geochemical nature of the coal reject material.	A geochemistry assessment (Section 8.3 and Appendix G) and water resources assessment (Section 8.4 and Appendix H) have been prepared by EMM for the proposed modification. The assessments recommend management measures that are required if Clarence CCR is to be used in ongoing rehabilitation activities at Charbon. The statutory context for the transport and disposal of CCR is provided in Table 5.4 (transport from Clarence by Centennial) and Table 5.5 (receipt and ongoing use at Charbon by Charbon Coal).
• Include an analysis of statutory requirements, including the relevant matters for consideration under Section 4.15 of the EP&A Act and the relevant objects of the Act.	Chapter 5 of this MR.
• Consult with key stakeholders during the preparation of the MR, including the Lithgow City and Mid-Western Regional councils, NSW Resources Regulator, EPA, Australian Rail Track Corporation, the Department's Biodiversity Conservation Division, the mine's Community Consultative Committee and any affected landowners.	Chapter 6 of this MR. Note: No engagement has been undertaken with Australian Rail Track Corporation as they are not responsible for the relevant sections of the rail line between Clarence and Charbon. Engagement has been undertaken with JHCRN (Section 6.4).

6.2.2 NSW Resources Regulator

A letter was sent to NSW Resources Regulator on 11 August 2020 to introduce the proposed modifications and notify them that a MR will be submitted to DPIE (Appendix L). No feedback regarding the proposed modifications has been received to date.

6.2.3 Environment Protection Authority

A letter was sent to EPA on 11 August 2020 to introduce the proposed modifications and notify them that a MR will be submitted to DPIE (Appendix L). The letter also sought confirmation from EPA on the application of the Coal Washery Rejects (Coal Mine Void) Order 2014 and Coal Washery Rejects (Coal Mine Void) Exemption 2014 to the transfer of CCR from Clarence and use of CCR in ongoing rehabilitation of existing voids at Charbon, respectively. The EPA confirmed receipt of the letter on 17 August 2020 and noted that they had no further queries at this stage.

6.2.4 Mid-Western Regional Council

A letter was sent to Mid-Western Regional Council on 11 August 2020 to introduce the proposed modifications and notify them that a MR will be submitted to DPIE (Appendix L). No feedback regarding the proposed modifications has been received to date.

6.2.5 Lithgow City Council

A letter was sent to Lithgow City Council on 11 August 2020 to introduce the proposed modifications and notify them that a MR will be submitted to DPIE (Appendix L). No feedback regarding the proposed modifications has been received to date.

6.2.6 Transport for NSW

A letter was sent to TfNSW on 12 August 2020 to introduce the proposed modifications and notify them that a MR will be submitted to DPIE (Appendix L). TfNSW responded with some comments on the potential for the proposed modifications to impact timing of existing rail movements. Consultation with TfNSW is ongoing.

6.2.7 Biodiversity Conservation Division

A letter was sent to DPIE's Biodiversity Conservation Division on 11 August 2020 to introduce the proposed modifications and notify them that a MR will be submitted to DPIE (Appendix L). No feedback regarding the proposed modifications has been received to date.

6.3 Community stakeholders

6.3.1 Clarence Community Consultative Committee

The Clarence CCC comprises of representatives from the local community and Lithgow City Council and is independently chaired. The CCC meets a minimum of twice a year and provides a forum for open discussion between Centennial, the community, Lithgow City Council and other stakeholders on issues directly relating to Clarence's ongoing operations, environmental performance and community relations.

The Clarence CCC met on 15 July 2020. As part of the meeting, attendees were introduced to the proposed modifications and notified that a MR will be submitted to DPIE. No feedback regarding the proposed modifications has been received to date. The proposed modifications will also be discussed at the next CCC meeting scheduled for 21 October. Minutes from CCC meetings are available on Centennial's website:

https://www.centennialcoal.com.au/Operations/OperationsList/Clarence

6.3.2 Charbon and Inglenook Community Consultative Committee

The Charbon and Inglenook CCC comprises of representatives from the local community, Mid-Western Regional Council and Lithgow City Council and is independently chaired. The CCC meets a minimum of twice a year and provides a forum for open discussion between Centennial, the community, Lithgow City Council and other stakeholders on issues directly relating to Clarence's ongoing operations, environmental performance and community relations.

Due to COVID-19, no face-to-face meetings have been held to date in 2020; however, an update was sent to the members of the CCC on 24 March 2020, which included an introduction to the proposed modifications. No feedback regarding the proposed modifications has been received to date. The proposed modifications will also be discussed at the next CCC meeting (22 September 2020). Minutes from CCC meetings are available on Centennial's website:

https://www.centennialcoal.com.au/Operations/OperationsList/Charbon

6.3.3 Private landholders

As described in Section 7.1.4, Centennial is engaging with landholders identified as experiencing operational noise emissions above the project noise trigger levels (PNTLs) at Clarence (ie sensitive receptors R1, R2, R3, R4, R5, R6 and R9 on Figure 2.1). The mitigation measures that could be implemented at the residences and/or the nature of any negotiated agreement between Centennial and the landholders will depend on the outcomes of this engagement. DPIE will be provided a copy of the negotiated agreements (where required).

In addition, letters were sent to private landholders within proximity of Charbon (Figure 2.4) on 2 September 2020 to introduce the proposed modifications and notify them that a MR will be submitted to DPIE. No feedback regarding the proposed modifications has been received to date.

6.4 Other stakeholders

A letter was sent to JHCRN on 12 August 2020 to introduce the proposed modifications and notify them that a MR will be submitted to DPIE (Appendix L). A representative from JHCRN responded on 13 August 2020 with questions in relation to the proposed timing of the material transport, proposed tonnages and rail car axle load estimates. A representative from Centennial responded to each of the matters raised.

7 Assessment of impacts – Clarence

This section addresses the potential impacts of the proposed modification at Clarence.

7.1 Noise

7.1.1 Overview

A noise and vibration impact assessment (NVIA) for the proposed modification was prepared by EMM (Appendix A). The assessment was prepared with reference to the methods outlined in the *Noise Policy for Industry* (NPfI) (EPA 2017).

7.1.2 Existing environment

i Ambient noise

Unattended noise monitoring was undertaken by EMM at four locations surrounding Clarence in December 2018 to establish the existing ambient noise levels. The noise loggers were programmed to record statistical noise level indices in 15-minute intervals.

On-site observations identified natural sounds (eg insects and birdsong), trains on the Main Western rail line, distant traffic noise and residential activity as being the main contributors to ambient noise levels. Noise from Clarence was audible at three of the four monitoring locations.

ii Assessment locations

Representative assessment locations are shown in Figure 2.1. The numbering of these receptors is consistent with that utilised in previous noise assessments for Clarence and DA 504-00 except for the addition of:

- R8, which is representative of the nearest residences within Clarence village; and
- R9, which is an existing dwelling near R2 that has not been previously assessed.

iii Existing noise emissions

Noise monitoring is undertaken annually at the end of Sandham Road (north of residences and south of the rail loop) (M1 on Figure 5.1 of Appendix A).

A review of the annual noise monitoring results for 2013–2018 indicate that evening and night time noise emissions from Clarence have, at times, been above the noise criteria applied at M1.

Within the last five years, there has only been one complaint received in relation to noise emissions from Clarence. This complaint was made in March 2017 and related to ‘a low hum’ emanating from site.

The applicability of modifying factors was determined based on noise monitoring results in accordance with the methodology in the NPfI. Modifying factors due to low frequency noise were not applicable during these surveys. Hence, low frequency noise modifying factors have not been applied to predicted noise emissions from Clarence.

iv Existing noise criteria

Noise criteria for Clarence are provided in Schedule 3 Condition 15 of DA 504-00 and Condition L5 of EPL 726. Noise limits are consistent between these two documents and are summarised in Table 7.1.

Table 7.1 Clarence noise limits

Location	Day	Evening	Night
	$L_{Aeq,15min}$ (dB)	$L_{Aeq,15min}$ (dB)	$L_{Aeq,15min}$ (dB)
Any residence on privately owned land	38	36	35

7.1.3 Assessment of impacts

i Noise criteria

The NPfI provides a methodology for the assessment of noise from existing industrial sites. As per the NPfI, project noise trigger levels (PNTLs) are the more stringent of either the project intrusive or amenity noise levels. The project intrusive noise levels, recommended amenity noise levels and PNTLs are provided in Table 7.2.

Table 7.2 Project noise trigger levels, $L_{Aeq,15min}$

Assessment location	Intrusive noise level, $L_{Aeq,15min}$, dB			Amenity noise level, $L_{Aeq,period}$, dB			PNTL, $L_{Aeq,15min}$, dB		
	Day[1]	Evening[1]	Night[1]	Day[1]	Evening[1]	Night[1]	Day[1]	Evening[1]	Night[1]
R1	40	35	35	48	43	38	40	35	35
R2	40	35	35	48	43	38	40	35	35
R3	40	35	35	48	43	38	40	35	35
R4	40	35	35	48	43	38	40	35	35
R5	40	35	35	48	43	38	40	35	35
R6	40	35	35	48	43	38	40	35	35
R7[2]	N/A	N/A	N/A	48	48	48	48	48	48
R8	40	39	37	48	43	38	40	39	37
R9	40	35	35	48	43	38	40	35	35

1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; evening: 6 pm to 10 pm; night: all remaining periods.
2. Passive recreation area. All other assessment locations are residential; however, there are no dwellings currently at R1, R5 and R6.
3. N/A: Not applicable.

As specified in Section 6.1 of the NPfI, PNTLs should not be applied as mandatory noise limits.

ii Construction noise assessment

No construction activities are required at Clarence to facilitate the proposed modification.

iii Operational noise assessment

Predicted noise levels for Clarence's existing operations (Table 7.3) and the proposed modification (Table 7.4) have been assessed. Within each table, two separate scenarios are provided (one excluding and one including trains). Noise levels predicted to be above the PNTLs are shown in **bold** text, while any increase in noise levels as a result of the proposed modification is shown in brackets in Table 7.4. Noise-enhancing weather conditions have been considered and the highest predicted noise level is presented for each period. Cells are shaded as follows:

- green cells – Clarence noise levels predicted to be less than or equal to 2 dB above PNTL;
- yellow cells – Clarence noise levels predicted to be 3–5 dB above PNTL; and
- red cells – Clarence noise levels predicted to be more than 5 dB above PNTL.

Table 7.3 Predicted $L_{Aeq,15min}$ operational noise levels – existing operations

Assessment location	Period[1]	Predicted noise level (excluding train) (dB)	Predicted noise level (including train) (dB)	PNTL $L_{Aeq,15min}$ (dB)
		Noise-enhancing conditions	Noise-enhancing conditions	
R1	Day	39	40	40
	Evening	**38**	**40**	35
	Night	**38**	**40**	35
R2	Day	40	**44**	40
	Evening	**39**	**44**	35
	Night	**39**	**44**	35
R3	Day	**41**	**43**	40
	Evening	**40**	**43**	35
	Night	**40**	**43**	35
R4	Day	34	**46**	40
	Evening	33	**46**	35
	Night	33	**46**	35
R5	Day	38	**49**	40
	Evening	**37**	**49**	35
	Night	**37**	**49**	35
R6	Day	37	**42**	40
	Evening	**36**	**42**	35
	Night	**36**	**42**	35
R7	Day	35	35	48
	Evening	36	36	48
	Night	36	36	48
R8	Day	35	36	40
	Evening	35	36	39

Table 7.3 Predicted $L_{Aeq,15min}$ operational noise levels – existing operations

Assessment location	Period[1]	Predicted noise level (excluding train) (dB)	Predicted noise level (including train) (dB)	PNTL $L_{Aeq,15min}$ (dB)
		Noise-enhancing conditions	Noise-enhancing conditions	
R9	Night	35	36	37
	Day	40	**44**	40
	Evening	**39**	**44**	35
	Night	**39**	**44**	35

1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; evening: 6 pm to 10 pm; night: all remaining periods.

Table 7.4 Predicted $L_{Aeq,15min}$ operational noise levels – proposed modification

Assessment location	Period[1]	Predicted noise level (excluding train) (dB)	Predicted noise level (including train) (dB)	PNTL $L_{Aeq,15min}$ (dB)
		Noise-enhancing conditions	Noise-enhancing conditions	
R1	Day	39	40	40
	Evening	**38**	**40**	35
	Night	**38**	**40**	35
R2	Day	40	**45 (+1)**	40
	Evening	**39**	**44**	35
	Night	**39**	**44**	35
R3	Day	**41**	**43**	40
	Evening	**40**	**43**	35
	Night	**40**	**43**	35
R4	Day	35 (+1)	**46**	40
	Evening	33	**46**	35
	Night	33	**46**	35
R5	Day	38	**49**	40
	Evening	**37**	**49**	35
	Night	**37**	**49**	35
R6	Day	38 (+1)	**42**	40
	Evening	**36**	**42**	35
	Night	**36**	**42**	35
R7	Day	36 (+1)	36 (+1)	48
	Evening	36	36	48
	Night	36	36	48

Table 7.4 Predicted $L_{Aeq,15min}$ operational noise levels – proposed modification

Assessment location	Period[1]	Predicted noise level (excluding train) (dB)	Predicted noise level (including train) (dB)	PNTL $L_{Aeq,15min}$ (dB)
		Noise-enhancing conditions	Noise-enhancing conditions	
R8	Day	36 (+1)	36	40
	Evening	35	36	39
	Night	35	36	37
R9	Day	40	**45** (+1)	40
	Evening	**39**	**44**	35
	Night	**39**	**44**	35

1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; evening: 6 pm to 10 pm; night: all remaining periods.
2. Changes from existing noise predictions in Table 7.3 shown in brackets.

The PNTLs are predicted to be exceeded at seven assessment locations (R1, R2, R3, R4, R5, R6 and R9 - Figure 2.1). However, it is predicted that there will be a negligible difference in noise levels between Clarence's existing, approved operations and the proposed modification. Nonetheless, an assessment of reasonable and feasible mitigation has been undertaken (Chapter 8 of Appendix A).

iv Sleep disturbance assessment

Clarence is approved to operate 24 hours a day, 7 days a week (including coal handling activities). Clarence's operations will not significantly change as a result of the proposed modification when compared to currently approved operations and, hence, maximum noise levels are expected to remain the same as those currently experienced.

The likely maximum noise level events at the nearest residential assessment locations have been assessed as part of the NVIA. Typical maximum noise level events at Clarence are associated with trains and dozer operations. A typical maximum sound power level of L_{Amax} 125 dB has been adopted for all such events and is based on EMM's measurements of similar activities.

Predicted maximum noise levels excluding a train on the rail loop are below the relevant L_{Amax} sleep disturbance screening level. When a train is on or exiting the rail loop, the predicted maximum noise levels are above the relevant L_{Amax} sleep disturbance screening level at seven assessment locations (R1, R2, R3, R4, R5, R6 and R9 – Figure 2.1).

The proposed modification is not expected to result in a change to Clarence's predicted maximum noise levels when compared with existing, approved activities at Clarence.

v Rail noise assessment

A spur rail line connects Clarence's surface facilities to the Main Western rail line. Clarence has approval to transport coal via rail, which can take place 24 hours per day, seven days per week.

As part of the proposed modification, one CCR-laden train will be used per day (ie two rail movements). The number of trains between Clarence and Charbon will be within the existing capacity of the rail network and no additional rail paths are required.

A detailed assessment of off-site rail noise impacts has not been included as part of the NVIA.

vi Vibration

Vibration from existing operational activities at Clarence is not expected to change as a result of the proposed modification. Therefore, a detailed assessment of vibration impacts has not been completed.

7.1.4 Mitigation and management

i Existing noise mitigation and management measures

Centennial will continue to implement the existing noise mitigation and management measures as provided in the Centennial *Western Region Noise Management Plan* (NMP).

The NMP outlines the noise mitigation and management measures common to all of Centennial's operations within the western region, as well as those specific to Clarence. The NMP also describes the noise monitoring program which incorporates operator-attended noise surveys at nearest residences as well as on-site sound power level measurements.

ii Feasible and reasonable assessment of additional mitigation

Consideration of the feasibility and reasonableness of additional noise mitigation measures has been undertaken with reference to the guidance provided in Section 3.4 of the NPfI (Table 8.1 of Appendix A). Mitigation strategies have been considered based on the following hierarchy:

1. Control of noise at the source.

2. Once feasible and reasonable controls at the source are exhausted, controlling transmission of noise.

3. Once source and transmission feasible and reasonable controls are exhausted, considering mitigation measures at the noise sensitive receivers (including negotiated agreements).

The main operational noise sources at Clarence contributing to off-site noise levels are trains on the rail loop, rail loading activities and dozers. Mitigation options targeting these noise sources have been considered.

Centennial is engaging with landholders identified as experiencing operational noise emissions above PNTLs (assessment locations R1, R2, R3, R4, R5, R6 and R9). The type of mitigation measures that could be implemented at the residences and/or the nature of any negotiated agreement between Centennial and the landholders will depend on the outcomes of this engagement. DPIE will be provided a copy of the negotiated agreements (where required).

7.1.5 Conclusion

The proposed modification is predicted to result in negligible changes to existing operational noise emissions.

Operational noise levels from existing and proposed activities are predicted to be above the PNTLs at seven assessment locations; however, there will be a negligible difference in noise emissions between Clarence's existing, approved operations and the proposed modification. An assessment of feasible and reasonable noise mitigation options concluded that negotiated agreements will be pursued with potentially affected residents.

Predicted maximum noise levels excluding a train on the rail loop are below the maximum sleep disturbance screening criteria. When a train is on or exiting the rail loop, the predicted maximum noise levels are above the maximum screening criteria. L_{Amax} noise is expected to be unchanged from existing activities at Clarence as a result of the proposed modification. Consultation with residences where maximum noise levels are predicted to be above the relevant screening criteria will continue.

Noise emissions from Clarence will continue to be managed in accordance with the existing NMP.

7.2 Air quality

7.2.1 Overview

An air quality impact assessment (AQIA) assessing the potential air quality impacts associated with Clarence's existing and proposed operations was prepared by EMM (Appendix B). The AQIA has been prepared in general accordance with the guidelines specified by the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2016). Emissions of total suspended particulates (TSP), particulate matter less than 10 micrometres (µm) in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$) were estimated and the dispersion of these potential pollutants modelled.

7.2.2 Existing environment

The local airshed is likely to be influenced by:

- emissions from existing operations at Clarence, including Hanson's Clarence sand quarry;
- neighbouring industrial emission sources, including the Hanson sand quarry;
- wind generated dust from exposed areas;
- dust entrainment and tailpipe emissions from vehicle movements along unsealed and sealed roads;
- seasonal emissions from household wood heaters; and
- long-range transport of fine particles into the region.

More remote sources which contribute episodically to suspended particulates include dust storms and bushfires.

Centennial maintains an air quality monitoring network for its operations, which consists of two E-Samplers (measuring TSP and PM_{10} on a campaign basis), three dust deposition gauges (recording monthly dust deposition rates), and a meteorological station (recording wind speed and direction, temperature, solar radiation, rainfall, atmospheric pressure and sigma-theta). Data from this equipment was used to establish background air quality concentrations for the AQIA.

No monitoring of $PM_{2.5}$ is conducted by the existing air quality monitoring network at Clarence. Therefore, DPIE's air quality monitoring station (AQMS) at Bathurst was used to establish average $PM_{2.5}$ concentrations. As PM_{10} concentrations monitored at Clarence are monitored on a campaign basis only, the Bathurst AQMS was also used to establish average PM_{10} concentrations.

The background air quality values adopted for the AQIA were:

- 24-hour PM_{10} concentration – daily varying;
- annual average PM_{10} concentration – 18.8 µg/m³;
- 24-hour $PM_{2.5}$ concentration – daily varying;
- annual average $PM_{2.5}$ concentration – 7 µg/m³;
- annual average TSP concentration – 47.1 µg/m³; and

- annual average dust deposition – 1.2 g/m²/month.

7.2.3 Assessment of impacts

i Assessment criteria

The EPA's impact assessment criteria for particulate matter, as documented in Section 7 of the *Approved Methods for Modelling*, are presented in Table 7.5. These are designed to maintain ambient air quality for the protection of human health and well-being.

Table 7.5 Impact assessment criteria for particulate matter

PM metric	Averaging period	Impact assessment criterion
TSP	Annual	90 µg/m^3
PM_{10}	24 hours	50 µg/m^3
	Annual	25 µg/m^3
$PM_{2.5}$	24 hours	25 µg/m^3
	Annual	8 µg/m^3
Dust deposition	Annual	2 g/m^2/month (increment only)
		4 g/m^2/month (cumulative)

Notes: µg/m^3: micrograms per cubic metre; g/m^2/month: gram per square metre per month.
Source: EPA (2016).

ii Construction

No construction activities are required at Clarence to facilitate the proposed modification.

iii Operations

Emissions estimation and dispersion modelling was completed for an existing operational scenario corresponding to a maximum coal processing rate of 3 Mtpa. The proposed modification scenario included the same maximum processing rate as well as:

- extraction of CCR from REA6;
- transfer of CCR from REA6 and Clarence's production stream to the existing TLO;
- loading of CCR into train-based containers via the existing TLO; and
- export of CCR off-site to Charbon via rail.

A range of best practice dust mitigation measures are currently, and will continue to be, employed at Clarence. These include the use of water carts and sprays, enclosed conveyors, enclosed processing plant and watering of stockpiles and REAs (Chapter 6 of Appendix B). These measures have been taken into account in the emissions estimation and dispersion modelling of each scenario.

a Emissions estimates

A graphical summary of the contribution to annual dust emissions, by source type, is provided in Figure 7.1 for the existing operational scenario and Figure 7.2 for the proposed modification scenario. The most significant source of particulate matter emissions from Clarence's operations (existing and proposed) is associated with dozer activities and wind erosion of exposed areas.

There will be an increase in emissions under the proposed scenario (Section 5.2 of Appendix B). This primarily relates to the additional material handling and hauling activities associated with proposed modification.

Hanson's Clarence Quarry is approximately 200 m west of Clarence's surface facilities (Figure 2.1). Given its proximity to Clarence and surrounding receptors, emissions from this site were calculated and sources included in the cumulative dispersion modelling. As there are no AQIAs available for this site, emissions were estimated by taking the maximum production rate of 500,000 t of sand from the site's EPL and apportioning TSP, PM_{10} and $PM_{2.5}$ emissions based on ratios of extraction rates to emissions from five other quarries (Section 5.2.2 of Appendix B).

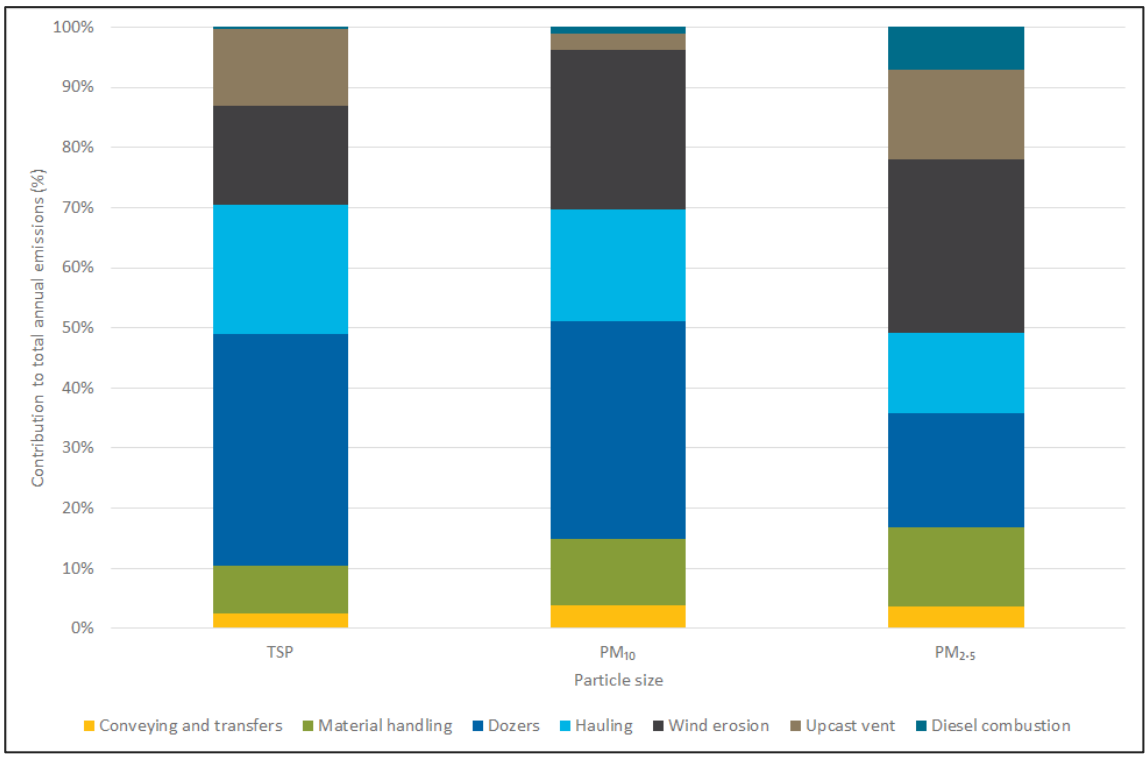


Figure 7.1 Contribution to annual emissions by emissions type and source – existing scenario

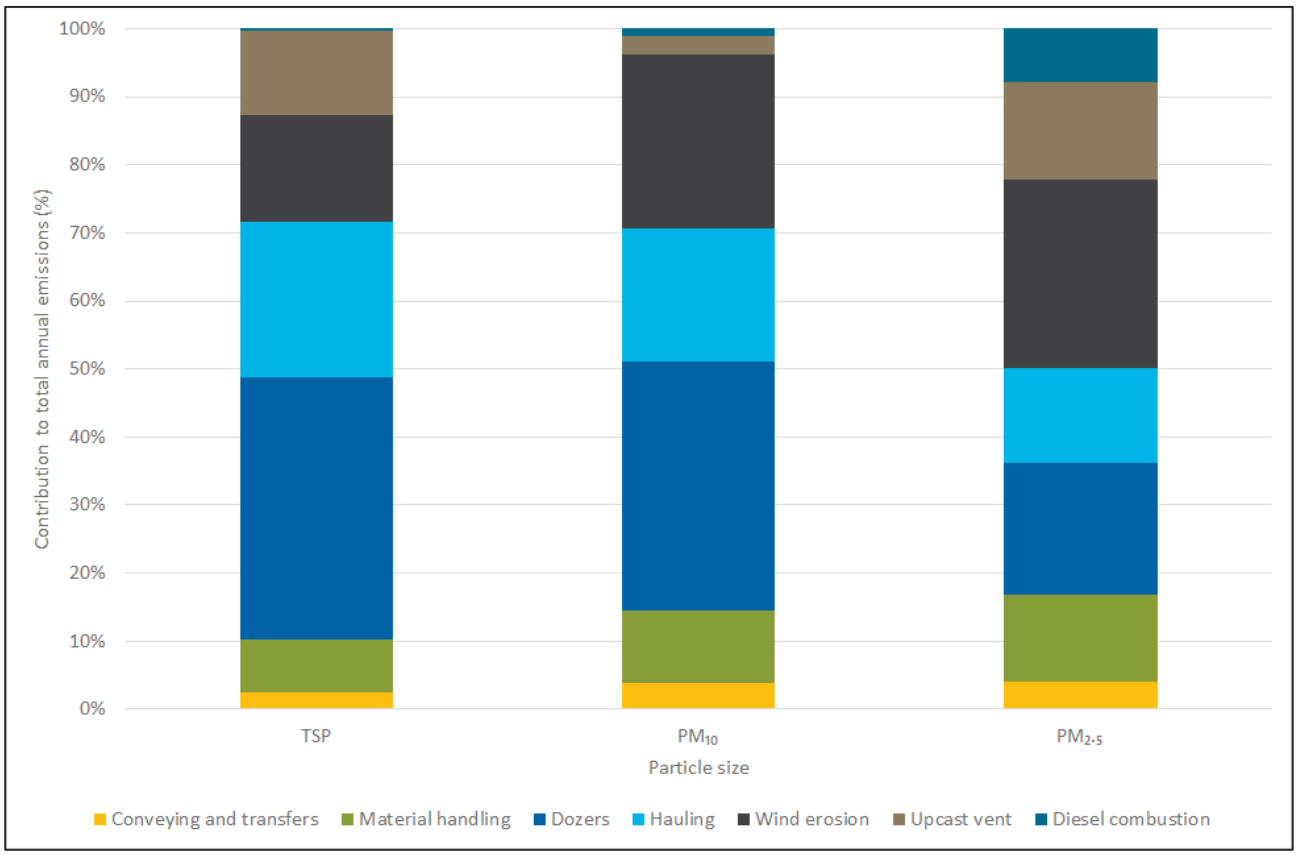


Figure 7.2 Contribution to annual emissions by emissions type and source – proposed scenario

b Air dispersion modelling

Atmospheric dispersion modelling was completed using the CALPUFF model system. Hourly meteorological observations from 2018, collected at the Clarence automatic weather station (AWS) and two monitoring stations operated by the BoM, were used as inputs to the dispersion modelling.

The results of the modelling show that the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition) are below the applicable impact assessment criteria at all assessment locations for both the existing operational (Table 7.6) and proposed modification (Table 7.7) scenarios.

Table 7.6 Incremental concentration and deposition results – existing operational scenario

Assessment location ID*	Predicted incremental concentration (µg/m³) and deposition rate (g/m²/month)					
	TSP	PM_{10}		$PM_{2.5}$		Dust deposition
	Annual	24-hour maximum	Annual	24-hour maximum	Annual	Annual
Criterion	**90**	**50**	**25**	**25**	**8**	**2**
R1	0.5	2.6	0.3	0.6	<0.1	<0.1
R2	0.7	3.2	0.4	0.7	0.1	0.1
R3	0.9	3.9	0.4	0.7	0.1	0.1
R4	0.8	3.6	0.4	0.7	0.1	0.1
R5	1.0	4.2	0.5	0.7	0.1	0.1
R6	1.9	6.7	0.9	1.4	0.1	0.2
R7	0.1	0.6	<0.1	0.2	<0.1	<0.1
R8	0.4	1.9	0.2	0.5	<0.1	<0.1

Note: Criteria for TSP, PM_{10} and $PM_{2.5}$ are applicable to cumulative (increment + background). Criteria is provided for comparison purposes only.
*R9 was not considered as part of the AQIA. Results at R2 are representative of incremental concentration and deposition results at R9.

Table 7.7 Incremental concentration and deposition results – proposed scenario

Assessment location ID*	Predicted incremental concentration (µg/m³) and deposition rate (g/m²/month)					
	TSP	PM_{10}		$PM_{2.5}$		Dust deposition
	Annual	24-hour maximum	Annual	24-hour maximum	Annual	Annual
Criterion	**90**	**50**	**25**	**25**	**8**	**2**
R1	0.4	2.5	0.2	0.6	<0.1	<0.1
R2	0.6	3.0	0.3	0.7	0.1	<0.1
R3	0.7	3.6	0.4	0.7	0.1	0.1
R4	0.7	3.4	0.3	0.7	0.1	<0.1
R5	0.8	3.9	0.4	0.7	0.1	0.1
R6	1.9	7.2	0.9	1.5	0.1	0.2
R7	0.1	0.7	<0.1	0.2	<0.1	<0.1
R8	0.4	2.0	0.2	0.5	<0.1	<0.1

Note: Criteria for TSP, PM_{10} and $PM_{2.5}$ are applicable to cumulative (increment + background). Criteria is provided for comparison purposes only.
*R9 was not considered as part of the AQIA. Results at R2 are representative of incremental concentration and deposition results at R9.

It is predicted that there will be a negligible difference in concentrations and deposition rates between the existing and proposed modification scenarios, indicating that the proposed modification will not adversely change air quality impacts from those associated with Clarence's existing operations.

Cumulative impacts were assessed by combining modelled impacts with recorded ambient background levels. It is predicted that cumulative levels will comply with EPA impact assessment criteria at all assessment locations for all pollutants and averaging periods under both the existing (Table 7.8) and proposed modification (Table 7.9) scenarios with the exception of predicted 24-hour average PM_{10} concentrations at:

- four assessment locations in the existing scenario (R3, R4, R5 and R6 - Figure 2.1); and
- three assessment locations in the proposed scenario (R3, R5 and R6 - Figure 2.1).

A **bold** value indicates an exceedance of the impact assessment criterion.

Table 7.8 Cumulative (existing scenario plus background) concentration and deposition results

Assessment location ID*	Predicted cumulative concentration (µg/m³) and deposition rate (g/m²/month)					
	TSP	PM_{10}		$PM_{2.5}$		Dust deposition
	Annual	9th highest 24-hour[1]	Annual	3rd highest 24-hour[2]	Annual	Annual
Criterion	**90**	**50**	**25**	**25**	**8**	**4**
R1	47.6	49.8	19.2	22.5	7.1	1.2
R2	47.9	50.0	19.3	22.5	7.1	1.2
R3	48.1	**50.2**	19.4	22.5	7.1	1.2
R4	48.0	**50.1**	19.3	22.5	7.1	1.2
R5	48.2	**50.2**	19.4	22.5	7.1	1.2
R6	49.2	**50.6**	19.9	22.4	7.2	1.3
R7	47.2	49.7	19.0	22.2	7.0	1.1
R8	47.6	49.7	19.2	22.2	7.1	1.1

1. Due to eight exceedances and exceptional events in the background dataset, the 9th highest cumulative PM10 concentration is presented.
2. Due to two exceedances and exceptional events in the background dataset, the 3rd highest cumulative PM2.5 concentration is presented.

*R9 was not considered as part of the AQIA. Results at R2 are representative of cumulative concentration and deposition results at R9.

Table 7.9 Cumulative (proposed scenario plus background) concentration and deposition results

Assessment location ID	Predicted cumulative concentration (µg/m³) and deposition rate (g/m²/month)					
	TSP	PM_{10}		$PM_{2.5}$		Dust deposition
	Annual	9th highest 24-hour[1]	Annual	3rd highest 24-hour[2]	Annual	Annual
Criterion	**90**	**50**	**25**	**25**	**8**	**4**
R1	47.6	49.7	19.2	22.5	7.1	1.1
R2	47.8	49.9	19.3	22.5	7.1	1.2
R3	47.9	**50.1**	19.3	22.5	7.1	1.2
R4	47.8	50.0	19.3	22.5	7.1	1.2
R5	47.9	**50.2**	19.3	22.5	7.1	1.2
R6	49.2	**50.7**	19.9	22.4	7.2	1.3
R7	47.2	49.7	19.0	22.2	7.0	1.1
R8	47.6	49.7	19.2	22.2	7.1	1.1

1. Due to eight exceedances and exceptional events in the background dataset, the 9th highest cumulative PM_{10} concentration is presented.
2. Due to two exceedances and exceptional events in the background dataset, the 3rd highest cumulative $PM_{2.5}$ concentration is presented.

*R9 was not considered as part of the AQIA. Results at R2 are representative of cumulative concentration and deposition results at R9.

The exceedance days have been analysed in further detail to provide context of the predicted concentrations (Section 7.3 of Appendix B). The analysis showed that all exceedances occurred on the same day, with the cumulative concentrations dominated by an elevated background level of 49.2 µg/m³ associated with a regional dust storm event. Incremental concentrations (ie Clarence only) contributed to less than 1.2 µg/m³ in each case of exceedance and it is unlikely that the proposed modification will result in significant adverse air quality impacts at nearby assessment locations.

7.2.4 Mitigation and management

Centennial will continue to implement the existing air quality mitigation and management measures as provided in the *Western Region Air Quality and Greenhouse Gas Management Plan* (AQGHGMP). This includes the use of water carts and sprays, enclosed conveyors, enclosed processing plant and watering of stockpiles and REAs.

7.2.5 Conclusion

The proposed modification will result in an increase in Clarence's operational air quality emissions; however, the results of the AQIA show that the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition) will remain below the applicable impact assessment criteria at all assessment locations.

Compliance with applicable EPA impact assessment criteria is predicted at all assessment locations for all pollutants and averaging periods, with the exception of a single additional exceedance of the 24-hour average PM_{10} impact assessment criterion at four assessment locations (R3, R4, R5 and R6) in the existing scenario and three assessment locations (R3, R5 and R6) in the proposed scenario. All exceedances occurred on the same day and the cumulative concentrations were dominated by an elevated background level of 49.2 µg/m³ (associated with a regional dust storm event). The corresponding incremental (ie Clarence only) contribution to the exceedance was below 1.2 µg/m³ at all receptors. It is unlikely that the proposed modification will result in significant adverse air quality impacts at nearby assessment locations.

Air quality impacts from Clarence will continue to be managed in accordance with the existing AQGHGMP.

7.3 Other environmental aspects

An assessment of other environmental aspects as a result of the proposed modification is provided in Table 7.10.

Table 7.10 Potential impacts of the proposed modification

Environmental consideration	Impact assessment
Biodiversity	No areas of native vegetation will be cleared for the proposed modification. No additional mitigation measures for potential impacts to biodiversity are considered warranted. Ecology monitoring, assessment and reporting are currently managed through the *Western Region Biodiversity Management Plan* (BMP). The BMP will continue to operate under the proposed modification.
Aboriginal cultural/historical heritage	The proposed modification does not require any clearing. Excavation works will be limited to REA6, which has been extensively disturbed as part of previous mining activities on-site. Aboriginal cultural and historic heritage will continue to be managed in accordance with the *Western Region Aboriginal Cultural Heritage Management Plan* (ACHMP) and *Western Region Historic Heritage Management Plan* (HHMP), respectively. In the event that a previously unrecorded Aboriginal cultural or historical site is identified during the proposed surface disturbance works, the unexpected finds protocols included in the ACHMP and HHMP will be followed.
Land and agricultural resources	There is no land mapped as biophysical strategic agricultural land (BSAL) within Clarence's holding boundary. No additional mitigation measures for potential impacts to land and agricultural resources are considered warranted. The EMS and erosion and sediment control plans will continue to operate under the proposed modification.
Waste	The production of waste will not increase as a result of the proposed modification. The beneficial use of CCR from Clarence at Charbon would reduce the amount of waste placed into the approved REAs at Clarence. Waste will continue to be managed in accordance with the EMS with all waste disposed of at a licenced waste management facility.
Traffic and transport	The potential impact of the proposed modification on level crossings between Clarence and Charbon has been assessed by EMM (Section 8.5 and Appendix I). The proposed modification will not significantly change traffic or transport impacts compared to approved operations at Clarence.
Water resources	Excavation works will be limited to REA6, which has been extensively disturbed as part of previous mining activities on-site. Leachate Dam 3 (LD3) will continue to collect runoff from REA6. All excavation works will be shallow with no potential to impact groundwater sources. There are no proposed changes to any other existing and approved site infrastructure. Surface water and groundwater will continue to be managed in accordance with Clarence's WMP.
Rehabilitation	Over a period of five years, it is anticipated that up to 1.5 Mt of CCR will be transported from Clarence to Charbon with an average annual transfer of between 300,000 t and 350,000 t. This may delay the progression of reject emplacement from REA6 to REA5; however, Clarence's reject emplacement strategy and existing rehabilitation commitments will not change as a result of the proposed modification. Rehabilitation will be undertaken in accordance with Clarence's MOP.

Table 7.10 Potential impacts of the proposed modification

Environmental consideration	Impact assessment
Socio-economics	A socio-economic impacts analysis was prepared by AIGIS (Appendix C) to address the potential social and economic effects of the proposed modification. The assessment also considered potential social and economic effects from the proposed modification to Charbon's SSD 08_0211. The assessment was undertaken in accordance with the *Social Impact Assessment Guidelines for State Significant Mining, Petroleum Production and Extractive Industry Development* (DPE 2017) and the *Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals* (DPE 2015) and supporting technical notes. The potential social and economic impacts of the proposed modification will be limited. Works will be undertaken on an existing mine site and will utilise existing infrastructure. Where required, mitigation and management measures have been proposed to reduce potential impacts on sensitive receptors.
Greenhouse gas	An updated summary of GHG emissions from Clarence was completed by EMM (Appendix D). The GHG emissions sources considered in the assessment are listed in Table 2.1 of Appendix D and include scope 1, 2 and 3 emissions. Annual average GHG emissions (Scope 1 and 2) generated by Clarence in both the existing and proposed scenarios total 56,144 t CO_2-e per year, which represents approximately 0.043% of total GHG emissions for NSW and 0.01% of total GHG emissions for Australia, based on the National Greenhouse Gas Inventory for 2018. Scope 3 emissions from Clarence are 6,597,053 t CO_2-e per year under the existing scenario and 6,597,132 t CO_2-e per year under the proposed scenario. The increase is related to diesel used by trains to transport CCR from Clarence to Charbon in the proposed scenario. Mitigation of GHG emissions will continue to be conducted in accordance with the existing AQGHGMP.

8 Assessment of impacts – Charbon

This section addresses the potential impacts of the proposed modification at Charbon.

8.1 Noise

8.1.1 Overview

A noise and vibration impact assessment (NVIA) for the proposed modification was prepared by EMM (Appendix E). The assessment was prepared with reference to the methods outlined in the NPfI (EPA 2017).

8.1.2 Existing environment

i Ambient noise

Unattended noise monitoring to establish the existing ambient noise levels surrounding Charbon was undertaken at two locations by EMM in December 2018. The noise loggers were programmed to record statistical noise level indices in 15-minute intervals.

On-site observations identified natural sounds (eg insects and birdsong), distant traffic noise and residential activity as being the main contributors to ambient noise levels. Noise from Charbon was not audible.

ii Assessment locations

Representative assessment locations are shown in Figure 3.2. The numbering of these receptors is consistent with that utilised in previous noise assessments for Charbon and SSD 08_0211.

iii Existing noise emissions

Noise monitoring is undertaken to measure ambient noise levels at the nearest potentially worst-affected receptor locations surrounding Charbon in accordance with Condition 1 of Schedule 3 in SSD 08_0211 and Condition L4 of EPL 528.

A review of historical data from Charbon's Annual Reviews (2015–2020) found that Charbon has been compliant with existing noise limits over the period between 2015 and 2020. No complaints have been made in relation to noise or vibration emissions from Charbon since April 2015.

iv Existing noise criteria

Noise criteria for Charbon are provided in Schedule 3 Condition 1 of SSD 08_0211 and Condition L4 of EPL 528. Noise limits are consistent between these two documents and are summarised in Table 8.1.

Table 8.1 Charbon noise limits

Location	Day	Evening	Night	
	$L_{Aeq,15min}$ (dB)	$L_{Aeq,15min}$ (dB)	$L_{Aeq,15min}$ (dB)	$L_{A1,1min}$ (dB)
Residence P	35	39	39	45
All residences within 150 m of, and including, Residence Q	38	38	38	45
Residence M	36	37	35	45
All other privately-owned land	35	35	35	45

8.1.3 Assessment of impacts

i Noise criteria

The NPfI provides a methodology for the assessment of noise from existing industrial sites. As per the NPfI, PNTLs are the more stringent of either the project intrusive or amenity noise levels. The project intrusive noise levels, recommended amenity noise levels and PNTLs are provided in Table 8.2.

Table 8.2 Project noise trigger levels, $L_{Aeq,15min}$

Assessment location	Intrusive noise level, $L_{Aeq,15min}$, dB			Amenity noise level, $L_{Aeq,period}$, dB			PNTL, $L_{Aeq,15min}$, dB		
	Day[1]	Evening[1]	Night[1]	Day[1]	Evening[1]	Night[1]	Day[1]	Evening[1]	Night[1]
A	40	35	35	53	48	43	40	35	35
B	44	35	35	53	48	43	44	35	35
D	44	35	35	53	48	43	44	35	35
E	44	35	35	53	48	43	44	35	35
F	44	35	35	53	48	43	44	35	35
H	44	35	35	53	48	43	44	35	35
I	44	35	35	53	48	43	44	35	35
J	44	35	35	53	48	43	44	35	35
K	44	35	35	53	48	43	44	35	35
L	44	35	35	53	48	43	44	35	35
N	44	35	35	53	48	43	44	35	35
O	44	35	35	53	48	43	44	35	35
P	44	35	35	53	48	43	44	35	35
Q	44	35	35	53	48	43	44	35	35
R	44	35	35	53	48	43	44	35	35
S	40	35	35	53	48	43	40	35	35

1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; evening: 6 pm to 10 pm; night: all remaining periods.

ii Construction noise assessment

All construction activities will be undertaken during standard daytime construction hours as defined by the ICNG (DECC 2009). No additional employees will be required during construction and the expected total duration of the proposed construction activities will be approximately eight weeks.

Most of the plant, materials and equipment required to complete the proposed construction activities (primarily dozers and trucks) are available on-site and have been captured in the operational noise assessment. Hence, the likely impacts from the proposed construction activities are not expected to be greater than those predicted for operational activities.

Given the limited extent and duration of construction activities, construction noise impacts have not been assessed in detail as part of the NVIA.

iii Operational noise assessment

A high level of conservatism has been incorporated into the operational noise model. The current fleet available at Charbon consists of two dozers and ten trucks. For the purpose of noise modelling, this fleet has been assumed to operate in each open cut and REA, simultaneously. Similarly, it has been assumed that the full fleet of trucks used to transport CCR (ie four trucks) will operate between the rail loop and each open cut area, simultaneously.

Predicted operational noise levels are presented in Table 8.3 for the proposed hours of operation (ie daytime only). Noise-enhancing weather conditions have been considered and the highest predicted noise level is presented.

Table 8.3 Predicted daytime $L_{Aeq,15min}$ operational noise levels at Charbon

Assessment location	Predicted daytime noise level (dB)	PNTL $L_{Aeq,15min}$, dB
	Noise-enhancing conditions	
A	33	40
B	34	44
D	36	44
E	37	44
F	37	44
H	41	44
I	39	44
J	35	44
K	41	44
L	40	44
N	34	44
O	37	44
P	41	44
Q	38	44
R	37	44
S	<30	40

1. Daytime: 7 am–6 pm Monday to Saturday; 8 am–6 pm Sundays and public holidays.

Operational noise levels are predicted to satisfy the PNTLs at all assessment locations for operations associated with the proposed modification. Noise levels are expected to be unchanged compared to currently approved rehabilitation activities.

Noise levels are predicted to be highest at assessment locations closest to the Main REA or active rehabilitation areas (Residences H, K and P - Figure 2.4). Dozers operating in the 8 Trunk Open Cut or Southern Open Cut areas are the main contributors to noise emissions at Residences H and K. The main contributors at Residence P are the dozer operating in the Main REA and locomotives on the rail loop.

iv Sleep disturbance assessment

An assessment of maximum noise levels is not required as activities associated with the proposed modification will be limited to daytime hours only.

v Rail noise assessment

As part of the proposed modification, one CCR-laden train will be used per day (ie two rail movements). This is within previously assessed and approved train movements during the day period (ie eight rail movements between 7 am and 10 pm). Hence, a detailed assessment of off-site rail noise impacts has not been included as part of the NVIA.

vi Vibration

Given the low level of proposed construction activity and the distance between these activities and the closest residences (ie greater than 1,200 m), vibration impacts from construction activities are not expected.

Vibration impacts associated with train movements and ongoing rehabilitation activities as a result of the proposed modification are not expected to change from previously assessed and approved impacts.

8.1.4 Mitigation and management

Charbon Coal will continue to implement the existing noise mitigation and management measures as provided in the NMP. The NMP outlines the noise mitigation and management measures relevant to Charbon's existing operations and also describes the noise monitoring program which incorporates operator-attended noise surveys at nearest residences as well as on-site sound power level measurements.

8.1.5 Conclusion

The proposed modification is not predicted to change existing operational noise emissions associated with approved rehabilitation activities.

A high level of conservatism was incorporated into the noise model. Nonetheless, operational noise levels are predicted to satisfy the PNTLs at all assessment locations for operations associated with the proposed modification.

Noise emissions from Charbon will continue to be managed in accordance with the existing NMP.

8.2 Air quality

8.2.1 Overview

An air quality impact assessment (AQIA) (Appendix F) assessing potential air quality impacts associated with Charbon's existing and proposed operations was prepared by EMM. The AQIA has been prepared in general accordance with the guidelines specified by the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA 2016). Emissions of total suspended particulates (TSP), particulate matter less

than 10 micrometres (µm) in aerodynamic diameter (PM_{10}), particulate matter less than 2.5 µm in aerodynamic diameter ($PM_{2.5}$) were estimated and the dispersion of these potential pollutants modelled.

8.2.2 Existing environment

The local airshed is likely to be influenced by:

- emissions from existing activities at Charbon;
- neighbouring industrial emission sources, including the Charbon Lime Works;
- wind generated dust from exposed areas;
- dust entrainment and tailpipe emissions from vehicle movements along unsealed and sealed roads;
- seasonal emissions from household wood heaters; and
- long-range transport of fine particles into the region.

More remote sources which contribute episodically to suspended particulates include dust storms and bushfires.

Charbon Coal maintains an air quality monitoring network for its operations, which consists of one High volume air sampler (HVAS) (measuring TSP and PM_{10} on a one-in-six day cycle), four dust deposition gauges (recording monthly dust deposition rates), and a meteorological station (recording wind speed and direction, temperature, solar radiation, rainfall, atmospheric pressure and sigma-theta). Data from this equipment was used to establish background air quality concentrations for the AQIA.

No monitoring of $PM_{2.5}$ is conducted by the existing air quality monitoring network at Charbon. Therefore, DPIE's air quality monitoring station (AQMS) at Bathurst was used to establish average $PM_{2.5}$ concentrations. As PM_{10} concentrations monitored at Charbon are monitored on a one-in-six day run cycle only, the Bathurst AQMS was also used to establish average PM_{10} concentrations.

The background air quality values adopted for the AQIA were:

- 24-hour PM_{10} concentration – daily varying;
- annual average PM_{10} concentration – 18.8 µg/m³;
- 24-hour $PM_{2.5}$ concentration – daily varying;
- annual average $PM_{2.5}$ concentration – 7 µg/m³;
- annual average TSP concentration – 47.1 µg/m³; and
- annual average dust deposition – 1.3 g/m²/month.

8.2.3 Assessment of impacts

i Assessment criteria

The EPA's impact assessment criteria for particulate matter, as documented in Section 7 of the *Approved Methods for Modelling*, are presented in Table 8.4. These are designed to maintain ambient air quality for the protection of human health and well-being.

Table 8.4 Impact assessment criteria for particulate matter

PM metric	Averaging period	Impact assessment criterion
TSP	Annual	90 µg/m^3
PM_{10}	24 hours	50 µg/m^3
	Annual	25 µg/m^3
$PM_{2.5}$	24 hours	25 µg/m^3
	Annual	8 µg/m^3
Dust deposition	Annual	2 g/m^2/month (increment only)
		4 g/m^2/month (cumulative)

Notes: µg/m^3: micrograms per cubic metre; g/m^2/month: gram per square metre per month.
Source: EPA (2016).

ii Construction

The proposed modification includes some minor construction activities that have the potential to generate dust emissions. Construction phase emissions will principally consist of particulate matter emissions related to the construction of the hardstand, link road, powerline poles and transmission line and widening of some of Charbon's existing haul roads (Section 4.2).

All construction activities will be undertaken during daytime hours only and the duration of construction is likely to be eight weeks. It is considered that any construction phase dust emissions will be minor compared to emissions related to the proposed importation of CCR and ongoing rehabilitation activities. Given the short timeframe and small scale of the construction activities, dust emissions from these activities have not been assessed.

iii Operations

One worst-case emissions scenario was developed to quantify particulate matter impacts from Charbon. This included consideration of existing rehabilitation activities and the proposed modification. This scenario corresponds to the estimated maximum amount of Charbon overburden and Clarence CCR moved around the site as well as the extent of areas exposed to wind erosion. An 'existing' scenario was not assessed given the small-scale of changes for the proposed modification.

A range of best practice dust mitigation measures are currently, and will continue to be, employed at Charbon. These include the use of water carts on unpaved haul roads, grader routes and dozer materials and routes. (Chapter 6 of Appendix F). These measures have been taken into account in the emissions estimation and dispersion modelling.

a Emissions estimates

A graphical summary of the contribution to annual dust emissions, by source type, is provided in Figure 8.1. The most significant source of particulate matter emissions from Charbon's operations is associated with wind erosion of exposed areas with a lesser percentage from hauling on unpaved roads.

A detailed description of the assumptions and emission factors adopted in the development of the emissions inventory is provided in Appendix B of Appendix F.

Neighbouring operations, including Charbon Lime Works and Cement Australia's production facility have not been explicitly modelled in the air quality assessment (Section 5.2.2 of Appendix F).

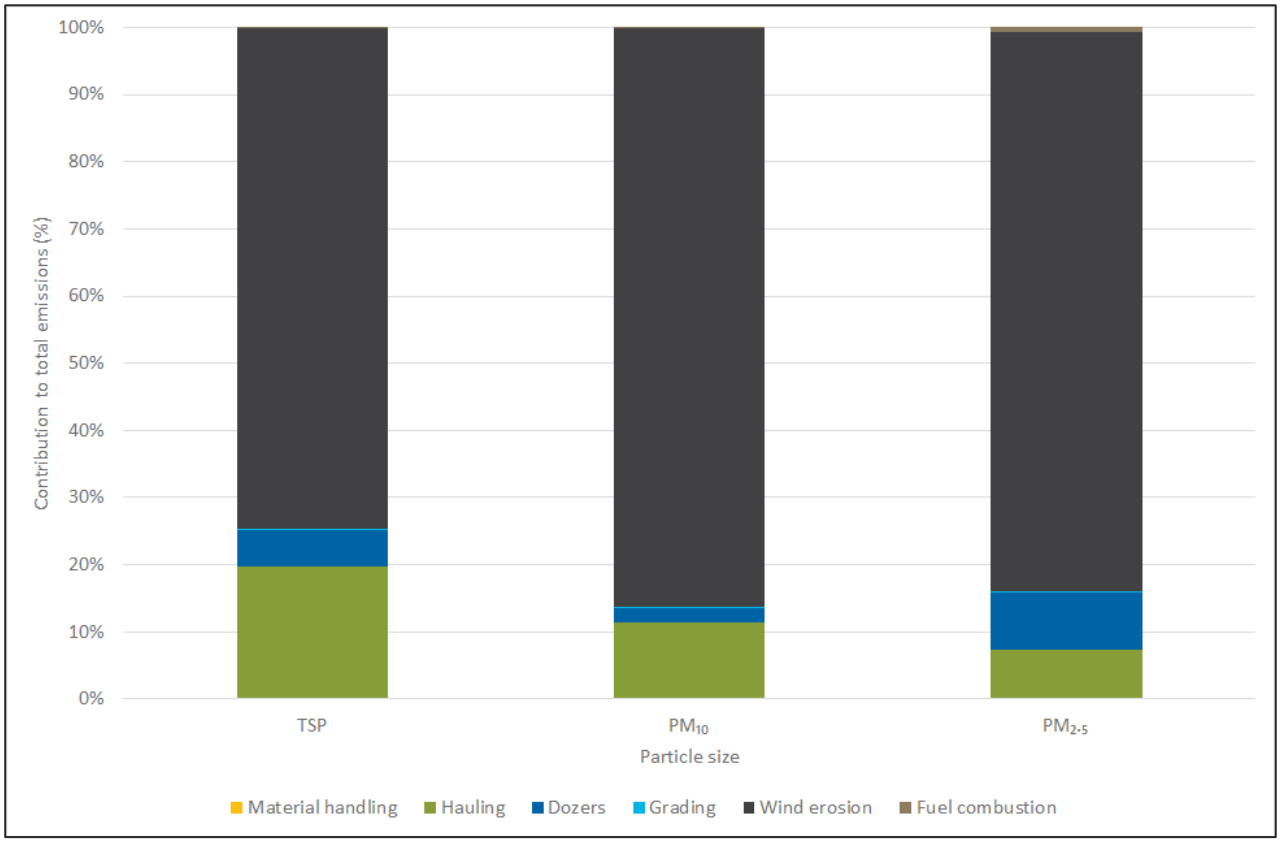


Figure 8.1 Contribution to annual emissions by emissions type and source

b Air dispersion modelling

Atmospheric dispersion modelling was completed using the CALPUFF model system. Hourly meteorological observations from 2018, collected at the Charbon AWS and a monitoring station operated by the BoM, were used as inputs to the dispersion modelling.

The results of the modelling show that the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition) are below the applicable impact assessment criteria at all assessment locations (Table 8.5).

Table 8.5 Incremental concentration and deposition results

Assessment location ID	Predicted incremental concentration (µg/m³) and deposition rate (g/m²/month)					
	TSP	PM_{10}		$PM_{2.5}$		Dust deposition
	Annual	24-hour maximum	Annual	24-hour maximum	Annual	Annual
Criterion	**90**	**50**	**25**	**25**	**8**	**2**
A	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
B	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
C*	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
D	<0.1	0.1	<0.1	0.1	<0.1	<0.1
E	<0.1	0.2	<0.1	0.1	<0.1	<0.1
F	<0.1	0.2	<0.1	0.1	<0.1	<0.1
G*	0.1	2.5	0.1	0.5	<0.1	<0.1
H	0.1	2.6	0.1	0.4	<0.1	<0.1
I	0.1	1.1	<0.1	0.3	<0.1	<0.1
J	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
K	0.1	1.2	0.1	0.3	<0.1	<0.1
L	0.1	1.2	0.1	0.3	<0.1	<0.1
M*	0.3	2.0	0.2	0.4	<0.1	<0.1
N	0.1	0.7	<0.1	0.2	<0.1	<0.1
O	0.1	0.6	0.1	0.1	<0.1	<0.1
P	0.2	1.0	0.1	0.2	<0.1	<0.1
Q	0.1	2.0	0.1	0.4	<0.1	<0.1
R	0.1	3.6	0.1	0.6	<0.1	<0.1
S	0.2	2.1	0.1	0.5	<0.1	<0.1

1. Criteria for TSP, PM_{10} and $PM_{2.5}$ are applicable to cumulative (increment + background). Criteria is provided for comparison purposes only.
2. *Assessment location is Centennial-owned. All other assessment locations are residential.

Cumulative impacts were assessed by combining modelled impacts with recorded ambient background levels. The cumulative results showed that compliance with applicable NSW EPA impact assessment criteria is predicted at all assessment locations for all pollutants and averaging periods (Table 8.6).

Table 8.6 Cumulative (Charbon plus background) concentration and deposition results

Assessment location ID	Predicted cumulative concentration (µg/m³) and deposition rate (g/m²/month)					
	TSP	PM_{10}		$PM_{2.5}$		Dust deposition
	Annual	9th highest 24-hour[1]	Annual	3rd highest 24-hour[2]	Annual	Annual
Criterion	**90**	**50**	**25**	**25**	**8**	**4**
A	47.1	49.7	18.8	22.1	7.0	1.3
B	47.1	49.7	18.8	22.1	7.0	1.3
C*	47.1	49.7	18.8	22.1	7.0	1.3
D	47.1	49.7	18.8	22.1	7.0	1.3
E	47.1	49.7	18.8	22.1	7.0	1.3
F	47.1	49.7	18.8	22.1	7.0	1.3
G*	47.2	49.7	18.8	22.1	7.0	1.3
H	47.2	49.7	18.8	22.1	7.0	1.3
I	47.2	49.7	18.8	22.1	7.0	1.3
J	47.1	49.7	18.8	22.1	7.0	1.3
K	47.2	49.7	18.8	22.1	7.0	1.3
L	47.2	49.7	18.8	22.1	7.0	1.3
M*	47.4	49.7	18.8	22.1	7.0	1.3
N	47.2	49.7	18.8	22.1	7.0	1.3
O	47.2	49.7	18.8	22.1	7.0	1.3
P	47.3	49.7	18.8	22.1	7.0	1.3
Q	47.2	49.7	18.8	22.1	7.0	1.3
R	47.2	49.7	18.8	22.1	7.0	1.3
S	47.3	49.7	18.8	22.1	7.0	1.3

1. Due to eight exceedances and exceptional events in the background dataset, the 9th highest cumulative PM_{10} concentration is presented.
2. Due to two exceedances and exceptional events in the background dataset, the 3rd highest cumulative $PM_{2.5}$ concentration is presented.
3. *Assessment location is Centennial-owned. All other assessment locations are residential.

8.2.4 Mitigation and management

Centennial will continue to implement the existing air quality mitigation and management measures as provided in the *Charbon Colliery Air Quality and Greenhouse Gas Management Plan* (AQGHGMP). This includes the use of water carts on unpaved roads, grading routes and exposed areas.

8.2.5 Conclusion

Dispersion modelling has been completed for a worst-case rehabilitation scenario at Charbon. This scenario considered existing rehabilitation activities and the estimated maximum amount of Charbon overburden and Clarence CCR moved around the site as well as the maximum extent of areas exposed to wind erosion.

The results of the modelling show that the predicted concentrations and deposition rates for incremental particulate matter (TSP, PM_{10}, $PM_{2.5}$ and dust deposition) are below the applicable impact assessment criteria at all assessment locations. Similarly, the cumulative results showed that compliance with applicable EPA impact assessment criteria is predicted at all assessment locations for all pollutants and averaging periods.

Air quality impacts from Charbon will continue to be managed in accordance with the existing AQGHGMP.

8.3 Suitability of Clarence coarse coal reject for rehabilitation activities

8.3.1 Overview

A geochemical assessment of the suitability of Clarence CCR for use in rehabilitation at Charbon was prepared by EMM (Appendix G). The assessment determined the potential geochemical risks associated with placement of REA6 CCR at Charbon.

The assessment considered whether the approved rehabilitation design will minimise contamination of leachate and mitigate potential impacts to water resources down gradient of the proposed emplacement areas at Charbon.

8.3.2 Existing environment

i Clarence reject emplacements

Clarence has six approved REAs that accept CCR (Section 1.3.1). REA6 is currently operational and available as a source of material for rehabilitation activities at Charbon. The geochemical characteristics of CCR from REA6 are broadly similar to the characteristics of the other Clarence REAs (EMM 2020; GHD 2018; GHD 2013). This is expected given the consistency of mining the Katoomba coal seam of the Permian Illawarra coal measures throughout mining operations at Clarence.

ii Charbon reject emplacements

Charbon also mined the Permian Illawarra coal measures. During mining operations, waste material was handled in two REAs (Main REA and Northern REA - Figure 3.2), which both contain CCR and fine tailings. The geochemistry of Charbon's waste material has been characterised (EGi 2018; LAMAC 2018).

8.3.3 Assessment of impacts

i Overview

It is important to understand the geochemistry of Clarence CCR to determine if any specific management would be required if the material is used in rehabilitation activities at Charbon as a result of:

- AMD;
- increased salinity and/or metals in soils; and
- impacts to groundwater and sensitive receptors (eg landholder bores, surface water bodies or groundwater dependent ecosystems (GDEs)).

ii Geochemical risk from coarse coal reject emplacement

a Methodology

The potential geochemical impact of placement of Clarence CCR at Charbon was assessed by examining:

- geochemical characterisation data from Clarence CCR at REA6 (EMM 2020);
- laboratory geochemical characterisation and Australian Standard Leaching Procedure (ASLP) leachate data from Clarence's REA2, REA3 and REA4 and mineral waste (GHD 2013; GHD 2018);
- potential water quality of REA6 seepage based on water quality data from LD3 which is downslope of REA6 (Figure 3.1) to characterise the reactivity of Clarence CCR in situ (eg exposure to water and oxygen) and to assess AMD potential and contaminants of potential concern (EMM 2020); and
- water quality data from Leachate Dam 1 and 2 (LD1 and LD2 - Figure 3.1) at Clarence, which collect seepage from the other Clarence REAs and comparing these with water quality characteristics of LD3.

b Acid mine drainage potential of REA6 coarse coal reject

The initial assessment of the AMD potential of the samples was undertaken via acid-base accounting, which evaluates the balance between acid generation processes and acid neutralising processes (AMIRA 2002). Of the 15 samples analysed:

- 4 samples are non-acid forming (NAF);
- 9 samples are PAF; and
- 2 samples are uncertain (UC).

While some REA6 samples are classified as PAF, they have low metal and metalloid contents and low sulfur concentrations (the maximum sulfur content recorded in REA6 CCR was 0.109%).

The presence or absence of acid neutralising capacity (ANC) governs whether AMD will be buffered. Some REA6 CCR samples have zero ANC and lack the capacity to buffer low levels of acidity that may be generated if the material is left exposed.

c Geochemical variability of Clarence coarse coal reject

REA6 CCR geochemistry was compared to the geochemical characteristics of samples from REAs 2, 3 and 4 to evaluate the Clarence waste material as a whole and to determine how representative the recently analysed REA6 samples (EMM 2020) are of Katoomba coal seam waste.

The acid-base characteristics of the REA6 CCR samples are within the range of those from the other Clarence REAs. REA6 CCR samples have among the lowest maximum potential acidity (MPA) values (and lowest sulfur contents) of all of the samples.

Although eight REA6 CCR samples have zero ANC, the remaining seven REA6 CCR samples have the highest ANC of the Clarence samples.

REA6 CCR metal and metalloid concentrations are similar to those in other Clarence REA material, with many analytes recorded at or below the laboratory limits of report (LORs). REA6 CCR cobalt concentrations are enriched compared to global median soil concentrations, but the concentrations are similar to other Clarence REA material, indicating that this is likely a feature of Clarence's lithology.

d Clarence REA leachate water quality

The laboratory leachate results and the observed REA 2, 3, 4 and 6 leachate water quality indicate:

- leachate pH is generally acidic (ie less than 6.5), which may be because:
  - Clarence waste rock material contains limited buffering capacity for acidity that may result from sulfide oxidation and, following emplacement of CCR, weathering and infiltration of rainfall may load acidity in the leachate dams;
  - the REAs may contain 'pockets' of acidity, which are yet to be sampled and may have been subjected to preferential seepage and weathering resulting in AMD reporting to the leachate dams; or
  - as yet undiscovered sources of AMD that may contribute to leachate dam acidity; and
- leachate metal and metalloid concentrations are generally low and are reported at or below LORs for many analytes; however, cobalt, nickel and lead concentrations exceed Clarence's EPL 726 limits for off-site discharge.

REA6 leachate water quality from LD3 is geochemically similar to water quality reported from LD1 and LD2 at Clarence (Figure 3.1). This is consistent with the similarities in the whole-sample geochemistry of REA6 and material from the other REAs.

iii Adequacy of approved Charbon rehabilitation design

a Methodology

The geochemical assessment:

- compared the geochemical characteristics of REA6 CCR with rock and water quality information available at Charbon to identify whether there is higher, lower or similar risk to the receiving environment as a result of the proposed modification; and
- reviewed the approved rehabilitation design at Charbon to determine whether potential adverse impacts associated with the proposed modification can be adequately addressed through existing management measure.

b Comparison of Clarence and Charbon rejects characteristics

Samples from Charbon's Main REA and Northern REA have sulfur contents generally up to 8.5% and most samples are classified as PAF. Given that PAF material is present at both Clarence and Charbon, it is the presence or absence of ANC that largely governs whether AMD will be generated.

A number of samples from Clarence REA6 CCR, other Clarence REAs and Charbon Main REA and Northern REA have zero ANC and it is likely that acidity may be produced in the absence of buffering capacity.

In contrast to REA6 CCR, material from Charbon's Main REA and Northern REA generally records higher metal and metalloid concentrations (EGi 2018). The exception is cobalt, which is generally reported in higher concentrations in Clarence samples, although these are comparable to Charbon samples from 8 Trunk Open Cut and Southern Open Cut (LAMAC 2018).

c Comparison of Clarence and Charbon leachate water quality

Samples of CCR from Charbon generally have a higher capacity for acid generation and higher metal and metalloid concentrations than those from Clarence. In contrast, in situ measurements of leachate water quality from the waste emplacement facilities (Main REA and Northern REA at Charbon; REAs 2, 3, 4 and 6 at Clarence) indicate that Charbon leachate is neutral to mildly alkaline but Clarence leachate is mildly acidic to acidic.

EGi (2018) noted that the highest risk of AMD at Charbon was likely to be close to tailings spigot points within the Main REA, which represented 'hot spots' of potential acidity and that the bulk of the leachate arising from Charbon's waste material was likely to be neutral/saline. In contrast, sampling of REA6 CCR found no evidence for acidity hot spots, with samples reporting low sulfur concentrations (low MPA) and low metal and metalloid contents (EMM 2020). However, the acidic leachate recorded at LD3 requires some source of AMD input, which may include:

- similar pockets of acidity at REA6 as at the Main REA (albeit in waste rock rather than tailings), which were not encountered during sampling (such pockets may have been subjected to preferential seepage and weathering); and/or
- due to the low ANC of REA6 CCR, limited buffering of the (low) acidity resulting from sulfide oxidation may result in a build-up of acidity over time; and/or
- alternatively, as yet undiscovered sources of AMD may contribute to LD3 acidity.

Although leachate monitoring of LD3 suggests that REA6 material may pose an additional risk of AMD if emplaced at Charbon, aside from pH it is generally within the expected range at Charbon based on monitoring and laboratory leach testing data.

If the geochemistry of the samples collected at REA6 are representative of the REA6 geochemistry as a whole, the low MPA values will require moderate addition of buffering capacity to prevent AMD.

8.3.4 Mitigation and management

i Rehabilitation design

Comparison of the geochemical characteristics of materials at Charbon and Clarence supports the requirement for the rehabilitation strategies at Charbon to contain adequate mitigation and management measures to manage AMD in order to prevent potential adverse impacts on the receiving environment.

The rehabilitation design proposed by Centennial (2020) is a combination of the design principles for the Main REA and Northern REA and the characteristics of the void spaces at Charbon (ie Western Open Cut, 8 Trunk Open Cut and Central Open Cut Box Cut). It also considers the geochemical characteristics of Clarence CCR material to be placed in the voids.

The final landform at Charbon will be representative of existing landforms within and adjacent to the site. The areas proposed to receive Clarence CCR will be 'water shedding' as they are all hillside rehabilitation landforms.

A deep multi-layer moderate hydraulic conductivity cover will be developed on the sloping landforms with store-and-release characteristics, that will allow plant establishment and growth, while minimising deep-drainage (potential AMD seepage) and mitigating upward migration of soluble salts.

The deep multi-layer cover will be 3-m-thick and will consist of a 2.5 m benign overburden layer (average thickness) followed by approximately 0.5 m of Southern Open Cut resistant overburden cladding. This cover will be adopted at areas to be rehabilitated with Clarence CCR (Centennial 2020). Field trials of the cover designs will be conducted prior to the full-scale use of CCR in rehabilitation activities (LAMAC 2018; EGi 2018; and GHD 2018).

Charbon's MOP (Centennial 2019a) will be updated to reflect the changes proposed as part of this modification. No changes to the approved final landform are required as part of the proposed modification.

Monitoring of water resources down slope/gradient of Charbon rehabilitation areas is described in Section 8.4.4.

ii Assessment and management of CCR

The geochemical properties of Clarence CCR will be assessed as it is being excavated (ie CCR from REA6) or as it is generated from Clarence's CHPP. This may be conducted at Clarence and may include rapid turn-around laboratory analysis. Active management of Clarence CCR may include screening material with higher AMD that is unsuitable for use in Charbon rehabilitation activities or the possible addition of buffering capacity in the form of limestone or other suitable material (LAMAC 2018; EGi 2018) to reduce the AMD risk from Clarence CCR used at Charbon. Options for limestone addition in situ are described in detail in Chapter 4 of Appendix G.

The comparison of the geochemical characteristics of materials at Charbon and Clarence support the requirement for rehabilitation strategies at Charbon to contain adequate mitigation and management measures to manage AMD.

8.3.5 Conclusion

From a geochemical perspective, REA6 CCR has a similar or lower AMD risk to other waste material at Clarence and waste material currently in Main REA and Northern REA at Charbon.

Mitigation and management measures have been identified to manage AMD to minimise risks to the receiving environment.

Clarence CCR used in rehabilitation activities at Charbon will be treated as PAF material with the capacity to generate AMD if exposed. Primarily, a deep multi-layer moderate hydraulic conductivity cover on a sloping landform with store-and-release characteristics will be used to cap any areas at Charbon that receive Clarence CCR (Centennial 2020).

Field testing of the AMD potential of Clarence CCR will be used to provide limestone addition rates to mitigate AMD risk at Charbon.

8.4 Water resources

8.4.1 Overview

A water resources assessment assessing the groundwater and surface water impacts of the proposed modification was prepared by EMM (Appendix H). The assessment:

- reviewed local and regional groundwater and surface water data;
- developed a hydrogeological and hydraulic conceptual model;

- reviewed available geochemical data for Clarence CCR and assessed the anticipated metal and metalloid mobilities;
- included a water risk assessment that assessed possible impacts against applicable assessment criteria and known constraints;
- identified potential pathways between the proposed CCR emplacement areas and identified receptors;
- recommended management measures (including groundwater and surface water quality indicators or triggers and a trigger action response plan (TARP)); and
- described the residual risks to the groundwater and surface water environments as a result of the proposed modification.

8.4.2 Existing environment

i Groundwater

a Overview

The principal groundwater resources in the vicinity of Charbon are:

- unconsolidated colluvial/alluvial surficial quaternary sediments;
- consolidated coal measures, interburden and basement rock of the Permian Coal Measures; and
- consolidated basement rock of the Shoalhaven group.

The local groundwater sources that occur in the vicinity of the project site boundary are generally low yielding and are predominantly within the weathered and/or fractured sandstone and coal seams that occur within Haystack Mountain and the Great Dividing Range.

More details of the local groundwater environment are provided in Section 2.2.6 of this MR and Section 2.3 of Appendix H.

b Groundwater levels and flow directions

Groundwater elevation contours and flow directions indicate the water table is a subdued reflection of topography (Figure 8.2). Groundwater levels are highest near Charbon, just west of the Great Dividing Range. Groundwater flows in a westerly direction at least initially, from the elevated areas of the Great Dividing Range towards Carwell Creek, north towards the township of Kandos and south towards Brogans Creek and Stony Creek.

c Groundwater recharge

Groundwater recharge estimates for two bores (PB2 and PB3 on Figure 8.2) were derived using the chloride mass balance method and calculated as 11.3 mm/year and 6.3 mm/year, respectively.

d Hydraulic conductivity

The horizontal hydraulic conductivity (K_H) of the aquifer surrounding PB2 was estimated to be 0.46 m/day, and 0.11 m/day in the vicinity of PB3. These results are in the expected range for the fractured rock aquifer associated with the Shoalhaven Group.

e Groundwater quality

Groundwater quality of the Shoalhaven Group aquifer is characterised as brackish, with average electrical conductivities (EC) of 2,593–3,569 µS/cm. Groundwater is neutral at PB2 and slightly acidic at PB3. Major ion composition is similar in both bores, with PB3 having slightly higher concentrations, as expected from the higher average EC. Dissolved metal concentrations are low in both bores, except for manganese which is present in concentrations of 8.1 mg/L in PB2 and 11.9 mg/L in PB3, which suggests reducing conditions in the aquifer.

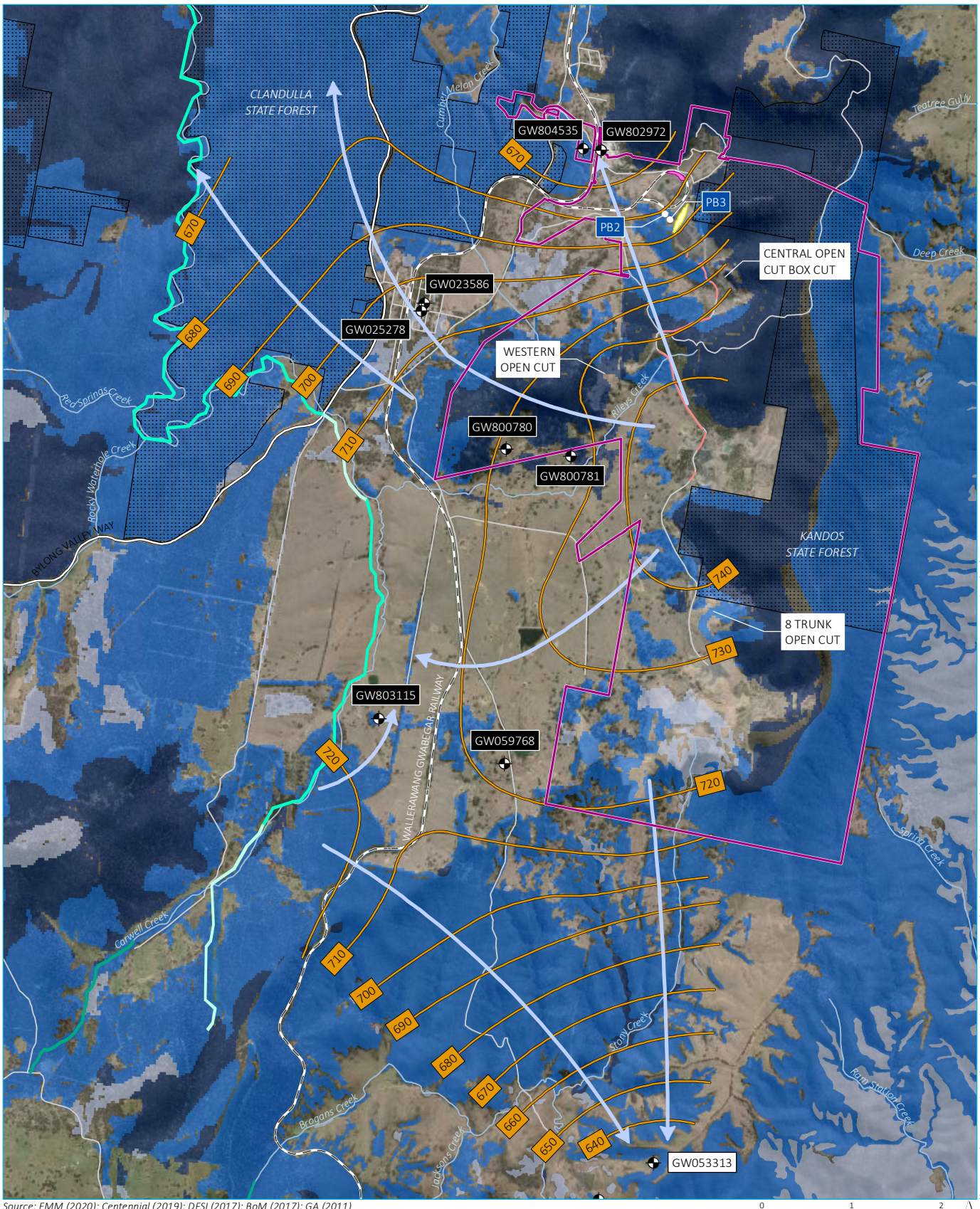
f Groundwater receptors

The results of a search for registered bores in the vicinity of the proposed CCR emplacement areas are summarised in Table 8.7 and shown in Figure 8.2. The direct distance listed is the straight-line distance between the bore and the closest emplacement area, rather than the flow line distance, therefore representing the more conservative value when considering potential impacts.

Table 8.7 Third-party groundwater bores down hydraulic gradient from proposed CCR emplacement areas

Bore ID	Easting (m)	Northing (m)	Upgradient CCR emplacement area(s)	Direct distance from closest CCR emplacement area (km)
GW059768	776744	6350200	8 Trunk Open Cut	3.2
GW803115	775340	6350697	8 Trunk Open Cut	3.9
GW053313	778411	6345744	8 Trunk Open Cut	7.2
GW070786	777802	6345329	8 Trunk Open Cut	7.6
GW804127	217199	6344944	8 Trunk Open Cut	7.9
GW800781	777488	6353633	Western Open Cut/8 Trunk Open Cut	0.9
GW800780	776763	6353708	Western Open Cut/8 Trunk Open Cut	1.4
GW023586	775848	6355344	Western Open Cut	2.2
GW025278	775819	6355252	Western Open Cut	2.2
GW804126	217196	6356048	Central Open Cut Box Cut/Western Open Cut	1.1
GW804125	217430	6356753	Central Open Cut Box Cut/Western Open Cut	1.5
GW802972	777822	6357049	Central Open Cut Box Cut/Western Open Cut	2.1
GW804535	777626	6357064	Central Open Cut Box Cut/Western Open Cut	2.3

A review of the BoM's *Groundwater Dependent Ecosystems Atlas* (GDE Atlas) indicates there are potential terrestrial GDEs surrounding Charbon. The register indicates there are areas of low, moderate, and high potential terrestrial GDEs in the area. No subterranean GDEs were identified in the GDE Atlas surrounding Charbon.



Source: EMM (2020); Centennial (2019); DFSI (2017); BoM (2017); GA (2011)

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KEY

- Charbon Colliery project site boundary
- Third-party bore
- Inferred groundwater contour (mAHD)
- Inferred groundwater flow direction

Proposed modification elements

- Hardstand
- Link road
- Haul road widening

Aquatic GDE groundwater interaction

- High potential
- Moderate potential
- Low potential

Terrestrial GDE groundwater interaction

- High potential
- Moderate potential
- Low potential

- Rail line
- Major road
- Minor road
- Named watercourse
- State forest

Groundwater receptors, contours and flowline analysis

Clarence Colliery and Charbon Colliery
Modification report
Figure 8.2

EMM
creating opportunities

g Conceptual groundwater model

A conceptual hydrogeological model has been prepared to illustrate the potential sources of groundwater and the movement of groundwater at Charbon (Figure 2.7 of Appendix H). Based on the model, it is noted that:

- rainfall infiltration on the mountainous areas leads to intermittent recharge of the coal seam aquifers and localised, ephemeral, perched water tables;
- rainfall recharge of the coal seam aquifers and seepage from the Third Entry Evaporation Dam could lead to a build-up of water in the underground coal seam workings;
- groundwater from the Permian Coal Measures aquifer intermittently seeps out of the eastern side of outcropping coal seams;
- seepage from CCR emplacement associated with the proposed modification could contribute recharge to the water table;
- there is limited hydrogeological connection of the regional Shoalhaven Group aquifer with the coal seam and alluvial aquifers; and
- groundwater depths are typically at least 30 m deep beneath the underground workings.

ii Surface water

a Overview

Charbon's mining lease and project site boundary extends across four local catchments which include Reedy Creek and Rileys Creek, draining to the north and west respectively, which are part of the Macquarie-Bogan River catchment, and the Stony Creek and Deep Creek catchments which predominantly drain to the south and are within the Hawkesbury-Nepean catchment.

The local surface water environment is described in detail in Section 2.2.6 of this MR and Section 2.4 of Appendix H.

b Surface water management

During mining, the Charbon surface water management system, comprising both clean and dirty water systems, relied on demands driven by usage of water from the CHPP and underground mining operations.

Charbon's existing surface water management system is summarised in Section 3.2.7 of this MR and shown on Figure 2.8 of Appendix H. The system is described in detail in the WMP and has progressively developed over the life of Charbon (including since the cessation of mining and commencement of rehabilitation).

c Surface water users

Downstream surface water users were identified by searching for licensed water users and domestic and stock rights users with a water supply work approval. Four lots in total with works approvals related to surface water were identified on Cumber Melon Creek downstream of Reedy Creek Dam and upstream of the Cudgegong River (Section 2.4.4 of Appendix H).

iii Potential transport of leached metals and metalloids

The potential transport of leached metals and metalloids from Clarence CCR was investigated to support the assessment of potential impacts on water resources. In lieu of laboratory solid/water-derived K_d values, partition coefficients were calculated using metal/metalloid concentrations from REA6 CCR and the average dissolved concentrations recorded in LD3 leachate at Clarence. Calculated K_d values for REA6 CCR and LD3 leachate are listed in Table 2.13 of Appendix H and indicate that cobalt, manganese, nickel and zinc will be the most mobile metals.

8.4.3 Assessment of impacts

i Overview

The aim of the impact assessment was to quantify the potential risk of the proposed modification causing a change to the existing groundwater and surface water environment.

The construction activities described in Section 4.2.2 (ie hardstand pad, link road, haul road widening and new powerline poles) are not anticipated to have any impacts on the existing groundwater environment and were not considered in the assessment.

ii Methodology

A source-pathway-receptor model was adopted and analytical groundwater methods were used to determine potential impacts to the groundwater system from the proposed CCR emplacement activities. The models considered the 'pathway' portion of the source-pathway-receptor model and consisted of:

- 1D unsaturated modelling, which was used to estimate the time taken for water at the surface to recharge the regional groundwater system; and
- solute transport modelling, which was used to estimate the transport time and quantity of solutes from Clarence CCR seepage that may reach the regional aquifer and travel down-hydraulic gradient towards groundwater receptors.

The modelling assumptions are discussed in detail in Section 4.2 of Appendix H and include:

- the plume of solutes is a static source (ie not dissipating over time) with a constant thickness that occurs in the regional aquifer directly below the potential seepage source;
- all emplacement areas will generate or contain the solutes of interest; and
- chemical reactions which could reduce the concentration of the solutes in the groundwater were not modelled, which effectively assumes the aquifer has no buffering capacity.

iii Groundwater flow

Given the absence of detailed unsaturated zone hydrogeological properties in the area, a single 1D unsaturated model was developed to represent the expected average conditions. Six model scenarios were prepared representing a range of possible hydraulic parameters and recharge fluxes (ie rainfall recharge, hydraulic conductivity and aquifer porosity). The scenarios are detailed in Section 4.2 of Appendix H.

The 1D unsaturated model scenarios estimate that water from the surface will take between four and ten years to reach the regional groundwater system, with higher modelled rainfall recharge, hydraulic conductivity and porosity leading to shorter infiltration times.

iv Groundwater quality

To model a 'worst-case' scenario, the dissolved contaminant species were assumed to be present at all of the emplacement areas and would dissolve in percolating water (ie rainfall and/or emplacement seepage). This is a theoretical worst-case scenario, as Clarence CCR is considered to be no worse in quality (ie concentration of metals and acid generation potential) than material on-site at Charbon currently being used for rehabilitation and only certain samples show indications of AMD.

The solute concentrations used as model inputs were calculated using leachate concentrations from LD3 at Clarence (downslope of REA6) and Charbon's Main REA and Northern REA to represent the potential range of source concentrations that may be expected following placement of Clarence CCR at Charbon (Table 8.8).

Two different model scenarios were considered:

- An 'ideal' scenario with solute that encounters no impedance to movement. For this scenario, the effects of adsorption and chemical reactions have been ignored and the model estimates movement of the solute due to advection (movement with groundwater flow) and dispersion only.

- A sorptive scenario, which is considered to be more realistic and takes into account the effects of sorption of solutes onto the aquifer surfaces during solute transport.

Model receptor distances were chosen to represent the range of receptors down-gradient of the proposed CCR emplacement areas. These are shown in Figure 8.2 and include:

- landholder bore GW800781, which is the closest receptor to the proposed CCR emplacement areas at approximately 0.9 km from the Western Open Cut and 8 Trunk Open Cut;

- landholder bore GW804127, which is the furthest receptor from the proposed CCR emplacement areas at approximately 7.9 km from the 8 Trunk Open Cut; and

- Carwell Creek, which is approximately 3.2 km from the Western Open Cut at its closest point

The ideal solute transport scenario estimated the time taken for solute to travel 0.9 km (the shortest distance between one of the proposed CCR emplacement areas and an identified, down hydraulic gradient, groundwater receptor) to be between 10 and 120 years. Higher modelled hydraulic conductivity and lower effective porosity led to shorter transport times.

For all modelled scenarios, the estimated concentration reaching the receptor is approximately 5.6% of the source concentration. Using the shortest transport time to reach the nearest receptor as representing the 'worst-case' scenario, solute from the 8 Trunk Open Cut is predicted to first reach GW800781 after 14 years and to approach an equilibrium concentration with the aquifer groundwater after approximately 26 years.

The results in Table 8.8 are presented for the closest receptor (GW800781 - Figure 8.2) where the shortest travel times and maximum solute concentrations are expected to occur. Predicted solute concentrations have been compared to ANZECC (2000) long-term irrigation guidelines due to the prevalence of groundwater being used for this purpose in the vicinity of Charbon. The long-term irrigation guideline values are presented in Table 2.9 of Appendix H.

Table 8.8 Equilibrium solute concentrations at the source and closest receptor (GW800781)

Analyte	Clarence LD3		Charbon Main REA		Charbon Northern REA	
	Median source concentration (mg/L)	Receptor concentration (mg/L)	Median source concentration (mg/L)	Receptor concentration (mg/L)	Median source concentration (mg/L)	Receptor concentration (mg/L)
Aluminium	21.4	1.2	9.1	0.5	0.01	0.0006
Arsenic	0.005	0.0002	0.001	0.00006	0.001	0.00006
Cobalt	11.9	**0.7**	0.03	0.002	0.0015	0.00008
Manganese	102	**5.7**	17.1	**1.0**	2.4	0.1
Nickel	30.0	**1.7**	0.10	0.006	0.01	0.0006
Zinc	18.9	1.1	1.8	0.1	0.04	0.002

Note: **Bold** and grey cells exceed the long-term irrigation (ANZECC 2000) guideline values at GW800781 only.

Under the worst-case model scenario, cobalt, manganese and nickel concentrations are predicted to exceed the long-term irrigation guidelines (ANZECC 2000) at the closest receptor (GW800781) following equilibrium between the solute and aquifer water quality (Table 8.8).

It is noted from Table 2.9 of Appendix H that the regional groundwater is naturally high in manganese. Therefore, an increase in groundwater manganese concentrations as a result of the proposed modification may not represent an impact to the beneficial use of groundwater at the receptors close to Charbon.

The ideal scenario modelling is conservative since no attenuation (eg due to sorption) has been taken into account and solute transport under this scenario may be considered as the worst-case estimate. To provide more realistic predictions of solute transport, a sorptive scenario was also developed. The results of the sorptive scenario predict solute transport to the closest receptor (GW800781) to take at least 400 years, with equilibrium between the solute and aquifer water quality only reached after at least 1,300 years. Results from this model scenario are included in Appendix H.

Clarence CCR geochemistry is comparable to Charbon overburden. In addition, the large transport times modelled and the small percentage of solute reaching the receptors indicate that the risk of heavy metals and other contaminants being transported to and discharged at the groundwater receptors as a result of the proposed modification is low.

The beneficial use of groundwater at receptors close to Charbon is not expected to decrease as a result of the proposed modification.

v Surface water

Construction and operational activities, including physical changes to land cover and storage of CCR containers on the hardstand pad, may increase the risk of impacts on, or changes to, surface water hydrology and the receiving environment in terms of both water quality and quantity. Potential impacts on the surface water environment are:

- contamination of surface runoff due to proposed construction activities;
- increased runoff volumes and discharge rates due to increased local impermeable areas;

- increased concentrations and loads of suspended solids and other contaminants mobilised in runoff from the hardstand and road developments (ie link road and haul road widening); and
- potential for contamination of receiving waters due to accidental leaks or spills.

The proposed construction activities will result in the removal of vegetation and disturbance of soils. This could contribute to:

- an increase in sedimentation in receiving waters (ie if runoff from construction areas is laden with coarse sediment); or
- an increase in total suspended solids and turbidity in receiving waters (ie as a result of an increase in fine and/or dispersive sediments that will not readily settle under gravity).

In the absence of effective management and mitigation measures, these impacts are likely to be limited to a relatively local scale (eg localised increase in surface erosion and scour impacts). However, the scale of impacts and associated consequences could become more extensive if appropriate management and mitigation measures are not implemented.

The use of Clarence CCR in ongoing rehabilitation activities at Charbon is only expected to result in a change in impacts on the surface water environment if there is a significant change in the hydrological properties and characteristics of Clarence CCR when compared with Charbon overburden.

It is assumed that the emplacement and rehabilitation process and final landform design will remain unchanged from that which is approved under SSD 08_0211 and the MOP (Centennial 2019a). Charbon's MOP will be updated to reflect the changes proposed as part of this modification.

The hydraulic performance and rainfall-runoff responses of the rehabilitated landforms at Charbon will remain consistent with that which is approved under SSD 08_0211. Therefore, impacts to receiving surface water environments have not been considered as part of this MR. It is assumed that impacts will be assessed (where required) as part of any future amendments to the MOP (and associated rehabilitation strategies) and/or WMP.

8.4.4 Mitigation and management

i Rehabilitation design

As described in Section 8.3.4, a deep multi-layer moderate hydraulic conductivity cover will be used in all areas receiving Clarence CCR to limit infiltration of water (and upward migration of salinity) both into, and from, the Clarence CCR.

ii Groundwater monitoring

Groundwater monitoring at Charbon will include:

- continued monitoring of groundwater quality at existing monitoring bores PB2 and PB3;
- visual inspections as part of monthly site inspections at temporarily backfilled adits for signs of groundwater seepage; and
- installation of monitoring bores down gradient of each emplacement area and upgradient of receptors (ie a total of three bores).

The exact location of the monitoring bores will be confirmed prior to the commencement of CCR importation and due diligence assessments will be completed prior to installation.

Monitoring will be undertaken at PB2, PB3 and the three new bores on a quarterly basis for two years and annually thereafter and will target the Shoalhaven Group aquifer. Groundwater monitoring criteria will include the following parameters:

- physical: groundwater level;
- physicochemical: dissolved oxygen, EC, pH, total dissolved solids (TDS);
- major ions: alkalinity, calcium, chloride, magnesium, potassium, sodium, sulfate; and
- metals (dissolved): aluminium, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, cerium, chromium, cobalt, copper, erbium, gallium, iron, lead, lithium, manganese, mercury, molybdenum, nickel, rubidium, selenium, silver, strontium, thallium, thorium, tin, titanium, uranium and zinc.

The WMP will be updated to include regular monitoring of groundwater quality at these locations in order to detect potential changes to groundwater quality.

The current groundwater trigger is a complaint by an adjacent landholder regarding groundwater quality or level in their bore, as detailed in the WMP. A robust set of trigger values will be determined following collection of baseline groundwater quality in the areas downgradient of the emplacement areas. The trigger values adopted will be an early warning of potential groundwater contamination occurring from the proposed CCR emplacement areas.

The groundwater TARP (Table 5.5 of Appendix H) will be updated following two years of baseline data collection from the proposed monitoring bores.

iii Surface water

The management and mitigation of potential surface water impacts as a result of the emplacement of Clarence CCR at Charbon will remain consistent with the principles of the WMP. Water management measures incorporated in the existing rehabilitation plans for the Western Open Cut, 8 Trunk Open Cut and Central Open Cut Box Cut include:

- maintaining adequate drainage between the rehabilitated areas and sediment basins; and
- maintaining the integrity of the sediment basins and surface water management infrastructure to ensure they do not overtop.

Surface runoff and stormwater controls associated with the handling and pre-placement storage of Clarence CCR will be implemented to:

- minimise the risk of contamination of stormwater from construction and operational activities;
- manage stormwater runoff from the hardstand area and road development and upslope clean water areas reporting to stormwater management system receptors; and
- contain accidental leaks or spills.

Surface water monitoring, trigger values and performance criteria for Charbon are outlined in Section 5.5 of Appendix H and include inspections of existing water management structures and sediment control structures for capacity, structural integrity and effectiveness.

Discharges from Charbon's LDPs will continue to be undertaken in accordance with EPL 528 requirements and the water quality of discharges will be managed within or below EPL 528 limits.

Charbon's existing WALs provide sufficient capacity for the ongoing transfer of water to Airly, as well as ongoing rehabilitation and closure activities.

8.4.5 Conclusion

Analytical groundwater methods have been used to determine potential impacts to the regional groundwater system. The large transport times modelled and the small percentage of solute reaching neighbouring receptors indicate that the risk of metals/metalloids and other contaminants being transported to, and discharged at, neighbouring groundwater receptors as a result of the proposed modification is low. The beneficial use of groundwater at receptors close to Charbon is therefore not expected to decrease as a result of the proposed modification.

Management measures are proposed to reduce potential for contamination to occur as a result of the importation of Clarence CCR both prior to arrival on-site at Charbon and as part of ongoing rehabilitation activities. A deep multi-layer moderate hydraulic conductivity cover will be implemented to reduce water infiltration and keep material dry if some of the emplaced material is PAF.

Groundwater and surface water monitoring and management will continue at Charbon in accordance with the WMP, which will be updated to include regular monitoring of groundwater quality at five locations in order to detect potential changes to groundwater quality.

By implementing the proposed management measures, the residual impacts of the proposed modification on the groundwater and surface water environment have been assessed to be low risk.

8.5 Transport

8.5.1 Overview

A level crossing impact assessment for the proposed modification was prepared by EMM (Appendix I). The assessment:

- reviewed of the rail network, existing train frequency and relevant statutory planning policies;
- identified issues or constraints at each level crossing between Clarence and Charbon;
- assessed the capacity of the existing rail network to accommodate the proposed transport of CCR; and
- determined the future level crossing traffic delay for vehicular traffic as a result of the proposed transport of CCR by train.

8.5.2 Existing environment

i Rail network

The rail network between Clarence and Charbon (Figure 8.3) is jointly managed by Sydney Trains and John Holland and includes four sections:

- Airly to Charbon - Country Rail Network (heritage trains and Centennial freight trains);
- Wallerawang to Airly - Country Rail Network (heritage trains and Centennial freight trains);
- Lithgow to Wallerawang – Sydney Trains (passenger and freight trains); and
- Lithgow to Clarence (Newnes Junction) – Sydney Trains (passenger and freight trains).

John Holland is responsible for the maintenance and operation of the Country Rail Network.

ii Train movements

a Airly to Charbon

There are approximately two train movements daily (one in each direction) on the Country Rail Network line between Airly and Charbon (associated with water deliveries from Charbon to Airly). A heritage train uses this section of the line infrequently.

b Wallerawang to Airly

There are approximately four train movements daily (two in each direction) on the Country Rail Network line between Wallerawang and Airly (associated with coal deliveries from Airly to Lidsdale Siding, Port of Newcastle or domestic power stations). A heritage train uses this section of the line infrequently.

c Lithgow to Wallerawang

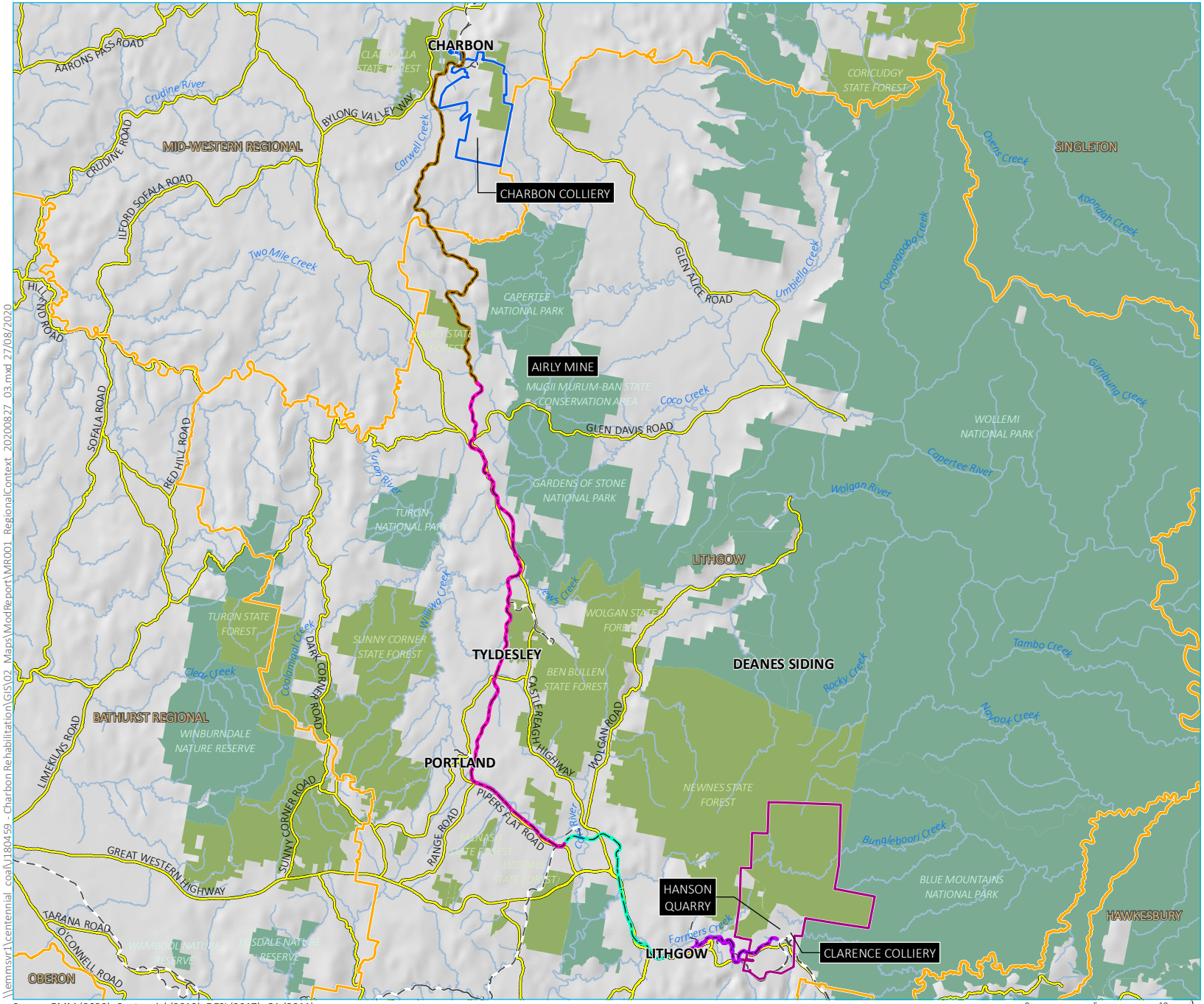
The existing daily train movements on the Main Western line between Lithgow and Wallerawang are significantly greater than between Wallerawang and Airly/Charbon and are summarised in Table 8.9.

Table 8.9 Daily train movements between Lithgow and Wallerawang (two-way total)

Train type	Weekday	Weekend
Freight (excluding coal)	10	6
Freight (coal only)	4	4
Passenger	11	11
Total	**25**	**21**

d Lithgow to Clarence (Newnes Junction)

On the Main Western line, there are eight Sydney and NSW passenger trains each way that stop at Lithgow daily, with five trains continuing further to and from the west and three trains travelling only between Lithgow and Central Station in Sydney. The Indian Pacific long-distance passenger train between Sydney and Perth also operates on selected days each week.



KEY

- Clarence Colliery holding boundary
- Charbon Colliery project site boundary
- LGA boundary
- Rail line
- Main road
- Watercourse
- NPWS reserve
- State forest

Sections of the rail network

Country rail network

- Airly to Charbon
- Wallerawang to Airly

Sydney trains

- Lithgow to Wallerawang
- Lithgow to Clarence Colliery (Newnes Junction)

Source: EMM (2020); Centennial (2019); DFSI (2017); GA (2011)

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Rail network between Clarence Colliery and Charbon Colliery

Clarence Colliery and Charbon Colliery Modification report

Figure 8.3

EMM creating opportunities

iii Level crossings

An inspection of the level crossings between Charbon and Clarence was carried out on 5 and 6 May 2020. Twenty-one operational level crossings were identified along the rail line between the two operations (Figure 1.2 to Figure 1.6 of Appendix I), each with one of three control types:

- passive crossings;
- active – flashing lights and bells; and
- active – boom barrier, flashing lights and bells.

The inspection record and inventory details of each level crossing are included in Appendix A of Appendix I. The current type of level crossing control and associated road and rail traffic volumes is summarised in Table 8.10.

Table 8.10 Control type and existing traffic and train volumes at level crossings

Level crossing ID	Level crossing location	Type of control	Daily road traffic volume range[1]	Existing daily train movements
Clandulla 1	Canary Street, Clandulla	Passive -stop signs	50–100	2
Clandulla 2	Cooper Drive, Clandulla	Active (boom barrier, flashing lights and bells)	150–300	2
Clandulla 3	Flatlands Road off Brogans Creek Road, Clandulla	Passive -stop signs	Less than 20	2
Weenga	Minor road off McDonalds Hole Road, Weenga	Passive -stop signs	Less than 20	2
Torbane 1	Minor road, Torbane	Passive -stop signs	Private and service traffic only[2]	4
Torbane 2	Minor road, Torbane	Passive -stop signs	Private and service traffic only[2]	4
Ben Bullen 1	Castlereagh Highway, Ben Bullen	Active (flashing lights and bells)	500-1,000	4
Ben Bullen 2	Red Springs Road, Ben Bullen	Passive -stop signs	Less than 20	4
Ben Bullen 3	Minor road south of Red Springs Road, Ben Bullen	Passive -stop signs	Service traffic only[2]	4
Cullen Bullen	Portland Cullen Bullen Road, Cullen Bullen	Active (flashing lights and bells)	500-1,000	4
Portland	Williwa Street, Portland	Active (flashing lights and bells)	Approximately 1,000	4
Pipers Flat 1	Minor road off Pipers Flat Road near Range Road, Wallerawang	Passive -stop signs	Less than 20	4
Pipers Flat 2	Minor road off Pipers Flat Road, Wallerawang	Passive -stop signs	Less than 20[2]	4
Wallerawang 1	Minor road off Pipers Flat Road near Irondale Road, Wallerawang	Passive -stop signs	Less than 20	4
Wallerawang 2	Minor road off Pipers Flat Road, Wallerawang	Passive -stop signs	Less than 20	4
Wallerawang 3	Minor road off Pipers Flat Road, Wallerawang	Passive -stop signs	Less than 20[2]	4

Table 8.10 Control type and existing traffic and train volumes at level crossings

Level crossing ID	Level crossing location	Type of control	Daily road traffic volume range[1]	Existing daily train movements
Wallerawang 4	Minor road off Pipers Flat Road, Wallerawang	Passive -stop signs	Less than 20	4
Wallerawang 5	Pipers Flat Road, Wallerawang	Active (flashing lights and bells)	3,000-4,000	4
Marrangaroo	Oakey Forest Road, Marangaroo	Active (boom barrier, flashing lights and bells)	500-1,000	25
Bowenfels 1	Minor road off Great Western Highway, Bowenfels	Passive -stop signs	Less than 20	25
Bowenfels 2	Geordie Street, Bowenfels	Active (boom barrier, flashing lights and bells)	Approximately 2,000	25

1. A 10 minute count of road traffic movements was undertaken at each level crossing to estimate daily range of road traffic volume.
2. Inaccessible during site inspection.

As there are no level crossings between Clarence (Newnes Junction) and Lithgow on the Main Western line, no operational impacts are expected to occur on this section of the rail network as a result of the proposed modification and it has not been considered further.

8.5.3 Assessment of impacts

i Proposed rail movements

The proposed transport of CCR from Clarence to Charbon will be via one loaded train daily (ie two train movements with the empty train returning to Lithgow Siding after unloading before travelling to Clarence). Trains will stop or idle at Clarence for approximately 2.5 hours for loading and shunting and at Charbon for approximately 3.5 hours for unloading and shunting.

The average line speeds for the proposed CCR train operations were calculated based on the proposed route lengths and train operating details. The range of typical train operating speeds at various locations along the line between Lithgow and Charbon will generally be between 40 km/hr and 60 km/hr, with trains generally travelling faster in the northbound (uphill) direction.

ii Level crossing delays

For the purpose of the level crossing impact assessment, a typical average train passing speed for all level crossings was assumed to be 40 km/hr for laden trains and 60 km/hr for empty trains. This corresponds to each CCR train taking approximately 53 seconds (loaded) and 36 seconds (empty) to pass each level crossing. This translates into overall delay times of approximately:

- 101 and 84 seconds for laden and empty CCR trains, respectively, at active level crossings; and
- 66 and 49 seconds for laden and empty CCR trains, respectively, at passive level crossings.

The existing and proposed average number of vehicles delayed at a level crossing each day can be calculated as the product of the daily vehicle traffic and the likelihood a delay will occur at any given time of the day. The average daily number of vehicles delayed for the existing and proposed total two-way train movements were

assessed at the busiest level crossings along each section of the route between Lithgow and Charbon (Table 4.6 of Appendix I).

On the three busiest roads on each section of the assessed route (ie Geordie Street, Pipers Flat Road and Cooper Drive), which are controlled by active level crossings, the additional number of daily vehicles likely to be affected by the additional level crossing delays from the proposed CCR train movements will be:

- Bowenfels 2 (Geordie Street) - 4 additional daily vehicles affected (ie increase from 50 to 54 vehicles);
- Wallerawang 5 (Pipers Flat Road) - 8 additional daily vehicles affected (ie increase from 20 to 28 vehicles); and
- Clandulla 2 (Cooper Drive) - 0.7 additional daily vehicles affected (ie increase from 0.7 to 1.4 vehicles).

On the other roads where there is currently light traffic (eg Canary Street (Clandulla 1) and Red Springs Road (Ben Bullen 2)), which are controlled by passive level crossings, the average number of daily vehicles affected will be negligible.

Impacts to typical traffic flow and journey times each day for motorists travelling in these areas will be minor.

iii Level crossing safety

Operational safety issues on the rail network are most evident at level crossings where there is a potential collision risk between trains, road transport vehicles and/or pedestrians.

The level crossing safety of 21 level crossings between Clarence and Charbon has been reviewed (Appendix A of Appendix I). The existing level of safety (including either active or passive control) of all assessed level crossings is considered acceptable.

iv Rail network capacity

No capacity constraints with potential to affect the proposed CCR train movements have been identified on the assessed sections of the rail network (Section 3.3 of Appendix I).

8.5.4 Mitigation and management

No additional mitigation or management measures are required to address the potential impacts of the proposed modification on the rail network.

8.5.5 Conclusion

The highest average number of additional daily vehicles delayed at an active level crossing as a result of the proposed train movements will be 8 vehicles per day for which a typical additional delay of between 84 and 101 seconds will occur. At the majority of the existing passive level crossings, daily traffic volumes are sufficiently low that there will be a negligible number of daily vehicles affected by the proposed train movements.

The existing level of safety of all assessed level crossings is considered acceptable and no capacity constraints have been identified on the assessed sections of the rail network.

8.6 Other environmental aspects

An assessment of other environmental aspects as a result of the proposed modification is provided in Table 8.11.

Table 8.11 Potential impacts of the proposed modification

Environmental consideration	Impact assessment
Biodiversity	A BDAR waiver request has been prepared as part of the proposed modification (Appendix J). As a result of the proposed modification, approximately 0.04 ha of native vegetation will be cleared (Appendix J). This includes some scattered trees; however, these trees are not part of an EEC. Further, no threatened species or ecological communities or their habitat has been identified in the proposed disturbance area. The proposed modification will not impact the ecological value of the land within the project site boundary or its immediate surrounds. Ecology assessment and reporting are currently managed through the BMP. The BMP will continue to operate under the proposed modification.
Aboriginal cultural/historical heritage	The proposed areas for the additional construction activities have been extensively disturbed. Aboriginal cultural and historic heritage will continue to be managed in accordance with the ACHMP and HHMP, respectively. In the event that a previously unrecorded Aboriginal cultural or historical site is identified during the proposed surface disturbance works, the unexpected finds protocols included in the ACHMP and HHMP will be followed.
Waste	The production of waste will not increase as a result of the proposed modification. Construction waste generated as a result of the proposed modification will be removed from site in accordance with existing protocols by the construction contractor. Waste will continue to be managed in accordance with the EMS with all waste disposed of at a licenced waste management facility.
Land and agricultural resources	There is an approximately 74 ha parcel of land mapped as BSAL approximately 550 m north-east of the Northern REA and outside of the project site boundary at Charbon. There is no land mapped as BSAL within the project site boundary at Charbon and the proposed modification is not expected to adversely affect agricultural resources or industries within or adjacent to Charbon. No additional mitigation measures for potential impacts to land and agricultural resources are considered warranted. The EMS and erosion and sediment control plans will continue to operate under the proposed modification.
Traffic	The majority of plant, materials and equipment required to complete construction activities at Charbon are available on-site. Additional materials may be delivered to site via the local road network. No additional employees will be required during construction. The proposed modification will operate within the current assessed and approved limits for road traffic movements. Consequently, the proposed modification will not significantly change traffic impacts compared to approved operations at Charbon.
Rehabilitation	Ongoing rehabilitation at Charbon can be enhanced using a combination of Charbon overburden and Clarence CCR. As shown in Table 1.1, when compared with Charbon overburden, Clarence CCR is more suitable for fill and landform construction due to its physical properties, while the material available on-site is more suitable for the upper layers of fill and capping. Clarence CCR will be used as fill during ongoing rehabilitation of the Central Open Cut Box Cut, Western Open Cut and 8 Trunk Open Cut (Figure 3.2). Charbon's MOP (Centennial 2019a) will be updated to reflect the changes proposed as part of this modification. No changes to the approved final landform are required as part of the proposed modification.

Table 8.11 Potential impacts of the proposed modification

Environmental consideration	Impact assessment
Socio economics	A socio-economic impacts analysis was prepared by AIGIS (Appendix C) to address the potential social and economic effects of the proposed modification. The assessment also considered potential social and economic effects from the proposed modification to Clarence's DA 504-00. The potential social and economic impacts of the proposed modification will be limited. Works will be undertaken on an existing mine site and the amount of additional infrastructure required is limited. Where required, mitigation and management measures have been proposed to reduce potential impacts on sensitive receptors.
Greenhouse gas	An updated summary of GHG emissions from Charbon was completed by EMM (Appendix K). The GHG emissions sources considered in the assessment are listed in Table 2.1 of Appendix K and include scope 1, 2 and 3 emissions. Charbon is currently being rehabilitated. Therefore, there are no emissions related to coal mining (eg fugitive emissions from underground mining, combustion of product coal, transport of product coal, etc). Charbon Coal has also indicated that there is no sulfur hexafluoride (SF6), oils, greases or liquid petroleum gas (LPG) used at Charbon. Annual average GHG emissions (Scope 1 and 2) generated by Charbon in both the existing and proposed scenarios total 975 t CO_2-e per year, which represents approximately 0.001% of total GHG emissions for NSW and 0.0002% of total GHG emissions for Australia, based on the National Greenhouse Gas Inventory for 2018. Scope 3 emissions from Charbon are approximately 57 t CO_2-e per year under the existing scenario and 136 t CO_2-e per year under the proposed scenario. This increase is related to diesel used by trains to transport CCR from Clarence to Charbon in the proposed scenario. Mitigation of GHG emissions will continue to be conducted in accordance with the *Charbon Colliery Greenhouse Gas and Energy Management Plan*.

9 Evaluation of merits

A description of the need and justification for the proposed modifications is provided below with regard to biophysical, social and economic factors; the principles of ecologically sustainable development (ESD); and the consistency of the proposed modification with the objects of the EP&A Act.

9.1 Modification impacts

This MR examines the potential impacts that may result from the proposed modifications. The assessment of environmental issues has been multi-disciplinary and involved consultation with DPIE and other key stakeholders (including Lithgow City Council, Mid-Western Regional Council and Centennial's CCCs).

The proposed modifications will not result in significant environmental, social or economic impacts and this MR has identified that any residual impacts can be appropriately managed through proposed management measures and the existing EMSs at Clarence and Charbon.

9.2 Modification benefits

Centennial has identified an opportunity to transport CCR from Clarence to use for fill at Charbon. This would be a beneficial use of CCR that would otherwise be waste placed into the approved REAs at Clarence.

The combined use of Charbon overburden and Clarence CCR will allow Charbon Coal to be more selective when using material already available on-site and will provide an improved rehabilitation outcome compared to that which can be achieved under SSD 08_0211 and the MOPs. The importation and use of CCR will have minimal additional environmental impacts, as described within this MR, compared to the use of overburden alone.

The proposed modifications require only minor alterations to the handling and distribution of CCR at Clarence. Additional infrastructure to facilitate the proposed modifications will be limited to construction of a hardstand and link road at Charbon and minor road widening works on internal haul roads.

All aspects relating to environmental management will continue in accordance with DA 504-00 and EPL 726 (Clarence), SSD 08_0211 and EPL 528 (Charbon), the approved management plans and other elements of the development consents. Where existing management controls and mitigation strategies are not already in place to monitor, mitigate and/or manage the potential impacts of the proposed modifications, additional safeguards and monitoring have been proposed.

9.3 Ecologically sustainable development

Under Section 516A of the EPBC Act, Commonwealth organisations have a statutory requirement to report on their environmental performance and how they accord with, and advance, the principles of ESD.

Australia's *National Strategy for Ecologically Sustainable Development* (AGESDSC 1992), defines ESD as "using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased".

The principles of ESD, for the purposes of the EP&A Act, are provided in Clause 7(4) of Schedule 2 of the EP&A Regulation. The four principles of ESD are:

- precautionary principle – the precautionary principle states that 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;

- inter-generational equity – the principle of inter-generational equity is 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;
- conservation of biological diversity and maintenance of ecological integrity – the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making; and
- improved valuation and pricing of environmental resources – improved valuation, pricing and incentive mechanisms should be promoted.

The overall objectives of ESD are to use, conserve and enhance natural resources. This ensures that ecological processes are maintained facilitating improved quality of life, now and into the future. Centennial and Charbon Coal are committed to the principles of ESD and understand that biophysical, social and economic objectives are interdependent. Centennial and Charbon Coal acknowledge that a well-designed and effectively managed operation will avoid significant and/or costly environmental impacts or degradation.

Centennial has identified an opportunity to transport CCR from Clarence to use for fill at Charbon. This would be a beneficial use of CCR that would otherwise be waste placed into the approved REAs at Clarence.

Consideration has been given to appropriately identifying, avoiding, mitigating and managing environmental risks. Management measures have been identified to mitigate any residual impacts from the proposed modification. This demonstrates environmental due diligence and will provide for ongoing and adaptive monitoring and management of ongoing operations at Clarence and Charbon in line with the principles of ESD outlined in the following sections.

9.3.1 Precautionary principle

This MR has assessed the potential impacts of the proposed modifications on biophysical, social and economic factors based on on-site monitoring, historical data, laboratory analyses, modelling and surveys. This has included comparing the impacts of the approved operations with the potential impacts of the proposed modifications.

As described within this MR, a conservative approach has been adopted in considering the risks associated with the long-term emplacement of Clarence CCR in previous open cut mining areas at Charbon. All Clarence CCR will be treated as PAF material with the capacity to generate AMD and a deep multi-layer moderate hydraulic conductivity cover will be applied to any areas at Charbon that receive Clarence CCR.

Where existing management controls and mitigation strategies are not already in place to monitor, mitigate and/or manage the potential impacts of the proposed modifications, additional safeguards have been proposed.

9.3.2 Inter-generational equity

Centennial and Charbon Coal undertake ongoing environmental monitoring to provide effective environmental management across their existing operations. This management is provided through planning, communication, documentation, review and feedback. These environmental management measures ensure that the health, diversity and productivity of the environment is maintained or enhanced for future generations.

The improved rehabilitation outcomes will benefit current and future generations.

9.3.3 Conservation of biological diversity and maintenance of ecological integrity

The potential environmental impacts of the proposed modifications and the existing and/or additional measures to ameliorate these potential impacts are detailed in this MR. The proposed modifications are unlikely to cause any additional impacts to threatened species or EECs at, or adjacent to, Clarence and Charbon.

9.3.4 Improved valuation and pricing of environmental resources

Centennial has identified an opportunity to transport CCR from Clarence to use for fill at Charbon. This would be a beneficial use of CCR that would otherwise be waste placed into the approved REAs at Clarence.

Ongoing rehabilitation at Charbon can be enhanced using a combination of Charbon overburden and Clarence CCR. The combined use of Charbon overburden and Clarence CCR will allow Charbon Coal to be more selective when using material already available on-site and will provide an improved final landform compared to that which can be achieved under SSD 08_0211 and the MOPs. The importation and use of CCR will have minimal additional environmental impacts, as described within this MR, compared to the use of overburden alone.

9.4 Conclusion

The proposed modifications have been designed to avoid and minimise adverse biophysical, social and economic impacts. Appropriate management measures have been identified to mitigate any residual impacts from the proposed modifications. These management measures will ensure the importation and use of Clarence CCR will have minimal additional environmental impacts compared to the use of on-site material alone.

The proposed modifications are considered to be consistent with the relevant objects of the EP&A Act, including the principles of ESD, and will not change the nature of the developments originally approved. All aspects relating to environmental management will continue in accordance with DA 504-00 and EPL 726 (Clarence), SSD 08_0211 and EPL 528 (Charbon), various approved plans and other elements of the consents.

Abbreviations

ACHMP	Western Region Aboriginal Cultural Heritage Management Plan
AHD	Australian Height Datum
AMD	acid and metalliferous drainage
AQGHGMP	air quality and greenhouse gas management plan
AWS	automatic weather station
BC Act	NSW *Biodiversity Conservation Act 2016*
BMP	Western Region Biodiversity Management Plan
BSAL	biophysical strategic agricultural land
CCC	Community Consultative Committee
CCR	coarse coal reject
Centennial	Centennial Coal Company Limited
Charbon	Charbon Colliery
Charbon Coal	Charbon Coal Pty Limited
CHPP	coal handling and preparation plant
Clarence	Clarence Colliery
DAWE	Australian Government Department of Agriculture, Water and Environment
DCO	Development Control Order
DECC	Department of Environment and Climate Change
DPIE	NSW Department of Planning, Industry and Environment
EC	electrical conductivity
EEC	endangered ecological community
EIS	environmental impact statement
EMM	EMM Consulting Pty Limited
EMP	environmental management plan
EMS	environmental management system
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EP&A Regulation	NSW Environmental Planning and Assessment Regulation 2000
EPA	NSW Environment Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

EPL	environment protection licence
ESD	ecologically sustainable development
Forestry NSW	Forestry Corporation of NSW
GDE	groundwater dependent ecosystem
HHMP	Western Region Historic Heritage Management Plan
ICNG	Interim Construction Noise Guideline
JHR	John Holland Rail
km	kilometre
LDP	licensed discharge point
LGA	local government area
m	metre
Mid-Western Regional LEP	Mid-Western Regional Local Environmental Plan 2012
Mining Act	NSW *Mining Act 1992*
Mining SEPP	State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007
ML	mining lease
ML	megalitre
ML/year	megalitre per year
mm	millimetre
MNES	Matter of National Environmental Significance
MOP	mining operations plan
Mt	million tonnes
Mtpa	million tonnes per annum
NAF	non-acid forming
NMP	noise management plan
NPfI	Noise Policy for Industry
NRAR	Natural Resources Access Regulator
NSW	New South Wales
PAF	potentially acid forming
POEO Act	NSW *Protection of the Environment Operations Act 1997*
REA	reject emplacement area
RING	Rail Infrastructure Noise Guideline

ROM	run-of-mine
SEPP	State environmental planning policy
SIA Guideline	*Social impact assessment guideline for State significant mining, petroleum production and extractive industry development*
SRD SEPP	State Environmental Planning Policy (State and Regional Development) 2011
TARP	trigger action response plan
WAL	Water Access Licence
WM Act	NSW *Water Management Act 2000*
WMP	water management plan
WMS	waste management strategy

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